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# Construction of Urban Green Infrastructure (GI) Based on Waterlogging Security Pattern: A case study on Jiaozuo City

Kai WANG*, Yan WU, Can ZHAO

**Abstract:** Coordinating the spatial layout of green infrastructure (GI) and its functional coupling with the rainstorm process in a comprehensive way is an important way to solve the problem of urban flood disasters. Taking Jiaozuo City, Henan Province as an example, by establishing the SCS Hydrological Model, the flood-producing areas, potential runoff corridors and confluence nodes in the study area are identified, the potential inundation range of rainstorms under different rainfall frequency is simulated, and a rainstorm security pattern is established to macroscopically indicate the key positions for urban flood control. Starting from the perspective of site suitability, combined with terrain data, hydrological data, socio-economic data and the rainstorm security pattern, an urban adaptive planning method for suitability evaluation of green infrastructure construction based on rainstorm process simulation is proposed, providing a new optimization path for reconstructing the spatial pattern of regional green infrastructure. The results show that the central urban area of Jiaozuo City is relatively safe due to terrain advantages. The areas with extremely high rainstorm risk and high rainstorm risk total 10.5 $km^2$, which are mainly distributed along the river channels, posing a greater flood risk to the counties under the jurisdiction of the southeastern part of the city. The suitable areas for GI construction show two characteristics of distribution along rivers or lakes and concentrated distribution. The extremely high suitability areas, and high suitability areas account for 12.3% of the total urban area, are mainly concentrated in the large tracts of farmland in the east of Wuzhi County, the south of Xiuwu County and Wen County.

**Keywords:** green infrastructure; rainstorm process simulation; suitability evaluation; spatial pattern

## 1 INTRODUCTION

The rapid urban intensive construction has led to an increased hardening degree of underlying surface and drastic changes in urban land use/cover. The various functions of the hydrological ecosystem have been significantly weakened, resulting in an increasing frequency and intensity of rain-flood disasters across the country [1]. However, the traditional "fast-drainage" engineering pipe network model can no longer solve urban rainstorm problems and is difficult to exert multi-objective comprehensive effects such as rainwater resource utilization and ecological landscapes. Green infrastructure (GI) is a network of interconnected natural areas and other open spaces and is a "natural life support system" that provides ecosystem services [2]. Green infrastructure emphasizes the use of large-scale wetlands, green corridors and other methods on a larger scale to replace traditional gray infrastructure [3] to achieve the goals of controlling regional storm runoff and restoring the sound development of hydrological and ecological systems. How to scientifically layout green infrastructure through scientific planning methods with regional suitability is an important issue for realizing sustainable rainstorm management.

In existing studies, conducting rainstorm simulation, suitability evaluation of GI construction, spatial identification and visual expression have become an important foundation for realizing rainstorm management on a watershed scale [4]. Among them, rainstorm process simulation based on hydrological models can identify rain-flood runoff generation areas, confluence corridors, confluence nodes and inundated areas [5-8]. However, the site selection of GI not only depends on the results of rainstorm process simulation but also on other aspects such as terrain, vegetation coverage, and social economy. It is necessary to construct an evaluation system for the suitability of GI layout based on rainstorm security and screen out spaces that play an important role in maintaining the stability of the water ecosystem, so that the evaluation results are more in line with the actual construction needs of GI, and then reconstruct the green space pattern of the watershed to guide and optimize existing urban planning and development.

In view of this, this paper uses Geographic Information System (ArcGIS) and SCS hydrological model to simulate and quantify urban rainfall, runoff, and inundated areas; it constructs a suitability evaluation system for GI layout from three aspects of natural conditions, rain-flood safety, and social economy; and proposes the construction idea of GI of "delimiting the research scope - rainstorm process simulation - extracting 'inundated source area + runoff corridor' - suitability analysis of GI - land use identification". The research results are conducive to guiding the division of rainstorm control zones and the site selection of GI, and providing an urban planning path reference for systematically promoting urban sustainable rainstorm management in the whole domain.

