



Institutional and Participatory Challenges in Governing Sustainable Capital City Development: The Case of Nusantara, Indonesia

Wikan Danar Sunindyo^{1*}, Alfrojems Alfrojems¹, Doddi Septian¹, Rini Rachmawati², Dana Indra Sensuse³,
Galuh Syahbana Indraprahasta⁴, Suet Leng Khoo⁵, Khin Khin Soe⁶

¹ School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Bandung 40132, Indonesia

² Faculty of Geography, Universitas Gadjah Mada, Yogyakarta 55281, Indonesia

³ Faculty of Computer Science, University of Indonesia, Depok 16424, Indonesia

⁴ Research Center for Population, National Research and Innovation Agency (BRIN), Jakarta 12710, Indonesia

⁵ Development Studies Program, School of Social Sciences, Universiti Sains Malaysia, Minden 11800, Malaysia

⁶ Pro- Rector (Administrative), Sagaing University of Education, Sagaing 01051, Myanmar

Corresponding Author Email: wikan@itb.ac.id

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ABSTRACT

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The relocation of national capitals represents a critical pathway toward achieving sustainable urban development, yet it also introduces complex governance and planning challenges. Indonesia's new capital city, Nusantara, provides a unique case to examine how sustainable urban transformation is governed under conditions of institutional complexity and rapid development. This study investigates the institutional and participatory dynamics shaping the governance of Nusantara, with particular attention to multi-level coordination, inclusivity, and the role of emerging digital urban systems. A qualitative case study approach was employed, combining document analysis, semi-structured interviews, stakeholder mapping, and scenario-based exploration conducted in Sepaku, East Kalimantan between 2023 and 2025. The findings reveal three key challenges: (1) institutional fragmentation and overlapping mandates among national, regional, and special-purpose authorities, leading to coordination gaps and service uncertainty; (2) uneven participation, where indigenous communities, women, and small businesses face structural and capacity barriers to meaningful engagement; and (3) limited effectiveness of digital urban systems as participatory tools, due to issues of trust, accessibility, and institutional alignment. In response, the study proposes a hybrid adaptive governance approach that integrates centralized strategic direction with decentralized participation and iterative learning. The study contributes to the literature by linking capital city development with sustainable urban governance, highlighting how institutional arrangements and participatory practices shape the sustainability of large-scale urban transformation. The findings offer practical implications for policymakers and planners in emerging capital cities, emphasizing the need for institutional alignment, inclusive participation, and capacity-building to achieve sustainable and equitable urban development.

1. INTRODUCTION

The development of new capital cities has emerged as a strategic approach to addressing urban sustainability challenges, including environmental degradation, regional inequality, and excessive concentration of economic activities in existing metropolitan areas. Across different contexts, capital relocation is often framed as an opportunity to create more balanced, resilient, and sustainable urban systems. However, beyond their spatial and symbolic dimensions, such projects introduce complex governance and planning challenges, particularly in coordinating multiple institutions, ensuring inclusive participation, and aligning long-term sustainability goals with rapid implementation [1, 2].

Indonesia's decision to relocate its capital from Jakarta to Nusantara represents one of the most ambitious contemporary

examples of sustainable capital city development. Jakarta has experienced severe environmental pressures, including land subsidence and flooding, which have intensified the urgency for capital relocation [3, 4]. The move is driven by a combination of environmental pressures and the need to redistribute development across the archipelago. Nusantara is envisioned as a model of sustainable and smart urban development, integrating green infrastructure, low-carbon systems, and digital technologies into urban planning and governance. As a result, the project has attracted significant attention from policymakers, researchers, and urban planners interested in sustainable urban transformation.

Despite these ambitions, research on urban governance highlights that large-scale urban transformation is not merely a technical or design-driven process but a deeply institutional and political one. Governance arrangements in such projects

often involve multiple actors across national, regional, and local levels, resulting in overlapping mandates, coordination challenges, and fragmented decision-making structures [1]. In addition, participatory planning processes—while widely promoted as essential for sustainable development—frequently remain limited in practice, with marginalized groups facing structural and capacity-related barriers to meaningful engagement [5].

While previous studies have proposed information and communication technology (ICT) infrastructure frameworks to support smart city development in Nusantara [6], limited attention has been given to governance complexity, institutional coordination, and participation dynamics.

This study addresses this gap by examining the governance of sustainable urban transformation in Indonesia's new capital city, Nusantara. It investigates three interrelated questions: how institutional roles and responsibilities are configured, how participatory mechanisms enable or constrain inclusion, and how digital urban systems mediate governance and engagement. The study adopts a qualitative case study approach, combining document analysis, semi-structured interviews, stakeholder mapping, and scenario-based exploration conducted between 2023 and 2025.

Unlike previous studies on Nusantara that primarily focus on smart city visions, digital infrastructure frameworks, or technological development strategies [6-8], this study emphasizes the governance dynamics underlying sustainable urban transformation. The study contributes empirically by providing grounded qualitative evidence from field observations, interviews, and stakeholder interactions conducted during the early development phase of Nusantara between 2023 and 2025.

Theoretically, this study extends discussions on sustainable urban governance by proposing a hybrid adaptive governance perspective that integrates centralized strategic coordination, decentralized participation, and iterative institutional learning in the context of emerging capital cities. Methodologically, the study combines qualitative case study approaches with stakeholder mapping and scenario-based exploration to capture governance complexity across institutional, social, and digital dimensions.

By integrating institutional fragmentation, participation dynamics, and digital urban systems within a single governance framework, this study offers a more context-sensitive understanding of sustainable capital city development in the Global South.

The study contributes to the literature on sustainable urban governance by proposing a hybrid adaptive governance approach that integrates centralized strategic coordination with decentralized participation and iterative learning. In addition, the findings provide practical insights for policymakers and planners involved in emerging capital city development and large-scale urban transformation initiatives in the Global South.

2. LITERATURE REVIEW

2.1 Sustainable urban governance and urban transformation

Sustainable urban governance has become a central issue in contemporary urban development, particularly in response to rapid urbanization, environmental pressures, and socio-economic inequality. Sustainable cities are not only expected

to achieve economic growth and technological advancement but also to balance environmental protection, social inclusion, and long-term governance resilience [9]. In this context, governance plays a critical role in coordinating diverse actors, institutions, and policy objectives involved in urban transformation processes.

The emergence of smart city paradigms has further expanded discussions on sustainable urban governance. Smart cities are commonly associated with the integration of digital technologies, data-driven systems, and intelligent infrastructures to improve urban efficiency and service delivery [10, 11]. However, scholars have argued that technological innovation alone is insufficient to achieve sustainability objectives. Sustainable urban governance requires broader integration of environmental, social, institutional, and participatory dimensions [9].

Large-scale urban transformation projects are often characterized by governance complexity involving multiple institutional actors operating across different administrative levels. Such transformations are inherently political and institutional processes rather than purely technical planning exercises [1]. Governance fragmentation, overlapping mandates, and coordination challenges frequently emerge in rapidly developing urban contexts, affecting policy implementation and long-term sustainability outcomes.

