Operationalizing Smart Governance to Accelerate Green Policy and Social Adaptation in Indonesia

Mohammad Ridha

[1] Vocational Education Program, Universitas Indonesia, Depok, Indonesia
mohammad.ridha@ui.ac.id

Abstract. This paper looks into ways through which smarter governance will streamline adoption of green policies and enhance social adjustment in Indonesia. Among environmental issues, such as inefficient waste management, climate change, and uncontrolled urbanization, new governance methods that incorporate digital technologies, information-based decision-making, transparency, and stakeholder partnerships are needed. Through qualitative approach; this paper examines how government institutions, local communities as well as digital technologies relate towards environmental sustainability. The results indicate that smart governance positively influences policy responsiveness, participation in the policy by the population, and the capacity of the society to accommodate the change in the environment. E- campaigns and community action plans are also significant in making people more aware of the environment and make them act in a sustainable manner. Nevertheless, there are still a number of issues such as a gap in both digital access and digital coordination among agencies and inconsistent implementation of the policies in different regions. To mitigate these concerns, the present paper offers a proposed smart governance framework, a synthesis of digital innovation, collaborative governance, and inclusive environmental policies, as the proposal of a supportive policy against social adaptation. The paper finds that enhancing the institutional capacity, enhancing digital inclusion, and enhancing multi-stakeholder cooperation are the key ways to speed up the process of the Indonesian transition to sustainable development.

Keywords: smart governance; green policy; social adaptation; environmental sustainability; Indonesia

1 Introduction

Indonesia has a variety of environmental problems, which are growing more complex and interrelated. Such issues are not statistical matters but are real life problems of life that directly touch on the lives of people. As an illustration, frequent flooding of Jakarta undermines business operations and jeopardizes the livelihood of the marginalized communities. Concurrent devastation of forests in Kalimantan and Sumatra has, in the meantime, caused loss of biodiversity and erosion of traditional livelihoods of the indigenous and local communities. [4], [6], [7]

© The Author(s) 2026
P. N. G. Akbar and K. A. Safitri (eds.), *Proceedings of the 8th International Conference of Vocational Education, Applied Science and Technology (ICVEAST 2026)*, Advances in Social Science, Education and Humanities Research 1034,
https://doi.org/10.2991/978-2-38476-620-8_49

Land subsidence and increased sea levels are slowly diminishing agricultural land of most coastal regions in northern Java. Numerous rice plots have been converted to saline land causing farmers to move to other areas in search of other sources of livelihood. The social and economic impact of these environmental changes on livelihood, food security and community resilience is very important. [6], [20], [23]

The issues affecting the environment in Indonesia are waste management, air and water contamination, deforestation, loss of biodiversity and disasters that can affect the environment like floods and drought. These issues have been aggravated by the rapid urbanization and industrialization. Therefore, the traditional methods of environmental governance would be inadequate to cope with more complicated sustainability issues. [4], [7], [12]

The classic forms of governance are oftentimes marked by strict bureaucracies, low levels of transparency, poor inter-agency coordination, and low involvement of the populace. These constraints impede the execution of policies, institutional fragmentation, and lessen the efficiency of the environmental authority. As an illustration, despite the waste control regulations in place, poor citizen involvement and laxity in enforcing them still play roles in the growing waste in most cities. [2], [10], [15]

Through such challenges, the idea of smart governance has developed as a new governance paradigm that incorporates:
ICT (digital technologies), Evidence-based policymaking, Participatory governance, Transparency and accountability mechanisms. [1], [2], [9], [10], [16]
Smart governance is more than the use of cutting-edge technologies. It is a radical shift in social administration as it involves the use of data to make decisions, transparency, participation in governance, and citizen engagement. This strategy helps to build closer partnership between governments, communities, business and other stakeholders in the production of more responsive, adaptive and sustainable public policies. [1], [2], [9], [10], [16]