## 2 OVERVIEW OF THE STUDY AREA

Jiaozuo City is located in the northwest of Henan Province, between 34°48′N and 35°30′N latitude, and 112°32′E and 113°38′E longitude, with a total area of 4071 square kilometers. It governs four counties (Xiuwu County, Bo'ai County, Wuzhi County, Wen County), administers two county-level cities (Qinyang City, Mengzhou City), and has four districts (Jiefang District, Shanyang District, Zhongzhan District, Macun District). Jiaozuo City is bordered by the Taihang Mountains to the north and the Yellow River to the south, situated in the transitional zone between the Taihang Mountain Range and the North Henan Plain. The terrain is higher in the north and lower in the south, with significant variations in topography and diverse landforms. The climate is variable, and the city faces a higher risk of urban flooding, with a history of frequent flood disasters. Within the city's jurisdiction, there are more than 50 rivers of various sizes, over 10 medium and small reservoirs, and the central route of the South-to-North Water Diversion Project passes through the middle of the city. In 2016, Jiaozuo City was designated as a pilot city for sponge cities in Henan Province, with the aim of establishing a natural drainage system for urban flood prevention and management to ensure the safe development of the city.

## 3 DATA AND RESEARCH METHODS

### 3.1 Data Sources and Preprocessing

Digital elevation data of Jiaozuo City with a resolution of 30 meters of GDEMV2 and a satellite image map of Landsat 8 with a precision of 30 meters in May 2021 are obtained from the Geospatial Data Cloud of the Chinese Academy of Sciences (http://www.gscloud.cn/). The soil classification map of Henan Province at a scale of 1:200000 by county is downloaded from the National Earth System Science Data Sharing Platform. The administrative boundary map of Jiaozuo City, the topographic map at a scale of 1:100000, and Google maps are used for the interpretation and accuracy correction of remote sensing images. ArcGIS is used to process DEM data to obtain the elevation, slope, and aspect analysis maps of Jiaozuo City. Land-use classification followed the FAO Land Cover Classification System (LCCS) with localized adaptations. Five categories were defined: construction areas, farmland, forest land, unused land, and water area. The classification map (Fig. 1) was generated by integrating supervised classification and visual interpretation of Landsat 8 satellite imagery.

