

Analysis of Sponge City Construction Problems and Countermeasures

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Abstract: With the acceleration of urbanization, various urban problems have become increasingly prominent, particularly the frequent "urban inland sea" phenomenon during heavy rainfall. The primary cause is the inadequate sewage pipeline system, which makes cities prone to waterlogging, especially during the rainy season. Additionally, water pollution has become a significant challenge for the country. In this context, how to efficiently utilize precipitation resources has become a critical concern for many cities, leading to the emergence of the "sponge city" concept. This concept aims to mitigate urban water management issues through natural storage, infiltration, and purification of rainwater. However, the construction of sponge cities faces numerous challenges, such as unreasonable urban planning, insufficient funding, and incomplete management systems. This paper will thoroughly explore the potential problems encountered in the construction of sponge cities and propose corresponding countermeasures to provide more effective solutions for sustainable urban development and water resource management in the future.

Keywords: Sponge City; Construction; Issue; Countermeasures

1. Introduction

The construction of sponge city is the main transformation and development of Baicheng's innovative development concept. It is the idea of sponge city construction to implement the people-oriented business philosophy, implement the people's expectations for a happy life, promote the development of urban ecological governance and ecological wisdom, ensure the core value of green and stable development of urban green living conditions, and establish a conservation-oriented, green environmental

protection and eco-environment-safe social development with a balanced population. At present, there are many problems in the construction of sponge cities in China, such as core concepts, management systems, overall planning, management mechanisms, and implementation.

2. The Connotation and Role of Sponge City

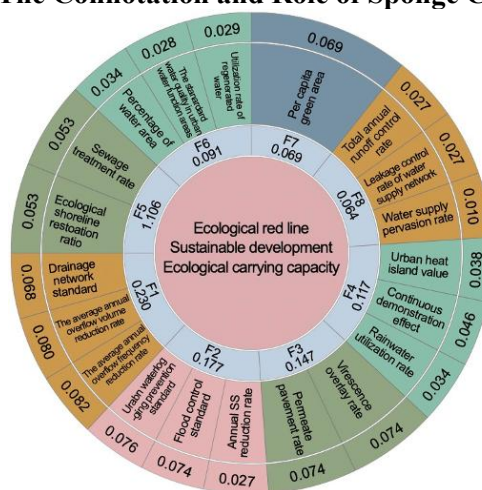


Figure 1. Ecological Carrying Capacity of Ecological Red Line

Sponge city is a new idea of urban stormwater management. Cities can be as resilient as sponges in the face of environmental pollution and heavy precipitation caused by flooding. When the urban surface runoff is sufficient, the road surface can effectively and efficiently store this water resource through digestion and absorption, infiltration, water filtration, etc. When urban water resources are scarce, the stored water resources can be released and utilized, so as to complete the rational arrangement of water in the urban ecological system and reduce urban waterlogging safety accidents. The actual effect of building a sponge city mainly includes these aspects. Figure 1 shows the ecological carrying capacity of the sustainable development of the ecological red line.