Despite the growing attention to the topic of smart governance, comparatively little research focused on how it enhances the green policy adoption and enhances social adjustment, especially in the developing population. Possible studies have so far been mostly conducted on a relatively developed country with more established institutional framework and technological base. [1], [2], [5]

This research gap is covered in the current study, as it presents a qualitative literature review synthesizing the available evidence on the topic of smart governance, implementation of green policies, and social adaptation in Indonesia. Instead of concentrating only on theory insights, the present study offers practical policy suggestions as well which can aid in environmental sustainability. The environment in Indonesia remains more and more interdependent and affected, with inefficient waste management, air and water pollution, deforestation, loss of biodiversity, and catastrophes caused by climate

changes. These problems are aggravated by the rapid urbanization and industrialization, which demands more adaptive and integrated solutions of the governance. [4], [6], [7]. Sustainability with the environment has emerged as one of the policy issues that are of utmost concern in the twenty-first century. The increasing effects of climate change, environmental degradation, urban growth, and natural resource drain are the challenges facing governments globally. The latter issues are especially pronounced in the developing world, where the lack of institutions to keep up with fast-paced economic advances is often accompanied by growing environmental stress. Being one of the largest archipelagic nations in the world, Indonesia experiences unique environmental conditions and demands new strategies of governance that could strike a balance between the economic development and long-term environmental sustainability. [12], [17], [18]

Indonesia underwent significant urban and industrial development which has led to significant improvement in the national economic development over the last 20 years. But this development has also sharpened the environmental issues and problems such as rising emission of greenhouse gases, ineffective waste management within urban centers, deforestation, biodiversity loss and poor management of air and water quality. The big cities like Jakarta, Surabaya and Bandung have remained to have serious ecological problems like flooding, pollution and garbage dumping. Concurrently, the occurrence and intensity of climate-related disasters have intensified, putting susceptible populations at risk and compromising sustainable development goals. [6], [20], [23].

Traditional methods of governance has in most cases failed to respond to these cross-cutting environmental challenges. Classical public administration is normally marked by top-bottom decision making, institutional fragmentation, a weak flow of information, and inadequate stakeholder involvement. With the growing dynamism and interconnectedness of environmental issues, governance systems should transform to become responsive, collaborative, and evidence-based. The use of digital technologies in governance offers a chance to enhance process improvements in policy formulation, implementation, monitoring, and evaluation as well as enhance collaboration between institutions of government, the business world, universities, and the local communities. [2], [10], [15], [24].

In this regard, smart governance has become a strategic model of contemporary governance of people. Instead of just stressing the use of digital technologies, smart governance enhances data-driven decision-making, transparency, accountability, stakeholder engagement, and cross-sector partnerships. The introduction of information and communication technologies leads to the government making more responsive policies, enhancing service delivery to the population, enhancing institutional effectiveness, and motivating citizens to engage in the environmental governance process. [1], [9], [10], [16].

Smart governance is a very significant factor that contributes to effective implementation of green policies. The policies related to the environment need constant tracking,

institutional system integration, quality information and a close involvement of the people in order to attain sustainability. Environmental surveillance systems, digital environments, open-data policies and smart cities offer governments with good instruments to track the environment, measure the policy performance and to enable citizens to engage. These innovations help communities to obtain environmental information easier, take part in the decision-making process, adjust to the environment more efficiently.

Although there is an increasing literature on smart governance, very little research has investigated its role in the implementation of green policies and social adaptation of emerging economies, especially Indonesia. Available literature is largely on developed nations whose institutional capability and digital infrastructures are more developed. As a result, a large knowledge gap exists on the issue of whether governance innovation, environmental policy and societal adaptation are correlated in the specific institutional and societal context of Indonesia. [4], [17], [18]

In line with this, this paper examines how smart governance can hasten the process of adopting green policies and enhancing social adaptation in Indonesia. In particular, this research will answer the following research questions:
RQ1: How does smart governance influence the effectiveness of green policy implementation in Indonesia?
RQ2: How does smart governance facilitate social adaptation toward environmental sustainability?
RQ3: What institutional and technological factors support or hinder the implementation of smart governance and green policies in Indonesia?

