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SMART CITY CONCEPTS, GOVERNANCE, AND SUSTAINABILITY: A COMPARATIVE STUDY OF MALAYSIA AND INDONESIA

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Abstract

Smart city development has become increasingly crucial as technology continues to shape urban governance and daily life, particularly in Southeast Asia. This study examines the development of smart cities in Malaysia and Indonesia, with a focus on governance, policy frameworks, technological implementation, and stakeholder engagement. Through a comparative analysis of Kuala Lumpur and Jakarta, the research explores how contextual factors influence strategies and collaborations in each city. Methodologically, the study draws on secondary data such as official reports, policy documents, and academic literature, as well as

primary data collected through interviews with local authorities, policymakers, stakeholders, and residents. The findings indicate that while both countries pursue smart city initiatives to enhance sustainability and urban quality of life, Malaysia adopts a centralized governance approach through the Malaysia Smart City Framework (MSCF), whereas Indonesia's 100 Smart Cities program is more decentralized. Kuala Lumpur emphasizes smart infrastructure and integrated data systems, while Jakarta focuses on improving public service delivery via digital platforms such as JAKI. Despite shared objectives, differences in governance models and socioeconomic conditions shape each city's approach. The study concludes with key insights and recommendations for enhancing smart city frameworks and promoting sustainable urban development in Southeast Asia.

Keywords: smart cities, urban governance, sustainability, Malaysia, Indonesia

Introduction

In an era characterized by rapid urbanization and technological advancement, the concept of a "smart city" has emerged as a promising solution to address the complex challenges of modern urban environments. A smart city integrates advanced technology, data-driven approaches, and innovative urban planning strategies to increase the efficiency, sustainability, and livability of cities (Galati 2018). The emergence of the smart city idea stems from the community's needs for simpler, faster, and more efficient public services (Grossi et al. 2020). Due to this, smart cities emphasize technology, socioeconomics, human capital, regulations, infrastructure, and the resolution of urban problems (Chen and Cheng 2022).

However, this paradigm shift is not only about integrating technology into the urban fabric but also fostering sustainable development, ensuring inclusivity, and enhancing citizen engagement. This integration also concerns tackling the needs of marginalized communities and providing equitable access to a better quality of life. Currently, an increasing number of diverse concepts are emerging regarding the characteristics of smart cities (Angelidou 2015), especially with the evolution of smart city models through various generations, namely Smart City 1.0, Smart City 2.0, Smart City 3.0, and Smart City 4.0 (Zwick and Spicer 2023).

The smart city concept revolves around three key elements: Smart People, Smart Technology, and Smart Collaboration (Meijer and Bolivar 2016). Its relevance is increasing due to urbanization, technological advancements, sustainability concerns, and economic growth. The COVID-19 pandemic further underscored the need for smart solutions in healthcare, remote working, and economic recovery (Kostina and Kostin 2022). Additionally, Industry 4.0 trends, such as IoT, cloud computing, open data, and big data, are optimizing city operations. As a result, smart city initiatives are accelerating, addressing modern urban challenges through integrated, technology-driven solutions (Sancino and Hudson 2020).

Malaysia and Indonesia pursue smart city initiatives with distinct approaches. The Malaysia Smart City Framework (MSCF), introduced in 2018, outlines seven items: Smart Economy, Smart Living, Smart Environment, Smart People, Smart Government, Smart Mobility, and Smart Digital Infrastructure. While lacking a fixed timeline, it includes seven core components, 16 policy directions, and five pilot cities. Malaysia's centralized governance and stronger economy enable efficient decision-making and resource allocation, fostering a cohesive national strategy for smart cities (Samsudin et al. 2022). This structured approach distinguishes Malaysia's smart city from Indonesia's.

Indonesia's Smart City Development Strategy 2015–2045 aims to establish 100 smart cities by 2045, focusing on economy, living, environment, people, government, and mobility (Mahesa et al. 2019). It focuses on economic, social, and environmental intelligence while promoting regional collaboration (Hasna and Room Fitrianto 2022). With decentralized governance and regional autonomy, operation varies across regencies and cities, allowing for tailored innovation based on local needs. This approach raises adaptive smart city expansion, ensuring strategies align with diverse urban challenges.