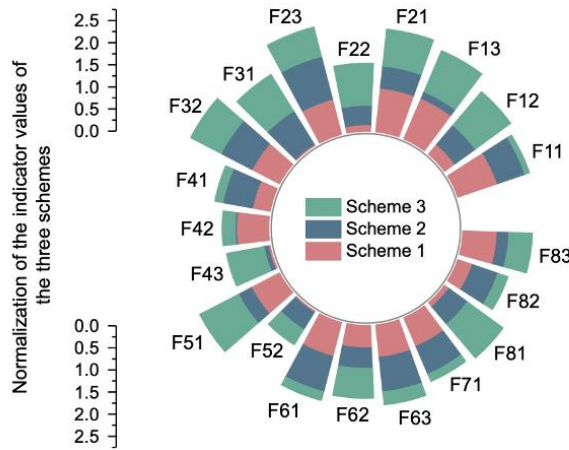


Figure 2. Normalization of the Index Values for the Three Schemes

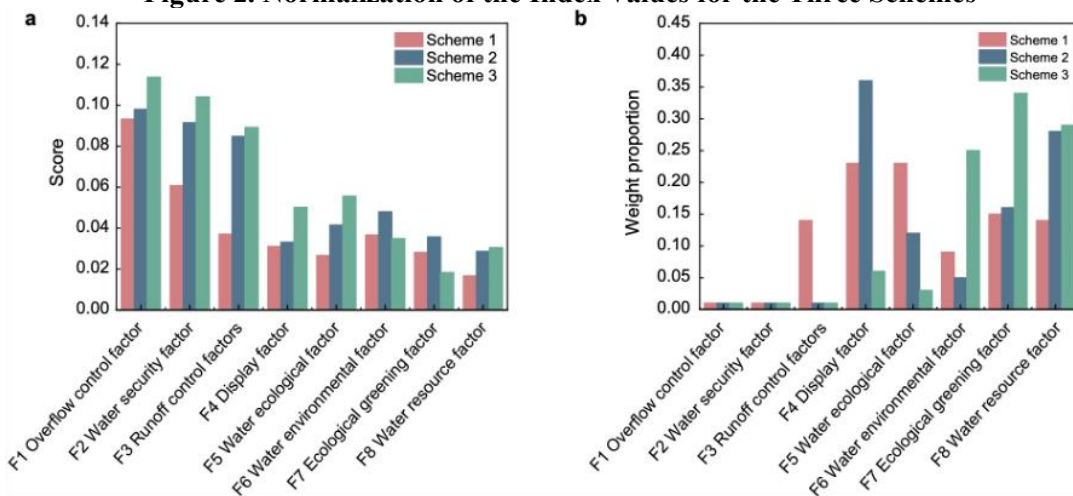


Figure 3. The Three Scheme Factor Scores and the Weights

First, the core concept of alleviating urban waterlogging and building a sustainable sponge city is usually to solve the problem of excessive rainfall in cities. The idea of relying solely on outdoor drainage pipes and sewage pipes in pump rooms, scientifically and rationally using the urban ecological model to store and drain water, and taking into account the adjustment of human factors and ecological adjustment, has alleviated the situation of urban waterlogging. Second, the establishment of a good water circulation system to prevent urban soil erosion can not only effectively improve the urban waterlogging situation, but also rectify a major problem of lack of water and water pollution in China, and establish a good water circulation system for the city. Third, improve the urban landscaping and ecological environment, when building a sponge city, scientifically and standardize the division of urban ground and residential area ground, improve the green coverage rate, and adopt permeable pavement on the ground to expand the urban water circulation system. In addition, the construction of the

sponge city will expand the construction of wetland parks and gardens, and enhance the beautiful natural garden landscape design for the city. Specific data indicators are shown in Figure 2 and Figure 3.

3. Problems in the Construction of Sponge Cities in China

3.1 The Fragmentation of Urban Construction Planning

Sponge city is a set of system software, which not only includes the whole process of overall planning, control system design, engineering project construction, management information system, implementation and operation, but also closely related to the natural conditions, topography, topography and soil stratification underlying surface of each city, and is a unity. Therefore, in the planning and construction of sponge cities, we should try to be based on reality and long-term, and formulate scientific, standardized, reasonable and effective long-term plans and standards. However, due to some

taking the existing water quality of the city as the design framework, and other reasonable layouts combined with the actual development level of the city. However, the development trend of urban construction in China is backward, the construction of sponge city is also relatively backward, the iterative update rate of building outstanding talents and basic knowledge is slow, and the lack of specific case scientific research in China's scientific and technological personnel has caused the sponge city to start late in the construction stage and the construction difficulty is high. Once the funds are insufficient, the progress of sponge city construction may slow down, and the enthusiasm and support rate of giants for sponge city construction may weaken to a certain extent.

3.4 Understand One-Sidedness and Operational Rigidity

Sponge city is a comprehensive service platform, which embodies the diversified and multi-scale characteristics of sponge city construction by infiltrating, detention, storage, purification, use, and emission. However, judging from the current construction plans and results of some cities, there are still problems of one-sidedness, stiff muscles in the operation process, and unclear understanding. For example, when some cities formulate sponge city implementation plans, they separate the six words and implement separate project arrangements, which is obviously unscientific. Some cities are affected by the danger of foreign stormwater management methods, and regard sponge urban infrastructure as equivalent to low-hazard development, and some even recognize sponge city infrastructure as a water landscape project one-sidedly, ignoring the close integration of urban fire elements and urban environment. In the process of sponge city construction, some cities ignore the close connection and coupling relationship between various functional equipment, such as rainfall regularity, total runoff output, pollution control and drainage and flood prevention indicators are not completely different and separate in the rainwater intelligent management system, but are relative and interactive with each other, which is a unity. The one-sided perception of the rigid practical operation in the construction of sponge city will not only make the sponge city infrastructure deviate from the target track, but also easily cause a negative impact on the sponge city

infrastructure, and cause fraud and misjudgment to the evaluation work.

4. Analysis of Specific Countermeasures for the Construction of Sponge City

4.1 Restore Urban Wetland Systems and Improve Stormwater Control Capacity

The wetland park operating system is an extremely important living conditions and an industrial base for the survival and development of animals and plants, which is called the "kidney of heaven and earth", which has powerful effects such as regulating part of the climate, beautifying the environment, and alleviating flood disasters.

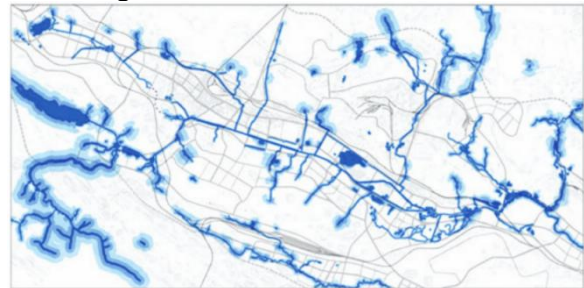


Figure 5. A Case of Urban Water Resources Display Diagram

However, with the rapid urbanization of cities, many natural wetlands have been damaged due to the rapid expansion of cities to nearby cities. In addition, the total urban population has increased significantly, resulting in the natural environment air pollution of domestic waste disposal, which reduces the overall ecological role of the wetland park. Therefore, it is imperative to implement proactive preventive measures to restore the urban wetland park system and control stormwater capacity. Figure 5 shows the water ecological layout of a city.