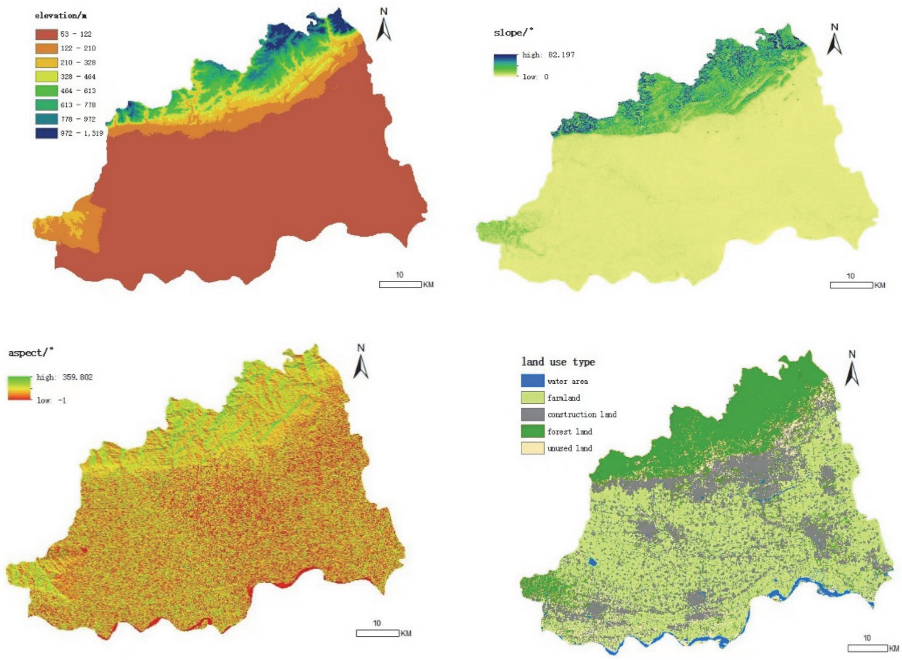


**Figure 1** Geographic information and land use classification map of Jiaozuo

### 3.2 Research Ideas and Methods

First, by simulating rain-flood runoff and the inundation process of Jiaozuo City under different return periods of rainfall, analyzing the key issues of urban hydrological characteristics and the occurrence mechanism of rain-flood disasters, and extracting the safety pattern based on the rainstorm process, the environmental factors that affect and restrict the construction of green infrastructure are screened from three aspects of rainstorm security, natural conditions, and social economy, and a suitability evaluation system for GI construction based on rain-flood management is established. Finally, from a comprehensive perspective on the urban scale, connecting river and lake water systems, green corridors, and protecting and restoring wetland systems, a green infrastructure construction pattern that conforms to the natural process of water is constructed. The overall research framework is shown in Fig. 2.

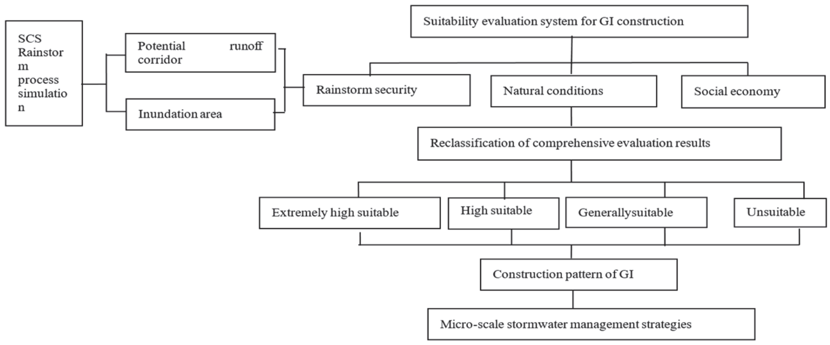


**Figure 2** Research ideas and technical framework

### 3.2.1 Rainstorm Process Simulation

The land use data obtained by interpreting remote sensing images is in the form of rasterized planar information. Therefore, the grid-based SCS hydrological model is selected to simulate the runoff process. The study uses DEM data to divide the catchment area within Jiaozuo City and generates a total of 22 catchment sub-areas (hydrological response units HRUs). According to the precipitation data from 1980 to 2014 of Jiaozuo meteorological station, the Pearson-III distribution curve has the best fitting effect on the theoretical frequency of rainstorm intensity [9]. Therefore, this paper uses the Pearson-III distribution curve to calculate the precipitation with a design duration of 24 hours and recurrence intervals of two years, ten years, and fifty years ($P$ = 10 $a$, 50 $a$, 100 $a$) in Jiaozuo City, which are 85.2 mm, 169.9 mm, and 251.1 mm respectively.

A distributed hydrological model for constructing the SCS model is used to estimate the rainstorm flow in Jiaozuo City under different recurrence intervals [10]. The final expression of the rainfall-runoff relationship of the SCS model is:

$$Q=\begin{cases}\dfrac{\left(P-I\alpha\right)^2}{P+S-I\alpha}, & P\geq I\alpha\\ 0, & P<I\alpha\end{cases}$$

$Q$ is the runoff (mm); $P$ is the total amount of one rainfall (mm); $S$ is the maximum possible retention amount (mm) of the basin; $Ia$ is the initial loss (mm). The model designer introduces the following formula to determine $S$:

$$S=\frac{25400}{CN}-254$$

According to the hydrological model , the $CN$ value is a dimensionless parameter of underlying surface factors such as land use type, soil type, and antecedent soil moisture condition, which directly affects the accuracy of the model. Determining the $CN$ value of the study area is the primary task of runoff simulation. According to the $CN$ value table for urban areas provided by the Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture [11], the $CN$ values were calibrated using local soil characteristics and historical flood data. The model outputs were validated against the observed runoff records from Jiaozuo hydrological stations (2010 - 2021), with the model achieving the Nash-Sutcliffe efficiency (NSE) of 0.78, confirming model reliability. A sensitivity analysis of the $CN$ value was conducted through field surveys and soil moisture adjustments. Varying the $CN$ value within ±10% resulted in a 12 - 15% change in runoff volume, indicating moderate sensitivity and underscoring the necessity of precise parameter determination.

