

Designing Tomorrow: Comparative Analysis of Sustainable cities from Green Sustainability Perspective

Dr. Shabina Shaikh

Post-Doctoral Fellow, International Islamic University, Malaysia
Email: shabinashaikh@gmail.com

Dr. Asadullah Shah

Professor at International Islamic University, Malaysia
Email: asadullah@iiu.edu.my

Dr. Narvind Kumar

PhD, Institute of Business Administration, University of Sindh, Jamshoro
Email: knarvind@hotmail.com

Rajkumar Lohano

PhD, Scholar Institute of Business Administration, University of Sindh, Jamshoro
[Email: rajkumar1986@hotmail.com](mailto:rajkumar1986@hotmail.com)

Abstract

Purpose – Sustainable cities became one of the significant key players in the achievement of the UN Sustainable Development Goals (SDGs). This research paper aims to examine the two sustainable cities, one from Europe that is Amsterdam and second one is from Asia Specific that is Seoul, South Korea, ranked in the top cities provided by the Sustainable Cities Index 2024. Two dominant global metropolises at the forefront of environmentally responsible urban development

Design/methodology/approach – The study carried out an analysis of the sustainability initiative undertaken by the two cities. The research methodology of this paper is presented through the qualitative analysis using the archival research method for comparing the two initiatives.

Findings – Through a comprehensive comparative examination, the research analyzes policies connected to environmental planning, infrastructural advancements, transportation networks, renewable energy integration, climate adaptation strategies, and public participation.

Originality/value – By emphasizing distinctive regional methodologies, this study provides valuable insights into exemplary practices that may guide forthcoming sustainable urban planning endeavors on a global scale.

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Introduction

Sustainability is now at the forefront of urban planning and development, which has led to a global movement towards creating cities that are environmentally conscious, socially just, and economically viable (Perry et al., 2020). Sustainable cities are essential for addressing the challenges posed by rapid urbanization and climate change, as they promote a balanced approach to economic, social, and environmental well-being. As urbanization continues to transform contemporary existence, sustainability has emerged as a vital challenge of this contemporary era (Castelblanco & Guevara, 2022). With over fifty percent of the global populace inhabiting urban environments, it is imperative for local governmental entities to reconcile swift development with ecological preservation (Wei et al., 2025).

Green sustainability involves integrating environmentally friendly principles into urban infrastructure, public policy, and everyday routines. Green sustainability is not only an aspiration but also an operational necessity for creating urban centers that can withstand ecological pressures while enhancing the quality of life for their inhabitants, necessitating a holistic approach that integrates environmental, social, and economic dimensions into urban development strategies (Castelblanco & Guevara, 2022). As (Iqbal et al., 2025) emphasize, the adoption of digital technologies in urban management systems, particularly in solid waste management, plays a crucial role in advancing Sustainable Development Goals (SDGs) by enhancing efficiency and reducing environmental impact. Cities that lead in sustainability serve as models for others, demonstrating how innovation and strategic planning can lead to significant improvements in environmental quality and urban resilience. Recent contributions from the 2024 Sustainable Cities Index and the World Bank's Urban Sustainability Insights reinforce the role of urban governance, resilience planning, and green technology (Shahidi Hamedani et al., 2025).

The primary objective of this paper is to conduct a comparative analysis of green sustainability initiatives in Amsterdam and Seoul, elucidating the distinct approaches, strategies, and outcomes achieved by each city. Emphasizing the manner in which each city addresses ecological limitations, urban necessities, and civic participation to construct resilient urban futures. Seoul and Amsterdam are two such cities that have distinguished themselves through their dedication to innovative urban development and environmental stewardship (Castelblanco & Guevara, 2022).

Literature Review

Urban sustainability has become a crucial issue in the 21st century because of socio-economic development and global climate change. It is a process to monitor the balance between economic, social and environmental interests, and urbanization is closely linked to this (Shen et al., 2023).

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Sustainability isn't just about protecting the environment anymore. It's grown into a big, connected idea that brings together tech advancements in engineering, smart economic plans, taking care of people's well-being, and the basic rules of how nature works.

The idea of eco-cities started back in the 1980s, introduced by German scholars, and since then, terms like "eco-city," "green city," and "garden city" are popping up more and more in academic literature, policy frameworks, and urban planning discourse (Qian et al., 2023). As urbanization continues its relentless expansion, cities find themselves at the forefront of global challenges, grappling with issues ranging from escalating greenhouse gas emissions to the depletion of natural resources (Creutzig et al., 2024).

