Proceedings of CONF-BPS 2026 Symposium: Innovation, Finance, and Governance for Sustainable Global Growth
DOI: 10.54254/2754-1169/2026.BJ31177

Multi-dimensional Construction of Urban Climate Resilience —A Systematic Review of Infrastructure, Governance Model and Financial Mechanism

Linjiang Zhu

International Business School, Tianjin University of Finance and Economics, Tianjin, China
zhulinjiang@stu.tjufe.edu.cn

Abstract. Against the background of the risk of global climate change and the need for urban sustainable development, building systematic, dynamic and adaptive urban climate resilience is an important topic of common concern of the international community. Focusing on three core dimensions (infrastructure, governance models and financial mechanisms), this paper combs through the existing research on urban climate resilience and puts forward a three-dimensional analytical framework. The study finds that cities currently have three challenges in responding to climate risks: infrastructure systems themselves have clear mutual vulnerability; governance with clear cross-level and cross-sectoral coordination mechanism; model not yet to stable and sustainable funding mechanism. This paper further argue that in future resilience building, there is a need to build resilience beyond single domain approaches, but systematically recognize the transportity of engineering measures, institutional design, and financial instruments; to enhance dynamic assessment and digital empowerment; conceive and create differentiated, multi-stakeholder implementation strategies suited for regional characteristics. By incorporating perspectives from multiple disciplines, this study provides a theoretical framework and practical policy insights for urban climate resilience, while also revealing the existing gaps in empirical research, evaluation standards and practices in non-western contexts, indicating directions for further in-depth study.

Keywords: urban climate resilience, infrastructure governance, multi-level collaboration, financial mechanisms, resilience financing instruments

1. Introduction

Since the 21st century, cities around the world have been confronted with prominent challenges of climate change. According to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), the global average temperature has increased by around 1.1 °C relative to pre-industrial levels.

This has triggered severe extreme climate events and rising sea levels. As the most crowded and economically active regions of the world, cities bear the greater climate risks to their infrastructure and ecosystems, as well as the social risks that result from them. The heavy rainstorm in Zhengzhou

© 2026 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2754-1169/2026.BJ31177

on July 20, 2021 caused direct economic losses of more than 120 billion yuan, which exposed the systemic vulnerability of current cities in the face of extreme climate.

It is against this background that "urban climate resilience" concept slowly emerged. With the concept of assessing the comprehensive capacity of various urban systems to continue to function, recover quickly, and develop sustainably in the face of climate impacts. Compared with traditional climate adaptation approaches, climate resilience gives greater consideration to the adaptive capacity of urban systems in a dynamic environment, and more particularly draws attention to the ability of urban systems to move from passive response to proactive planning.

This paper reviews the latest literature on urban climate resilience, focusing in greater depth on infrastructure, governance and finance. In the infrastructure section, this paper examine the exposure of urban infrastructure to extreme climate events and how resilience can be improved. On governance, this paper focuses on multi-tiered policy coordination, public participation, and cross-sectoral collaboration capabilities. Under finance, this paper investigate resilience financing tools, public-private partnerships and risk management policies, comparing spending approaches for cities at different stages in their funding evolution world-wide. This article pays special attention to three major issues of how to build a multi-level collaborative infrastructure resilience; how to develop a cross-sector governance structure for climate risk; and finally, how to innovate financial instruments to create sustainable funding for resilience building? Investigating these questions will deepen the understanding of pathways and trajectories to building urban climate resilience, and might also yield novel theoretical perspectives and methodological tools for researchers in related policy fields. Following this, this paper propose a new three-dimensional framework for analysing urban climate resilience, which incorporates infrastructure, governance and finance. This framework crystallises, at an abstract level, the synergies operating between urban systems, but also serves as a multi-disciplinary base for practitioners assessing urban resilience and looking for guidance and directions on the ground.

2. Concepts and theoretical foundations

2.1. Conceptual evolution of urban climate resilience

Urban climate resilience is a concept based on the theory of "resilience" in ecology. In 1973, Holling defined as "resilience" the capacity of an ecosystem to absorb disturbance and still retain its basic characteristics [1]. The concept was later adopted in urban studies, giving rise to the composite notion of "urban climate resilience." While the term "climate adaptation" highlights the static nature of responses, climate resilience signifies the importance of dynamic adaptation capacity, learning, and transformation of urban systems in the light of prolonged threat or a sudden threat.