2.2 Participatory planning and inclusive governance

Participatory governance has been widely recognized as a key component of sustainable urban development. Collaborative planning approaches emphasize the importance of involving multiple stakeholders, including governments, communities, civil society organizations, and private actors, in urban decision-making processes [12]. Inclusive participation is expected to improve policy legitimacy, strengthen accountability, and support more socially responsive urban development.

Nevertheless, participation in practice often remains uneven and constrained by institutional, socio-economic, and political factors. Critical perspectives on participatory governance argue that participation mechanisms may become symbolic or consultative rather than genuinely deliberative [5]. In many cases, actors with greater institutional resources, technical expertise, and digital capacity dominate decision-making processes, while marginalized communities face barriers to meaningful engagement.

These challenges are particularly evident in Global South urban contexts, where planning systems are frequently shaped by informality, institutional instability, and uneven development [13, 14]. Rapid urban transformation may intensify inequalities if governance systems fail to accommodate diverse local interests and socio-cultural conditions. As a result, understanding participation dynamics is essential for evaluating the sustainability and legitimacy of large-scale urban projects.

2.3 Digital urban systems and smart governance

Digital urban systems increasingly influence how cities are planned, governed, and managed. Technologies such as urban data platforms, digital twins, artificial intelligence, and online participation systems are often promoted as tools for improving coordination, efficiency, transparency, and citizen engagement [2]. These technologies support the broader

transition toward smart governance models in which data and digital infrastructures play a central role in urban management. Smart urban governance emphasizes not only technological capability but also institutional coordination and governance adaptability in managing complex urban systems [1].

Recent studies, however, emphasize that digital technologies do not automatically produce better governance outcomes. The effectiveness of smart governance systems depends on institutional capacity, governance arrangements, public trust, and socio-technical integration [2, 15]. Digital systems are therefore better understood as socio-technical infrastructures embedded within broader political and institutional environments.

In the context of Nusantara, previous studies have proposed sustainable ICT infrastructure frameworks to support smart city governance, environmental resilience, and integrated urban management [6]. Emerging concepts such as digital twins and metaverse-based urban platforms have also been introduced as part of the broader vision for sustainable digital urban development in Indonesia's new capital city [7, 8]. These studies highlight the growing importance of digital ecosystems in enabling urban coordination, monitoring, and decision-support processes.

At the same time, the implementation of digital urban systems introduces new governance challenges related to institutional readiness, interoperability, digital inclusion, and long-term governance sustainability. Recent discussions on metaverse governance and digital urban infrastructure further suggest that technological systems should not be viewed merely as technical solutions, but as socio-technical governance environments requiring adaptive institutional arrangements and stakeholder collaboration [8].

In addition, digital transformation may also reproduce or reinforce existing inequalities if access to technology, digital literacy, and institutional support are unevenly distributed. In developing urban contexts, digital divides remain significant barriers to inclusive governance and participation. Consequently, the implementation of digital urban systems must be examined not only from a technological perspective but also from governance and social inclusion perspectives.

2.4 Governance in new capital city development

The development of new capital cities provides a unique context for examining sustainable urban governance. Capital relocation projects are often associated with experimental governance arrangements, large-scale infrastructure development, and national modernization agendas [16, 17]. Examples such as Brasília, Putrajaya, and Naypyidaw demonstrate that new capital city development involves not only physical planning but also institutional restructuring and political negotiation [18, 19].

Previous studies have shown that many new capital city projects face governance challenges related to centralized decision-making, limited participation, and coordination complexity [1, 18]. While some projects succeed in developing modern administrative infrastructures, they may also generate social segregation, uneven participation, and governance legitimacy concerns [19, 20]. These experiences highlight the importance of balancing centralized planning capacity with inclusive and adaptive governance mechanisms [12, 21].

In the context of Indonesia, Nusantara has been widely promoted as a sustainable and smart capital city integrating

green infrastructure and digital technologies into urban governance. Previous studies have proposed ICT infrastructure frameworks and smart city concepts to support Nusantara's development [6-8]. However, limited research has examined how institutional arrangements, participation dynamics, and digital urban systems interact in shaping sustainable urban transformation in practice.

Accordingly, there remains a need for more context-sensitive and governance-oriented analyses of Nusantara's development. This study addresses this gap by examining how institutional fragmentation, participation dynamics, and digital urban systems collectively shape the governance of sustainable urban transformation in Indonesia's new capital city.

3. METHODOLOGY

3.1 Research design

This study employed a qualitative exploratory case study design to investigate the governance of sustainable urban transformation in Indonesia's new capital city, Nusantara. The case study approach is appropriate for examining complex, real-world governance processes involving multiple actors, institutional arrangements, and socio-spatial dynamics [22]. Given the evolving nature of Nusantara as an emerging capital city, an exploratory design allows for capturing dynamic governance interactions and adaptive practices [23].

3.2 Data collection and fieldwork context

Data collection was conducted between 2023 and 2025 through a combination of semi-structured interviews, focus group discussions (FGDs) [24], direct field observations, webinars, stakeholder consultations, and comparative governance discussions across Indonesia, Malaysia, and Myanmar [25]. The longitudinal fieldwork design allowed the study to capture governance dynamics, institutional adaptation, and socio-technical transformation processes during multiple phases of Nusantara's development.

The first phase of fieldwork was conducted between July and November 2023 in East Kalimantan, including Balikpapan, Samarinda, Penajam Paser Utara (PPU), and surrounding Nusantara areas. Three major FGDs were conducted with regional planning agencies, Communication and Information Offices (Diskominfo), transportation agencies, housing agencies, environmental institutions, and local governments. Additional online webinars and expert discussions focusing on smart governance, digital twins, and sustainable urban development were conducted in November 2023.

The second phase of the study was conducted throughout 2024 and expanded the research into comparative governance analysis involving Indonesia, Malaysia, and Myanmar. Semi-structured interviews were conducted with representatives from Otorita Ibu Kota Nusantara (OIKN), Dinas PU, Dinas Perkim, Diskominfo Samarinda, and the Director of Macro Planning of OIKN between May and June 2024. Comparative field visits and institutional discussions were conducted in Kuala Lumpur and Putrajaya in August 2024, while online interviews with Myanmar stakeholders and academics were conducted between September and November 2024.

The third phase of the study was conducted throughout 2025

and focused on governance continuity, adaptive governance, and socio-technical transformation after Indonesia's political transition. Online interviews were conducted with the Deputy for Green and Digital Transformation of OIKN on 15 May 2025 and the Deputy for Social, Cultural, and Community Empowerment of OIKN on 4 June 2025. Direct field observations and FGDs were also conducted in Sepaku and Bukit Raya Smart Village on 11–12 June 2025. Comparative field observations and governance discussions were further conducted in Yangon and Naypyidaw, Myanmar, during November 2025.

