ISSN: 1813-4890

Review and Prospect of Urban Waterlogging Decision Support System

Mi Tang

School of Southwest Petroleum University, Chengdu 610000, China;

Abstract

The urban waterlogging decision support system has the characteristics of reasonable, fast, and accurate auxiliary decision-making, which can comprehensively improve the ability of urban flood control and waterlogging control. This paper systematically reviews the research progress and application of urban waterlogging decision support systems in various large and medium-sized cities, points out the problems of low data accuracy, narrow research scope, and slow model calculation speed in the current system research and application, and looks forward to future development trends. It proposes to strengthen the collection of multi-source data on urban waterlogging Strengthening the integrated prediction and prediction of river basin and urban floods, as well as optimizing the overall calculation speed of the model, and other various solutions.

Keywords

Urban waterlogging; decision support system; system development.

1. Introduction

With the rapid development of the economy and society, urbanization is advancing rapidly, and human activities have a significant impact on the underlying surface and the characteristics of production and flow. In the context of global climate change, the high concentration of population and wealth has led to increasingly serious flood disasters.

Urban waterlogging is caused by heavy or continuous precipitation exceeding the city's drainage capacity, resulting in waterlogging disasters within the city. The root cause is not only the waterlogging itself, but also closely related to urban development and drainage systems. In order to solve the problem of urban waterlogging, relevant departments have been committed to the construction of urban drainage and rainstorm waterlogging prevention facilities by combining engineering measures with non engineering measures.

On the basis of organizing relevant literature in the past 20 years, this article systematically reviews the research status and application of urban waterlogging decision support systems, analyzes the problems in current research on urban waterlogging decision support systems, and provides prospects for the future.

2. Research status of urban waterlogging decision support system

Urban waterlogging involves the three-dimensional monitoring data of rainstorm and flood as well as the interconnected information of multiple departments. The rapid collection and fusion processing of multi-source data is of great significance for urban flood control and waterlogging control decision-making.

Chang et al. [1] used fusion technology of multi-source and multi-scale remote sensing data to evaluate the availability of water resources in urban areas, which can better support regional

sustainable planning; Mohamed et al. [2]Using remote sensing data fusion technology and combined with geographic information systems, the groundwater potential zones in the Qena Valley of Egypt were classified; Rokni et al. [3] proposed a method based on pixel level image fusion and A new method for monitoring surface water changes combining image classification technology can generate sharpened multispectral images while highlighting the changing areas and providing high-precision results; Jiang Rengui et al.

3. Application of Urban Waterlogging Decision Support System

In recent years, urban management has increasingly attached importance to the application of urban waterlogging decision support systems in flood prevention and control. Multiple cities have developed waterlogging decision support systems and achieved significant results.

The China Academy of Water Resources and Hydropower Sciences has implemented an urban flood control and embankment management system in Anqing City, which can monitor flood conditions, process information such as engineering conditions, dangerous situations, and disaster situations, as well as analyze flood control scheduling and formulate emergency plans. [4] Wang Jing et al. [5] developed a flood risk map management system for the urban area of Lianyungang City based on GIS technology, providing the function of drawing and analyzing flood risk maps, providing a basis for flood control decision-making and flood risk management in Lianyungang City. Wang Haozheng [6] designed the flood prevention early warning, command and dispatching system of Zhenjiang City, which provides decision-making basis for urban drainage management departments to formulate pre flood prevention plans, conduct emergency command of dispatching in the rain, and analyze ponding problems after the rain.

4. Problems in the Development and Application of Urban Waterlogging Decision Support System

4.1. Insufficient timely update of information on urban underlying surfaces and engineering construction

China's urban construction is in a stage of rapid development, and the conditions of urban underlying surfaces and pipeline network conditions are constantly changing. Currently, the existing urban waterlogging decision-making system lacks a mechanism for updating and maintaining relevant data, which can easily lead to urban waterlogging simulation not accurately reflecting the actual situation and affecting the accuracy of analysis.

4.2. The research scope needs to be further expanded.

At present, research on urban waterlogging decision-making systems mostly focuses on individual cities or even central areas as spatial boundaries, mainly focusing on rainwater and flood management within cities. Research on the interaction between cities and watersheds is relatively rare. From the characteristics of urbanization evolution and the causes of floods, it can be seen that floods outside the watershed constrain the scale of urban drainage and have a significant impact on urban waterlogging management. The research scope of urban waterlogging decision-making system needs to be further expanded.

ISSN: 1813-4890

5. Research prospects of urban waterlogging decision support system

5.1. Strengthen the research on the collection methods and fusion technologies of multi-source data on urban waterlogging.

In view of the fact that urban waterlogging involves rainstorm and flood stereoscopic monitoring data and multi department interconnection information, there are massive, multi-source, heterogeneous, redundant and other characteristics. According to the demand for urban waterlogging decision-making and calculation, research on multi-source data collection technology, and fusion and mining of real-time data can improve the effectiveness and accuracy of data.

5.2. Establish a mechanism for updating and maintaining basic information such as the underlying surface of urban waterlogging systems and engineering construction.

Based on the overall urban planning, land use planning and other planning achievements, as well as the real-time construction situation of the city, timely update relevant basic data when there are significant changes in the underlying surface conditions or engineering conditions of the city, providing basic support for urban waterlogging simulation.

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