During its development, international initiatives like the UN-Habitat 2018 Urban Resilience Framework and the Rockefeller Foundation's 100 Resilient Cities program have played a vital role in popularisation and spreading the application of this concept [2]. Urban climate resilience is also extends beyond engineering, environmental and ecological issues to encompass the adaptive capacities of social systems (the latter becomes relevant in the development of smart city technology).

2.2. Theoretical basis and core elements of urban climate resilience

The theory of systemic resilience provides a general basis for research into urban climate resilience, with the capacity for system-wide maintenance of function, adaptation to change, and transformation in the face of disturbance at its heart. Holling's notion of ecological resilience has slowly been expanded to include complex urban systems, and the Guidelines for Safe and Resilient City Evaluation state climate resilience should include three processes: resistance, recovery, and reorganization [3].

Social-Ecological Systems theory further addresses the interactions and overlaps of natural systems and human systems. In 2009, Elinor Ostrom's multi-level analytical framework highlights the feedback loops across resource systems, governance systems and user groups. Urban complex systems theory is concerned with the implications of urban as nonlinear dynamic systems. In 2013, Batty suggested that urban climate resilience research was a matter of recognizing the net of interconnections between different elements and mapping emergent properties amongst them [4].

The core elements of urban climate resilience can be captured in a three-dimensional framework encompassing Infrastructure resilience, Governance resilience and financial resilience. This involves the ability of urban physical systems – infrastructure and the built environment – to cope with climate shocks, including the linked-up construction of green infrastructure (spongy cities and ecological corridors) and grey infrastructure (flood embankments and smart drainage systems) [5,6]. Research shows resilient infrastructure needs to have certain underlying characteristics such as, redundancy, flexibility and recover ability. Financial resilience requires safeguard for funding and risk-spreading mechanisms that can deliver long-term financial support of resilience building. For both infrastructure and financial-resilient systems, integrated approaches can only deliver under strong governance models and a conducive surrounding policy environment. The tree of Infrastructure, Governance and Finance – all supporting each other where infrastructure is the material bedrock of resilience; governance models determine how the spadework gets done, while finance forms the armory of resources" – is well-known in international experience and only by analysing urban climate resilience through all three dimensions can a genuine system quality prevail. Therefore, this paper proposes a three dimensional analytical framework of "Infrastructure–Governance–Finance".

3. Infrastructure resilience

3.1. Identifying climate vulnerability of urban infrastructure

Assessing climate vulnerability of urban infrastructure is a priority in climate adaptation research. Most studies construct vulnerability indices through a three-dimensional indicator system of exposure, sensitivity, and adaptive capacity [7]. Multiple studies have indicated that infrastructure is vital for building climate-resilient mega cities. In flood risk assessment, are important indicators for drainage networks include density, hardness rate of ground surface, underground space distribution, and other factors. Tang Zhong's team confirmed the positive role of surface runoff organization modification in meeting the excellent qualities of drainage system resilience [8]. In terms of urban extreme heat response capabilities, some studies attempted to analyze the correlation between urban heat island effects and building density, green space ratio, etc., proving that vertical greening can help instead reduce the building surface temperature by 3-5 °C [9]. In storm disaster assessment, research focus on wind resistance ratings of power facilities, redundancy of communication base stations other parameters. He Xianjing's team discovered a serious mismatch between development and disaster response capabilities of China's coastal cities [10]. In their theorization of networked cities, infrastructure systems have a great impact on urban areas, also meaning of cascading failure risks, with climate being the main influencing factor and effects between elements being like a chain

DOI: 10.54254/2754-1169/2026.BJ31177

domino effect: Heavy rain water accumulation will contribute to the occurrence of snow blockages, leading to traffic obstruction, which could in turn paralyze medical services [11].

