Research Paper

Blue-Green Infrastructure Planning Based on Flood Risk Assessment:

A Case Study of Mentougou New Town, Beijing, China

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Abstract

The rapid urbanization in flood-sensitive areas has exacerbated the need for integrated flood risk management. As a critical junction in the Yongding River Basin, the special topological characteristics of Mentougou New Town, Beijing, surrounded by mountains on three sides, exacerbate the occurrence probability and intensity of rainfall and floods when severe climate events are detected. It underscores the need for Mentougou New Town to optimize urban ecological infrastructure planning and boost the city's adaptation competencies in responding to the pressures of climate change. This paper integrates ecological sensitivity analysis with the InVEST-Urban Flood Risk Mitigation (UFRM) model. The main results comprise the following indicators: (1) Through ecological sensitivity analysis, the research zone could be classified according to high, medium, and low sensitivity regions, with sites along the Yongding River and low-lying Xincheng Park showing the highest ecological sensitivity scores. (2) UFRM model simulation showed that, during the extreme rainstorm situation, the cumulative runoff retention volume in Mentougou New Town reaches 5,826,297m3 (which is equal to 582.63 million cubic meters). According to the flood risk assessment results, we drew up a high-risk flood zone as priority areas to realize a multi-scale "point-line-surface-network" BGI strategy. After these measures, Mentougou New City earned runoff retention capacity of 9.37% and amounted to 6,372,375 cubic meters. The framework discussed here offers a variety of actionable scientific advice to urban planners in optimizing and improving BGI schemes, thereby helping to conquer flood threats and maximizing the ability of urban ecological systems to deal with disasters. It has particularly strong ability in confronting the problems brought by severe weather events and provides valuable support in the sustainable development of the urban world.

Keywords

Blue-green infrastructure, Flood risk assessment, Urban Flood Risk Mitigation (UFRM) model, Ecological sensitivity analysis, Resilient cities

1. Introduction

Flood towns are seriously threatened because of the acceleration of global climate change, leading to the increase in frequency and severity of extremes weather events worldwide (Tabari, 2021; Rijal *et al.*, 2024; Lenderink *et al.*, 2025). Their unique topographical characteristics can significantly raise the risks of flooding and rainfall. Nowadays, fast urbanization in flood-affected regions has replaced natural, pervious terrains with impervious surfaces. This change has disrupted natural water circulation in two key ways: it increases surface runoff, and, more notably, it raises urban floods' susceptibility. The reality has illuminated that traditional "gray" infrastructure alone may no longer suffice to address flood risk management comprehensively, and its global demand is growing for more resilient and sustainable mitigation interventions. In light of this context, Blue-Green Infrastructure (BGI) has offered itself as a potential solution to reducing flood risk by restoring natural water circulation.

Given the rising pluvial floods and climate change, urbanization, the city's flood management paradigm is undergoing a radical revolution in engineering blue-green, shifting from gray infrastructure to ecological resilience planning (Chen, Ding and Deng, 2020; Lin *et al.*, 2020; Xing *et al.*, 2023; Dong *et al.*, 2024). In detail, in risk assessment methodology, the researchers' focus has widened from classic hydrological models and evolved to consider ecological ones such as InVEST-UFRM (Quagliolo, Comino and Pezzoli, 2021; Azadgar, Nyka and Salata, 2024; Vilca-Campana *et al.*, 2025), and extended further to integrate machine learning and Multi-Criteria Decision-making approaches that allow for precise risk quantification and identification of decisive cause-effect relationships (Luo *et al.*, 2022; Taromideh *et al.*, 2022). Through in-depth risk mechanism research, the urban land pattern's basic regulating roles, such as the environmentally favorable threshold values for blue-green space coverage, the necessity of natural morphology for pluvial rainfall retention capacity (Yu *et al.*, 2021) , and the important influence of supply- demand harmony in green stormwater infrastructures (Wang *et al.*, 2022) , were discovered. The "source-sink" landscape doctrine also clarifies that the spatial extension and dispersion of construction terrain are key contributors to intensified flood risk (Yan *et al.*, 2023; Zhang *et al.*, 2025).

BGI has emerged as a new strategy for enhancing urban flood resilience as a form of Nature based Solutions (NbS) (Aziz *et al.*, 2024; Dai, Meng and Lu, 2025). The implementation of BGI exhibits a range of involved scales. Stormwater retention time are prolonged at the building scale when integrating vertical greening and green roofs combined with the building drainage network, providing temporary storage for rooftop stormwater and releasing them to municipal sewer pipes. In order to create a synergistic stormwater management system at the neighborhood level, Low Impact Development (LID) facilities must also be integrated with grey infrastructure (Lin *et al.*, 2020; Dai and Liu, 2023; Dong *et al.*, 2024). Coherent BGI networks can successfully reduce urban waterlogging and restore urban ecological functions at the city and regional levels (Dai and Bo, 2023; Vilca-Campana *et al.*, 2025). For BGI projects to be implemented successfully, community involvement and the integration of scientific data are essential (Dai, Meng and Lu, 2025; Tian, Zeng and Zeng, 2025). Upcoming studies should focus on integrating high-precision data with intelligent models to advance urban flood management toward more sophisticated and intelligent strategies (Aziz *et al.*, 2024; Tian, Zeng and Zeng, 2025; Vilca-Campana *et al.*, 2025).

