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GREENING CITIES WITH SPONGE CITY TECHNOLOGY: A VISION FOR THE FUTURE

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Abstract

In response to escalating global environmental concerns, particularly those surrounding climate change, contemporary urban development requires innovative approaches. The concept of a 'sponge city' has emerged as a pivotal strategy for fostering sustainable and cyclical urban ecosystems. At the heart of urban development lies landscaping, an arena that now calls for the integration of modern technology and novel materials. Incorporating the principles of the sponge city paradigm into landscaping practices holds the potential to optimize and enhance internal urban traffic and drainage systems. This ensures the robust functioning of urban drainage networks during the rainy season while judiciously managing water resources during drier periods. This symbiotic approach not only augments urban aesthetics but also engenders a positive impact on the broader ecological landscape.

1. Introduction

With the emergence of global warming and other ecological and environmental problems, human beings pay more attention to environmental problems at this stage, which also puts new demands on the construction of modern cities. The reasonable application of sponge city in urban ecosystem can promote the sustainable and circular development of urban ecosystem. Landscaping is the core construction in urban construction, and the modernization of landscaping also needs to integrate modern technology and new materials. The application of sponge city in landscaping construction can optimize and improve the urban internal traffic and drainage system, ensure the good operation of urban drainage system in rainy season, and "release" water resources in dry season, which plays a significant role in landscaping.

2. Overview of the sponge city technology

Sponge city, as its name implies, is to give the city the characteristics of sponge. The application of sponge city technology in urban landscaping projects can effectively use modern technology as an auxiliary means to turn the city into a sponge, which can effectively store and release water resources and achieve a state of freedom. Specifically, it is to effectively collect and store the precipitation in the city, and then release the stored water

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resources when the city encounters drought, so as to achieve the purpose of effectively storing water and releasing water reasonably. At the same time, in case of rainstorm, when the urban precipitation is particularly heavy and the urban drainage system is difficult to carry, it can make a reasonable response to the waterlogging situation in the city and can firmly absorb the water beyond the load of the original drainage system in the city, which can greatly reduce the possible natural disasters in the city. The application of sponge city technology has the same elastic characteristics as sponge, which plays a role in maintaining the ecological balance of the city and also plays a good auxiliary role in China's landscaping projects. Sponge city technology has played a positive role in the growth of trees, promoted environmental protection, and slowed down global warming[1]. Nowadays, with the acceleration of the construction of cities in our country, sponge city technology is also fully applied to the construction of urban landscaping projects, and it also plays an important role in improving the city's disaster resistance. Due to the effective application of sponge city technology in the greening process of landscape engineering, the greening progress and construction speed of urban landscape engineering in China have been greatly improved, and the construction quality of landscape engineering has been further optimized, which plays an important role in ecological balance and environmental protection in China.

3. The relevance between sponge city and landscaping project

It is particularly important to combine the sponge city construction with a good urban drainage system. A good urban drainage system can ensure the storage of natural water sources needed by urban residents in their daily lives, effectively integrate with natural forces in urban drainage, and release water well when the city needs it, which is conducive to meeting the development needs of the city. Nowadays, the key content of urban landscaping work is to effectively integrate the natural environment with urban construction[2].

Economic development is the most important part in the construction of modern cities, so the destruction of water circulation system is ignored. According to the demand part of the existing urban landscaping project, the water circulation system is set up, which is another effective explanation for the application of sponge city in urban landscaping project. By effectively combining with the plants and green space in the garden, we can build a sponge city, for example, we can effectively reduce the problem of water accumulation in the field. Green space can also automatically adjust water resources, just like sponge, which means that in the construction of sponge city, the degree of landscaping needs to be further expanded, so as to fully play the role of sponge city in a certain range. That is to say, the landscaping project is an indispensable and important content in the construction of sponge city, and landscaping is also inseparable from sponge city technology. The relationship between them complements each other and jointly promotes the development of the city in a better direction.