Thus, while both Malaysia and Indonesia are committed to developing their urban landscapes through smart city initiatives, their distinct contexts require tailored approaches that leverage their strengths and address their specific challenges. This comparison highlights that, despite the global trend towards smart city development, the diverse governance, cultural, and socioeconomic contexts of Malaysia and Indonesia may present unique opportunities and challenges in implementing and managing smart city initiatives. Acknowledging and adapting to these contextual differences is crucial for both countries to extend the advantages of smart city technologies and adopt sustainable growth.

This study explores the similarities and differences in Malaysia's and Indonesia's smart city agendas through an analytical framework that focuses on four key dimensions: governance structures, policy frameworks, stakeholder involvement, and technology integration. By comparing their approaches, it examines how conceptual and governance variations shape urban dynamics, socioeconomic impacts, citizen engagement, environmental considerations, and technological advancements. The findings provide insights into refining strategies, improving governance, and fostering inclusive, sustainable smart city development aligned with the 17 Sustainable Development Goals (SDGs). This study contributes to better policy formulation and cross-country learning in advancing smart cities in Southeast Asia.

Literature Review

The growing literature on smart cities explores various definitions and strategies for urban innovation. Grossi and Welinder (2024) highlight the importance of public governance in managing smart cities, ensuring sustainability, accountability, and stakeholder coordination. Effective governance drives policy implementation and aligns strategies with local

needs. Governance concerns organizations and their environments (Jacobsson et al. 2015). The datapolis also supports governance by leveraging data to enhance decision-making, transparency, productivity, and citizen engagement (Meijer 2018). Beyond governance structures, factors such as service provision, business dynamics, and national agendas emphasize the need for democracy and accountability mechanisms (Ehwi et al. 2024).

Public governance relies on educated citizens to share input, follow policies, and support resilient urban development (Hartley 2023). Thus, smart city strategies should enhance citizen awareness, digital skills, and access to digital resources while ensuring affordable, efficient, and inclusive technologies. Achieving this requires a balance between community, technology, and policy (Tsonkov and Petrov 2024). Additionally, different actors may respond differently, necessitating collaborative innovations at the micro-level (Dolmans et al. 2023).

As cities become smarter, comprehensive policy frameworks are essential for improving public services and governance across social, environmental, and economic dimensions (Castelnovo et al. 2016). A bottom-up approach enhances public engagement and policy legitimacy (Choi and Kenney 2024). To unlock their potential, policies must promote knowledge-based, innovative, and proactive strategies (Badran 2021). Additionally, policy transfer plays a key role in building political and policy capacity, understanding local contexts, and fostering effective ecosystems (Li et al. 2022).

The following case studies from Malaysia and Indonesia illustrate smart city initiatives in public governance, citizen involvement, technological adoption, and policy frameworks. These examples highlight how local contexts shape policy adaptation, showcasing both successes and challenges. However, a gap remains in comparative studies on smart city governance models in both countries. This research addresses that gap by analyzing and comparing the adaptability of smart city strategies in Malaysia and Indonesia, offering insights into policy implementation and urban innovation across different governance structures.

Research on smart cities in Malaysia primarily focuses on stakeholder acceptance (Lim et al. 2021) and environmental sustainability (Hamzah et al. 2023), reflecting the concept's relatively recent emergence in the national context. Other studies examine smart communities, e-government (Omar et al. 2017), and mobility solutions (Kee and Ching 2020). In Indonesia, the literature addresses urban challenges (Utomo and Hariad 2017) and smart solutions (Abdurrozzaq and Sulaiman 2019). Tosida et al. (2024) link smart economy with smart villages, while Rifaid et al. (2023) emphasize the role of human resources, financial capacity, and infrastructure. Furthermore, Sarosa et al. (2023) underscore the significance of digital literacy, equitable access, and data security.

Methodology

This study employs a qualitative approach to examine how historical, socioeconomic, technological, and policy contexts influence smart city initiatives in Kuala Lumpur and Jakarta. These two cities are selected as case studies based on their high rankings in the 2024 Smart City Index published by the Institute for Management Development (IMD 2024), which reflects their active engagement in smart urban development. The research utilizes both secondary and primary data sources. Secondary data include official reports, policy documents, and academic literature. Primary data were gathered through semi-structured interviews with five informants from each city, comprising local authorities, policymakers, stakeholders, and residents. Data were analyzed using content analysis and a comparative case study method (Yin 2009) to explore similarities and differences between the two cities. To ensure the validity of findings, data triangulation was conducted by cross-verifying information from multiple sources. The consistency between secondary and primary data supports the trustworthiness of the analysis (Stewart 2012).

