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Sustainable Urban Renewal Based on Blue-Green Infrastructure: A Case Study of Cheonggyecheon Stream Restoration

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Abstract. Against the background of rapid urbanization, many big cities suffer from heat-island effect, polluted urban rivers and shortage of public leisure space. Traditional city construction focused too much on traffic construction, which could not meet the needs of modern sustainable development. Taking the Cheonggyecheon restoration project in Seoul as the research object, this paper evaluates its achievements, existing problems and practical inspirations from environmental, economic and human-cultural perspectives. This study adopts case-study and literature-review methods. The results show that river renewal should realize coordinated progress among ecology, economy and local culture. Human-cultural activities such as Cheonggyecheon Night Reading play a vital role in the long-term operation of ecological space. Besides, hidden problems including rising rents and artificial-ecosystem instability cannot be ignored. This research provides practical references for old-city river renovation and inclusive sustainable urban construction worldwide.

Keywords: Urban Renewal, Blue-Green Infrastructure, Ecological Restoration, Sustainable Development, Humanistic Value

1. Introduction

Modern densely populated cities commonly suffer from urban heat islands, polluted waterways, backward old-town economies and insufficient public leisure spaces. Traditional urban construction prioritized road expansion and traffic efficiency, which ignored ecological protection and public cultural needs. Most existing studies on urban renewal only focus on environmental improvement or economic growth, while comprehensive research integrating ecology, economy and humanistic development remains insufficient [1].

Against this background, this paper selects the Cheonggyecheon restoration project in Seoul as a typical case. It mainly addresses three research aspects: the project's multi-dimensional sustainable achievements in environment, economy and culture, its existing limitations, and practical enlightenment for global urban renewal. This study adopts case-study and literature-review methods.

By combining humanistic value with ecological and economic benefits, this research fills the one-sided perspective of previous studies. It enriches practical exploration of urban blue-green

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infrastructure renewal and provides effective reference for old river renovation, low-carbon urban construction and sustainable urban development worldwide.

2. Research background and theoretical framework

This study puts forward three key research questions about river ecological restoration. First, how to balance the interests of environment, economy and people's livelihood in river-renewal projects. Second, how to prevent water-environment restoration from becoming short-term landscape beautification. Third, whether waterfront public cultural activities can provide lasting driving force for the long-term operation of ecological spaces. Among these research dimensions, human-oriented sustainable development constitutes the core issue of this research.

Three theories are adopted to support the analysis. The theory of sustainable development requires balanced progress among environment, economy and society [2]. The blue-green infrastructure theory helps us understand the ecological regulation value of urban rivers [3]. The inclusive governance theory points out that urban renewal projects are not merely government-led initiatives, but also require multi-stakeholder demand collection and vulnerable group interest protection [4].

3. Case review — from buried to reborn

Cheonggyecheon Stream reflects the changes of urban ecological space in the process of urbanization. In ancient times, it was a vital water system in Seoul for water supply and drainage, as well as an important carrier of citizens' life and local culture. With industrialization, the water body was severely polluted and gradually degraded into a sewage channel, before being covered by concrete with an elevated highway constructed above. In the process of rapid modernization, the city lost its public waterfront space and broke the connection between people, nature and urban culture [5].

The year 2003 marked a turning point. The Seoul government carried out urban renewal, removed the elevated highway and restored the natural river channel. It was not only an engineering breakthrough and ecological-restoration practice, but also an urban-remolding movement focusing on people's livelihood, public interests and local culture. The project included ecological treatment, industrial adjustment and cultural heritage protection. It has become a world-famous case of urban water-environment restoration empowered by humanistic value.

4. Sustainable-development achievements of Cheonggyecheon restoration

4.1. Environmental sustainability

The Cheonggyecheon project builds a complete aquatic ecosystem and realizes ecological restoration. It separates sewage from clean water and diverts water from the Han River to keep the river flowing in dry seasons. The government dismantled heat-absorbing asphalt elevated roads, reconstructed natural river channels, introduced flowing water, and planted native vegetation.

The riverside temperature dropped by 3-6℃, greatly easing the heat-island effect. Fewer people chose to drive, so carbon emissions were reduced.