Mentougou New Town is a major hub in the Yongding River Basin, due to its geographic profile of being isolated by mountains on three sides (**Figure** 1). In 2023, the region experienced unprecedented heavy rainfall due to Typhoon Doksuri, triggering devastating flash floods. This topography significantly increases flood and rainfall risks during extreme weather events (Zhang *et al.*, 2024). Mentougou New Town's overall

ecological infrastructure planning and resilience to broader climate change challenges need urgent improvements, as the disaster has unequivocally made the urgent request clear.

This study utilizes Mentougou New Town in Beijing as the case study. It combines the evaluation of ecological sensitivity with the InVEST-UFRM model to conduct an integrative flood risk assessment. Buying on the results of the flow risk assessment, a BGI strategy was implemented in the subject city. These results could be utilized to calculate flood reduction benefits, in addition to the original benefit. Lastly, based on the BGI strategy, the InVEST-UFRM model was once again applied to evaluate if the flood reduction benefits can be reached or not. This paper is also a great basis for the provision of scientific guidance to urban BGI planning, so as to greatly support the reduction of flood risks for urban eco-systems and promote the improvement of the overall capacities. Besides, this study offers an applicable and empirically validated framework of integrating flood risk evaluation with actionable planning and management, thereby providing an important support to the other cities in face of hydrological and climatic difficulties.

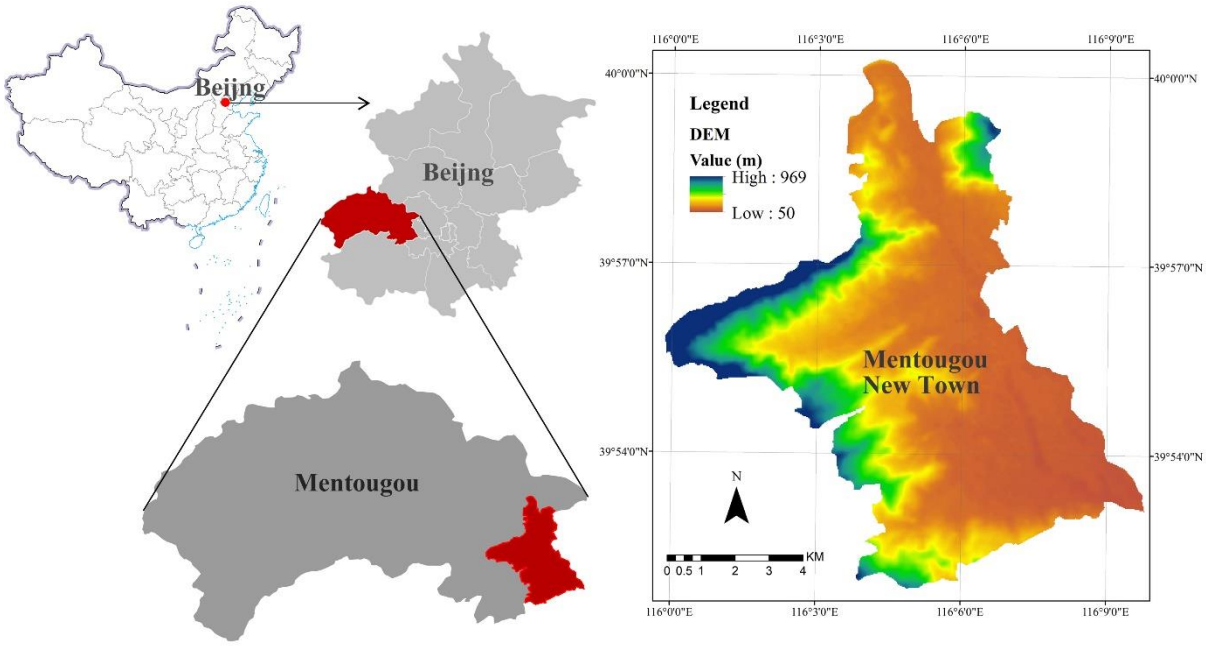


Figure 1. Study Area: Mentougou New Town, Beijing, China. Source: All figures are self-drawn, except for the top-left figure. Note: The top-left figure is based on a standard map (Map Review No.: GS (2019) 1651) from the Standard Map Service System of the Ministry of Natural Resources of China, with unmodified base map boundaries.

2. Methodology

This paper combines ecological sensitivity analysis with the InVEST-UFRM model to evaluate and plan BGI in Mentougou New Town. First of all, the ecological sensitivity of the Mentougou New Town was assessed based on a set of multiple factors (Table 1), including the digital elevation model (DEM), the slope, its distance from rivers, and the land use. Each indicator was normalized to a common scale and aggregated using a weighted overlay method to produce an ecological sensitivity map. Then, the UFRM module of the InVEST model was applied to simulate the runoff retention index for existing urban areas. The model calculates retention as the difference between rainfall and runoff using the curve number method,

providing spatially explicit retention values for each grid cell. In addition, the ecological sensitivity map and the runoff retention map were overlaid and reclassified into different risk levels, resulting in a composite whole-runoff risk map. This map identifies priority areas for intervention. Next, based on the "Point-Line-Plane-Network"-derived risks assessment method, the spatially explicit BGI plan is conducted: rain gardens and infiltration trenches (Point), green streets (Line), constructed wetlands (Plane), and connected drainage corridors (Network). Finally, we re-ran the InVEST-UFRM model to simulate post-planning runoff retention under the same rainfall scenario. Pre- and post-planning retention values were quantitatively compared using percent change and spatial subtraction analyses, providing an evidence-based assessment of the proposed BGI interventions.