4.2 Plant Lots of Greenery

With the acceleration of urbanization, the vast majority of urban land resources are occupied by developers, and there is too little greenery available. In order to facilitate the development of cities, we should actively face various problems. The government must reduce the construction of urban buildings and increase the planting of urban greenery again. Effectively promote tree planting on the road, expand the total area of road greening, build as many ecological parks and tourist attractions as possible with plant communities, and avoid asphalt roads with aquifers as much as possible.

Only in this way can many plant communities in the city infiltrate and digest and absorb rainwater when the urban rainwater is relatively large or the city is waterlogged [2]. If you can't use urban landscaping, rooftop greening is possible. It is also the key to promoting greening construction, giving full play to the effect of rainwater storage, further promoting ecological protection, energy conservation and consumption reduction, reducing the urban heat island effect, and completing better greening construction.

4.3 Innovate the Institutional Mechanism for the Construction of Sponge Cities

In the construction of sponge city, scientific system and mechanism innovation has played a very important role, which can be more standard construction projects. The infrastructure construction of sponge city can not be understood only from the aspect of engineering design, but should be regarded as the main project to deepen the reform, upgrade the old system, create a new system, combine ecological technology with the design of the administrative management system, the optimization and reorganization of the competent department, and the fine management, and coordinate the complex relationship between all aspects must be coordinated in the overall joint force formed by the close connection and interaction of ecological rationality, ecological wisdom, ecological system, ecological technology, and ecological culture. First of all, in the construction of sponge cities, planning should be the basis, and planning should be institutionalized, and there should be no subjective, casual, and short-term problems. It is necessary to build a spatial planning system for sponge cities through the scientific preparation and planning of high environmental strategic assessment, pay attention to the sustainability of the layout, ensure the innovation, comprehensiveness, scientificity and enforceability of the overall planning of sponge cities, and introduce consultative democratic rules and regulations in the process of building sponge cities [3]. The construction of sponge cities is directly related to the legitimate rights and interests of many residents, and in daily work, it is necessary to build a system of deliberation and deliberation with the participation of multiple subjects, the organization of the Chamber of Commerce, the supervision mechanism and the accountability

system. In the process of urban life and management, residents are the main body, and the subjectivity and participation of residents play a very important role in the process of sponge city construction. As the owners of the city, residents have the right to autonomously, express and decide on the infrastructure construction of Haimian City. The foothold and focus of sponge city construction are all to provide services to residents, and from the perspective of the city, it is adapted to the times.

4.4 Take Advantage of the City's Topography

When the rainy season comes, the flow of water in the relatively high-lying area is generally not likely to cause waterlogging in the city, but the water flow is to converge from the area with strong terrain to the relatively low-lying area, from separation to convergence into a stream, accompanied by a larger and larger drop, the potential produced is getting higher and higher, and the destructiveness is also very large. Therefore, in the high-terrain area, attention should be paid to the measures to prevent urban waterlogging, and when the ecological park and city square are built, the garden waterscape equipment and reservoirs, ponds, etc., should be built, so that the water flow of the high-terrain can be buffered and stored in the process of dripping downward, so as to reduce the water flow to the main stream and reduce the pressure of the main stream dredging work. The lower terrain areas are flooded by the high terrain, and the middle and lower reaches are washed by water or rivers into low-lying areas, which usually contain a lot of gravel waste. Those areas usually have a good retention effect but are not suitable for habitation, not only have the effect of blocking and depositing upstream and downstream water, but also have the effect of relieving the flow speed of rivers and water flows, and relieving the pressure of middle and lower river embankments. However, these areas are usually smoothed out in the construction process of the city, and they are not used better. In practice, great attention should be paid to its efficacy in ensuring the infiltration and volatilization of the hydrological and hydraulic circulation system. Use its own importance in ecological and environmental protection, and double as a landscape park to increase its intrinsic value. On the contrary, this kind of area is not reasonably arranged by the overall planning, and all kinds of garbage accumulated

on the ground will cause environmental pollution to the soil layer over time, and the structure of land resources will change, which will also have a negative impact on the water quality and land in the middle and lower reaches.

5. Conclusion

In short, sponge city construction is not only a key transformation and development of sustainable urban development, but also a measure for the implementation of sustainable development. At the same time, in the construction and management of sponge cities, it is necessary to pay attention to the application and implementation of modern science and technology, and closely integrate with the national smart city construction pilot, because the construction of sponge city is the integration of information technology such as big data technology, Internet of Things technology, cloud computing technology, etc., and it is difficult to achieve the most primitive detection of the main parameters is relatively easy to complete. In the future, the sponge city can be built through the technology of smart city, integrate GIS network to build an intelligent platform for water management and drainage management, promote the creation of a perfect data management system according to the intelligent monitoring system of the Internet of Things, actively find problems, and implement a real-time monitoring system, so that the city can respond quickly and deal with water problems intelligently and flexibly.

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