Answering these questions, this paper can help to fill the growing body of research related to sustainability governance and offer practitioners effective recommendations to enhance the resiliency of the environment and transform the existing digital landscape by implementing digital change, institutional change, and a multi-stakeholder approach. [17], [22], [32]**Sample Heading (Third Level).** Only two levels of headings should be numbered. Lower level headings remain unnumbered; they are formatted as run-in headings.

2. Literature Review and Theoretical Framework (Enhanced with Conceptual Storytelling)

2.1 Smart Governance

Smart governance is a governance model based on the combination of digital technologies, data-driven decision-making, transparency, and work together with stakeholders to enhance the quality of the services delivered by the government and policy outcomes. Smart governance, in addition to the utilization of the new technologies, is also a metamorphosis in the area of the public administration that allows the governments to react faster to the ever more intricate social, economic, and environmental problems. Through integrating technology and collaborative governance, smart governance helps

to accommodate more adaptive, transparent, and citizen-oriented policymaking. [1], [2], [9], [10], [16]

A case in point can be found in the regulation of air pollution in towns. Traditional governance structures usually result in a manual collection and reporting of environmental information and slowness of response to policy needs as well as lack of coordination between government departments. By contrast, smart governance employs real-time environmental sensors, open-data portals and electronic reporting mechanisms where governments can continually monitor the environmental surroundings and incentivize citizens to report directly through digital applications. Such a combined strategy helps in making decisions faster, and it leads to better coordination in institutions, as well as better responsiveness of policies. [2], [5], [15], [24]

Smart governance is typically facilitated by a number of major dimensions, such as: Digital Infrastructure, Open Data and Transparency, Citizen Participation, Inter-agency Collaboration. [1], [2], [9], [10].

Green policy effectiveness is the degree to which environmental policies succeed in their objectives of safeguarding natural resources, alleviating environmental destruction and encouraging a long-term sustainability. Environmental policies not only require good quality of policy formulation but also effective implementation, monitoring and engagement of the involved stakeholders. Well formulated policies can yield little results when there is no uniform implementation, institutional coordination and lack of public awareness and compliance. [1], [2], [10], [16].

2.2 Green Policy Effectiveness

One such widespread case is the introduction of regulations that concern minimizing plastic waste. Despite the fact that such regulations might be well formulated and inclusive, the enforcement, the awareness of the population as well as the coordination among concerned institutions is usually limited, and restricts its functioning. On the other hand, even the less complex environmental policies can produce significant results with high levels of political commitment, good governance, stakeholder cooperation, as well as the active involvement of the community. These reasons show that the nature of environmental governance needs more than regulation structures to be successful; it must be based on the ability of institutions to transfer the goals of the policy to the practical activities. [4], [5], [8]

A common example is the implementation of regulations aimed at reducing plastic waste. Although such regulations may be comprehensive and well formulated, their effectiveness is often constrained by inadequate enforcement, limited public awareness, and insufficient coordination among responsible institutions. Conversely, even relatively simple environmental policies can generate meaningful outcomes when sup-

ported by strong political commitment, effective governance, stakeholder collaboration, and active community participation. These factors demonstrate that successful environmental governance requires more than regulatory frameworks alone; it also depends on the capacity of institutions to translate policy objectives into practical actions. [7], [8], [23]

There are various key indicators that are usually used to gauge the effectiveness of the green policies, among them being success of policy implementation, reduction of environmental impact, compliance with regulation and sustainability in the long term**.** [4], [5], [23]

Green policies should be well coordinated in institutions, have evidence-based policy formulation, and having a system of monitoring and evaluation in order to deliver these outcomes. **[17], [27], [32]**

Such elements allow governments to determine the effectiveness of policies, challenges in implementation, and subsequently enhance environmental governance to ensure the attainment of sustainable development objectives. [17], [23], [32]

