

Study on the Management Strategy of Flood Disaster in China Based on the Construction of Sponge City

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Abstract In view of the serious flood disaster, the shortage of water resources and the deterioration of water environment, etc. the concept of the construction of sponge city is put forward in China. The construction of sponge city can not only absorb water and store water, effectively alleviate the phenomenon of urban water, but also the full use of rainwater, promote the ecological construction of the city. This paper explores the construction of China city's rainwater management based on the construction of sponge city, from the reasons of urban waterlogging formation to the prevention and control measures, and finally gives suggestions for the construction of sponge city.

Keywords Flood disaster; sponge city; control strategy; suggestion

Introduction

In recent years, one summer, floods throughout the country frequently occur, along with the occurrence of urban water logging, which seriously affect the normal life of residents, threatening the people's property security, but also affect the sustainable development of urban economy. Such as last year reported that some of the townships in Liping County, Guizhou Province, generalized heavy rain, causing serious national economy, people's lives and property losses.

Much of the city has this kind of situation, the rainy season will appear "The Flooding of Jinshan Temple", heavy rains, serious water logging disaster. However, some cities in the winter when the serious lack of water, many cities are facing severe water stress. In the development process, more cities to ignore the environmental carrying capacity, continued for many years the ecological balance is gradually broken, forming a more complex ecological water logging and water problems [2]. To achieve the city development and environmental resources coordination, the construction of a natural accumulation, natural infiltration, natural purification function of the sponge city, become the future direction of China's urban construction. This paper mainly introduces the construction of sponge city in China's urban flood disaster management process, the use of what strategy to prevent the formation of floods.

Overview of the sponge city

The concept of sponge city was first proposed in April 2012, "2012 low-carbon city and regional development technology forum", after the "sponge city construction technology guide" proposed sponge city construction, that is, to build low-impact development of the rain system, to enter the rain briefly stored up, slowly infiltration or pooled into the ecological water system, in reducing the burden of urban drainage at the same time, effectively improve the original municipal drainage facilities to withstand heavy rain, supplement the conservation of groundwater, rehabilitation spring and restoration of river Flow, restore the natural surface of the city surface environment [1]. Therefore, the definition of sponge city is: a new generation of urban rainwater



management concept, refers to the city in adapting to changes in the environment and response to natural disasters such as rainwater has a good "elastic", also known as "water elastic city". When it rains, the water will be absorbed, saved, infiltrated and purified. When necessary, the water will be "released" and to use, to enhance the function of urban ecosystems and reduce the occurrence of urban floods. The construction of the "green sponge", combined with the city's ecological security pattern, scattered storage and initial purification, get rid of the single view of urban rainwater management.

According to the letter of December 2014, the general secretary of Xi Jinping on "strengthening the sponge city construction" speech and work requirements, China to support the sponge city construction pilot work. In March 2015, a total of 16 cities to obtain sponge city qualifications, including Zhenjiang, Xiamen, Wuhan, Chongqing, Suining and so on. In April 2016, the second batch of pilot a total of 14 cities, Beijing, Tianjin, Shanghai, Sanya and other cities. In addition to Suining in Sichuan Province has been listed as a national sponge city pilot, the province will also be in five prefecture-level cities, 10 county-level cities to carry out provincial sponge city pilot and provincial sponge city project demonstration, so to point to face, Sponge city construction.

March 5, 2017 People's Republic of China Twelfth National People's Congress at the fifth meeting, Premier Li Keqiang government work report mentioned: the co-ordination of urban ground and underground construction, and then start construction of urban underground integrated corridor more than 2,000 kilometers, Start to eliminate the city focus on water logging section three years of action to promote the construction of sponge city, so that the city both "face", more "son."



Figure 1: Sponge city diagram

The Causes of Urban Waterlogging

External causes

Because the city vegetation is sparse, the pond is less, there is no storage of rainwater, led to the emergence of "catchment" phenomenon of formation water. And the emergence of heat island effect, resulting in increased



risk of rainstorms, precipitation concentrated; global climate change, extreme weather caused by frequent rainstorms, resulting in urban rain and flood problems become increasingly tense.

Intrinsic cause

Due to the rapid development of urbanization, impermeable area increased. Over the past 10 years, in the process of rapid urban development in China, many rivers and lakes were buried, thus weakening the natural water system on the regulation and acceptance of the rain. In some places for the beautiful city, the city Ming River change to blind ditch, significantly reduced the capacity of city rainwater. The rivers, ponds, gullies, depressions and other water systems on the urban land have been damaged, so that the urban water conservation and flood storage function weakened or even lost, resulting in a great change in the natural hydrological cycle[2]. In the case of a small drainage system alone, the design criteria for urban drainage pipelines are not enough to withstand the increasingly severe urban rain and flood problem; coupled with the old drainage network system is old and backward, resulting in frequent rainfall under the low-lying urban poor drainage, pumping station efficiency is reduced, the city water time is longer, water level deepened, and the frequency and severity of the occurrence of waterlogging are increasing.