Results

Malaysia's smart city development marks a shift from an industrial to an informational global society, driven by humanware, technoware, infoware, and valueware (Jalaluddin 2019). The focus is on seven essential components: Smart Economy, Smart Living, Smart Environment, Smart People, Smart Government, Smart Mobility, and Smart Digital Infrastructure. These goals are guided by five major policies: the New Urban Agenda, Sustainable Development Goals, Twelfth Malaysia Plan, National Physical Plan 3, and National Urbanization Policy 2. Led by the Ministry of Housing and Local Government, alongside the Malaysia Digital Economy Corporation (MDEC), Malaysia is currently in Phase 3 (2023–2025), emphasizing advanced development and monitoring (*Malaysia Smart City Framework* 2018).

Kuala Lumpur leads Malaysia's smart city transformation, evolving from vision to implementation. Kuala Lumpur City Hall (KLCH) oversees initiatives under the Kuala Lumpur Smart City Master Plan (2021–2025), aligning national policies with local needs. Local governments manage urban planning, public health, and infrastructure, ensuring responsive governance. In 2023, Kuala Lumpur ranked 89th in the Smart City Index, improving to 73rd in 2024 due to enhanced online transport tickets, medical appointments, and job listings (Berita Harian 2024). With a growing population of 1.98 million (Department of Statistics Malaysia 2023), Kuala Lumpur's digital transformation reflects Malaysia's broader push for urban innovation and smart governance.

Kuala Lumpur's smart city vision is central to KLCH's Digitalisation Strategic Plan, emphasizing citizen-centric services. Key initiatives include: (i) the Go KL mobile app for

public transport, (ii) cashless payments for KLCH services, (iii) the Mobile Integrated Services app, (iv) the Visit KL one-stop tourism portal, (v) the Kuala Lumpur Urban Observatory for data analytics, (vi) IoT gateways for smart city data, (vii) IoT devices for public services, and (viii) AI-powered big data integration. While the Digitalisation Plan targets 2030, the Kuala Lumpur Structure Plan 2040 (PSKL 2040) addresses the city's rapid expansion and long-term urban challenges.

Table 1. *List of Project Implementation Briefs (PIBs) for Kuala Lumpur Smart City*

PIBs	Component	Project Type	Ease of Implementation	Key Agencies
Kuala Lumpur Urban Observatory (KLUO)	Smart Government	System	Difficult	Kuala Lumpur City Hall
Smart Bin at public housing and tourist attraction areas	Smart Environment	Project	Easy	• Kuala Lumpur City Hall • SWCorp • National Solid Waste Management Department • Department of Environment
E-payment usage for lower retail activities	Smart Economy	Project	Easy	• Central Bank of Malaysia • Service providers
Installation of Smart Pole	Smart Living	Project	Moderate	• Kuala Lumpur City Hall • Service providers

Source: Malaysia Smart City Framework (2018)

Table 1 categorizes Kuala Lumpur's smart city initiatives by project type, implementation ease, and responsible agencies. The Kuala Lumpur Urban Observatory (KLUO), a "Smart Government" system managed by KLCH, is challenging to implement. Easier projects include Smart Bins (Smart Environment, SWCorp) and e-payment systems (Smart Economy, Central Bank). Smart Poles (Smart Living) are moderately challenging, coordinated with service providers. Kuala Lumpur Intelligent City (KliC) integrates systems for KLCH, residents, businesses, and tourists. Other initiatives include electric buses, a low-carbon city, and expanded CCTV installations (*Kuala Lumpur Smart City Plan 2021-2025* 2021; Berita Harian 2023).

However, Kuala Lumpur's smart city initiatives face key challenges, including low public transport usage, which worsens congestion and pollution. High solid waste generation

and poor recycling practices strain waste management systems. A high crime rate raises security concerns, affecting investment and tourism. Additionally, slow internet speeds and limited digital infrastructure hinder digital transformation. A major obstacle is the lack of data sharing within KLCH, limiting the integration and efficiency of smart city solutions (*Malaysia Smart City Framework* 2018). Addressing these issues is critical to achieving a seamless, sustainable, and secure smart city.