The project uses a three-section differentiated design. The upper section creates a modern urban gateway; the middle section highlights city energy and commercial culture; the lower section keeps original wetlands for people to get close to nature.

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4.2. Economic sustainability

Although the restoration project required substantial upfront investment, it has generated considerable long-term economic benefits. Before reconstruction, most businesses nearby were low-profit small-goods shops. After the project, visitor numbers rose sharply. Cultural-creative, tourism and catering industries moved in, creating many jobs. Total economic gains exceeded initial costs and eased the economic gap between northern and southern Seoul.

Besides, the river replaced the elevated highway, cutting highway maintenance costs. Free public access has attracted massive tourist flows and fostered a stable revenue-generating economic model.

4.3. Human-cultural sustainability

Compared with environmental improvement and economic growth, human-cultural sustainability is the most valuable and long-lasting achievement of this project. Traditional urban renewal used to prioritize roads, traffic and economy, paying little attention to public life needs and cultural inheritance. Cheonggyecheon changes this logic and puts citizens' rights, public space and cultural inheritance at the heart of urban renewal.

The project changed the road-first idea of past urban reconstruction. It built free riverside walkways for all people to walk and relax and increased public leisure resources. The open waterfront space serves all citizens without charge, offering places for urban residents to rest and improving urban livability and public well-being.

Meanwhile, many historical sites were restored. Various cultural activities are regularly held to form a complete cultural tourist route. Cheonggyecheon Night Reading is one of its representative cultural IPs. It holds regular night-reading, folk-custom and public-welfare cultural activities in waterfront areas. It provides spiritual-cultural places for citizens and strengthens their sense of urban belonging. Through these public-cultural events, urban history is integrated into modern public life. The river is no longer merely a landscape water body, but has evolved into a human-centered public space that carries urban memories and enhances public identity.

This case shows that high-quality urban ecological space should serve people and nourish urban culture. Human-cultural vitality is the fundamental force for the long-term survival of ecological space.

5. Summary of effects from multiple perspectives

From the environmental perspective, the project constructs a complete urban aquatic ecosystem, relieves the heat-island effect and lays a foundation for urban green development.

From the economic perspective, it boosts tourism, cultural-creative and catering industries, creates jobs, increases economic benefits and reduces municipal maintenance costs, thereby supporting the city's sustainable operation.

From the human-cultural perspective, the project achieves high-value urban-renewal outcomes. By opening riverside walkways and holding events such as Cheonggyecheon Night Reading, it activates waterfront public space. The river turns into a daily public place for citizens and inherits urban historical culture. It realizes human-oriented activation and public benefit of ecological space, which serves as the most valuable highlight of the entire project.

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6. Existing problems of Cheonggyecheon restoration

1. Limited Self-regulation Capacity of the Ecosystem

Most river water comes from man-made diversion from the Han River instead of natural water supply, consuming much water and electricity. Besides, the man-made ecosystem has weak resistance to pollution and lacks ecological stability.

2. Commercial Impacts

The improved riverside environment has pushed local rents significantly higher. Some original merchants and residents could no longer afford living costs and had to move away.

This result goes against the original human-oriented goal of the project. Local residents cannot equally share the benefits brought by urban improvement. The conflict of "space beautification with loss of local life" weakens the inclusiveness and fairness of urban renewal.

3. Chain Influences Caused by Local Climate Change

Although the project alleviated local urban heat island effects, artificial transformations have disturbed the original regional climate and may trigger chain impacts on surrounding areas.

7. Research conclusions and reflections

Combined with the Cheonggyecheon case, conclusions responding to the initial three research questions are as follows.

First, urban river renewal should not merely focus on landscape beautification and short-term economic gains, but also prioritize social value. People-oriented fairness, cultural benefit and social inclusiveness are the bottom line and ultimate goal of ecological transformation.

Second, sustainable urban ecology cannot be achieved by one-off construction. Long-term ecological monitoring and livelihood-guarantee policies are required to protect residents' interests and local cultural features.

Third, waterfront public cultural activities represented by Cheonggyecheon Night Reading are key to activating urban ecological space. They help water-environment facilities shift from simple construction to long-term sustainable operation. Human-cultural vitality prevents ecological space from becoming mere landscape decoration.