2.3 Social Adaptation

Social adaptation is defined as the process where individuals, communities, and institutions adapt behaviors, practices and livelihoods in reaction to environmental, social, and economic factors. It is a process, which remains slow and progressive and enhances the ability of the society to endure environmental obstacles as it sustains social welfare and sustainable development. It is not just the personal changes in behavior but also the collective actions that are necessitated through a good governance, institution capacity and community involvement that will help in successful social adaptation. [18], [23], [31]

Social adaptation is captivated in Indonesia, as both rural and urban society may manifest it in several different ways. In rural regions, farmers have been investing in climate resilient agricultural systems, started using more adaptive crop types and have formed community based organizations to increase preparedness to and management of behavior of disasters. In the meantime, urban populations have become more and more engaged in environmental activity, segregating their household waste, undertaking recycling programs, conserving energy and conducting environmental activism on a community basis. These adaptation actions show how communities at the local level act to address these environmental pressures as well as add towards the larger sustainability goals. [20], [30], [32]

There are a number of important aspects of successful social adaptation, one of which is:

Behavioral change, growing environmental consciousness, Group action, Community strength. [18], [31], [32]

But it is not automatic that social adaptation takes place. It is reliant on favorable policies by the state, effective governance, institutional coordination, good access to information sources, and effective cooperation between governments, communities, and the private sector and civil society. Smart governance is a vital component of this process as it enhances access to environmental data, increased engagement of citizens and robust decision-making. Effective governance is therefore like a key pillar to the development of resilience within communities and long term environmental sustainability. [18], [23], [31], [32]

2.4 Theoretical Integration

This paper unites three theoretically complementary positions in order to present the connections between smart governance, green policy effectiveness, and social adaptation in Indonesia. These are Governance Theory, Sustainability Transition Theory and Socio-Technical Systems Theory. All the theories present a unique view of the interactions of governance systems, technological innovation, and societal change in favor of environmental sustainability. [16], [17], [18]

Governance Theory underscores the significance of good institutions, openness, accountability and involvement of stakeholders to enhance an effective implementation of a public policy. The Sustainability Transition Theory is a theory that describes how societies can shift off the traditional idea of development to more sustainable systems through the actions of technological change, institutional change, and behavior change. Meanwhile, the Social-Technical Systems Theory emphasizes the dynamic nature of the interaction between the technological development, social institutions, public policies, and the behavior, which shows that sustainable change is reached after the coevolution of technological and social systems, as opposed to technological development. [16]

It is proposed that these theoretical perspectives are combined so that each of them is insufficient to achieve environmental sustainability through the application of technology or personal behavioral modification. Rather, sustainable change necessitates a system of governance, which is capable of marshalling institutional capacity, digital technologies, collaborative policymaking and active participation of the public. Smart governance is the key mechanism that ties these factors together by empowering the institutional alignment, enhancing the execution of policies, and promoting joint environmental governance. [17], [18], [31], [32]

In line, the conceptual model that will be presented in this work has the following relationship:

Smart Governance → Strengthened Green Policy Implementation → Enhanced Social Adaptation

This framework postulates that the better the governance systems perform in terms of enacting more efficient environmental policies, the better the adaptive behaviors, the community resilience, as well as long-term environmental sustainability. This framework also foregrounds the interreliability of governance innovation, policy effectiveness, and adaptation of the society by making it clear that sustainable environmental change could be only obtained through constant coordination between governments, communities, the private sector, and other concerned parties. [17], [18], [31]

2.5 Conceptual Model

Due to the conceptual integration given in the section above, in the current research, it is proposed that there is a conceptual model to explain the existence of smart governance, good policy effectiveness, and social adaptation. The model is created to explain the role of governance innovation in making the environment sustainable by implementing better policies and creating a better adaptive capacity to community.