KLCH benchmarks against global smart cities, such as Singapore, Dubai, Oslo, Copenhagen, Boston, Amsterdam, New York, London, Barcelona, and Hong Kong, to adopt best practices (*Kuala Lumpur Smart City Master Plan*, n.d.). KLCH also collaborates with industry leaders, including Huawei (Fokus 2024), and partners with international stakeholders, such as China, to enhance smart city solutions (Bernama 2024). These efforts aim to position Kuala Lumpur as a globally competitive smart city, leveraging technology, innovation, and strategic partnerships for urban development and sustainability.

Kuala Lumpur's smart city initiatives are ongoing, making immediate impacts uncertain. However, 5G adoption and digital infrastructure improvements are expected to enhance public services, mobility, economic growth, and overall quality of life. These innovations aim to create a connected, efficient, and sustainable urban environment. In 2023, Kuala Lumpur achieved a sustainability score under the Malaysian Urban-Rural National Indicators Network for Sustainable Development (MURNInets), a framework established by the Town and Country Planning Department (PLANMalaysia), which assesses economy, environment, healthy community, land use and natural resources, infrastructure and transportation, and governance (MURNInets, n.d.). Moreover, Kuala Lumpur's commitment to smart city implementation is demonstrated by its hosting of the Smart City Expo Kuala Lumpur 2025, the first Southeast Asian edition of the globally renowned Smart City Expo World Congress. The event will carry the theme "AI Cities: Shaping Our Digital Future."

Indonesia's e-government journey began in 2003 with Presidential Instruction No. 3, transitioning public services from conventional to digital platforms. Smart city initiatives have since become key to enhancing service efficiency. Jakarta Smart City (JSC), launched in 2016, pioneered urban digitalization (Akbar et al. 2024). In 2017, the "Movement Towards 100 Smart Cities" was introduced by multiple ministries to promote smart city development, focusing on tourism and the seven pillars of "smart": Environment, Economy, Branding, People, Governance, Mobility, and Living. These initiatives drive Indonesia's digital transformation and improve its urban services and governance.

The JSC office, under the Department of Communications, Informatics, and Statistics, supports smart city development across DKI Jakarta. Government Regulation No. 59 of 2022 guides urban governance through smart city principles, covering bureaucracy, economy, society, environment, and mobility. Additionally, Governor DKI Jakarta Law No. 25 of 2022 outlines the 2023–2026 Regional Development Plan, emphasizing public service transformation and improved governance. JSC plays a key role in fostering smart provinces and cities, ensuring digital innovation enhances urban living and administrative efficiency

within Jakarta's smart city framework.

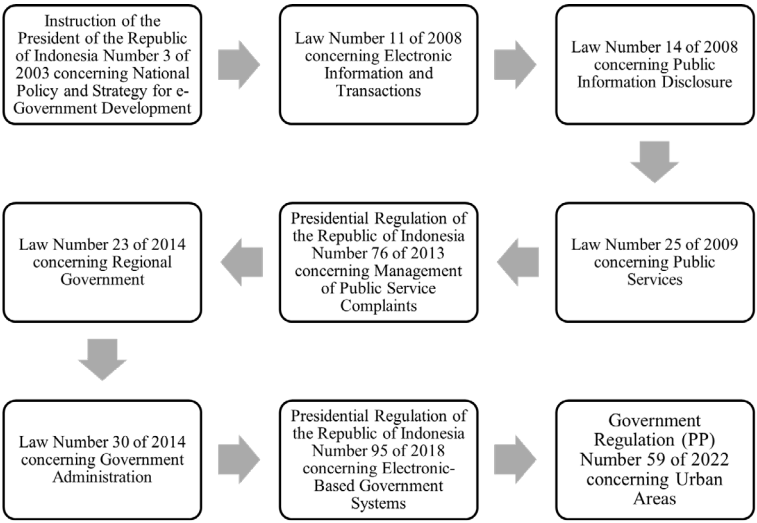

Figure 1. *Governing the Development of Smart Cities in Indonesia*
Source: JSC Annual Report (2023)

JSC is managed by 16 state civil servants and supported by 126 experts with diverse expertise, including information technology, marketing, research analysis, product analysis, social media analysis, and administration. By 2018, the IoT had been integrated into public services, such as Transjakarta buses and smart streetlights. The following year, the JAKI super-app was introduced as a one-stop digital platform for various public services, significantly enhancing service delivery. During the 2020 pandemic, JSC spearheaded Jakarta's digital transformation through the JAKI app and a dedicated COVID-19 website. In 2021, JAKI expanded to include a vaccination registration system, and in 2022, the Citizen Account (Digital ID) feature was launched to provide more personalized services.