8. Enlightenments for global urban renewal

8.1. Give priority to ecology as well as human needs

In the past, urban construction prioritized traffic efficiency by building and widening elevated roads at the expense of ecological environments. The Cheonggyecheon case demonstrates that removing redundant overpasses and developing blue-green infrastructure can effectively mitigate various urban problems. Ecological infrastructure forms the core framework for sustainable city construction.

At the same time, ecological construction should not only pursue greening indexes and landscape effects. All ecological transformation should improve living conditions and humanistic value, and combine ecological construction with cultural development [6].

8.2. Promote environment, economy and culture together with human-orientation as the core

River renewal is more than simple greening. Single environmental remediation measures can hardly achieve sustainable urban renewal effects. Centered on river restoration, Cheonggyecheon promoted

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industrial upgrade, economic growth and cultural protection. Cultural activities such as Cheonggyecheon Night Reading enrich space connotation and avoid unreasonable reconstruction that only emphasizes greening while ignoring residents' real demands.

Human-cultural inheritance, public service and livelihood guarantee connect ecological value and economic value. Only with lasting human-cultural vitality can ecological and economic benefits be truly realized.

8.3. Make long-term plans and attach importance to fairness of public space

Urban construction should not focus only on short-term costs. Despite high early investment, Cheonggyecheon delivered long-term rewards in environment, economy and culture. Urban public space belongs to all people. City renewal must take social fairness into consideration.

The ultimate goal of urban renewal is not to create popular landscapes or business districts, but to protect the public nature of urban space, keep local cultural features and guarantee ordinary citizens' living rights. It helps build sustainable cities with good ecology, economic energy and warm humanistic care.

9. Conclusion

This paper analyzes the sustainable effects and existing problems of the Cheonggyecheon Stream restoration project from environmental, economic and humanistic perspectives. Overall, the case proves that high-quality urban renewal cannot rely only on landscape improvement or economic growth. A successful urban river renovation requires the coordinated development of ecology, economy and public culture. The Cheonggyecheon project effectively optimized the urban ecological environment, promoted regional economic development, and enriched urban public cultural life. In particular, continuous humanistic activities have helped ecological space achieve long-term sustainable operation.

Nevertheless, this study has some limitations. First, this paper only analyzes a single case, so its research findings lack universal applicability to diverse urban renewal scenarios. Second, this study mainly adopts qualitative analysis and lacks specific long-term data comparison. Some potential ecological risks and community problems are only discussed briefly.

For future research, more different urban renewal cases can be compared to obtain more universal conclusions. In addition, future studies can collect long-term ecological and economic data to support more accurate analysis. Moreover, researchers can further explore how to balance commercial development and public fairness in urban transformation, so as to provide more comprehensive strategies for sustainable and inclusive urban construction.

References

[1] Wang, D., Yang, C., Zheng, Y., Xiao, X., Zhao, L., & Chen, Z. (2021). Estimation of the mitigation effect of sponge city renovation on heat island effect. *Yangtze River Basin Resources and Environment, 30*(4), 968-975.

[2] Luo, H., Huo, Y., Hu, Y., & Pang, W. (2004). Review of sustainable development theory. *Journal of Northwest A&F University (Social Science Edition)*(1), 35-38. https://doi.org/10.13968/j.cnki.1009-9107.2004.01.008.

[3] Wu, C. (2019). *The integrated natural mitigation effects of blue and green infrastructure on urban surface temperature* (Doctoral dissertation, East China Normal University). https://doi.org/10.27149/d.cnki.ghdsu.2019.000348.

[4] Xu, Q. (2015). Inclusive governance: New approaches to social governance. *Jiangsu Social Sciences*(4), 17-25. https://doi.org/10.13858/j.cnki.cn32-1312/c.2015.04.003.

DOI: 10.54254/2753-7064/2026.36612

[5] Leng, H., & Yuan, Q. (2007). Seoul Cheonggyecheon revitalization and redevelopment, South Korea. *International Urban Planning*(4), 43-47.
[6] Zhang, Z. (2019). The practice of Cheonggyecheon revitalization in Korea and its spatial planning implications. *Journal of Urban Planning*(6), 120.