Overall, the study involved 127 participants consisting of policymakers, OIKN officials, regional government agencies, academics, planners, telecommunication stakeholders, village representatives, indigenous community figures, and local communities. Respondents were selected using purposive and stakeholder-based sampling strategies according to their institutional roles, governance responsibilities, and involvement in smart city and capital city development processes.

Interview duration ranged from approximately 60 to 180 minutes depending on the interview format and stakeholder category. Most interviews and FGDs in Indonesia were conducted in Bahasa Indonesia, while comparative interviews in Malaysia and Myanmar were primarily conducted in English. Data collection also included stakeholder mapping, scenario-based governance exploration, and comparative

governance analysis.

Secondary documents analyzed in this study included smart city masterplans, OIKN planning documents, regional development reports, governance policy documents, institutional presentations, webinar materials, smart village reports, infrastructure development plans, and comparative studies related to emerging capital cities.

To improve credibility and reliability, the study applied methodological triangulation by combining interviews, FGDs, field observations, webinars, comparative case studies, stakeholder consultations, and document analysis conducted across multiple institutional contexts between 2023 and 2025. Data were analyzed using thematic analysis following Braun and Clarke's [26] framework.

To provide greater methodological clarity regarding the fieldwork process, stakeholder engagement, and longitudinal empirical investigation, the major data collection activities conducted between 2023 and 2025 are summarized in Table 1.

The longitudinal fieldwork was implemented in several phases between 2023 and 2025. While the formal research phase undertaken in 2024 was covered by BRIN ethical clearance, the remaining field activities conducted in 2023 and 2025 were carried out under institutional permission as part of stakeholder consultations, comparative governance studies, field observations, and FGD involving non-sensitive public governance issues.

Table 1. Summary of qualitative data collection

Year	Interview	FGD	n	Stake Holders	Location	Language
2023	1	4	52	OIKN, local governments, community representatives	East Kalimantan, Indonesia	Indonesian
2024	2	3	20	Government agencies, enterprises, academics	Malaysia & Online	English & Indonesian
2025	–	3	55	OIKN, community representatives, Myanmar stakeholders	Indonesia & Myanmar	Indonesian & English
Total	3	10	127	Government, OIKN, communities, enterprises, academics	Indonesia, Malaysia & Myanmar	Indonesian & English

As summarized in Table 1, this longitudinal qualitative study was conducted between 2023 and 2025 through 10 FGDs, three semi-structured interview sessions, and field observations, involving a total of 127 participants across Indonesia, Malaysia, and Myanmar. Data collection was carried out in Indonesian and English, depending on the study location and participants' backgrounds. Participants were purposively selected based on their institutional roles, expertise, and direct involvement in planning, implementing, or experiencing the development of Nusantara as Indonesia's new capital city. The participant pool represented a diverse range of stakeholders, including OIKN, national and local government agencies, community representatives, indigenous peoples, local traders and SMEs, enterprises, and academics. This diversity enabled the study to capture multiple perspectives on institutional coordination, stakeholder participation, and governance practices across different administrative and socio-cultural contexts.

A detailed breakdown of participant composition by stakeholder category is presented in Table A1, while the complete chronology of interviews, FGDs, field observations, and comparative governance activities is provided in Table A2.

3.3 Stakeholder mapping and comparative governance analysis

Stakeholder mapping was conducted to examine the complex governance ecosystem surrounding Nusantara development and comparative capital city governance in Southeast Asia. The mapping process aimed to identify the institutional actors, governance relationships, participation dynamics, and coordination structures involved in sustainable urban transformation processes [27].

Stakeholders were categorized according to their institutional influence, governance authority, level of participation, and strategic interest in Nusantara development. The identified stakeholders included OIKN, national ministries, regional governments, planning agencies, digital governance institutions, local communities, indigenous groups, academics, telecommunication stakeholders, private sector actors, and civil society organizations. This mapping process enabled identification of governance overlaps, institutional fragmentation, asymmetries in participation, and coordination gaps across multiple governance levels.

The stakeholder mapping process was supported by interviews, FGDs, institutional discussions, and field

observations conducted between 2023 and 2025. Comparative stakeholder perspectives from Malaysia and Myanmar were also incorporated to examine similarities and differences in governance arrangements, smart city implementation, institutional centralization, and public participation within emerging capital city contexts.

Comparative governance analysis was conducted to explore how different governance structures influence sustainable urban transformation outcomes. The Indonesian case of Nusantara was comparatively examined alongside Putrajaya and Naypyidaw to understand how institutional coordination, digital governance systems, socio-political adaptation, and participation mechanisms operate under different political and administrative settings.

The comparative analysis focused on several dimensions including governance centralization, digital urban systems, adaptive governance capacity, public participation, sustainability orientation, and socio-technical integration. This approach enabled the study to identify both strengthening and limiting factors influencing the governance of emerging capital cities in the Global South.

3.4 Data analysis

The collected qualitative data were analyzed using thematic analysis following the framework proposed by Braun and Clarke [26]. The analysis process was conducted iteratively to identify recurring governance patterns, institutional dynamics, participation challenges, and socio-technical transformation processes emerging across the Nusantara case and comparative governance contexts.

The analysis involved four main stages: data familiarization, initial coding, theme development, and interpretive synthesis. During the familiarization stage, interview transcripts, FGD notes, field observations, webinar discussions, and institutional documents were reviewed repeatedly to identify preliminary governance issues and recurring narratives.

Initial coding was conducted manually by grouping relevant statements, observations, and institutional findings into governance-related categories. The coding process focused on themes related to institutional fragmentation, multi-level coordination, participation asymmetries, digital urban systems, adaptive governance, socio-technical integration, and sustainability challenges.

The coded data were subsequently organized into broader thematic categories to identify relationships among governance actors, institutional arrangements, participation mechanisms, and digital infrastructures. Comparative interpretation was also conducted across Indonesia, Malaysia, and Myanmar to examine similarities and differences in governance structures, planning approaches, and adaptive governance practices within emerging capital city contexts.

Scenario-based exploration was integrated into the analytical process to evaluate possible governance trajectories under different institutional and socio-technical conditions. The analysis emphasized how governance configurations influence participation, institutional coordination, sustainability implementation, and digital transformation processes in large-scale urban development.

The analytical process was conducted iteratively throughout the study period to accommodate evolving governance dynamics and emerging findings obtained from longitudinal fieldwork conducted between 2023 and 2025.

3.5 Research credibility and triangulation

To enhance research credibility and analytical rigor, this study applied methodological triangulation across multiple data sources, collection methods, institutional settings, and comparative governance contexts [28]. Triangulation was conducted throughout the research process to improve interpretive consistency, reduce single-source bias, and strengthen the reliability of governance-related findings.

The study combined semi-structured interviews, FGDs, direct field observations, webinars, institutional discussions, stakeholder consultations, and document analysis conducted between 2023 and 2025. Findings obtained from one source were continuously cross-validated with other empirical sources including institutional documents, comparative field observations, stakeholder perspectives, and governance discussions across Indonesia, Malaysia, and Myanmar.