3.2. Resilient infrastructure development and adaptation strategies

The resilient infrastructure enhances urban climate adaptation capacity, and a technical system based on a combination of green infrastructure and digital infrastructure is beginning to emerge. Sponge city technologies, using low-impact development facilities like permeable pavements and rain gardens, have achieved a 72 % annual runoff volume control rate in projects like the Dasha River Basin in Shenzhen [12]. Smart monitoring can reduce lead time of waterlogging warnings. Singapore's "ABC Waters Programme" has raised the urban flood protection bar by "enhancing its drainage capacity by 15 % to 50 % with bioretention ponds and ecological river corridors 'transforming once foul drains into ecologically vibrant waterbodies of significant social and economic value'." [13,14]

These examples show that resilient infrastructure is assessed by three criteria: climate risk mitigation capacity, system redundancy, and recovery from damage, and that nature based solutions tend to provide more favorable cost-benefit analysis than gray-infrastructure, while reducing its life-cycle costs.

3.3. Multi-level and systemic construction pathways

Urban climate resilience construction should build a systematic method of multi-level coordination. Regional level, the Dutch "Delta Plan" constructed a whole country water management system, and with smart sluice gates, flood storage areas and other engineering measures to achieve dynamic adjustment. National policy level, the "Resilient National Construction Guide" of the U.S. Federal Emergency Management Agency provides local governments with technical standards and financial support to form a policy transmission mechanism. The key to multi-level coordination is to build a common risk assessment framework and realize risk data sharing at different administrative levels through standardised vulnerability indicators. The application of digital twin technology have further strengthened system coordination, such as the British Environment Agency "Estuary 2100 Plan" to manage the sea level through dynamic adaptation path. Promote risks that dynamically adjust local governments coordinate actions.

4. Governance models for urban climate resilience

4.1. Multi-level governance and policy coordination

In the construction of climate resilience, multi-level governance has the dual characteristics of vertical integration and horizontal coordination. From the perspective of vertical integration, national experience such as that of China exemplifies the path whereby the strategic framework and the enabling policies of the National Climate Change Adaptation Strategy 2035 provide high-level guidance to local actors through the former's policy text. Local governments, in turn, are provided guidance to locally translate national policies into practice through vertical policy implementation at local levels that coordinates various functional departments, as necessary, to do so in light of unique regional characteristics.

From the perspective of horizontal coordination, Rotterdam's "Climate-Proof City" initiative in the Netherlands has established among municipal departments, water authorities, transportation, and other actors joint task force mechanisms. This regularly convened mechanism meets for

DOI: 10.54254/2754-1169/2026.BJ31177

consultations and manages a platform for information-sharing to manage these cross-sectoral relationships [15]. From the perspective of integrating citizens directly into the policy-making system, New York City's Climate Resilience and Preparedness Plan incorporates access for grassroots needs or information through public hearings and volunteer networks.

This discussion implies that effective multi-level governance requires regulators in different levels of governance to agree to a common standard of resilience assessment indicators (potentially indexed thereafter to Climate Resilience Assessment Index, CRAI) as well as mechanisms for dynamically adjusting across them as climate risk scenarios evolve and emerge.

4.2. Public participation and social co-governance mechanisms

Public participation constitutes a critical component of urban climate resilience governance, with its effectiveness primarily reflected in three aspects: enhancing risk awareness, democratizing decision-making, and fostering collaborative action.In climate resilience building, social organizations play a distinctive role. For instance, under New York City's "Rebuild Better" initiative, nonprofit organizations collected localized demand data through community workshops, which helped improve the precision of flood control facility placement by approximately 30%. However, social co-governance still faces challenges related to insufficient depth of engagement. According to the EU Urban Resilience Index Report, only 34% of climate adaptation projects have achieved genuine co-decision-making. In China, the "Sponge City" initiative has introduced a "Sponge City Observer" program to promote public awareness through widespread communication of the sponge city concept. Nevertheless, issues of imbalanced participation across different social strata persist.

Therefore, future efforts should focus more on leveraging digital tools to innovate traditional participation models. Enhancing technical empowerment and exploring their potential effectiveness will be key to advancing more inclusive and impactful public engagement in resilience governance.

4.3. Cross-sectoral collaboration and governance innovation

Under traditional fragmented administrative models, government agencies often struggle to address the systemic risks posed by climate change. Therefore, it is imperative to establish cross-departmental collaboration mechanisms. Through a study on air pollution governance, Jiang Hua's research team validated the effectiveness of multi-agency collaborative governance and emphasized that establishing a sound cooperative governance framework requires comprehensive planning and integrated decision-making [16]. This involves transitioning from specialized control approaches to diversified control objectives, ultimately realized through systematic indicators and refined management.