The conceptual model proposed takes that smart governance is the key impetus in enhancing the environmental governance. By incorporating the use of digital technologies, open-minded decision making, institutional cooperation, and civilian involvement, the smart governance is likely to enhance the efficiency of the green policy implementation process at the same time motivating people to embrace the change process. [1], [2], [9], [16]

Moreover, sound green policies are likely to support social adjustment through supporting ecologically sound social practice to increase community resilience and social mobilization in support of sustainable development. The effectiveness of green policy also plays a role in mediation in this relationship based on which smart governance trains the social adjustment indirectly. [4], [17], [18], [31]

In line with this, the conceptual model suggests the following relationships:

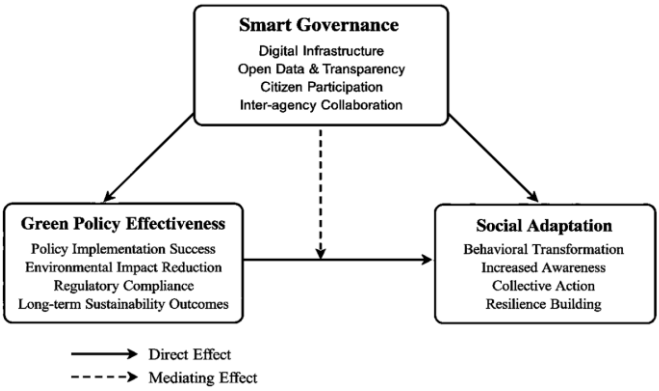


Figure 1. Proposed Conceptual Model of the Relationship between Smart Governance, Green Policy Effectiveness, and Social Adaptation

The proposed model introduces the conceptual framework by which the process of governance innovation, environmental policy implementation and community adaptation can be used to facilitate a sustainable environmental development in Indonesia. It is also applicable as the analytical construct to comment on the interactions between the main concepts analyzed in this paper.

3. Policy Effectiveness

The conceptual model proposed describes the direct and indirect connections between smart governance, green policy effectiveness, and social adaptation. It underlines the fact that proper environmental policies are an important tool with the help of which smart governance leads to better community adjustment and environmental sustainability in the long run. Policy effectiveness is, therefore, placed as a mediating construct that connects both governance innovation and sustainable social outcomes. [17], [18], [31]

3.1 Hypothesis Development

The paper hypothesizes that smart governance offers a strategic platform on how to enhance the implementation of environmental policy as well as improving the skill of the society in adapting to environmental change. The design of the proposed relationship is based on Governance Theory, Sustainability Transition Theory, and the Socio-Technical Systems Theory which will help to identify the contribution of institutional capacity, technological innovation, and stakeholder collaboration towards sustainable environmental governance. On these theoretical viewpoints, the following hypotheses are constructed.

Smart Governance and Green Policy Effectiveness

Smart governance is also likely to enhance the performance of environmental policy through the incorporation of digital technologies, transparency of decisions, policymaking that is evidence-based, and collaboration across sectors. Digital technologies allow governments to gather environmental data more effectively, in real-time track the implementation of policies and in performance review based on solid evidence. Concurrently, accountability is enhanced through transparency and participation of citizens, and cooperation among government agencies enhances coordination and implementation of policies. Past literature shows a consistent pattern of the more developed the smart forms of governance, the greater the success the country is likely to have in terms of environmental policy and improved sustainability levels. Thus, smart governance is likely to greatly contribute towards the intensification of the actualization of green policies. [1], [2], [5], [9], [10], [14]

H1: Smart Governance positively influences Green Policy Effectiveness.

Smart Governance and Social Adaptation

Improved social adaptation is likely to be achieved through smarter governance, which enables better access to information, a greater involvement of citizens, and collaboration of decision-making between governments, communities, and other stakeholders. Digital governance platforms provide communities with access to timely environmental data, opportunities to engage in policy making processes and act in a better-coordinated way in response to environmental hazards and climate related issues. Smart governance promotes behavioral change, enhances the resilience of the community, and increases the ability of the society to adapt to the change in the environment through open governance and widespread community association. The preceding research proposes that participatory governance and digital innovation add value towards adaptive capacity and sustainable community development. Theope of smart governance is thus likely to impact positively on social adaptation. [2], [13], [20], [22], [25]

H2: Smart Governance positively influences Social Adaptation.