Indicator		Sensitivity Weighting					Weight
		1	3	5	7	9	
Ecological sensitivity (0.60)	DEM	<100	100-200	200-400	400-600	>600	0.10
	Slope	0-5	5-10	10-15	15-25	>25	0.30
	River Buffer Zone	—	>200	100-200	50-100	0-50	0.40
	LULC	Built-up	Bare / sparse vegetation	Cropland	Tree cover; Grassland	Permanent water bodies; Herbaceous wetland	0.20
UFRM (0.40)	Runoff retention ratio	0.154-0.212	0.123-0.153	0.101-0.122	0.013-0.1	0.006-0.012	1

Table 1. Flood Risk Assessment Factor.

The data for this study are divided into two categories based on the modeling steps: (1) geospatial data for the ecological sensitivity analysis, and (2) inputs data for the Urban Fish Flood Risk Mitigation (UFRM) Model.

(1) The geospatial data used for the ecological specificity analysis are the following:

- **Digital Elevation Model (DEM)**: The DEM data were obtained from the Geospatial Data Cloud platform.
- **Land Cover Map**: The land cover information was gathered from the European Space Agency (ESA) WorldCover project containing global coverage of 10-meter resolution (https://esa-worldcover.org/).
- **River**: A River vector layer was implemented to depict the hydrology network.

(2) The following inputs data were needed in the Urban Flood Mitigation Model:

- **Watershed**: The vector layer representing the boundary of the watershed of interest was taken. In this investigation, the New Town area of the special plan for the Sponge City Construction in Mentougou District was used in this region.
- **Rainfall Depth**: The rainfall depth as a quantifiable number of the extreme rainfall (depth in mm) was needed. In this study, the heavy rainfall occurred in Mentougou District was chosen. Based on data collected from the Beijing Mountain Geological Hazard Monitoring Rain Gauges distributed in and around the Mentougou New Town area, the average rainfall reached 426 mm over 24 hours and 595 mm over 72 hours during the "23·7" extreme rainstorm (Zhang *et al.*, 2024). Consequently, a rainfall depth of 500 mm was applied in the model simulation.
- **Land Cover Map**: The same ESA WorldCover land cover map, as mentioned before, was used as a key input for the hydrological model.
- **Soils Hydrological Group Raster**: The hydrological soil group classification was derived from the HYSOGs250m global dataset provided by the ORNL DAAC (https://daac.ornl.gov/SOILS/guides/Global_Hydrologic_Soil_Group.html). The original dataset provides letter values, which were converted to numerical codes following the standard convention: A=1, B=2, C=3, D=4. Pixels with dual classifications (e.g., A/D) were assigned a numerical value within the 1-4 range accordingly.
- **Biophysical Table**: A biophysical table containing model-specific parameters (e.g., CN values) corresponding to each land use/cover class in the Land Cover Map was constructed (Table 2). The parameterization was informed by methodologies described in the literature, notably from the study by Quagliolo et al.(Quagliolo, Comino and Pezzoli, 2021).

lucode	Description	CN_A	CN_B	CN_C	CN_D
0	Sponge Community	46	65	77	82
10	Tree cover	36	60	73	79
30	Grassland	30	58	71	78
40	Cropland	64	75	82	85
50	Built-up	98	98	98	98
60	Bare / sparse vegetation	68	79	86	89
80	Permanent water bodies	99	99	99	99
90	Herbaceous wetland	99	99	99	99

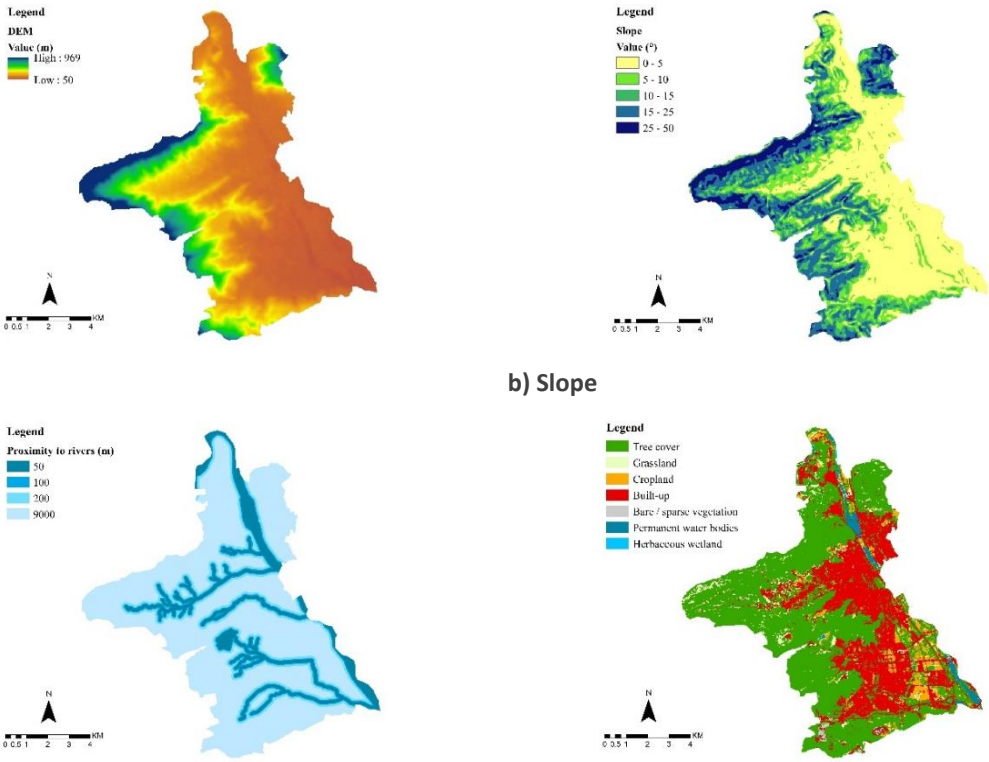
Table 2. Biophysical table with land use and curve numbers.