Source triangulation was applied by comparing perspectives among policymakers, OIKN officials, regional governments, academics, planners, telecommunication stakeholders, local communities, and indigenous representatives. This approach enabled the study to identify converging and diverging interpretations regarding governance coordination, participation dynamics, digital transformation, and sustainability implementation.

Method triangulation was also employed through the integration of thematic analysis, stakeholder mapping, comparative governance analysis, and scenario-based exploration. The combination of these analytical approaches enabled the study to examine governance dynamics from multiple interpretive perspectives rather than relying on a single analytical framework.

In addition, longitudinal triangulation was conducted by examining governance developments and institutional adaptation processes across multiple fieldwork phases between 2023 and 2025. Comparative triangulation involving Nusantara, Putrajaya, and Naypyidaw further strengthened the analytical depth by enabling cross-contextual interpretation of governance structures, institutional coordination, and adaptive urban transformation processes.

These triangulation strategies improved the credibility, consistency, and contextual validity of the study's findings regarding sustainable urban governance and smart capital city development in the Global South.

3.6 Ethical considerations

All participants involved in interviews, FGDs, webinars, stakeholder consultations, and field observations were informed about the objectives of the study, the voluntary nature of participation, and the intended academic use of the collected data prior to the research activities. Verbal consent was obtained before interviews and discussions were conducted.

The study involved policymakers, government officials, academics, local communities, and international stakeholders. To protect participant confidentiality, sensitive institutional and personal information was anonymized during data analysis and reporting. Direct quotations and stakeholder perspectives presented in the study were used only for academic purposes and were carefully contextualized to avoid misinterpretation.

The research adhered to general ethical principles for qualitative social research, including informed consent,

confidentiality, respectful stakeholder engagement, and responsible handling of comparative international data. Field activities conducted outside the formal ethical clearance period were undertaken with institutional permission from the collaborating institutions and in accordance with established ethical principles for qualitative social research.

In addition, the formal research phase conducted between August and December 2024 received ethical clearance from the Ethical Committee on Social Studies and Humanities of the National Research and Innovation Agency (BRIN), Indonesia (Ethical Clearance No. 641/KE.01/SK/07/2024), under the research project entitled Creative, Innovative, and Smart Sustainable City Concept for Capital City, coordinated by Universitas Gadjah Mada (UGM). Data collection activities conducted before and after this period (2023 and 2025) were carried out under institutional permission through stakeholder consultations, FGD, field observations, and comparative governance activities involving adult participants discussing public governance issues. Participation was voluntary, informed consent was obtained from all participants, and all

reported data were anonymized prior to analysis and publication.

All collected materials, interview notes, field observations, and supporting documents were securely stored and used exclusively for research and academic publication purposes.

4. RESULTS AND DISCUSSION

4.1 Institutional fragmentation and governance complexity

The findings reveal that the governance of Nusantara is characterized by institutional fragmentation and overlapping mandates among key actors. As shown in Figure 1, the governance structure involves multiple institutional levels, including national authorities, regional governments, private actors, and local communities. This fragmentation generates uncertainty in decision-making processes, particularly in public service provision such as healthcare, education, and spatial planning.

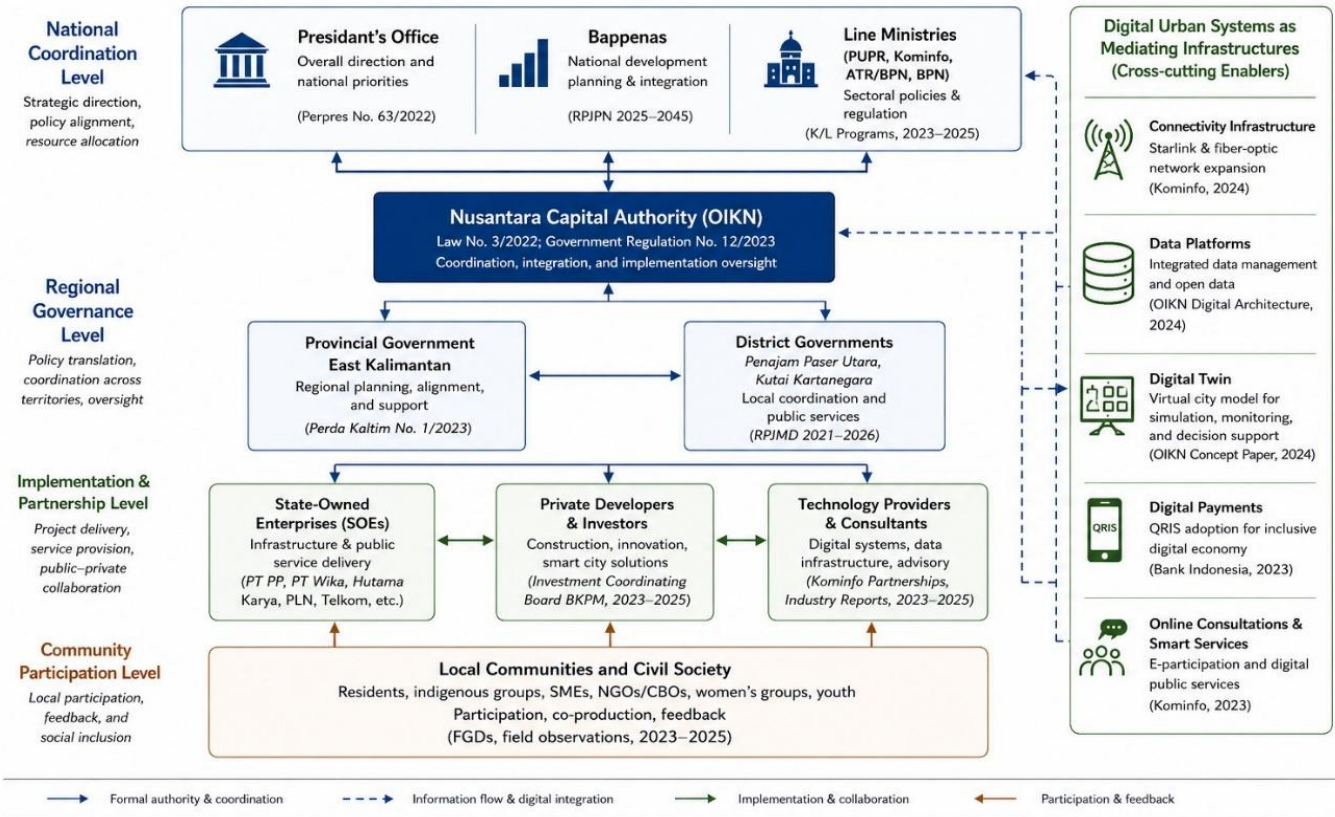


Figure 1. Nusantara digital governance structure
Source: Developed by the authors based on interviews, FGD, field observations, and document analysis (2023–2025).

These governance challenges are also reflected in stakeholder experiences, where local officials report uncertainty regarding jurisdictional authority and service provision. A local government stakeholder in Sepaku explained:

“There is still uncertainty regarding which institution is responsible for several public services after the transition to OIKN authority.” (Local government official, FGD, Sepaku, June 2025).