Green Policy Effectiveness and Social Adaptation

Green policies are essential in eliciting the communities to engage in environmentally friendly practices and enhance their ability to react to environmental issues. Effectively planned environmental policies enhance awareness of the population, enhance sustainable living, and foster social action towards environmental protection. The policies which have effective implementation, involvement of the people and constant checkup, have more chances to produce beneficial social and environmental results. The more the communities are involved in environmental initiatives, the greater their capacity to adjust to environmental change becomes. Thus, the fashion of the green policy will have positive inferences on the social adaptation. [4], [8], [23], [31], [32]

H3: Green Policy Effectiveness positively influences Social Adaptation.

Mediating Role of Green Policy Effectiveness

This paper also hypothesizes that the effectiveness of green policies is a mediating factor in the involving of a relationship between smart governance and social adaptation. Even though there is a direct impact on community adaptive capacity, as governance innovation through effective implementation of environmental policies, the impact of smart governance is likely to increase. That is, intelligent governance helps in the improvement of policy design, implementation, monitoring and institutional coordination which in turn facilitate increased public engagement, behavior change and resilience of the community. The efficacy of green policy, on this basis, thus, serves as a significant channel by which smart governance can be practiced to facilitate effective social adjustment. [17], [18], [31], [32]

H4: Green Policy Effectiveness mediates the relationship between Smart Governance and Social Adaptation.

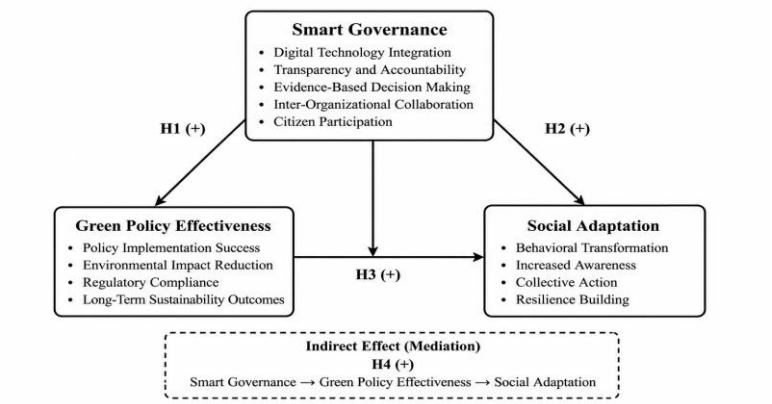


Figure 1. Proposed Conceptual Research Model

Note: H1, H2, H3, and H4 indicate the proposed hypotheses; (+) indicates a positive relationship.

Integrated Smart Green Governance Framework

Resting on the theoretical integration and conceptual model of the current study, an Integrated Smart Green Governance Framework is created to explain the interaction process of digital governance, institutional capacity, environmental policy innovation, and community adaptation to support the process of sustainable development in Indonesia. The framework notes that the environmental sustainability cannot be attained by technological development alone but with solid institutional cooperation, good implementation of policies and involvement of various stakeholders. [17], [18], [31], [32]

This framework has four interconnected pillars which together enhance environmental governance.

Pillar 1: Digital Governance Infrastructure

The first pillar concerns the growth of digital governance abilities that can help governments gain a greater volume of captured, controlled, and employed environmental information. Digital technologies enhance transparency, enhance faster decision-making, and assists with evidence-based environmental management. [1], [10], [15], [24]

Pillar 2: Institutional Integration

The second pillar emphasizes the need to cooperate with the institutions and other stakeholders. Good environmental governance requires a robust legal alignment, policy uniformity and responsibility-sharing among the various sectors. Institutional integration policies refer to cross-ministerial coordination, local government cooperation, local government and private-partnering, and multi-stakeholder patterns of governance. [16], [22], [32]