3. Findings and Discussions

3.1. Ecological sensitivity analysis

As the evaluation results in Figure 2 and Figure 3 indicate, the ecological sensitivity evaluation shows clear spatial sensitivity patterns. The most high ecological sensitivity areas are located at the northwestern and westwestern parts of the study area to reach a total of 44.02% of the new town's total area. The area had a high level of slope (usually more than than 25°), high altitude, plus vegetation coverage is heavy forest. Besides that, in the built-up regions of the dense built-ups Zone, the riparian area besides Yongding River and its downstream rivers is also high Ecological sensitivity areas. And out of these high Ecological sensitivity places, the New Town Park area (a formerly sand pit area) was the low lying area with a relatively high edge slope at both sides and a source River branch of Yongding River passing through was very high ecological sensitivity.

On the contrary, the low-sensitivity and relatively low-sensitivity areas were mainly concentrated on the built up regions of the cities at the middle and the south eastern parts of the study area. The low sensibility areas cover a total of 18.45% of total area. These areas have a mild relief and far from river source. The intermediate Sensibility area covers a total of 32.74% of study area, and it was also mainly concentrated in the buffer area of the river.



a) DEM

b) Slope

c) Proximity to rivers

d) LULC

Figure 2. Ecological Sensitivity Factor. Source: Self-drawn.

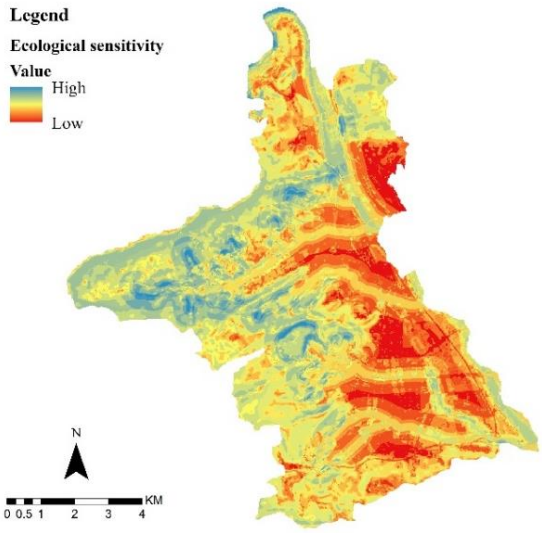


Figure 3. Ecological Sensitivity Analysis Results. Source: Self-drawn.

3.2 Evaluation of runoff retention capacity

The runoff retention capacity of the study area was evaluated by the UFRM model in an extreme rainstorm condition with a run-off rainfall depth of 500 cm. The UFRM extreme rainstorm simulation results indicated the total runoff retention amount is 5,876,297 m3 , for the Mentougou New Town. As shown in Table 3 and Figure 4, it wasn't evenly divide to the 6 delimitation Watershed. Watershed 5 is the most run-off amount (1,584,703.50 m^3), and Watershed 4 is the least amount (187,460.25 m^3).

A large difference was found at the land-use scale (Figure 5): woodlands had the greatest retention ratio (0.212) followed by built-up areas with the least capacity (0.006). This finding showed that urban green spaces had the greatest potential in rainwater retention vs. impervious ground surfaces.

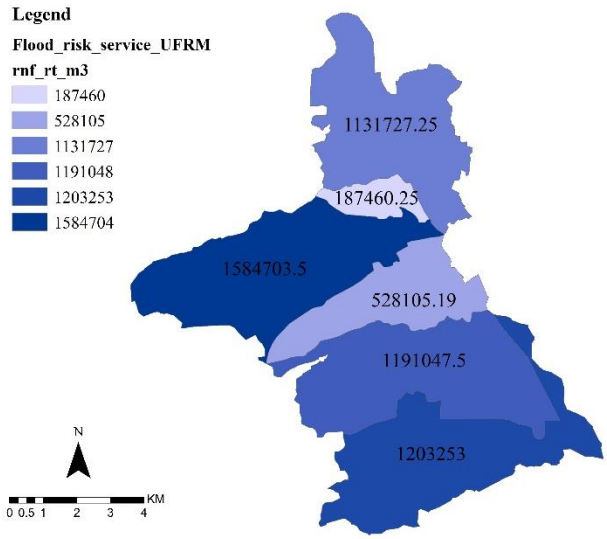


Figure 4. Runoff Retention Volume of Watersheds (Pre-planning Scenario). Source: Self-drawn.

