Integrating Natural Vegetation on Riverbanks as Part of Sustainable City Planning

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Abstract

Urbanization has led to ecological degradation along riverbanks, increasing flood risks and deteriorating urban environmental quality. This study aims to analyze the integration of natural vegetation on riverbanks as part of sustainable city planning. Conducted through a hybrid community engagement program by KABA Academic Society (Indonesia) and KRIRK University (Thailand), the study employed surveys, training sessions, and impact observation. The target area was Soi Ram Intra, Bangkok, facing significant environmental pressure. The results show that the implementation of riparian vegetation and appropriate technologies, such as household composters, improved community awareness, riverbank ecological function, and public participation in environmental management. The findings support the argument that riverbanks should be embedded into urban spatial planning as multifunctional green infrastructure. The study also emphasizes the importance of participatory approaches in bridging technological innovation and community empowerment for social, economic, and environmental sustainability.

Keywords: *Riparian Vegetation, Sustainable City, Riverbanks, Community Engagement, Green Infrastructure*

Peningkatan urbanisasi telah menimbulkan degradasi ekologis pada bantaran sungai, yang memperbesar risiko banjir dan penurunan kualitas lingkungan kota. Studi ini bertujuan untuk menganalisis integrasi vegetasi alami pada bantaran sungai sebagai bagian dari perencanaan kota berkelanjutan. Melalui kegiatan pengabdian masyarakat berbasis kolaborasi antara KABA Academic Society (Indonesia) dan KRIRK University (Thailand), penelitian dilakukan secara hybrid dengan metode survei, pelatihan, dan observasi dampak. Lokasi kegiatan terfokus di Soi Ram Intra, Bangkok, yang mengalami tekanan lingkungan tinggi. Hasil menunjukkan bahwa penerapan vegetasi alami dan teknologi tepat guna seperti komposter rumah tangga meningkatkan kesadaran masyarakat, fungsi ekologis sungai, dan partisipasi warga dalam pengelolaan lingkungan. Temuan ini memperkuat argumen bahwa bantaran sungai perlu diintegrasikan ke dalam tata ruang kota sebagai infrastruktur hijau yang multifungsi. Penelitian ini juga menyoroti pentingnya pendekatan partisipatif dalam menjembatani inovasi teknologi dengan keberdayaan komunitas lokal untuk keberlanjutan sosial, ekonomi, dan lingkungan.

Kata Kunci : *Vegetasi Riparian, Kota Berkelanjutan, Bantaran Sungai, Pengabdian Masyarakat, Infrastruktur Hijau*

A. Introduction

Rapid urbanization has placed significant pressure on environmental quality in major cities, particularly in riparian areas, which often experience ecological degradation and increased flood vulnerability (Koparde & Chalke, 2025). Natural vegetation along riverbanks (riparian buffers) has been identified as an effective nature-based solution for improving water quality, sequestering carbon, and mitigating floods and urban heat waves (Astell-Burt & Yang, 2024; Debele et al., 2023).

Research by Sopena Porta & Pellicer (2024) demonstrates that the requalification of riverbanks in European cities—such as the Ebro River in Zaragoza and the Isar in Munich—successfully enhanced urban-river landscape quality and strengthened urban socio-ecological systems through the integration of natural vegetation (Sopena Porta & Pellicer, 2024). Another study by Yousif & Abdulwahab (2024) highlights the potential of riparian zones as catalysts for urban sustainability, but notes that these areas are often neglected in traditional urban planning and require more systematic integration into spatial design (Yousif & Abdulwahab, 2024).

In Indonesia, research by Supangat et al. (2023) highlights the importance of watershed management adopting an ecosystem-based approach to maintain ecological functions and hydro-landscape productivity (Supangat et al., 2023). However, few studies have holistically examined how planting natural vegetation along riverbanks can be integrated into sustainable urban planning in tropical regions.

This article aims to analyze the role of natural riparian vegetation in sustainable urban governance. The study focuses on ecological contributions (carbon sequestration, flood control), social benefits (public spaces, urban identity), and green space planning at the city scale. By integrating international and local case studies, this research presents an integrative model of riverbank vegetation as a vital element in urban green infrastructure.

B. Method

This research and community service activity employs a qualitative-participatory approach based on field studies and structured observations in the Soi Ram Intra area, Bang Khen District, Bangkok. The activities were carried out in four stages. The first stage involved identifying community needs through field surveys and and community dialogues to understand key challenges, such as riverbank management and the potential use of natural vegetation as ecological -

buffers. The second stage focused on the development and adaptation of appropriate technology, including the selection of suitable local vegetation for soil stabilization along the river and piloting the use of organic composters as part of a natural waste management system. The third stage comprised hybrid training sessions: an offline session on June 30, 2025, and an online session on July 1, 2025, providing education on the utilization of natural vegetation and sustainable environmental management strategies. The fourth stage was the initial monitoring and evaluation of environmental and social impacts, conducted from July 4 to 6, 2025, by observing changes in perception, community participation, and early impacts on the environmental quality of the riverbank area.

C. Results And Discussion

The activity outcomes demonstrate that integrating natural vegetation along riverbanks effectively enhances community awareness of riparian ecosystems' importance for sustainable urban planning. Communities that previously overlooked the ecological functions of riverbanks began recognizing vegetation benefits such as stormwater absorption, carbon sequestration, and green open space provision. The implementation of simple technologies like composters and collaborative riverbank greening created dual benefits: reducing organic waste volumes while restoring the ecological functions of riparian zones.

The hybrid training discussions also generated adaptive practices replicable in other urban areas. These activities align with findings by Astell-Burt & Yang (2024), who emphasize that urban vegetation can reduce microclimatic temperatures and enhance environmental resilience. The study by Sopena Porta & Pellicer (2024) on vegetation integration along the Ebro and Isar rivers similarly parallels our results, demonstrating improved socio-ecological interactions and enhanced urban landscape value. Through this participatory approach, residents transitioned from passive beneficiaries to active stakeholders in program sustainability.

The active participation of residents in vegetation maintenance and composter management demonstrates that a bottom-up approach can enhance long-term program sustainability. Furthermore, multi-stakeholder engagement—spanning academics, local government, and community groups—facilitates knowledge exchange that enriches adaptation strategies for challenges such as flooding and land degradation.

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D. Conclusion

This activity demonstrates that integrating natural vegetation along riverbanks is a crucial strategy in sustainable urban planning. The community-based approach implemented by the KABA Academic Society and KRIRK University has led to increased ecological awareness, strengthened community capacity, and the initial implementation of practical environmental technologies. Previously underutilized riverbanks are now beginning to show potential as active green spaces and ecological buffers for the city. This experience can serve as a collaborative model between academia, government, and communities in building more resilient and nature-harmonious cities.

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