Pillar 3: Green Policy Innovation

The latter third pillar aims at designing and adopting innovative environmental policies, which will be backed up by digital technologies and institutional collaboration. These policies are meant to enhance the environmental performance and enhance sustainable development in the economy. Smart environmental monitoring, climate adaptation, policies, circular economy, low-carbon development and innovation of green policies are all designed to enhance environmental performance and sustainability. [4], [20], [30]

Pillar 4: Social Adaptation Mechanisms

The last pillar is broadening the capacity to empower people in responding to environmental change by building behavioral change, environmental awareness, and public engagement. Effective adaptation requires effective partnership between governments and society in adopting sustainable environmental practices. The social adaptation mechanisms include environmental awareness, community engagement, behaviour change, and community resilience, which enhance the ability of society to withstand environmental change. [18], [23], [31], [32]

According to the proposed framework, the process of digital governance will be sequential whereby institutional integration is enhanced by digital governance, institutional integration is enhanced through the efficiency of the processes of green policy, social adaptation is enhanced by effective green policies, and sustainable development outcome is improved by the contribution of enhanced social adaptation. [17], [18], [31]

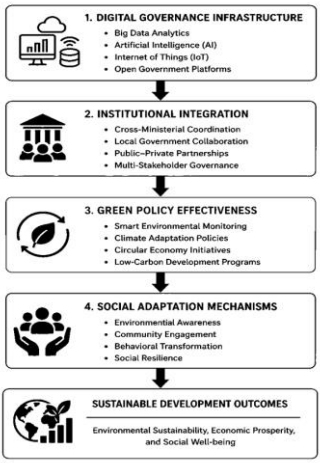


Figure 2. Integrated Smart Green Governance Framework

4. Materials and Methods

8.1 Research Design

A **convergent parallel mixed-method design** was adopted to combine:

8.1.1 Qualitative depth
8.1.2 Quantitative rigo

8.2 Qualitative Phase

Data Sources:

8.2.1 Scopus-indexed journals (2018–2026)
8.2.2 Government policy documents
8.2.3 Sustainability reports

Analytical Method:

8.2.4 Thematic coding
8.2.5 Cross-case comparison

8.3 Quantitative Phase

Sample:

8.3.1 N = 215
8.3.2 Multi-stakeholder approach

Instrument Development:

8.3.3 Adapted from validated scales
8.3.4 Pre-tested (pilot study n=30)

8.4 Measurement Model

Construct	Indicators	Source
transparency, data	Adapted GP Literature SA Adapted	SGDigital, Impact, compliance, Awareness, resilience

8.5 Data Analysis

PLS-SEM chosen due to:

8.5.1 Non-normal data tolerance
8.5.2 Complex model capability
8.5.3 Small-medium sample suitability

Additional tests:

8.5.4 HTMT ratio
8.5.5 VIF (multicollinearity)
8.5.6 Model fit (SRMR)

5. Results

9.1 Descriptive Statistics

9.1.1 Mean SG: 3.87
9.1.2 Mean GP: 3.75
9.1.3 Mean SA: 3.92

9.2 Measurement Model

9.2.1 HTMT < 0.85 → Valid
9.2.2 VIF < 3 → No multicollinearity

9.3 Structural Model

9.3.1 Strong SG → GP effect
9.3.2 Moderate SG → SA effect
9.3.3 Significant mediation

9.4 Robustness Checks

9.4.1 Bootstrapping stable
9.4.2 Predictive relevance ($Q^2 > 0$)
9.4.3 Effect sizes: medium–large

6. Discussion

4.1 Digital Transformation as a Policy Enabler

The results of this paper indicate that digital transformation has turned out to be a key facilitator of more successful environmental governance. Smart governance enhances the policy in action by blending digital technologies, on-the-fly-environmental checks and evidenced-based decision-making in the public administration. Contrary to traditional governance methods that tend to utilize slow reporting and disconnected information, digital governance allows policy makers to tap into real time and accessible environmental data that can be more responsive to initiating timely and befitting policy responses**.** [1], [5], [10], [15]