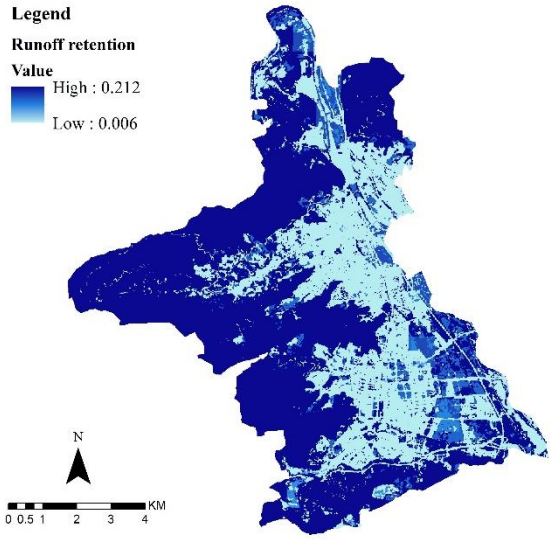


Figure 5. Runoff retention rate (Pre-planning Scenario). Source: Self-drawn.

ID	Rain event (mm)	Area (km^2)	Runoff retention index	Runoff retention (m^3)	Flood volume (m^3)
1	500	19.00	0.13	1203253.00	8285147.50
2	500	19.52	0.12	1191047.50	8564803.00
3	500	10.00	0.11	528105.19	4471295.00
4	500	2.67	0.14	187460.25	1148089.88
5	500	20.46	0.15	1584703.50	8640547.00
6	500	17.37	0.13	1131727.25	7543623.00
sum	—	89.03	—	5826296.69	38653505.38

Table 3. Flood Risk Mitigation model output for each of 6 watersheds (Pre-planning Scenario).

3.3 Evaluation of comprehensive flood risk

Our comprehensive flood risk visualization displayed several critical hotspots with high chance of inundation accumulation (Figure 6), particularly in: (i) Xincheng Park, (ii) Yongding River main channel, and (iii) its significant tributaries Jiang Zhan (Chengzi Ditch, Mentou Ditch, Zhongmensi Ditch, Fengcun Ditch, and Xifengsi Ditch). These rivers appeared the peak of flood risk scores everywhere in the research zone. The most prominent sources of increased risk were steep side hills facilitating quick runoff consolidation, and narrow river paths restricting output ability, and vast areas of impervious construction surfaces. This spatial pattern brings considerable risk to crucial facilities and residential buildings situated in such sensitive watersheds.

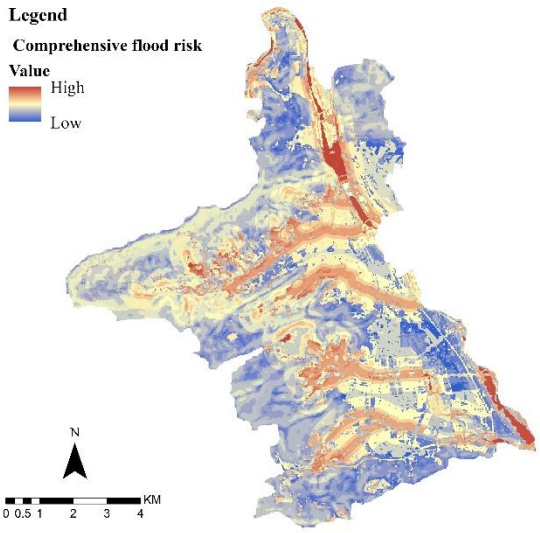
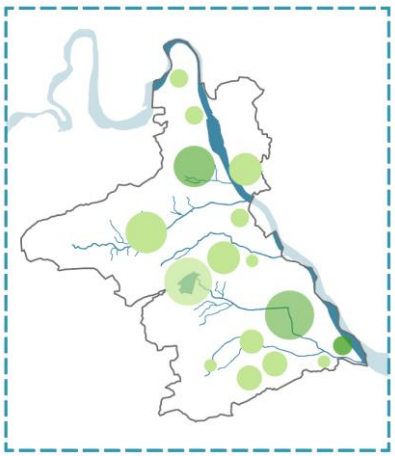


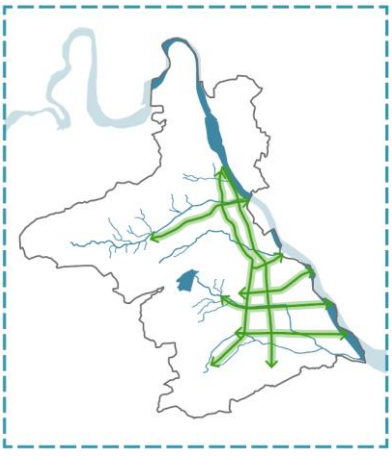
Figure 6. Comprehensive Flood Risk Assessment Results. Source: Self-drawn.