Background of Green Sustainability

Green sustainability is like a big change in how cities grow. It's all about mixing nature, people, and money in a way that keeps cities strong and healthy for the long haul. Green sustainability in urban areas incorporates a variety of ecological conservation strategies, the incorporation of renewable energy resources, and the enhancement of efficient transportation networks (Javidroozi et al., 2023). This involves proactively using eco-conscious resource management practices, creating and implementing effective strategies to reduce pollution, and protecting natural ecosystems, all working together to boost ecological balance and make urban environments better for the environment. Cities are complex adaptive systems, where environmental, economic, and social factors interact in ways that can either enhance or degrade urban sustainability. Green urbanism promotes an integrated approach that can lessen risks and offer social and economic benefits, in addition to lowering urban ecological footprints (Li et al., 2024). Knowledge automation and artificial intelligence, for instance, play a pivotal role in optimizing urban resource management, smart infrastructure, and predictive analytics for environmental monitoring, further contributing to the reduction of ecological footprints (Shaikh, 2022). Amsterdam's urban development is intrinsically linked to its historical expertise in water management and land reclamation, which has cultivated a sophisticated urban planning ethos centered on ecological preservation and resource efficiency (Peters et al., 2023). Seoul, on the other hand, has undergone rapid industrialization and urbanization in a compressed timeframe, necessitating a focus on technological innovation and infrastructure development to address environmental challenges and enhance urban livability. Seoul's approach to sustainability is often characterized by large-scale urban regeneration projects, such as the Cheonggyecheon restoration, which aim to integrate green spaces and improve environmental quality within the dense urban fabric (Iqbal et al., 2023; Kim & Yang, 2023).

Comparative Studies of Green Policies

Comparative studies of green policies in global cities have demonstrated the importance of policy integration, technological innovation, and public participation in maximizing the sustainability of urban environments (Boutreux et al., 2023). The issue of urban

forms has been particularly difficult to deal with, especially in relation to how they can improve the goals of sustainable development. The issues of sustainable urban development should not be mere analysis of the consequences of urban development, but also the development of new paradigms or the assessment of the adequacy of traditional development paradigms to understand the consequences that new urban dynamics have on quality of life for the residents of urban areas.

Challenges in Implementing Green Initiatives

However, it is important to note that strategies frequently overlook other crucial aspects of urban sustainability, such as local food production, circular waste management, biodiversity conservation, and cultural heritage preservation (Wei et al., 2025). Such omissions can result in a superficial and ultimately ineffective approach, failing to holistically address the intricate web of social, economic, and ecological interdependencies that underpin genuine urban sustainability.

In many cases, strategies do not give due consideration to other vital dimensions of urban sustainability, including local food production, circular waste management systems, the preservation of biodiversity, and the safeguarding of cultural heritage.

Methodology

This paper adopts a qualitative comparative case study approach to analyze the sustainability initiatives of Amsterdam and Seoul (Shaikh & Bhutto, 2019). Data is collected from academic literature, city policy documents, sustainability rankings, and government publications. Key indicators include transportation infrastructure, green space development, renewable energy usage, climate adaptation techniques, and levels of citizen participation. Comparative tables and visual summaries are used to synthesize data and present actionable insights.

Selection Criteria for Amsterdam and Seoul

The selection of Amsterdam and Seoul as case studies is predicated on their recognition as pioneering cities in sustainable urban development, each distinguished by unique historical trajectories, socio-economic contexts, and environmental challenges (Lee et al., 2023).

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Case Study: Amsterdam as a Sustainable City

Amsterdam has long been recognized as a pioneer in sustainable urban development, distinguished by its comprehensive approach to environmental stewardship and urban planning. The city's commitment to sustainability is deeply rooted in its history and culture, as evidenced by its extensive network of canals, green spaces, and bicycle-friendly infrastructure (Wang & Ren, 2025). Amsterdam's integrated approach to urban

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planning, exemplified by initiatives such as the "Amsterdam Smart City" program, demonstrates a commitment to sustainability that extends beyond environmental concerns to encompass social equity and economic viability (Lee et al., 2022).

Amsterdam is globally acknowledged as a front runner in environmentally conscious urban development. The city boasts a remarkable statistic, with over 60% of daily commutes facilitated by bicycles, leveraging an extensive network of cycling routes and seamlessly integrated public transportation options (Kutty et al., 2022). Furthermore, Amsterdam is actively implementing an ambitious climate strategy, prioritizing the reduction of dependence on automobiles, the curtailment of emissions, and the augmentation of renewable energy sources through the deployment of solar panels and wind energy technologies. The city's established proficiency in water management has spurred the development of pioneering climate adaptation initiatives, including innovative concepts such as floating residences and verdant roof installations (Sujatha et al., 2025). Additionally, Amsterdam distinguishes itself through progressive waste management methodologies, achieving substantial recycling rates and minimizing landfill usage through comprehensive public awareness campaigns and community involvement. Amsterdam's Circular Strategy 2024 aims to reduce the city's resource usage by 50% by 2030 and transition to a fully circular economy by 2050 (Friant et al., 2023).

Case Study: Seoul as a Sustainable City

Seoul has significantly invested in greening its urban environment through a combination of technological integration and community-focused programs. The city features a highly efficient metro system, enhanced by intelligent traffic management technologies and an expanding fleet of electric buses (Robinson & Ji, 2022). The Cheonggyecheon Stream restoration project, which converted a major highway into a vibrant urban greenway, exemplifies Seoul's commitment to ecological revitalization and the promotion of public well-being (Choi & Kim, 2022).