Another local government official also emphasized that institutional coordination remains challenging because overlapping mandates continue to create uncertainty during

the transition period.

“Coordination among ministries, local governments, and OIKN has improved, but responsibilities for several public services are still evolving.” (Local government official, FGD, Sepaku, June 2025).

These perspectives indicate that institutional fragmentation is experienced not only at the policy level but also in day-to-day administrative coordination.

Field observations further revealed that institutional coordination mechanisms between local governments and OIKN remain evolving, particularly in areas related to land administration, environmental management, public services,

and community-level governance. Several participants also highlighted that overlapping authority between the national government, OIKN, and district administrations has generated ambiguity in local implementation processes, especially regarding permits, infrastructure coordination, and social services.

These findings are consistent with studies highlighting fragmented governance structures and institutional complexity in rapidly planned urban developments and emerging smart city projects [1, 13, 14, 18, 19]. Table 2 compares governance characteristics of selected capital city developments, situating Nusantara within a broader global context. From a governance perspective, this supports the argument that urban transformation is inherently political and institutional, involving competing mandates and power negotiations rather than purely technical planning [13].

In the context of sustainable urban development, such institutional fragmentation may undermine long-term planning effectiveness, as sustainability initiatives require coordinated multi-level governance and clear accountability structures. In addition, several stakeholders expressed concerns that unclear institutional responsibilities may reduce community trust and limit effective public participation in governance processes.

4.2 Uneven participation and inclusion gaps

The study also identifies uneven participation, with indigenous communities, local residents, women-related community initiatives, and small businesses facing barriers to meaningful engagement in Nusantara's development process. Participation mechanisms were frequently perceived as consultative rather than genuinely deliberative, limiting community influence on strategic decision-making.

A community representative from Sepaku explained:

"Communities are invited to discussions, but many strategic decisions have already been determined beforehand." (Community representative, FGD, Sepaku, June 2025).

An indigenous community representative further emphasized:

"Our cultural values should be considered from the beginning of planning rather than only during consultation meetings." (Indigenous community representative, FGD, Sepaku, June 2025). This finding suggests that participation remains largely consultative rather than collaborative in practice.

Several participants further expressed concerns regarding uncertainty over land administration, local economic opportunities, and institutional responsibilities during the governance transition process. Field observations indicated that local communities often perceived themselves as being more affected by development impacts than actively involved in shaping policy directions.

The development of digital public service platforms, including government-to-citizen (G2C) and government-to-business (G2B) systems, was intended to improve accessibility, efficiency, and public participation. However, the findings suggest that these systems have not yet fully translated into meaningful engagement, particularly for marginalized and digitally vulnerable groups.

Concerns regarding indigenous communities and local cultural identity also emerged during field observations and stakeholder discussions. Several participants emphasized the importance of ensuring that indigenous communities are not

marginalized within large-scale urban transformation processes.

An indigenous community representative explained:

"Development should not only focus on buildings and technology, but also protect local identity and cultural heritage." (Indigenous community representative, FGD, Sepaku, June 2025).

Field observations further indicated that some local communities perceived rapid urban transformation as creating uncertainty regarding cultural continuity, land use, and long-term social adaptation. These concerns reflect broader governance challenges frequently observed in large-scale urban development projects in the Global South, where modernization agendas may conflict with local socio-cultural realities [13, 14].

From a sustainable urban governance perspective, the inclusion of indigenous communities is important not only for social justice and cultural preservation but also for strengthening the long-term legitimacy and social sustainability of urban transformation processes.

The study also identified concerns regarding uneven economic opportunities for local SMEs and small businesses during the Nusantara development process. While digitalization initiatives and QRIS adoption have expanded among some local entrepreneurs, several stakeholders argued that economic benefits remain concentrated among larger actors, incoming investors, and external businesses with greater financial and institutional capacity.

An SME representative noted:

"Some local businesses benefit from development, but many small local entrepreneurs still struggle to compete with outside investors." (SME representative, FGD, Bukit Raya, June 2025).

An SME representative also observed:

"Large companies have greater access to contracts and capital, making it difficult for local businesses to compete fairly." (SME representative, FGD, Bukit Raya, June 2025). This indicates that economic opportunities generated by the new capital are distributed unevenly among local business actors.

Field observations further indicated that local SMEs frequently face challenges related to limited capital access, digital readiness, market competition, and uncertainty regarding future economic positioning within the emerging smart city ecosystem. Several participants also emphasized that rapid urban transformation risks marginalizing smaller community-based economic actors if inclusive economic policies are not effectively implemented.

These findings suggest that economic inclusion remains an important governance challenge within Nusantara's sustainable urban transformation agenda. From a sustainability perspective, equitable participation of local SMEs and community-based businesses is essential for strengthening local resilience, reducing socio-economic disparities, and ensuring that urban development benefits are more broadly distributed across affected communities.

Several discussions also highlighted the importance of inclusive community empowerment programs involving women, local households, and vulnerable groups within the emerging smart village ecosystem. Stakeholders emphasized that rapid urban transformation should not only prioritize infrastructure and technological development but also strengthen local social resilience and community inclusion.

Field discussions revealed several initiatives aimed at

increasing women's participation in digital transformation programs through community-based digital literacy activities. These initiatives included "Coding Mom," coding programs for persons with disabilities, and digital literacy training designed to improve technological capacity and digital inclusion among local communities.

A community representative noted:

"Coding Mom and digital training programs have started to introduce technology and digital literacy to local communities." (Community representative, FGD, Sepaku, June 2025).

A women's group representative noted:

"Digital training has increased women's confidence in using online services, although participation remains uneven across villages." (Women's group representative, FGD, Sepaku, June 2025).

This suggests that digital inclusion initiatives have begun to empower women but require broader outreach to achieve equitable participation.

These initiatives indicate emerging efforts to broaden participation in Nusantara's smart city ecosystem beyond institutional and technological actors. Nevertheless, community representatives also expressed concerns regarding the social impacts of rapid migration and labor influx associated with large-scale development projects. One community representative explained: *"The increasing number of rented houses being used for informal commercial activities by incoming workers has begun to change the social environment of local neighborhoods."* (Community representative, FGD, Sepaku, June 2025). These findings suggest that while digital inclusion initiatives have expanded opportunities for community participation, the social consequences of rapid urban transformation remain an important governance challenge that requires greater attention.

Discussions further emphasized the importance of ensuring that women and vulnerable households are not marginalized during rapid urban transformation processes. Several stakeholders highlighted the need for inclusive empowerment strategies through digital literacy, SME participation, local economic strengthening, and community-based capacity-building programs.

From a sustainable urban governance perspective, these findings suggest that social inclusion and gender-sensitive empowerment remain important components of long-term

smart city sustainability and adaptive community resilience.

4.3 Digital governance and socio-technical transformation

Field observations demonstrated increasing implementation of digital governance systems across the Nusantara area, including Starlink connectivity, smart village applications, QRIS payment systems, digital public services, and community-based digital literacy initiatives. These developments reflect the growing integration of digital infrastructures within Nusantara's smart governance agenda.