3.4 Planning Strategies

However, through the findings of the flood risk investigation, we narrowed down the high-risk flooded zones to prioritize them as target locations for a multi-scale "point-line-surface-network" BGI initiative (Figure 7). At the point level, intervention measures like pocket parks and rain gardens were deployed in areas with elevated flood and waterlogging risks (Figure 7a). Linear interventions emphasized constructing ecological corridors to improve hydrological connection (Figure 7b). At the plane level, we focused on constructing sponge communities featuring inclined greening systems using rooftop gardens to maximize the runoff retention ability (Figure 7c). Each of these specific point, line, and plane parts, when integrated together, form a holistic urban blue-green ecological network (Figure 7d).



a) At the Point scale: create parks and wetlands.



b) At the Line scale: connect mountains and rivers through ecological corridors.



c) At the Plane scale: build sponge communities around the areas at high risk of flooding.

d) Network: parks and wetlands, ecological corridors, and sponge communities together form the resilient blue-green infrastructure.

Figure 7. A multi-scalar "Point-Line-Plane-Network" BGI planning framework. Source: Self-drawn.

Based upon the BGI network master Planning in the New Town, the cumulative of all the afore-mentioned multi-scale landscape interventions has been effectively incorporated into a visually appealing urban ecological network (Figure 8). The three principal implementation interventions for BGI implementation are: expanding the green space area within the novel city park, creating linear ecological corridors along urban roads, and forming the so-called sponge communities, particularly along rivers. The sponge communities, for this study, are defined as built-up areas with minimal impervious surfaces.

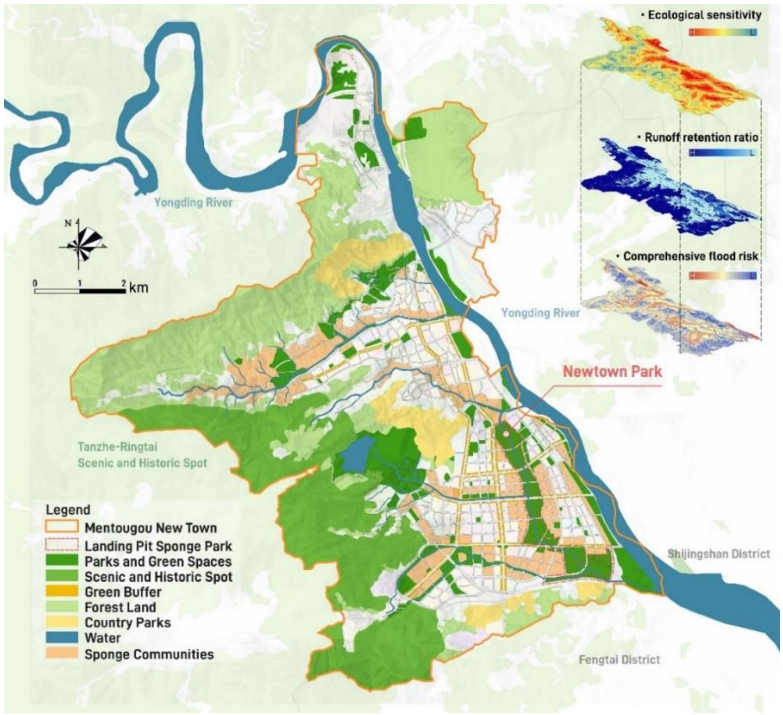


Figure 8. Blue-green infrastructure planning map of Mentougou New Town. Source: Self-drawn.

3.5 Assessment of Runoff Retention Capacity after BGI Planning

To substantiate the validity of the implemented BGI plan, the UFRM model was rerun under identical extreme rainfall conditions (500 mm rainfall depth) for comparison. The simulation from the post-planned situation showed a significant improvement in stormwater management system performance, witnessing the total runoff retention volume reaching 6,374,375 m^3. This increase, representing a 9.37% improvement relative to the baseline of the pre-planned planning scenario of five thousand, 5,826,297 m^3 (Table 4).

ID	Rain event (mm)	Area (km^2)	Runoff retention index	Runoff retention (m^3)	Flood volume (m^3)
1	500	19.00	0.14	1362139.25	8129411.00
2	500	19.52	0.14	1348444.88	8406106.00
3	500	10.00	0.12	601980.81	4397419.00
4	500	2.67	0.15	199158.23	1135991.88
5	500	20.46	0.17	1700796.88	8522654.00
6	500	17.37	0.13	1159855.38	7516445.50
sum	—	89.03	—	6372375.42	38108027.38

Table 4. Flood Risk Mitigation model output for each of 6 watersheds (Post-planning Scenario).

The post-planning simulation showed the same universal change in retention volume across all six watersheds (Table 4), and a quantitative comparison was shown on Figure 9 and Figure 10. This optimization ranged from largest to smallest with the following levels of watershed: Watershed 1, 2, 5, 3, 6 and 4. It is interesting to observe that the watershed featuring the most significant absolute benefits in terms of BGI levels - namely, watershed 1, 2 and 5 -were the exact areas of density of BGI measures. The spatial association shows that the planning effort has been successful and that the planning has centred on infrastructure in the area with the highest potential for maximizing capacity improvements.