Seoul's dedication to environmental sustainability is further demonstrated through the implementation of sophisticated air quality monitoring systems, eco-friendly building practices, and extensive urban afforestation programs. The city promotes energy efficiency through smart buildings, solar panel subsidies, and dynamic energy monitoring (Liu & Wan, 2025). The "One Less Nuclear Power Plant" initiative reflects Seoul's long-term vision of energy independence and net-zero emissions by 2050. Blockchain technology is used for transparent tracking of energy consumption and emissions. To realize these far-reaching ambitions, Seoul has enacted stringent building codes mandating energy-efficient designs, incentivized the installation of photovoltaic systems through subsidy programs, and deployed advanced energy monitoring infrastructure to optimize energy consumption across its building stock (Mohammadzadeh et al., 2023).

Sustainability Comparison of Amsterdam and Seoul

Both Amsterdam and Seoul demonstrate strong commitments to urban sustainability, yet their approaches diverge significantly due to differences in urban morphology, cultural contexts, and technological infrastructure (Vespasiano et al., 2025). While Amsterdam's strategy emphasizes integrated urban planning solutions, such as prioritizing cycling infrastructure and public transportation networks, Seoul's sustainability initiatives are characterized by a focus on technological innovation and ambitious ecological restoration projects, reflecting their unique urban environments and strategic priorities (Daniel Tang, 2024).

Table 1: Sustainability Comparison of Amsterdam and Seoul

Criteria	Amsterdam	Seoul
Transportation	Extensive cycling network; low car use	High-efficiency metro; smart transport tech
Renewable Energy	Solar, wind integration; circular economy	Smart grid; solar incentives; blockchain
Green Infrastructure	Green roofs; floating homes	Stream restoration; green corridors
Climate Adaptation	Flood-resilient infrastructure	Urban heat island reduction strategies
Citizen Engagement	Co-creation, participatory planning	Eco Mileage Program, citizen councils
Smart Technologies	Digital monitoring of sustainability goals	AI and blockchain in environmental tracking
Sustainability Vision	Fully circular by 2050	Carbon neutrality by 2050

The table 1 below summarizes key aspects of green sustainability initiatives in Amsterdam and Seoul.

Lessons Learned from Amsterdam

Amsterdam provides a model for other cities through its integrated, community-focused approach to sustainability. The city's focus on citizen engagement and participatory planning ensures that sustainability initiatives are aligned with the needs and preferences of its residents.

Amsterdam's emphasis on citizen engagement and participatory planning serves as a model for other cities striving to create inclusive and sustainable urban environments. By prioritizing community involvement, Amsterdam ensures that sustainability initiatives are tailored to the specific needs and preferences of its residents, fostering a sense of ownership and shared responsibility for the city's environmental performance.

Lessons Learned from Seoul

Seoul's transformation from a highly industrialized city to a green metropolis offers valuable insights into how technology and policy can drive environmental change. The city showcases the effective integration of smart technologies and policy interventions to tackle complex urban challenges.

Implications for Other Cities

The experiences of Amsterdam and Seoul offer actionable insights for other cities pursuing sustainable development pathways. Cities may adopt tailored strategies depending on their unique urban context, resources, and priorities.

Cities should also incorporate strategies of citizen engagement and stakeholder participation to promote environmental awareness (shah et al., 2025).

Key Findings

Amsterdam and Seoul exemplify distinct yet complementary models of green sustainability. Amsterdam's strengths lie in its circular economy, community design practices, and climate-resilient infrastructure. Seoul excels in smart technology integration, urban regeneration, and energy transparency. Both cities demonstrate the value of context-specific strategies that align environmental objectives with technological innovation and social inclusion. As more urban centers seek pathways to sustainability, the practices of Amsterdam and Seoul offer transferable insights for designing livable, resilient, and green cities of the future

Future Research Directions

Future research is needed to evaluate the long-term impacts of sustainability initiatives in Amsterdam and Seoul, including their contributions to carbon emissions reduction and resource efficiency.

It is crucial to assess the scalability of their strategies for other cities and to understand the trade-offs between economic growth and environmental protection. More sophisticated metrics and qualitative evaluations are needed to fully understand the social and ecological implications of urban sustainability policies.

Recommendations

Policy & Governance:

Promote bilateral knowledge exchange on green infrastructure and urban planning. Enhance citizen participation through digital and community-driven sustainability platforms.

Green Infrastructure:

Seoul should adopt green roof incentives modelled after Amsterdam. Both cities should develop biodiversity corridors linking urban green spaces.

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Sustainable Transportation:

Amsterdam can integrate Seoul's AI-powered transit systems. Seoul should expand protected bike lanes and promote cycling culture.

Urban Planning & Data:

Merge Amsterdam's data transparency with Seoul's smart tech to create a replicable smart-green city model. Establish standardized sustainability metrics for global benchmarking.

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