Calculate the rainfall time step as 24 hours, and take the recurrence period as 2$a$ and 10$a$. Calculate the area-weighted average $CN$ value of each catchment unit under these conditions, obtain the runoff volume and total water volume. Conduct rainstorm inundation analysis through the GIS volume module to obtain the rainstorm inundation range.

### 3.2.2 Suitability Evaluation for GI Construction

This paper employs a suitability evaluation method based on vertical ecological processes to assess the suitability levels for GI construction. The selection of evaluation factors adheres to the principles of "relevance, independence, and quantifiability" [12], and refers to related research [13-15]. Nine ecological environment factors are sequentially selected from three aspects: rainstorm security, natural conditions, and socio-economic factors, as the AHP (Analytic Hierarchy Process) indicator layer elements. The suitability of each ecological factor for GI construction is then classified into different levels (Tab. 1).

**Table 1** Ecological sensitivity evaluation system of Jiaozuo

| Criteria Layer | Single factor | Suitability grading of green infrastructure | | | |
|---|---|---|---|---|---|
| | | extremely highly suitable (assign the value 4) | highly suitable (assign the value 3) | generally suitable (assign the value 2) | unsuitable (assign the value 1) |
| rainstorm security | potential runoff corridor buffer zone | 0 - 100 | 100 - 250 | 250 - 500 | > 500 |
| | inundated area | inundated area with rainfall frequency 50% | inundated area with rainfall frequency 10% | inundated area with rainfall frequency 2% | uninundated area |
| natural conditions | elevation | < 150 m | 150 - 3500 m | 350 - 850 | > 850 |
| | Slope / ° | > 25 | 15 - 25 | 5 - 15 | < 5 |
| | aspect | north,northeast,northwest | east,west | southeast, southwest | south |
| | NDVI | > 0.5 | 0.3 - 0.5 | 0 - 0.3 | < 0 |
| socio-economic factors | land use type | forest land | unused land,construction land | farmland | water area |
| | traffic buffer zone/m | Expressway, national highway, provincial highway > 2000 county road > 1000 | expressway, national highway, provincial highway 1000 - 2000 county road 500 - 1000 | expressway, national highway, provincial highway 500 - 1000 county road 250 - 500 | expressway, national highway, provincial highway < 500 county road < 250 |

Note: The Normalized Difference Vegetation Index (NDVI) intuitively reflects the distribution of surface vegetation in the study area. NDVI is defined as the ratio of the difference between the two band values of the near-infrared band and the visible light red band to the sum. The value range is between −1 and +1.

Note: Slope classification follows hydro-mechanical principles: steeper slopes (> 25°) exhibit higher erosive potential. Aspect categorization reflects microclimate-driven infiltration variations.

Note: Water area is classified as ‘unsuitable’ because their natural hydrological functions (e.g., flood storage) duplicate GI objectives.

To ensure the rationality of weight assignment, relevant professional experts are invited to score questionnaires. Through the AHP method and in accordance with the principle of unifying subjective experience and objective laws, a comparison matrix is constructed for indicators at the same level and pairwise comparisons are made. The results have passed the consistency test, and the weight values of evaluation factors at each level and the total weight table of evaluation factors are obtained (Tab. 2). According to Tab. 2, grading and weight assignment overlay are performed on each factor to obtain the evaluation results of the suitability of GI construction in Jiaozuo.

**Table 2** Total weight table of evaluation factors

| Target layer A | criterion layer B | weight（B relative to A) | indicator layer C | Weight (C relative to B) | total weight |
|---|---|---|---|---|---|
| suitability evaluation index for GI construction in Jiaozuo | rainstorm security | 0.56 | potential runoff corridor | 0.35 | 0.196 |
| | | | inundated area | 0.65 | 0.364 |
| | natural conditions | 0.35 | elevation | 0.15 | 0.0525 |
| | | | slope | 0.18 | 0.063 |
| | | | aspect | 0.06 | 0.021 |
| | | | water buffer zone | 0.35 | 0.1225 |
| | | | NDVI | 0.26 | 0.091 |
| | socio-economic | 0.09 | land use type | 0.80 | 0.072 |
| | | | traffic buffer zone | 0.20 | 0.018 |