The emergence of smart city technologies has opened new pathways for cross-sectoral collaborative governance. By utilizing Internet of Things devices to collect environmental data in real time, cities can achieve coordinated risk warnings across meteorological, water management, and emergency response departments. In China's "Sponge City" pilot projects, systematic collaboration among housing and urban-rural development, water resources, and finance departments has successfully addressed the long-standing issue of fragmented stormwater management [17,18].

Nevertheless, current collaborative governance still faces challenges such as ambiguous delineation of responsibilities and inconsistent data standards. Moving forward, it is essential to establish institutionalized coordination mechanisms and a corresponding performance evaluation system to enhance the effectiveness and sustainability of cross-sectoral cooperation.

DOI: 10.54254/2754-1169/2026.BJ31177

5. Financial mechanisms for climate resilience

5.1. Resilient financing and investment instruments

Urban climate resilience investment and financing tools in recent years have progressively and diversely developed. As a mainstream financing tool, green bonds in China have grown from 618.6 billion yuan in 2015 to 1.118 trillion yuan in 2023. By the end of June 2024, China's cumulative issuance of labeled green bonds had reached 3.74 trillion yuan, with about 80% of them going to climate mitigation and adaptation. At the international level, the Green Climate Fund helps developing countries develop resilience investment plans through its preparatory mechanism, and as of October 2024 it had approved about 16 billion US dollars of financing. This shows that the proportion of investments towards climate resilience in every country is on the rise for it to be disclosed by the Green Climate Fund, and climate finance is going to be more and more sustainable and urgent. Meanwhile, insurance products are also innovating, and parametric insurance achieves rapid loss compensation by setting climate parameters. For example, the catastrophe bonds issued by Mexico reduced the time to settle claims from months in traditional insurance to about two weeks, which reflects the principle of rapid compensation in insurance. Resilience investment instruments have significant structural characteristics, for example performance-based payment mechanisms such as those adopted in New York City resilience bonds that link payment of interest rates to emission reduction goals, the Rotterdam Water Square project adopts the so-called hybrid financing model, wherein funding is weathered from three channels: city government grants, development bank loans, and private investments, and City of Paris resilience bonds can lower cost of financing using a five-tier risk sharing mechanism and optimizing their financing cost structure using a method called “risk stratification”.

5.2. Public-Private Partnership (PPP) and market-based mechanism

Public private partnership (PPP) model achieves “shared risk” and “shared benefits” by combining the policy guidance of powerful government departments with the technological and financing advantages of the private sector. In the field of flood control and drainage, PPP model has been successfully used in sponge city construction, change the traditional drainage system into rainwater infiltration and storage function of resilient infrastructure through this model, the China Shenzhen Dasha River Ecological Corridor project has managed to achieve such transformation. In addition, market mechanism can optimize resource allocation through the price signal. The United Kingdom's Thames Floodgate adopted a user fee mechanism, tying operational and maintenance costs to flood control benefits.

The sharing of risk is the central mechanism of PPP project. The Dutch adopted “Delta Project” risk with private institutions bearing the risks of construction and operation following a model of government providing a minimum return guarantee. This model significantly reduced the investment uncertainties posed by extreme climate events. However, challenges faced by PPP projects include long contract-terms and complex regulatory oversight requiring continual dynamic adjustment. Therefore, it is necessary to establish a effective performance evaluation system.

5.3. Financial risk management and incentive policies

In the process of constructing climate resilience, the role of policy-based financial institutions cannot be ignored either. They dynamically provide stable sources of funds to support urban

DOI: 10.54254/2754-1169/2026.BJ31177

infrastructure resilience transformation projects through long-term low-interest loans and dedicated credit support. Local government special bonds are also important financing tools. The innovative application of carbon financial instruments allows for the introduction of market-based incentives to resilience projects, for example, through trading mechanisms for reducing carbon emissions. The ecological benefits gained from resilient infrastructure can be translated into market value, however, existing financial mechanisms still face challenges in terms of insufficient risk pricing, and the application of climate risk assessment models into the design of financial products is relatively slow, which has resulted in problems such as insurance coverage gaps, and uncertain investment returns. Regarding incentive policies, tax incentives and subsidy policies that have been put in place have been effective in enhancing the role of the private sector. However, as is seen in other policy practices, there are problems such as "policy fragmentation" and "implementation deviations", so it is necessary for government departments to form a new systematic policy evaluation.