Prevention and Control of Flood Disaster under New Concept

Construction of sponge city will have "sponge"[3]. City "sponge" not only includes the river, lake, pond and other water systems, including green space, garden, can penetrate the road such city facilities. Rainwater through these "sponge" infiltration, stagnation, purification, reuse, the last part of the runoff through the pipe network, pumping station efflux, which can effectively improve the city drainage system standards, mitigation of urban waterlogging pressure.

In the water shortage area will be the first use of permeable brick pavement, sunken green space, biological detention facilities, planting grass ditch and other measures to supplement groundwater, reduce ground runoff. Other areas will give priority to the use of wet ponds, rain wetlands, reservoirs and other measures, regulation, purification of rain, reduce runoff peak.

Build a large drainage system

As most of the city's pipeline standards are clearly not meet the extreme weather rainfall standards, by upgrading the drainage network capacity on the one hand transformation is difficult and costly, while the city is constantly evolving, relying solely on improving the pipe network standard is not an ideal Methods. Therefore, waterlogging prevention and control should explore ideas, not just rely on the existing pipeline system transformation and upgrading, but must build a large drainage system. The large drainage system is composed of pipe network system, river and lake water system and urban green space. Through the surface drainage channel and the underground drainage system, it is emphasized that the reduction and the convergence speed are reduced to solve drainage problems in extreme rainfall conditions.

According to the requirements of the construction of the sponge City, the drainage and waterlogging problems should be impounded together to consider. The place of detention should not only consider the impounded capacity of rivers and lakes, to come into the city green space, let the soil also form an important place of rainwater storage. Urban green space is a green space to maintain the ability of rainwater infiltration in the city. Previous studies ignored the Green function in preventing waterlogging area. In recent years, the sunken green space[4] (including rainwater garden, ecological planting grass ditch) as a low impact development measures, has become a new way to solve the problem of the present stage vigorously promote city rainwater, to allow rain through the green infiltration, reduction while reducing rain convergence speed. If the role of urban green space systematically and on large scale, it will has a very significant contribution to reduce the threat of waterlogging. According to the experience of flood control in developed countries, the large and small drainage systems of urban flood prevention and drainage plays an important role, so that the three functions of urban drainage network, urban river and Lake water system and urban green space can cooperate with each other to play its best combination function. Therefore, the rational planning of the layout of these three is to prevent the city waterlogging effective solution [5].



The use of new pavement materials

In the sponge city concept put forward, in order to solve the problem of urban waterlogging, Shenzhen Lute new material company developed a new road pavement material - High Viscosity Asphalt. LT-HVA is a special high-viscosity asphalt modifier developed by Luther Company in order to meet the requirements of the construction of sponge city in China. The appearance of yellow or black particles, the use of the way you can add to the matrix asphalt in the preparation of high viscosity asphalt or directly added to the stone mixed production of high viscosity asphalt mixture. High viscosity asphalt prepared with LT-HVA is mainly used for paving drainage asphalt pavement, high viscosity color permeable asphalt pavement, stress absorbing layer, deck pavement waterproofing adhesive layer, high viscosity asphalt SMA.

Drainage Asphalt pavement (commonly known as OGFC pavement) is a kind of interconnected gap with the open-level mixture of pavement, mainly the use of gradation adjustment using coarse particles between the porosity increased to about 20%, so that on the road Moisture can be quickly removed by a large number of voids, to avoid the road surface water and the formation of water film on the pavement to improve the anti-skid performance of the road to reduce the rain splashing water. It has excellent drainage, anti-skid, noise reduction and other functions, as a safe, environmentally friendly ecological asphalt concrete pavement new technology, can be a good solution to problems in highway construction.

At present, Suining City, Sichuan Province is in accordance with the "rain is not water, heavy rain is not waterlogging, water is not black and smelly, heat island has to alleviate" the goal, accelerate the construction of sponge city. The pilot area of the project is 25.8 square kilometers, and it is planned to complete all construction in 2017. The following figure is a completed project picture.



Figure 2: Pedestrian walk in Suining City Hedong New Area on a permeable green road



Figure 3: The staff in the Suining City Hedong New Area test gravel penetration of the water absorption effect



The use of permeable bricks

Water permeable bricks is a very important "sponge" for the construction of sponge city. It is characterized by high permeability, high heat dissipation, eco-friendly, anti-skid noise reduction, anti-freeze and thaw resistance, easy to clean and maintain. It can be widely applied to the district courtyard, pedestrian trail, green space and park square and other construction, also can be applied to the highway along the road stone, ladder stone; river embankment slope protection, parking lawn tiles and so on.