## 4 RESULTS ANALYSIS

### 4.1 Analysis of Rainstorm Process Simulation Results in Jiaozuo

The sections through which surface runoff flows are dangerous sections where urban rain-flood disasters are easily triggered under strong rainfall conditions. Human activities such as excessive development, improper construction, and waterway excavation that disrupts the natural water system structure, all change natural runoff to a certain extent. Through hydrological simulation, this paper obtains potential surface runoff that is more in line with the natural geographical environment than the current water system (Fig. 3). In Fig. 3, blue lines denote potential runoff corridors, while dark purple shading represents inundation extent under a 50 year rainfall event. The closer to the potential runoff, the higher the flood risk, that is, the lower the rain-flood safety. At the intersection or branching points of runoff, the rain-flood process shows convergence or diversion, which is a key part for controlling water flow and water quality. The distribution and scope of the inundated area extracted in this paper, as one of the constituent elements of the urban rain-flood pattern, is the main factor guiding the content, intensity, and layout of future land use development. It should be emphasized that the scope of rainstorm inundation risk is mainly affected by the urban geography and landforms. The scope of the inundated area shown in Fig. 3 is not the scope that will definitely be inundated after rainfall of the same frequency, but the possible inundated scope without considering flood discharge.

Combined with indicators such as potential runoff and inundation area (Tab. 3), the rain-flood safety pattern of Jiaozuo City is constructed (Fig. 4). Color gradients from red (extremely high-risk) to green (zero-risk) represent storm flood security levels. High-risk areas (extremely high + high risk: 11.5 km²) are 30 times smaller than low-risk areas (341.4 km²), yet concentrated along rivers, emphasizing targeted flood mitigation. Notably, the total high-risk area accounts for only 0.28% of the city's total area (4071 km²), while low-risk zones cover 8.4%, indicating spatial heterogeneity in flood vulnerability. The data shows that the overall situation of Jiaozuo City in terms of rain-flood safety is relatively optimistic.

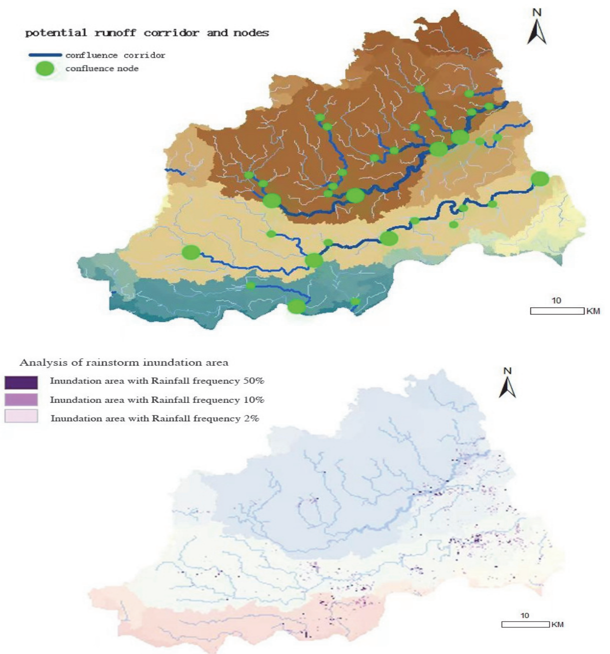


**Figure 3** Analysis of potential runoff corridors and rainstorm inundation area of Jiaozuo

The area of zero-risk areas accounts for 82.7%, which provides a relatively stable environmental foundation for building a livable ecological civilized city. As shown in Fig. 5, the high-risk areas of rain-flood spread along the river course. The high-risk areas are concentrated in the central urban area of Wuzhi County and the areas with a higher degree of urbanization in Xiuwu County. It can be seen that the rain-flood risk in urbanized areas near the river is significantly higher than that in other surrounding areas. It is worth mentioning that the central urban areas of Jiaozuo City, such as Shanyang District, Jiefang District, Zhongzhan District, and Macun District, are relatively safe. This is because the central urban areas belong to different catchment areas and are located at higher elevations in their respective catchment areas. Although the degree of urbanization is relatively high, high-risk rain-flood areas have not been formed. This provides a useful thinking direction for the site selection of new areas in later urban planning.