5.4. International experience comparison of financing mechanisms

From an international perspective, OECD countries often use a sub-tiers style of financing which combines society's public finances, market-based tools and community funds. The Netherlands combines matching funds to local projects through its National Climate Adaptation Fund and requires local governments which undertake resilience projects to match the funds used in the project, ensuring investment in the project as well as a local sense of responsibility for resilience. Significant developing countries such as India have also begun the practice of resilience bonds. In 2018, the State Bank of India issued a 650 million US dollars green bond, linking the returns from the project to climate performance indicators while convincing international institutional investors of their power to attract funds. What successful resilience financing mechanisms have in common are three elements: sharing risk-sharing mechanisms, tapping into the performance-based aspect of the payback structure, and cross-departmental coordination platforms. Singapore's Urban Resilience Financing Lab blends talent from the Building and Construction Authority, the Monetary Authority of Singapore and the private sector, and pairs government resources with enhanced private sector ingenuity to create insurance-based products focused on risk transfer and transfer 30% of project risks to the reinsurance market. These practices show that building an effective resilience financing system should go beyond the traditional public finance framework and establish an institutional framework that incorporates a transparency mechanism for scientific risk pricing data and the coordination of multiple stakeholders. However, the current mechanism still faces practical challenges such as unbalanced fund allocation for project identification and the absence of a standardized monitoring system.

6. Findings and gaps

6.1. Current research consensus

There are also some important consensuses in urban climate resilience research. In terms of conceptual connotation, the most authors believe that the urban climate resilience is dynamic, multi-dimensional systemic capacity that represents not just "hardware", such as infrastructure, but with its "network" and "software" supports via governance systems, financial mechanisms, etc. From the practical pathways, the proposed integrated applications of green infrastructure and digital infrastructure refers to contemporary mainstream solution for physical resilience, while, in the land of financial such as market-based tools of green bonds, PPP models etc. can be seen increasingly applied [19]. It is worth mentioning that points of consensus differ across cities, yet the alignment of national and local policies still plays a decisive role in the overall effectiveness of climate resilience building.

6.2. Research gaps and disagreements

Currently, there is poor conceptual clarity in this field of research, and scholars disagree on the boundaries and meaning of "urban climate resilience". Some studies equate urban climate resilience with climate adaptation capacity, while others stress that it has multiple dimensions like resistance, recovery, and transformation. Assessment standard is not yet unified. As a result, the same indicator system can differ wildly in terms of weight allocation and quantification methods. For example, OECD countries focus more on economic indicators, while developing countries emphasize social equity dimensions, and there is insufficient connection across spatial scales. At the same time, most studies focus on single-city level, with fewer studies paying attention to cross regional co-ordination mechanisms and urban-rural transition zones. Empirical validation fails--most studies rely upon theoretical deduction and case description, and there is a dearth of long-term tracking data and causal analysis. Research on financial mechanism is relatively fragmentary and a systematic framework for assessing risk and return of tools like green bonds and climate insurance remains to be established. Studies relate too heavily on European and American cases from western cities with fewer forays into their applicability in high density cities in Asia. Controversy exists in technology pathway selection — no agreement has been reached on how to balance privacy protection with resilience enhancement in digital infrastructure.

7. Future directions and policy implications

7.1. Directions for theoretical advancement

In terms of the theoretical system of urban climate resilience, future research needs to extend from single-discipline perspectives to an interdisciplinary integrated theoretical system. From a multi-level analytical perspective, it is imperative to establish a nested framework of "macro policy, meso-level governance mechanisms, micro technology" so as to integrate the national climate strategy with local implementation paths. Recognizing that governance dynamics are inherently multidimensional, it also need to study coordination mechanisms and pull from the complementary strengths of the three governance models, government-led, market-driven, community-participatory, to form a dynamically balanced governance structure. Furthermore, research should incorporate spatiotemporal coupling perspectives, focusing on the differential impacts of various climate risk types (such as sudden disasters and gradual crises) on urban systems, as well as the synergistic effects between short-term adaptation measures and long-term transition strategies. Theoretical innovation should also emphasize the dynamic development of resilience assessment indicators, integrating traditional engineering resilience metrics with social and economic resilience indicators through weighted synthesis, thereby forming a more explanatory comprehensive evaluation system.