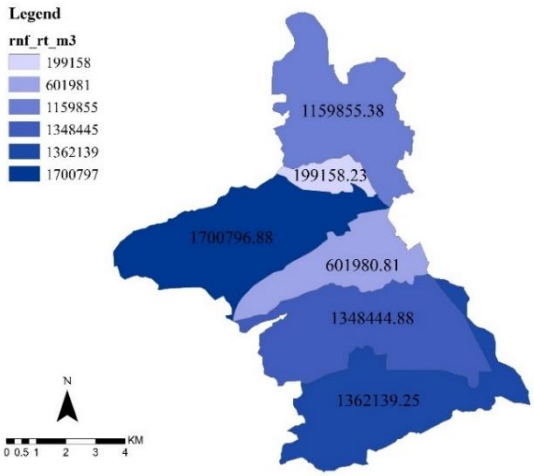


Figure 9. Runoff Retention Volume of Watersheds (Post-planning Scenario)**. Source: Self-drawn.**

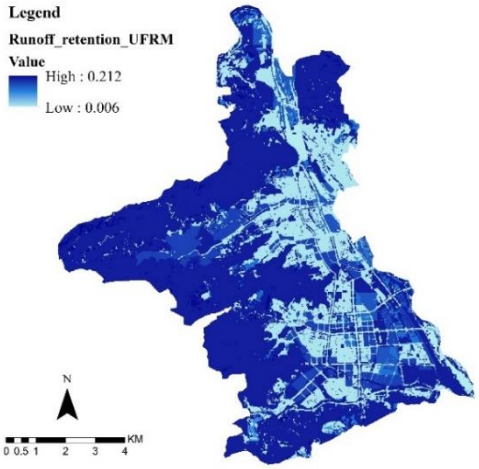


Figure 10. Runoff retention rate (Post-planning Scenario). Source: Self-drawn.

3.6 Implications for Planning Practice

The findings of this study offer actionable insights for planning practice in Mentougou New Town and other flood-sensitive urbanizing areas facing similar topographic and climatic pressures. From an urban design perspective, the spatially explicit identification of high-sensitivity zones along the Yongding River and low-lying Xincheng Park suggests that these areas should be prioritized for nature-based solutions, such as riparian buffer strips, permeable pavements, and decentralized stormwater retention features. The "Point-Line-Surface-Network" BGI strategy operationalizes these results into design interventions at multiple scales: rain gardens and infiltration trenches at critical hotspots (Point), green streets that follow drainage pathways (Line), constructed wetlands in high-risk flood zones (Surface), and interconnected ecological corridors that link fragmented green spaces (Network). This multiscalar framework enables urban designers to integrate flood mitigation measures seamlessly into public realm projects, street layouts, and open space networks.

From a policy perspective, the 9.37% increase in runoff retention capacity provides a quantifiable target for regulatory standards. Municipal authorities could incorporate this benchmark into zoning bylaws or green infrastructure ordinances, requiring new developments or redevelopment projects to achieve a minimum retention ratio. Furthermore, the methodological workflow—combining ecological sensitivity analysis with InVEST-UFRM simulation—can serve as a blueprint for climate-adaptive planning guidelines. Policymakers are encouraged to mandate such evidence-based assessments in environmental impact evaluations for urban expansion projects, particularly in regions with three-sided mountain topography that amplifies flash flood risks. Ultimately, the study demonstrates that strategic BGI interventions not only reduce flood hazards but also enhance co-benefits including groundwater recharge, water quality improvement, and recreational green space provision, thereby aligning disaster risk reduction with broader sustainability and resilience policy goals.

3.7 Limitations and Future Research

While this research offers a starting-point of evidence through case studies that show how effective BGI is in mitigating flood risk, there remains a significant need for empirical data to validate and refine the adopted model parameters and results. In future research endeavors, it is vital to emphasize the

establishment of longterm, all-encompassing surveillance networks to record real-time hydrological performance of blue-green infrastructure systems in varied precipitation scenarios. It not only augment the accuracy and resilience of models but also facilitate their transformation from a planning instrument to an adaptive management tool.

4. Conclusion

Increasing flood hazards have made the reconstruction of floodplain infrastructure difficult in Mentougou New Town, the standard mountainous urban settlement. In order to overcome this challenge and provide scientific foundation to BGI planning in the city, this study applied the principles of interdisciplinary research to combine GIS-based ecological sensitivity analysis with the InVEST-UFRM hydrological modeller to identify the most influential flood risk hotspots for mitigation, and to plot a coordinated planning strategy at different scales. The following are the major results of this study: (1) The highest ecological sensitivity and flood risk domains are accumulated in the topographical low-lying area of Xincheng Park and the corridors along the Yongding River. (2) As shown by our simulation, the runoff retention volume of 5,826,297 m^3 under the disastrous rainstorm scenario was obtained, indicating an urgent imbalance of retention capability between extremely rough wood lands (0.212) and fully impermeable artificial lands (0.006). (3) The system's overall resilience increased by 9.37%, as an extra storage capacity of 546,098 m3 of stormwater management was achieved with the establishment of the "Point-Line-Plane-Network" BGI system.