**Table 3** Area and division basis of Rainstorm Security Pattern in Jiaozuo

| Security level | Area (proportion) | Division basis |
|---|---|---|
| Extremely high-risk security level | 1.9(0.04%) | runoff corridor buffer zones within 0 - 250 m + inundated area with rainfall frequency 50% |
| High-risk security level | 9.6(0.24%) | runoff corridor buffer zones within 250 - 500 m +inundated area with rainfall frequency 50% |
| | | runoff corridor buffer zones within 0 - 250 m + inundated area with rainfall frequency 10% |
| Moderate-risk security level | 21.5(0.52%) | inundated area with rainfall frequency 50% |
| | | runoff corridor buffer zones within 0 - 250 m+ inundated area with rainfall frequency 2% |
| | | runoff corridor buffer zones within 250 - 500 m+ inundated area with rainfall frequency 10% |
| Mild-risk security level | 341.4(8.40%) | runoff corridor buffer zones within 0 - 250 m |
| | | inundated area with rainfall frequency 10% |
| | | runoff corridor buffer zones within 250 - 500 m + inundated area with rainfall frequency 2% |
| Slight-risk security level | 331.2(8.1%) | runoff corridor buffer zones within 250 - 500 m |
| | | inundated area with rainfall frequency 2% |
| Zero-risk security level | 3365.4(82.70%) | runoff corridor buffer zones greater than 500 m + uninundated area |


**Figure 4** Rainstorm security pattern of Jiaozuo

## 4.2 Evaluation and Analysis of the Suitability for GI Construction in Jiaozuo

The evaluation results of the suitability of green infrastructure construction in Jiaozuo City are shown in Fig. 5. Areas with higher values have higher rain-flood adaptation capabilities and are more suitable for the layout of green infrastructure. The results show that the highly suitable areas present the basic spatial characteristics of being distributed along rivers and lake systems. The low-suitability areas are concentrated in urban built-up areas and within the northern mountainous areas. Among them, the extremely highly suitable area is 66.3 square kilometers, the highly suitable area is 436.4 square kilometers, and the generally suitable area is 897.8 square kilometers, accounting for 1.6%, 10.7%, and 22.1% of the total area of Jiaozuo City respectively.

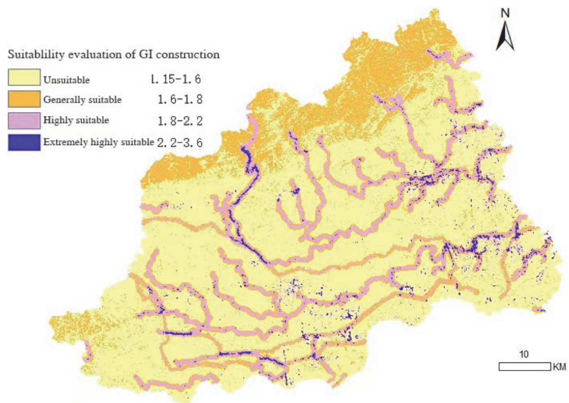


**Figure 5** Analysis of suitability for GI construction in Jiaozuo

## 4.3 Distribution Characteristics of Rainstorm Process and Suitable Areas for GI Construction

The study found that the areas with the highest risk of rainstorm inundation are distributed in low-lying areas with dense runoff corridors. The results of kernel density analysis (Fig. 6) show that flood disasters are more continuous and concentrated in the eastern parts of Xiuwu County and Wuzhi County. This is related to the fact that urbanization construction has changed the nature of natural water system corridors and underlying surfaces. Areas with high kernel density intensity are distributed at the intersection of the Qin River and its tributaries and at the intersection of the Dasha River and the Xinhe River, which coincide with the nodes of potential runoff corridors in the rainstorm runoff process simulation. This indicates that nodes with large confluence are more prone to rainstorm disasters.