4. Current state of landscaping and sponge city

At this stage, with the continuous improvement of China's national strength and the continuous progress of economic development, the original imprisonment for modern urbanization has been broken, and the destruction of infrastructure existing and left over from the original urban construction has gradually begun to be paid attention to. The status of urban landscaping projects in urban construction has been improved, and the original landscaping construction has been unable to meet the demand for landscape construction in modern urban construction. Water resources occupy an extremely important position in the ecosystem, and the maintenance of urban ecological balance can not be separated from water resources. Only when water resources are well protected and utilized can they play their greatest role in urban landscaping construction and ensure the construction and sustainable development of ecocities. The effective application of sponge city technology in urban landscaping construction project can play a good auxiliary role in landscaping construction project, make the city use water resources as freely as a sponge, and guarantee the construction of urban landscaping project. Our country's

landscaping and sponge city are gradually developing in a better direction, and the problems existing at this stage will be solved in the future[3].

5. The concrete application of sponge city in the landscaping project

5.1. Application of scientific biological retention in sponge cities

The effective application of sponge city in landscaping projects can control the construction zone of biological retention to a certain extent, and it is the significance of biological retention to better control rainwater. The design principle of biological retention is to penetrate into the lower ground through plant system, soil and microorganisms, and at the same time, rainwater runoff can be used as equipment. Its purpose is to ensure that the whole structure can effectively regulate and control the rainwater, which can effectively prevent the rainwater from flowing too fast, effectively avoid the bad problems caused by rainwater infiltration, and greatly avoid the risk of natural disasters caused by rainwater infiltration. Through the scientific and effective utilization of vegetation and soil in landscaping, the effect of rainwater purification can be effectively improved, and then the urban water resources system can be effectively transferred, so that the expected or even unexpected effect can be exerted to the greatest extent, and the demand in the whole process of sponge city construction and operation can be well met, and the role and significance of biological retention can also be exerted.

5.2. Application of grassed swales greening in sponge city

Grassed swales ditch is widely used in urban landscaping, which can not only realize the purpose of landscaping, but also significantly enhance the value of sponge to a certain extent. The treatment method of garden grassed swales in landscaping is relatively simple. It only needs to plant plants into the surface ditch, which can effectively improve the water quality problems and achieve the expected effect of water absorption and drainage. Of course, in the grassed swales of urban greening gardens, it is also necessary to strictly select and identify the plant species and ensure that the selected plants can grow well in the ditch[4]. At the same time, its growth will not be affected by the stagnant water in the ditch, so that the efficacy of plants can be maximized. In this process, the overall coordination of plants also needs to be considered, so as to make the plants in the grassed swales have relevance and interoperability, and better play the greatest role for the construction of urban landscaping and sponge city.

5.3. Application of roof greening of sponge city buildings

The application scope of sponge city technology in urban landscaping projects is expanding, and the application effect is getting better and better. It can also play an important role in the construction of urban building roofs, which makes the greening of urban building roofs realized. Effective cultivation of the selected plants in the roof structure enables them to afforest the building roof, which can effectively regulate the rainwater, play an important role in controlling and reducing environmental pollution, and at the same time effectively purify the rainwater in this process. In the current landscaping projects in our country, the roof greening of urban buildings is particularly important. Greening the roof of urban buildings can not only achieve the effect of beautiful appearance, but also better build a sponge city, achieve the expectations of urban landscaping, and be conducive to environmental protection and ecological balance maintenance.

5.4. Application of sunken green space in sponge city gardens

The construction of sunken green space in landscaping works can effectively show the effect of sponge city operation, and at the same time ensure that all green spaces in urban landscaping can have super water absorption, just like "sponge". There are many benefits in the construction of sunken green space, which not only can maximize water absorption, but also has excellent water purification function, which can effectively improve the overall storage capacity and further enhance the rainwater treatment capacity of sunken green space. In order to

maximize the sunken green space, it is necessary to take effective scientific measures in urban landscaping, prevent the problem of black and smelly water bodies and create a good urban ecological environment[5].

6. Greening promotion measures of sponge city in landscaping project

6.1. Consider the ecological environment and define the construction purpose

In the urban landscaping project, it is necessary to first clarify the purpose of construction. The construction of sponge city needs to protect the environment in urban greening construction and maximize the effective utilization of resources. In urban greening design, designers need to give priority to urban ecological environment, and then need to optimize the ecological restoration of natural water systems, including lakes and rivers, which can greatly improve the utilization and efficiency of urban natural drainage systems[6]. The application of sponge city combined with modern scientific means in urban landscaping construction can also enhance the self-repair ability of the natural environment. Nowadays, with the global warming, people pay more and more attention to the natural environment on which they live, which requires environmental protection as the basic principle in urban construction and urban landscaping projects, and then meet the aesthetic and functional needs.