Table 2. *Components of Smart City, Implementation, and Maturity Level of Service Capability*

Components	Implementation	Maturity Level
Smart Environment	Air Quality Check (JAKI App)	Level 1
	Flood Monitoring (JAKI App)	Level 2
	Emission Test Registration and Result (JAKI App and JakEmisi App)	Level 4

Smart Economy	Grocery Price (JAKI App)	Level 1
	Market Location (JAKI App)	Level 1
	Small and Medium Enterprise (SMEs) Activities (JAKI App and JakPreneur App)	Level 3
	Tax Check and Bill Payment (JAKI App) vehicle, property, regional tax, e-retribution	Level 4
	Banking Transaction (JAKI App and JakOne Mobile App/Bank DKI)	Level 4
Smart People	Citizen Report JAKI App Twitter (Now X): @DKIJakarta Facebook: Pemprov DKI Jakarta Instagram: Social Media of the Governor/Vice Governor of Jakarta E-mail: dki@jakarta.go.id SMS/WhatsApp: 08111272206 LAPOR 1708 *Aspirasi Publik Media Massa*	Level 4
	News (JAKI App)	Level 1
	Career Training Program (JAKI, prakerja.go.id, and Jaknaker.id)	Level 3
	Read and Borrow Digital Books (JAKI App-Jakarta Library and iJakarta App)	Level 4
	Finding Free Wi-Fi (JAKI App and Molecool App)	Level 4
	Education-Online Learning (JAKI App and Sekolahmu App)	Level 4
Smart Mobility	Public Transport: MRT, LRT, Transjakarta, and Mikrotrans (JAKI App-JakLingko App)	Level 4
Smart Governance	Public Survey (JAKI App)	Level 2
	Sharing Ideas in the *Musrenbang* (JAKI App)	Level 2
	Online Attendance for Civil Servants (JAKI App)	Level 2
	One-Stop Licensing Service (https://jakevo.jakarta.go.id/)	Level 4

Smart Living	Citizenship and Settlement (JAKI App and Alpukat Betawi)	Level 4
	Affordable Housing Info (JAKI-Sirukim App)	Level 1
	Healthcare (ambulance service and appointments) JAKI App	Level 4
Smart Branding	Festival Ini Jakarta	Level 1
	Travel Destinations (JAKI App and Jakcation App)	Level 3

Source: JAKI App, analyzed by authors (2024)

The seven indicators are realized through the best products and services of JSC, all linked to the JAKI App. However, challenges remain, as several criteria are still at Level 1, representing one-way information. In terms of smart city implementation and the maturity level of service capability, the reliance on one-way information within the JAKI App and the lack of integration with other applications pose significant challenges to JSC's development. Additionally, users still need to access websites and download multiple applications to meet their needs, which complicates the overall experience.

JSC aims to achieve cost efficiency in service delivery for the government, private sector, and citizens alike. One notable innovation is the *Antar Jemput Izin Bermotor* (AJIB) service, which enables the delivery of licensing documents and official letters directly to applicants' homes, significantly enhancing service efficiency. To further support Jakarta's economic ecosystem, JSC streamlines the licensing process for business permits, making it easier for investors to establish operations in the city and contribute to economic growth. Additionally, JSC has introduced the JSCLab Sharing initiative, which connects citizens with experts through classes focused on technology, smart city, public policy, and digital literacy, empowering participants to improve their skills across various fields.

Discussion

As cities face rapid urbanization, many adopt smart city strategies using technology to enhance governance and quality of life. Kuala Lumpur and Jakarta, despite differing political, social, and infrastructural contexts, exemplify smart governance in tackling environmental issues, traffic, public services, and sustainability. Their approaches differ based on governance structures and stakeholder roles. Kuala Lumpur follows a structured administrative model, while Jakarta struggles with coordination amid complex urban expansion. This comparison highlights distinct smart city strategies, reflecting unique national priorities and governance dynamics.