Several stakeholders highlighted that digital systems were expected to improve administrative efficiency, public service accessibility, institutional coordination, and local economic participation. However, the findings also revealed that digital readiness, technological literacy, and adaptive capacity remained uneven across different communities and stakeholder groups.

A community representative explained:

"Technology infrastructure is improving rapidly, but not all communities are equally prepared to use digital systems effectively." (Community representative, FGD, Sepaku, June 2025).

Another community representative explained:

"Internet connectivity has improved, but many residents still require assistance to access digital government services." (Community representative, FGD, Sepaku, June 2025).

Therefore, digital inclusion depends not only on infrastructure availability but also on digital literacy and user readiness.

Field observations further indicated that while digital infrastructure development progressed rapidly, disparities in digital literacy, access to devices, institutional support, and economic readiness continued to affect the ability of local communities to fully participate in emerging digital governance systems. Several stakeholders also emphasized that socio-technical adaptation remains as important as technological deployment itself.

These findings support critical perspectives on smart governance, which argue that digital transformation should be understood not merely as technological modernization but as a socio-technical process involving institutional adaptation, community readiness, and inclusive governance arrangements [2, 11, 29].

Table 2. Comparative governance characteristics of selected capital city developments

Capital City (Country)	Governance Structure & Lead Authority	Participation Characteristics	Key Challenges (Identified in Official Reports and Empirical Studies)	Implications for Sustainability	Primary Sources
Brasília (Brazil)	Highly centralized federal planning and implementation under strong federal authority (Secretaria de Estado de Governo do DF).	Limited public participation during early development phases; participation improved gradually through formal consultation mechanisms.	• Persistent socio-spatial segregation • Unequal access to public services • Expansion of informal settlements	Strong planning vision, but weak social sustainability and inclusion. Long-term sustainability requires more equitable public service distribution and affordable housing. Balanced physical and	[30, 31]
Putrajaya (Malaysia)	Centralized federal administrative city managed under the Federal Territory authority and Putrajaya Corporation.	Moderate participation through formal consultation processes during planning and policy formulation.	• Limited inclusiveness of local communities • Top-down governance dominance • Weak grassroots ownership	infrastructure development, but participatory governance remains constrained. Continuous efforts are needed to strengthen	[32, 33]

Naypyidaw (Myanmar)	Strongly centralized and state-controlled governance under the Union Government.	Minimal public participation; decision-making remains highly centralized with limited transparency.	• Lack of transparency • Restricted public engagement • Limited information accessibility • Institutional fragmentation and overlapping authority • Coordination gaps across governance levels • Uneven participation and digital divide • Inclusion challenges for indigenous communities and local SMEs	local inclusion and community ownership. Governance legitimacy and accountability challenges hinder inclusive and sustainable urban development.	[34, 35]
Nusantara (Indonesia)	Emerging multi-level governance system involving OIKN, national ministries, provincial government, district governments, private actors, and local communities. Overlapping authority remains during the institutional transition process.	Uneven and selective participation. Digital participation platforms and consultations exist, but inclusion of indigenous communities, SMEs, women's groups, and vulnerable populations remains limited.		Sustainable development requires a hybrid adaptive governance approach emphasizing institutional coordination, inclusive participation, digital governance readiness, and social legitimacy.	[36-38]

Note: The comparison focuses on governance dimensions relevant to sustainable capital city development and is synthesized from official planning documents, institutional reports, peer-reviewed studies, and empirical field findings.

From a sustainable urban governance perspective, the effectiveness of digital governance systems depends not only on infrastructure availability but also on the ability of communities, institutions, and local actors to adapt to rapidly evolving digital environments.

4.4 Service provision and transitional governance challenges

The results highlight disruptions in basic service provision during the early phases of Nusantara's development. Communities report limited access to healthcare, education, and public services, reflecting gaps between planning visions and implementation realities.

These governance challenges are also reflected in community perceptions, where residents express ambivalence toward urban transformation, balancing expectations of development benefits with concerns over environmental change and loss of local identity.

Similar transitional governance gaps have been observed in large-scale development projects, where planning ambitions outpace institutional capacity [39], reflecting a broader "transitional governance gap" in which institutional restructuring outpaces operational capacity.

Such gaps highlight the importance of aligning planning processes with service delivery mechanisms to ensure that sustainability goals are translated into tangible benefits for local communities.

In this context, sustainable urban development must be understood not only in terms of long-term environmental and technological goals, but also in terms of immediate social and service-related outcomes.

A local government official noted:

"Residents are often unsure whether they should seek services from OIKN or the district government because responsibilities are still being adjusted." (Local government official, FGD, Sepaku, June 2025).

This uncertainty illustrates how institutional transition directly affects citizens' access to public services.

4.5 Digital urban systems as mediating infrastructures

The expansion of digital infrastructure in Nusantara, including connectivity and digital services, provides new opportunities for coordination and participation.

Digital urban systems in Nusantara can be understood as socio-technical systems consisting of software, hardware, and human actors (brainware), where the effectiveness of digital governance depends not only on infrastructure but also on institutional capacity and human resources [37].

The smart city architecture of Nusantara is structured into multiple layers, including passive infrastructure (physical systems), active infrastructure (networks and data centers), and application layers (urban services). This layered architecture highlights the complexity of integrating digital systems into governance processes. Figure 2 illustrates the digital governance ecosystem of Nusantara, highlighting the interactions between infrastructure layers, digital systems, governance actors, and service delivery mechanisms.

Emerging technologies such as digital twins and metaverse platforms are increasingly integrated into sustainable urban development strategies [7, 8].

Artificial intelligence applications, such as traffic monitoring systems, chatbot-based public services, and drone-assisted spatial monitoring, further illustrate the integration of advanced technologies into urban governance.

National planning frameworks further emphasize the role of digital infrastructure in supporting long-term development [36, 40]. The establishment of the Nusantara Command Center illustrates the operationalization of smart city governance, enabling real-time monitoring of urban development and service delivery. However, its effectiveness as a participatory governance tool remains limited.

However, the findings indicate that digital systems currently function as enabling rather than transformative tools.

This supports existing literature suggesting that digital technologies, such as digital twins and smart city platforms, do not automatically improve governance outcomes but depend on institutional arrangements, user capacity, and trust [2, 15].

Moreover, the observed digital divide indicates that without adequate capacity-building, digital governance may reinforce existing inequalities rather than reduce them. Therefore, digital urban systems should be conceptualized as socio-technical infrastructures embedded within governance systems, rather than standalone solutions.

4.6 Toward hybrid adaptive governance for sustainable development

Despite the challenges identified, the study reveals

emerging forms of hybrid adaptive governance, characterized by informal collaboration between government, actors, communities, and civil society organizations. These practices

demonstrate the potential for more flexible and responsive governance arrangements.

