Urban waterlogging risk assessment based on the coupling land surface hazard-pregnant features and underground pipe network operation characteristics

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January 20, 2022

Abstract

Urban waterlogging becomes a challenge with the higher urbanization. This paper aims to assess waterlogging risk in the high-tech district of Zhengzhou city in China by coupling land surface hazard-pregnant (LSHP) features and underground pipe network operation (UPNO) characteristics. The LSHP risk is assessed according to the regional surface features firstly, and then with the UPNO characteristics by the Storm Water Management Model (SWMM), the conduit, junction and inundation risk indices are proposed to evaluate UPNO risk. Based on the LSHP risk and UPNO risk, the integrated waterlogging risks of different land use types are evaluated with rainstorm in different return periods (such as 1, 3, 5 and 10 years) and the "7.20 rainstorm event". The results show that the LSHP risk is not matched with the UPNO risk of each sub-region. From downtown to suburb, the LSHP risk increases first and then decreases, while the UPNO risk decreases. Combing with the LSHP and UPNO risk indices, the urban waterlogging risk is fully revealed, and it indicates that the study area can effectively resist rainstorm with return periods of 1 and 3 years. But for rainstorm with return period of more than 3 year, the rainwater will occur in the whole area. With the situation of the "7.20 rainstorm event", the anti-waterlogging engineering will be almost lost their functions. Generally, the waterlogging risk is higher in the northwest and southeast of the downtown and it becomes smaller in the suburbs.

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