7.2. Policy and practical recommendations

To more truly achieve the practical significance of urban climate resilience development, this paper advocates for a departmental coordination mechanism for resource integration from urban planning, environmental protection, finance, etc. to achieve policy synergy. For example, some departments in China can choose to establish a provincial (municipal) level Leading Group for Climate Resilience

DOI: 10.54254/2754-1169/2026.BJ31177

Development in consideration, or establish an inter-departmental joint conference system to form a unified standard framework for climate resilience assessment, and incorporate climate resilience indicators into the evaluation system of comprehensive urban planning. With the urban resilience plan, a multi-dimensional resilience assessment indicator system for infrastructure, ecosystems, social services and other domains shall be established. For financial innovation, to explore Municipal infrastructure financing model, develop hybrid financing instruments with green bonds and resilience-specific bonds. Moreover, strengthen the digital capacity building to build an urban climate risk monitoring and early warning platform for real-time monitoring and intelligent dispatching of operational status of infrastructures.

8. Conclusions

This paper has examined recent leading-edge developments in global urban climate resilience research and synthesized an analytical framework that encompasses infrastructure, governance types, and financial modalities. Around the world, building urban climate resilience progresses from a defense model based on traditional engineering paradigms towards a capacity system that integrates infrastructure, policy institutions, and financial safety nets.

Cities across the globe face common questions while they seek different paths to building resilience and focus their work on the dynamic potential of urban systems to resist, recover, and transform from climate shocks. Infrastructure wise, extreme climate shocks tend to expose the fragility of urban physical systems and the cascading risks that follow, yet also drive governments to search for true integration of green and gray infrastructure. Governance wise, implementation department continue to face various generic constraints such as inadequate multi-level policy coherence, departmental siloing, and limited involvement of the public make governance less effective. Financially, while innovative options such as green bonds, resilience bonds, and parametric insurance emerge, massive gaps in investment, difficulties with pricing, and a general lack of financing channels remain. These mundane challenges are a reflection of the fundamental tension in how climate change differs from conventional urban management.

Drawing on this analysis, this paper proposes that resilience-building going forward should remain multidimensional, and become three-dimensional: First, build a dynamic resilience assessment framework with international comparability and deeply integrating resilience goals into urban mainstream planning; second, develop a multi-tiered, performance-oriented mix of financing instruments to leverage more private capital; third, take fullest advantage of digital technology to build cross-departmental and cross-level data sharing and coordination platforms.

It should be stressed that this study is based on a review and comparison of literature and cases internationally and falls short in exploring the resilience mechanisms in Global South cities, territories undergoing rapid urbanization, and urban-rural transition zones. Future research should continue to deepen in several respects: constructing more spatiotemporally sensitive resilience assessment indicator system, doing comparative studies across cities longitudinally, and further explore frontier issues in terms of financing mechanism as effective instrument for resilience, digital technology governance, and just transition. Therefore, future development must prioritize infrastructure as the cornerstone of urban climate resilience, while continuously innovating financial mechanisms to facilitate the expansion and implementation of infrastructure projects. Meanwhile, the governance model serves as a unique “thread” for government agencies, enabling the integration of social capital through macro-level regulation and coordination, thereby forging a close link between finance and infrastructure.

DOI: 10.54254/2754-1169/2026.BJ31177

References

[1] Huan, Q.Z., Fang, S.N. and Geng, B.J. (2025) A Panel Discussion on Ecological Resilience Governance and Ecological Civilization Construction. Theoretical Investigation, (05), 93-104+2.

[2] Xu, Y.Y., Li, G., Cui, S.H., Xu, Y.P., Pan, J.B., Tong, N.J., Xu, J.R. and Zhu, Y.G. (2018) Review and Prospect of Resilience Science: From Ecological Theory to Urban Practice. Acta Ecologica Sinica, 38(15), 5297–5304.

[3] Meng, N., Zhang, Y.X. and Qin, Y.Y. (2025) Research on Digital Twin Enabling Resilient Urban Scenarios. Information and Communications Technology and Policy, 51(09), 49–55.