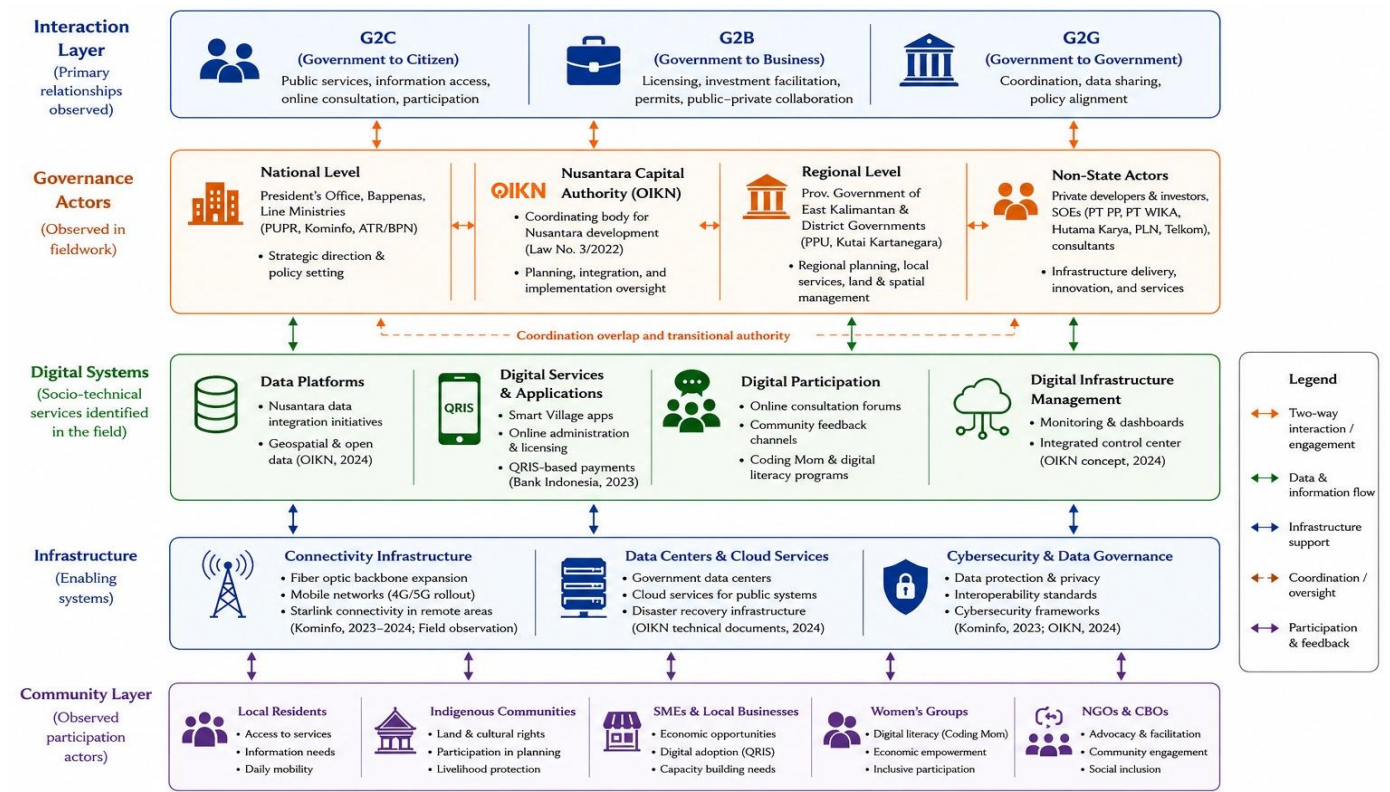


Figure 2. Governance and digital systems framework

Note: This figure is derived from empirical findings in Nusantara (2023–2025) and does not represent a generic smart city architecture.

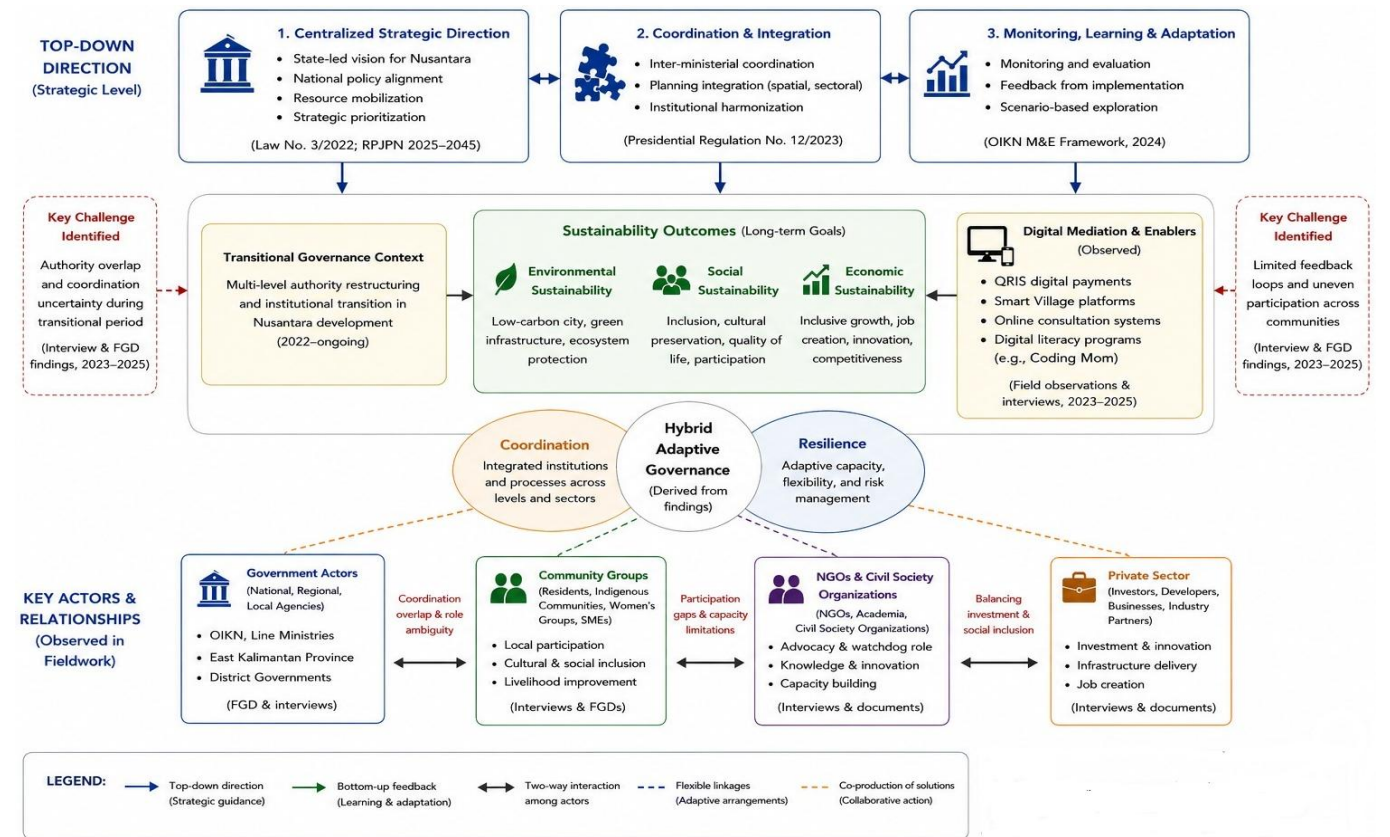


Figure 3. Nusantara governance framework and dynamics

Note: This figure reflects governance dynamics, challenges, and adaptive interactions empirically identified in Nusantara fieldwork (2023–2025), rather than a generic normative model.