6.2. Optimize drainage design and improve water permeability

Compared with the original urban drainage system and urban storm flood management, the new generation of urban storm flood management is based on the development of environmental protection and functionality, which can also be said to be the essence of sponge city and an innovative new "technology" in the field of urban landscaping and the optimization of drainage system. Based on the problem of urban drainage system, it regulates the infiltration control and drainage control of natural rainwater well. In the traditional urban construction, the pavement construction mostly uses materials with insufficient water permeability. In this case, rainwater can not seep through the ground, but can only be discharged through underground pipelines, which makes the utilization rate of rainwater extremely low and does not store rainwater resources well. The construction of modern sponge city puts forward new requirements for pavement construction materials. Nowadays, the permeability of raw materials is paid more attention to in the selection of pavement materials, and the idea of high permeability of pavement construction is put forward. Changing the original materials in urban pavement construction into new water-permeable bricks with high water permeability, etc., can improve the water permeability in urban construction, effectively store and discharge rainwater, which is also the significance of sponge city, effectively stabilize the urban drainage system and prevent the formation of urban waterlogging[7].

Compared with the original urban drainage system and urban storm flood management, the new generation of urban storm flood management is based on environmental protection and functional development, which can also be said to be the essence of sponge city. It is an innovative new "technology" in the field of urban landscaping and the optimization of drainage system. Based on the problem of urban drainage system, it can adjust the infiltration control and drainage control of natural rainwater well. In the traditional urban construction, the pavement construction mostly uses materials with insufficient water permeability. In this case, rainwater can not seep through the ground, but can only be discharged through underground pipelines, which makes the utilization rate of rainwater extremely low and does not store rainwater resources well. The construction of modern sponge city puts forward new requirements for pavement construction materials. Nowadays, the permeability of raw materials is paid more attention to in the selection of pavement materials, and the idea of high permeability of pavement construction is put forward. Changing the original materials in urban pavement construction into new water-permeable bricks with high water permeability can improve the water permeability in urban construction and effectively store and discharge rainwater, which is also the significance of sponge city, effectively stabilizing the urban drainage system and preventing the formation of urban waterlogging.

6.3. Adapt to regional characteristics and build according to local conditions

Our country has a relatively vast territory, the geographical features in different cities are completely different, and the climate environment and hydrological environment are very different. The application of sponge city in urban construction in different regions is different. The application of sponge city in urban landscaping project is not only a single technology, but also needs to be built according to local conditions for different regional environments, and at the same time, it needs to be effectively combined with various modern technologies and materials, so as to give full play to the maximum utility of sponge city, assist urban landscaping and achieve the best ecological environment protection. For example, in the project of "Guangming Department of Shenzhen Experimental School" in Shenzhen, the construction of this project combines and applies a variety of modern technologies at the same time, thus making the landscape effect very good[8]. The peak reduction rate of external drainage encountered in the three years after its complete construction has reached 18%, and the impact on the historical waterlogging points of the original Niushan Road has been effectively reduced.

6.4. Strengthen garden construction and control project quality

Urban landscaping construction not only needs modern technology and sponge city technology as support, but also needs to put forward new requirements for engineering construction management personnel. In the landscaping project, project personnel, including managers, decision-makers and workers, all need to further improve their original professional level. It is necessary to improve the ideological and moral character, professional ethics and technical level of all personnel in the project to ensure that the comprehensive quality of all engineering personnel is improved. Secondly, the quality of construction materials in landscaping construction needs to be strictly controlled to ensure the quality of raw materials, accessories and finished products in the project. The manufacturers of materials should be optimized, the materials used in construction should be scientifically selected, and the storage and transportation work should also be strengthened. The performance parameters of the construction machinery and equipment are guaranteed to fully meet the needs of the project, and the landscaping design is carried out in combination with the actual situation of the city to ensure the technical feasibility and better urban greening construction[9].

7. Conclusions

With the improvement of people's living standards and the continuous development of science and technology, the problem of urbanization is gradually increasing. People have gradually realized the importance of environmental and ecological protection, and urban landscaping construction has gradually attracted the attention of all walks of life. The application of sponge city in urban landscaping construction is an important content of urban construction now and even in the future. Sponge city and urban landscaping construction are in a state of mutual assistance, which can improve the efficiency and quality of landscaping construction and is worth being widely applied and popularized.

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