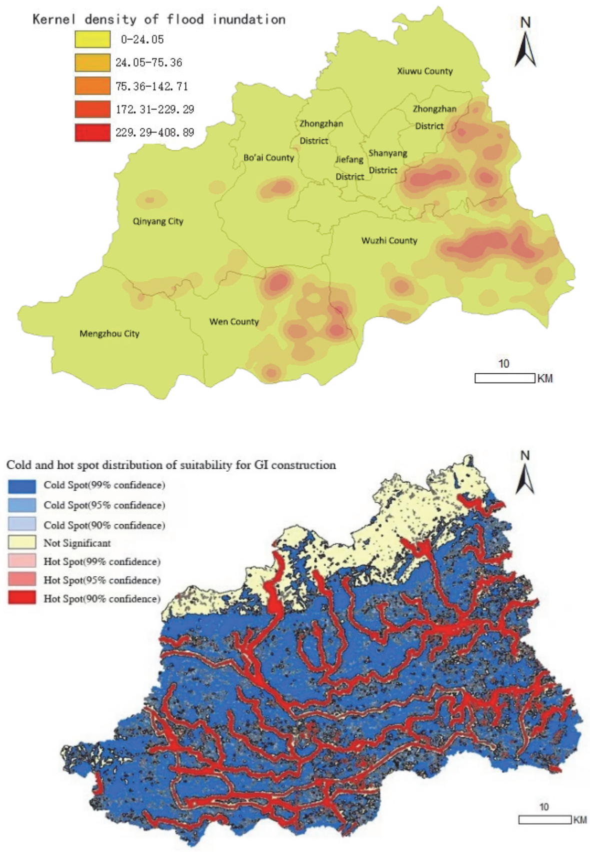


**Figure 6** Kernel Density of Stromwater Inundation and Analysis of cold hotspots for GI construction suitablity in Jiaozuo

The aggregation of high and low values of the suitability level for GI construction in space is shown in Fig. 6. The proportions of cold and hot spots for GI construction suitability in Jiaozuo City to the total area of the region are respectively: extremely significant hot spot 17.3%, significant hot spot 2.1%, hot spot 1.5%, non-significant point 22.7%, cold spot 4.5%, significant cold spot 14.3%, and extremely significant cold spot 37.6%. Judging from the data, the proportion of extremely significant hot spots is 17.3%, while the proportions of significant hot spot areas and hot spot areas are relatively small. This means that a certain scale of area has extremely superior conditions for green infrastructure construction, and areas with high suitability are relatively concentrated. The extremely significant hot spot areas are mainly distributed along the Qin River and the Dasha River. At the same time, in areas such as Xiuwu County, Wen County, and Wuzhi County, there are obvious characteristics of continuity and concentrated distribution. These areas should give full play to their advantages and arrange large-scale green infrastructure for flood regulation and storage in combination with the surrounding land use.

## 5 CONCLUSIONS AND DISCUSSIONS

### 5.1 Conclusions

This paper takes Jiaozuo City as an example to carry out rainstorm process simulation and suitability evaluation of GI construction. The conclusions are as follows:

(1) Through rainstorm process simulation, the key runoff-producing areas, runoff corridors and confluence nodes of the basin are accurately extracted, and the rainstorm safety pattern of Jiaozuo City is constructed. At the same time, the suitability evaluation method based on the vertical ecological process can comprehensively coordinate elements such as rainstorm, nature, and economy to analyze the suitable construction areas of urban green infrastructure, providing a bottom-up solution for promoting GI construction systematically on a macro scale.

(2) The central urban districts (e.g., Shanyang and Jiefang) exhibit lower storm flood vulnerability due to topographic advantages (mean elevation: 85 m), whereas Xiuwu and Wuzhi counties' eastern plains face elevated hydrological hazards. The highly suitable areas for green infrastructure construction are concentrated in the Wuzhi section of the Qin River and the Xiuwu section of the Dasha River. The overall rainstorm safety pattern of Jiaozuo City is characterized by distribution along the main river channels. The total area of extremely high-risk areas and high-risk areas is 11.5 square kilometers, accounting for 0.28% of the total area of the safety pattern. The total area of medium-risk areas is 21.5 square kilometers, accounting for 0.52% of the total area of the safety pattern. The overall situation is relatively optimistic. The suitable areas for green infrastructure construction show two characteristics of distribution along rivers and lakes and concentrated distribution. The area of extremely highly suitable areas is 66.3 square kilometers, accounting for 1.6% of the total urban area. It is mainly concentrated in the farmland areas in the east of Wuzhi County, the south of Xiuwu County and Wen County.