Such findings resonate with collaborative governance theory, which emphasizes the importance of iterative learning, stakeholder engagement, and co-production in addressing complex urban challenges [21]. Hybrid governance approaches reflect a shift toward more adaptive and collaborative urban governance models in complex development contexts [12, 21]. In the context of sustainable urban development, hybrid governance models may provide a pragmatic pathway for balancing centralized planning with decentralized participation.

This study therefore proposes a hybrid adaptive governance approach as a strategic framework for managing sustainable capital city development, integrating institutional coordination, inclusive participation, and adaptive learning processes. Figure 3 presents the proposed hybrid adaptive governance model for sustainable capital city development.

4.7 Implications for sustainable urban governance

Overall, the findings highlight that sustainable capital city development is shaped not only by planning visions and

technological innovations but also by institutional arrangements, participation dynamics, and governance capacity.

These findings suggest that capital city development should be understood as a negotiated and iterative governance process, rather than a linear implementation of planning frameworks [14].

From a broader perspective, the case of Nusantara illustrates that achieving sustainability in large-scale urban transformation requires:

- stronger institutional alignment across governance levels,
- more inclusive and deliberative participation mechanisms, and
- integration of digital systems with social and institutional contexts.

These insights contribute to ongoing debates on sustainable urban governance and provide lessons for other emerging capital cities facing similar challenges. Table 3 summarizes the key findings of this study and their implications for sustainable urban governance.

Table 3. Summary of key findings and governance implications in Nusantara

Theme	Empirical Findings	Governance Implications
Institutional fragmentation	Overlapping mandates among OIKN, national ministries, and local governments create coordination challenges and unclear authority in service delivery	Weak coordination and accountability may hinder effective implementation of sustainable urban planning
Uneven participation	Indigenous communities, women, and small businesses face barriers to meaningful engagement in planning processes	Limited inclusiveness reduces legitimacy and risks reinforcing social inequalities
Service provision challenges	Disruptions in healthcare, education, and public services during early development phases	Gaps between planning and implementation may undermine public trust and sustainability outcomes
Digital infrastructure	Expansion of digital systems (e.g., connectivity, platforms) but limited adoption in participatory processes	Digital divide and lack of capacity may reinforce existing inequalities
Hybrid governance practices	Emerging informal collaboration among government, communities, and civil society actors	Potential for adaptive governance combining centralized coordination and decentralized participation

5. CONCLUSIONS

This study has examined the governance of sustainable urban transformation in Indonesia's new capital city, Nusantara, with a focus on institutional arrangements, participation dynamics, and the role of digital urban systems. The findings demonstrate that the development of a new capital city is not a linear or purely technical process, but a complex governance challenge shaped by overlapping institutional mandates, uneven participation, and evolving socio-technical infrastructures.

The study highlights three main conclusions. First, institutional fragmentation and multi-level governance complexity create coordination challenges that affect decision-making and the delivery of public services. Second, participation remains uneven, with marginalized groups facing structural and capacity-related barriers, limiting the inclusiveness and legitimacy of urban transformation processes. Third, digital urban systems function as enabling but not yet transformative tools, with their effectiveness depending on institutional clarity, user capacity, and trust.

These findings underline the importance of aligning governance structures, participatory mechanisms, and digital infrastructures to achieve sustainable urban development. In particular, the study proposes a hybrid adaptive governance approach that integrates centralized strategic direction with

decentralized participation and iterative learning, offering a practical pathway for managing large-scale urban transformation under conditions of institutional complexity.

This research contributes to the broader discourse on sustainable urban governance by providing empirical insights from a Global South context, where rapid development, socio-cultural diversity, and institutional transitions intersect. The findings are relevant for policymakers and planners involved in capital city development and other large-scale urban projects, emphasizing the need for coordinated governance, inclusive participation, and context-sensitive implementation of digital systems.

However, this study has several limitations. The research is based on a qualitative case study in the early phase of Nusantara's development, which may not fully capture long-term governance dynamics and outcomes. In addition, while the study incorporates multiple stakeholder perspectives, certain groups may remain underrepresented due to access and logistical constraints.

Future research should adopt longitudinal approaches to examine how governance arrangements, participation, and service delivery evolve over time as the city develops. Comparative studies across new capital cities and large-scale urban projects in different contexts would also provide deeper insights into the generalizability of governance patterns and sustainability outcomes. Furthermore, future work should

explore the long-term social, cultural, and environmental impacts of digital urban systems to better understand their role in shaping sustainable and inclusive cities.

In conclusion, the case of Nusantara demonstrates that achieving sustainable urban transformation requires more than visionary planning and technological innovation. It demands coordinated governance, meaningful participation, and adaptive institutional arrangements that are responsive to local contexts and evolving urban realities.

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APPENDIX

Table A1. Participant composition by stakeholder category

Stakeholder Category	Participants
OIKN	8
Government (excluding OIKN)	68
Local communities	19
Indigenous peoples	2
SMEs / Local traders	2
Women representatives	6
Academics	6
Enterprises / Innovation agencies	3
Other community representatives	13
Total	127

Table A2. Summary of interviews, focus group discussions (FGDs), and field observations

Activity	Date	Location	Participants	Main Topics
FGD	02-Aug-23	Balikpapan	Regional agencies and planners	Smart city readiness, sustainability
FGD	03-Aug-23	PPU	Local government institutions	Governance readiness, infrastructure
FGD	04-Aug-23	Samarinda	Government agencies	Digital governance and smart services
Interview	28-May-24	Online	OIKN representatives	Governance innovation and sustainability
Interview	20-Jun-24	Online	Director of Macro Planning, OIKN	Adaptive governance and planning
Comparative Visit	Aug-24	Putrajaya & Kuala Lumpur	Government and planners	Smart governance comparison
Interview	15-May-25	Online	Deputy for Green and Digital Transformation, OIKN	Living Lab and digital systems
Interview	04-Jun-25	Online	Deputy for Social and Community Empowerment, OIKN	Inclusion and community resilience
FGD	11-Jun-25	Sepaku	Local stakeholders and communities	Governance transition and participation
Observation	11-Jun-25	Bukit Raya	Village stakeholders	Smart village and digital inclusion
Institutional	12-Jun-25	OIKN Office	OIKN officials	Sustainability and governance

FGD Comparative Visit	Nov-25	Yangon & Naypyidaw	Academics and government stakeholders	adaptation Comparative governance analysis
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