[4] Zhu, J.J., Xia, H.S., Liu, X.T. and Xu, R. (2025) Internet of Connectivity 2.0: Research on Collaborative Mode Between Rail Transit and Urban Space Based on Multi-level Network Efficiency. Urban Rapid Rail Transit, 38(01), 20–29.

[5] Alves, A., Gersonius, B., Kapelan, Z., Vojinovic, Z. and Sanchez, A. (2019) Assessing the Co-benefits of Green-Blue-Grey Infrastructure for Sustainable Urban Flood Risk Management. Journal of Environmental Management, 239, 244-254.

[6] He, X.Z., Lu, Y.W. and Zhai, G.F. (2024) Research Progress on Sponge Transformation of Urban Built-up Areas Under Flood Threats. Water & Wastewater Engineering, 60(S2), 395–401.

[7] Meng, Y.C., Guo, H.X. and Wang, J. (2025) Spatial Pattern and Governance Path of Climate-Resilient Cities in China. Urban Development Studies, 32(03), 9–17.

[8] Tang, Z., Cai, H.H., Liu, H., Zhang, L. and Li, Y. (2025) Exploration and Practice of Resilience Improvement of Urban Drainage System Under Extreme Climate Challenges. In Towards Chinese-Style Modernization: The Value and Action of Planning—2025 Annual Conference Proceedings of Chinese Urban Planning (02 Urban Safety and Disaster Prevention Planning) (pp. 125–135). Shenzhen Urban Planning & Design Institute Co., Ltd.; China Academy of Urban Planning & Design, Shenzhen Branch.

[9] Zhao, X., Shi, Y. and Liu, D.T. (2025) Aesthetic Path Research on Old Community Renewal Under the “Double Carbon” Goal. Beauty & Times, (09), 50–52.

[10] He, X.J., Qiao, G.M., Pan, Z.Y. and Qian, Y. (2025) Research on Spatiotemporal Characteristics and Response Configuration Paths of Coastal City Disaster Resilience. Journal of Catastrophology, 1–10.

[11] Lin, L., Jiao, Y.F., Ma, P., Hu, X.N. and Zhi, C.S. (2025) Waterlogging Risk Assessment in the Beiyuan Area of Jinan Based on a Hydrodynamic Coupling Model. Journal of University of Jinan (Science and Technology), 1–8.

[12] Guo, Y.Z. (2019) Research on Land Use Layout Optimization Method for High-Density Urban Areas Based on Low-Impact Development. (Master's thesis, Harbin Institute of Technology).

[13] Liao, K.H. (2019) The Socio-Ecological Practice of Building Blue-Green Infrastructure in High-Density Cities: What Does the ABC Waters Program in Singapore Tell Us? Socio-Ecological Practice Research, 1(1), 67–81.

[14] Yang, W. M., Liu, J. T., Ren, X. Y., Ren, D. W. and Wei, J. (2023) Flood Control Strategies in Shenzhen and Comparative Analysis with Cities of Similar Characteristics. China Municipal Engineering, (01), 83–87+98.

[15] Chen, Y.D. and Zhai, G.F. (2022) Water Resilience Planning and Construction in Rotterdam, Netherlands and Its Enlightenment. Shanghai Urban Management, 31(01), 2–10.

[16] Jiang, H., Gao, J., Li, H., Chu, W.H. and Chai, F.H. (2022) Preliminary Exploration of the Theoretical Framework for Coordinated Air Pollution Control in China. Research of Environmental Sciences, 35(3), 601-610.

[17] Deng, S.H., Zhang, X.Y., Shao, Z.Y., Yan, W.T., Chai, H.J. and He, Q. (2019) An Integrated Urban Stormwater Model System Supporting the Whole Life Cycle of Sponge City Construction Programs in China. Journal of Water and Climate Change, 10(2), 298-312.

[18] Gu, J. and Cui, H.Y. (2017) Analysis on the Role of Government in the Construction of Sponge City. Taking the Construction of Wuhan Sponge City of Hunan as an Example. 3rd International Conference on Economics, Management, Law and Education (EMLE 2017) (pp. 382-385). Atlantis Press.

[19] Monasterolo, I. (2020) Climate Change and the Financial System. Annual Review of Resource Economics, 12(1), 299-320.