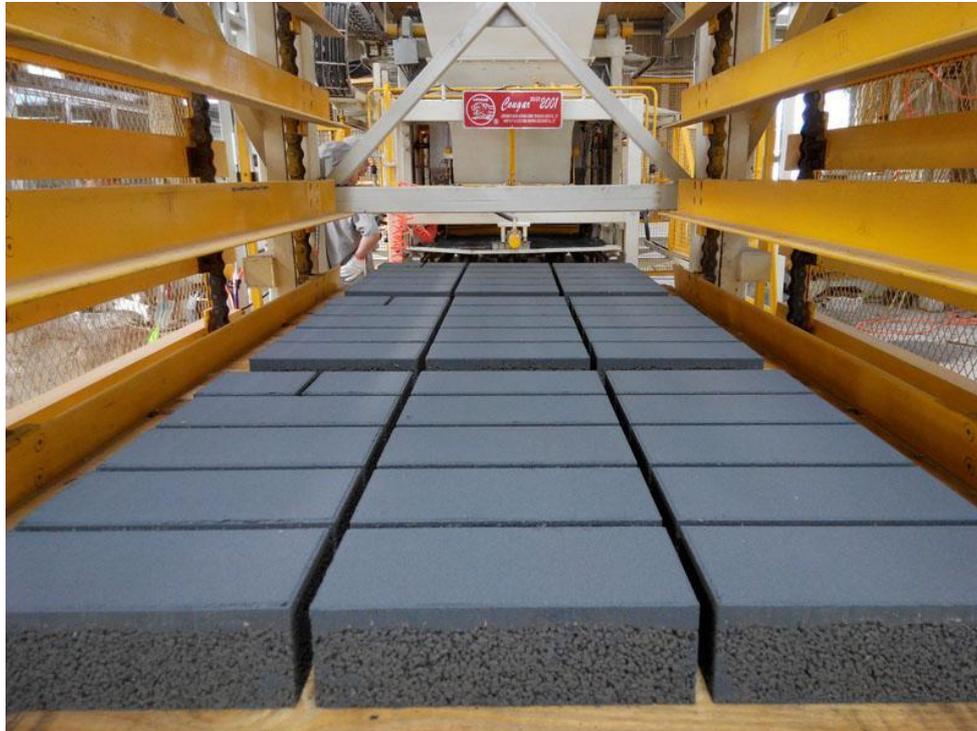


Figure 4: Prefabricated water permeable brick

Suggestions

Sponge city is a higher stage of the development of modern cities, popularization in the country has become an inevitable trend [6], combined with domestic and international experience in the construction of sponge city, in order to achieve a more harmonious coexistence between man and nature, reduce the destruction of urban ecological water network, the following suggest:

1) Reasonable planning, early control. In the urban planning development stage, the macro to grasp the development of the city, the right to rainwater management issues to be demonstrated, the land use and rainwater use, runoff control, the overall control to solve the problem of urban rain. In the case of pre-planning, land use activities are limited to the classification of land and the destruction of natural rainwater systems. In order to ensure the integrity and function of the ecological water network structure, it is necessary to avoid the separation of the water system boundary. In order to ensure the integrity and function of the ecological water network structure, the water system space which is important for urban ecological drainage is not only to be avoided, , In key areas and key points, the establishment of bridges, increase corridors, to maintain the continuity of the natural ground.

2) Use the ability to adjust the economy. The necessary economic measures for the urban rainwater use and runoff control, have a greater role in promoting. It is proposed to unify the restoration and restoration of urban natural drainage system and urban development, and effectively carry out the ecological and economic integration. Through the establishment of various types of preferential measures, such as the establishment of rain and sewage charges system, rain and rainwater purification incentive mechanism, limit damage, incentive protection, reasonable organization of urban construction, social benefits and overall benefits combined.

3) Improve the relevant system regulations. The development of local rules and regulations to promote the use of rainwater and rainwater runoff pollution control into the legal track. With the increasing rainwater project



and the further development of the project, it may produce new problems, improve the relevant policies and regulations, should deal with rainwater utilization and rainwater runoff pollution control and other work to be standardized, and need to clear the objectives of rainwater management, tasks, scope.

4) Strengthen publicity, and strengthen public awareness. Public participation is essential, including the training of urban managers, the education of urban residents, etc., is to solve the problem of urban rainwater support, rainwater project is also an important measure to promote. The process of public participation is the process of collision, integration and coordination of various interest groups, which is conducive to improving the scientific and rationality of planning decision-making and promoting the smooth implementation of sponge-based urban strategy.

Conclusion

To prevent floods, should not only emphasize on the drainage, and to discharge, storage combination, give the city ecological leave room to increase the water rate and green rate, to develop a reasonable rainwater management planning strategy can effectively protect the city from floods, it is guaranteed the city has the ability to withstand the devastating weather at the same time for the city to provide more blue and green space. The theory of sponge city is put forward to meet the needs of the development of the city, which is based on the practice of numerous urban planning practice. In order to ensure the continuous progress of the sponge city construction process, we need the whole society to participate in the implementation of the whole process of urban planning and construction to ensure that this concept can give full play to its improvement of urban water environment and the role of urban ecological environment.

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