Table 3. *Comparison of Kuala Lumpur and Jakarta's Smart City Experience*

	Kuala Lumpur	**Jakarta**
Concepts	1) Smart Economy 2) Smart Living 3) Smart Environment 4) Smart People 5) Smart Government 6) Smart Mobility 7) Smart Digital Infrastructure	1) Smart Economy 2) Smart Living 3) Smart Environment 4) Smart People 5) Smart Government 6) Smart Mobility 7) Smart Branding
Governance (Organizations and Environment)	• The government has had a master plan for the Kuala Lumpur Smart City since 2021 • The focus is on addressing environmental issues, traffic congestion, public services, and sustainability	• The government has a clear organizational structure, a wide range of policies, and a defined vision, and has recently completed the JSC 2025–2029 master plan • The focus is on addressing environmental issues, traffic congestion, public services, and sustainability
Sustainability	Has a priority in addressing social, environmental, and economic issues	Has a priority in addressing social, environmental, and economic issues

Source: Analyzed by authors (2025)

Jakarta's smart city implementation is more established than Kuala Lumpur's, with diverse initiatives enhancing urban living through technology. In contrast, Kuala Lumpur is still in its early stages, with many projects under development. Indonesia's earlier adoption of smart city concepts has fostered greater community awareness and engagement. Jakarta's proactive residents drive continuous innovation, while Kuala Lumpur can learn from Jakarta's experiences. By encouraging community participation and prioritizing technological advancements, Kuala Lumpur can develop a more responsive and sustainable smart city that effectively meets citizens' needs.

JSC focuses on applications such as JAKI to streamline public services, enhancing citizen access and issue reporting. In contrast, Kuala Lumpur's strategy extends beyond mobile apps, incorporating broader innovations such as Smart Bins for waste management and Smart Poles for monitoring and lighting. Currently, 10 Smart Bins and 31 Smart Poles are deployed, with further expansion planned (New Straits Times 2022). These initiatives integrate Smart Environment and Smart Living, aiming to enhance urban sustainability and livability. By combining environmental and technological advancements, Kuala Lumpur strives to improve the quality of life while promoting digital convenience.

However, three common weaknesses can be identified in the implementation of smart

city initiatives in both Kuala Lumpur and Jakarta. First, digital literacy remains relatively low, which limits effective public participation in smart city services. Second, both cities tend to emphasize technological adoption without effectively linking it to outcomes related to broader urban challenges, such as quality of life and social equity. This results in a tendency toward techno solutionism, where technology is seen as an end rather than a means. Finally, there is concern that smart services are concentrated primarily in well-developed or tourist-centric areas, leading to uneven service delivery and the marginalization of peripheral or underserved communities. Therefore, these weaknesses must be properly addressed to ensure the successful realization of smart city objectives.

Conclusions

Both Kuala Lumpur and Jakarta share the goal of enhancing public services and promoting sustainability through smart city initiatives. While both integrate technology, people, and the environment, their governance structures differ—Kuala Lumpur adopts a collaborative approach, while Jakarta's smart city unit centralizes efforts. Both cities use digital platforms such as JAKI in Jakarta and various apps in Kuala Lumpur to streamline services and engage citizens. Sustainability remains a priority, especially in tackling pollution and urban challenges. Though long-term impacts remain uncertain, both cities are progressing, emphasizing public participation, infrastructure development, and SDG alignment, ensuring a sustainable and livable future.

Kuala Lumpur and Jakarta have implemented policies, regulations, and master plans, and both strive to enhance urban sustainability and service delivery through digital innovation. To make these findings actionable, several specific policy strategies are recommended. The Kuala Lumpur government should prioritize addressing data silos by unifying cross-departmental data. A centralized urban data platform, which is modeled after Jakarta's JAKI, could streamline services and enhance evidence-based policymaking. Policymakers in both cities should allocate resources, from both government and citizens, to improve digital literacy. Additionally, both cities should adopt a performance-based budgeting mechanism tied to smart city key performance indicators (KPIs), such as internet accessibility, waste management efficiency, and public transport usage. Targeted infrastructure investments, such as expanding 5G coverage in Kuala Lumpur and integrating fragmented digital services in Jakarta, are essential to optimize impact. Finally, enhancing public–private–academia innovation ecosystems is crucial to ensure smart city development aligns with each city's master plan.

However, this study is limited by its focus on Kuala Lumpur and Jakarta, the capital cities of Malaysia and Indonesia, which may not fully represent the diversity of smart city development across other regions in these countries. Future research should incorporate broader comparisons and variables, including both developed and developing cities. Assessments of citizen satisfaction, the digital literacy of both government officials and

citizens in using technology, and the impact of smart city development using quantitative methods would complement this research and provide deeper policy insights.

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