(3) In Wuzhi County's eastern plains (high-risk zones), constructed wetlands and permeable pavements are prioritized to intercept runoff, while green roofs are recommended in urbanized areas of Xiuwu County to reduce impervious surfaces. Farmland-dominated regions (e.g., Wen County) can integrate agricultural ditches with bioswales for dual drainage and irrigation functions. The reconstructed spatial pattern of GI promotes the high coupling of the natural environment and the water system network and guides urban green space planning. It provides a basis for the type, quantity, function and spatial layout of green infrastructure at different spatial scales in the study area, coordinates the relationship between land use and rainstorm processes and patterns, and forms an infrastructure layout system with a combination of rigidity and flexibility and complementary functional structures.

### 5.2 Discussions

Compared to conventional stormwater management focusing solely on hydrological simulation [5], our integration of vertical ecological processes (terrain, vegetation, socio-economics) with SCS modeling provides a holistic framework for GI suitability mapping. Rainstorm process simulation is a crucial measure for restoring natural hydrological processes and promoting a benign urban hydrological cycle. It also serves as the foundation for analyzing and evaluating the suitability of GI. The technical method framework proposed in this paper, which uses the SCS hydrological model to simulate and analyze the coupling relationship between rainstorm processes and the suitability of green infrastructure, has reconstructed urban green space and guided the timing of urban special planning. The key runoff-producing areas, runoff corridors, and confluence nodes extracted from rainstorm process simulation provide an accurate direction for targeted planning and construction of flood control facilities. The suitability evaluation method based on the vertical ecological process can comprehensively consider multiple factors and help formulate more scientific and reasonable green infrastructure construction strategies on a macro scale. The methodology is transferable to cities with similar climatic and topographic conditions. However, adjustments may be needed for arid regions or areas with limited hydrological data.

The scale size, quantitative relationship, and functional connection mode of green infrastructure facilities are currently the key points in green infrastructure planning and construction. According to the research results, determining the suitable areas for green infrastructure construction based on the rainstorm process path can comprehensively integrate natural resource elements such as mountains, waters, forests, fields, lakes, and grasses in the watershed environment, ensure the naturalness, integrity, and connectivity of green infrastructure systems at all levels, optimize the spatial layout and configuration mode of green infrastructure facilities, and strengthen the collaborative relationship between rainstorm safety elements and the concept of promoting green infrastructure construction in the whole city in a systematic way. In general, for green infrastructure function maintenance areas and green infrastructure ecological conservation areas, it is recommended to build a watershed-scale rainstorm storage and detention system around wetland systems such as reservoirs and ponds. In extreme rainfall scenarios, flood peaks can be reduced and delayed through the linkage of systems at all levels to alleviate flood pressure on downstream urban areas. However, in practical work, it is still necessary to further refine the runoff control indicators of plots in combination with the land use nature and development mode to provide support for the total demand and spatial location of green infrastructure and related facilities. Additionally, from the perspective of rainstorm risk management, changes in social and economic systems and human settlement environments have a certain impact on the occurrence of rainstorm disasters. The spatial layout and quantity types of infrastructure obtained from the research should further comprehensively analyze the information on changes in society, economy, population, and the evolution of rainstorm disasters over time. Therefore, the rainstorm process simulation and suitability analysis method for green infrastructure construction proposed in this study still needs to be continuously improved and perfected in more empirical studies.

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**Contact information:**

**Kai WANG**
(Corresponding author)
College of Architecture,
North China University of Water Resources and Electric Power,
Zhengzhou 450011, China
E-mail: wangkai@ncwu.edu.cn

**Yan WU**
College of Architecture,
North China University of Water Resources and Electric Power,
Zhengzhou 450011, China

**Can ZHAO**
College of Architecture,
North China University of Water Resources and Electric Power,
Zhengzhou 450011, China