In addition, besides demonstrating the effectiveness of BGI in reducing flooding hazards in Mentougou New Town, this study aims to establish sustainable principles to inform future Sponge-city construction, as well as to raise awareness of integrated nature-based interventions in city ecological planning. The study also has some drawbacks. The UFRM model's parameters require to be validated with field monitoring, and current simulation's extreme scenario is static and cannot reflect the long-term impact of climate and land-use change. Future works should prioritize installation of BGI monitoring network and evaluate the network's long-term performance considering future climate change and urban pattern changes.

5. References

Azadgar, A., Nyka, L. and Salata, S. (2024) 'Advancing Urban Flood Resilience: A Systematic Review of Urban Flood Risk Mitigation Model, Research Trends, and Future Directions,' *Land*, 13(12), p. 2138.

Aziz, F. *et al.* (2024) 'Coastal urban flood risk management: Challenges and opportunities − A systematic review,' *Journal of Hydrology*, 645, p. 132271.

Chen, J., Ding, J. and Deng, M. (2020) 'Research Progress on Risk Assessment and Management for Urban Stormwater,' *Journal of Catastrophology*, 35(2), pp. 154-159,166.

Dai, D. and Bo, M. (2023) 'A Resilience Enhancement Approach to the Sponge City Based on Ecosystem-Based Disaster Risk Reduction—Taking the Urban Design of Jiangchuanlu Street in Shanghai, China as an Example,' *Journal of Resources and Ecology*, 14(6).

Dai, W. and Liu, B. (2023) 'Study on the Application of Nature-based Solutions in Planning for Urban Rain and Flood Resilience,' *Chinese Landscape Architecture*, 39(7), pp. 53–58.

Dai, W., Meng, M. and Lu, P. (2025) 'A Study on the Strategies of Flood Control Planning for Coastal City from the Perspective of Nature-Based Solutions,' *City Planning Review*, 34(02), pp. 26–35.

Dong, S. *et al.* (2024) 'Efficiency Evaluation of Sponge Facility Management and Control Schemes in Urban Blocks Based on Scenario Simulation,' *Journal of Disaster Prevention and Mitigation Engineering*, 44(4), pp. 762–771, 808.

Lenderink, G. *et al.* (2025) 'A Pseudo Global Warming Based System to Study How Climate Change Affects High Impact Rainfall Events.' SSRN.

Lin, Q. *et al.* (2020) 'Stormwater management measures in Beijing suburban hilly area based on hydrological model: taking the upper reaches of Jiakuohe River as an example,' *Journal of Beijing Forestry University*, 42(5), p. 132−142.

Luo, Z. *et al.* (2022) 'Hybrid EWM - TOPSIS and Neural Network for Flood Risk Evaluation of Xiamen City,' *Journal of Catastrophology*, 37(4), pp. 184–192.

Quagliolo, C., Comino, E. and Pezzoli, A. (2021) 'Experimental Flash Floods Assessment Through Urban Flood Risk Mitigation (UFRM) Model: The Case Study of Ligurian Coastal Cities,' *Frontiers in Water*, 3, p. 663378.

Rijal, M. *et al.* (2024) 'Global systematical and comprehensive overview of mountainous flood risk under climate change and human activities,' *Science of The Total Environment*, 941, p. 173672.

Tabari, H. (2021) 'Extreme value analysis dilemma for climate change impact assessment on global flood and extreme precipitation,' *Journal of Hydrology*, 593, p. 125932.

Taromideh, F. *et al.* (2022) 'Urban Flood-Risk Assessment: Integration of Decision-Making and Machine Learning,' *Sustainability*, 14(8), p. 4483.

Tian, J., Zeng, S. and Zeng, J. (2025) 'Intelligent Disaster Awareness and Resilient Disaster Bearing: Reconstruction and Planning Methods for Flood Safety Patterns Based on Eco-Hydrological Regulation,' *City Planning Review*, 49(8), pp. 118–130.

Vilca-Campana, K. *et al.* (2025) 'Improving Urban Flood Resilience: Urban Flood Risk Mitigation Assessment Using a Geospatial Model in the Urban Section of a River Corridor,' *Water*, 17(7), p. 1047.

Wang, M. *et al.* (2022) 'Supply–Demand Evaluation of Green Stormwater Infrastructure (GSI) Based on the Model of Coupling Coordination,' *International Journal of Environmental Research and Public Health*, 19(22), p. 14742.

Xing, K. *et al.* (2023) 'Stormwater management model in the Xiong'an New Area based on nature‐based solutions in the context of climate change,' *China population,resources and environment*, 33(4), pp. 13–22.

Yan, S. *et al.* (2023) 'Process Dynamic Analysis and Risk Assessment of Rainfall and flood in Yongchun County Based on the Source-Sink Landscape,' *Research of Soil and Water Conservation*, 30(4), pp. 286–292.

Yu, J. *et al.* (2021) 'Influence of Urban Blue-green Landscape Pattern on Rainfall-flood Regulation and Storage Function,' *Landscape Architecture*, 28(9), pp. 63–67.

Zhang, L. *et al.* (2025) 'Flood risk assessment and stormwater runoff process response in Dongting Lake Basin based on source-sink landscape pattern,' *Acta Ecologica Sinica*, 45(1), pp. 395–405.

Zhang, Y. *et al.* (2024) 'Retrospective simulation and planning strategies study of '23.7"flood for New Downtown in Mentougou District of Beijing City,' *China Flood & Drought Management*, 34(10), pp. 15–19.