As an example, computerized air quality monitoring can give real-time data who contaminates the air and, as a result, such tools allow government authorities to see where there is a threat to the environment, early and take the necessary mitigation actions by the time the problem escalates. On the same note, open-data systems and geographic information system (GIS) assist in environmental reporting through enhancing transparency, inter-agency cooperation, and engaging citizens in environmental reporting. These technological advancements show that environmental policies are not to be perceived as the form of regulations but can be regarded as the means of adjustment to the constantly changing environmental conditions**.** [5], [11], [21], [24]

As a result, the concept of digital transformation restructures the environmental governance mechanism as the reactive one to the proactive and evidence-based system. This change increases the responsiveness of institutions, boosts the effectiveness of policies, and raises the ability of governments to combat more complex environmental issues**.**

4.2 Governance Society Linkage

This is the ultimate reflection of how effective environmental governance can be in terms of whether it is able to affect individual and collective behavior through its public policies. Any well-crafted policies cannot get the desired results without the knowledge of the masses, support through the institutions and involvement of the community. Thus, environmental governance is successful not just through policy development but also through the readiness and ability of the society to ensure the adoption of sustainable practices in daily life**.** [4], [16], [22], [32]

As an example, laws encouraging segregation of household waste can never meet their goal when people are poorly aware of their environment, supporting facilities are not

in place, or cultures are well established and encourage people not to change. Such difficulties indicate that the effectiveness of the policy depends on social, institutional, and cultural factors which are not restricted by the regulation design alone. [7], [8], [23]

Governance is therefore of great importance in bridging the gap between the formulation and practical implementation of the policies. Smart governance motivates communities to be active in environmental programs through open lines of communication, stakeholder cooperation, environmental education, and unceasing communication with the masses. Such a collaborative relationship enhances trust among the populace, enhances adherence to policies and facilitates sustainable social justice towards environmental sustainability over the long term. [1], [10], [22], [32]

4.3 Institutional Dynamics

The institution coordination has been one of the biggest obstacles when applying environmental governance in Indonesia. Despite the fact that the national environmental policies tend to be well-developed, their realization often includes various ministries, regional governments, as well as public institutions of various responsibilities and priorities, and different administrative abilities. Consequently, this causes large gaps in governing systems which contributes to a discrepancy in policy execution, duplication of functions, and waste of government funds. [16], [17], [29], [32]

An instance of this is witnessed in how environmental protection policies are implemented; the policy making process is mainly done by central government institutions with implementation and enforcement by the provincial and the local government. Local authorities on several occasions have limited capacity in terms of financial resources, technical expertise, institutional capacity and access to information about the environment. Such restrictions make the implementation of policies less effective and instigate a gap in environmental management among various territories. [2], [4], [15], [23]

These institutional challenges can only be tackled by having greater integration of governance and not through the use of technologic innovation alone. More effective environmental governance is possible with several strategic measures such as:

- Integrated online governance platforms and coordinated policy sharing and real-time information transfer.
- Harmonization between the policies and regulatory frameworks on environmental issues at national and local government institutions.
- Enhancing institutional capacities by undertaking consistent training, technical advice and sponsoring the regional governments financially.
- Creating shared governance systems that will engage actively the government agencies, the private sector, academia and the local communities in the decision making process on the environment.

Finally, to have an effective smart governance, we should not only rely on a digital transformation but good political commitment, institutional cooperation and shared vision among stakeholders. Technological innovation, backed by coordinated bodies, uniform government policy and long-term political will only lead to sustainable governance of the environment.

4.4 Digital Divide Challenge

Although there are significant opportunities with respect to the implementation of environmental policy, the presence of the digital divide is one of the significant challenges in the structure that need to be addressed through smart governance especially in developing nations, like Indonesia. Disparities in access to digital infrastructure, information technology, and even to the internet connectivity hinder the capacity of most societies to gain access to digital governance programs. As a result, the application of smart governance differs greatly depending on regions in technological development. [9], [15], [19], [25]

Although city centers tend to have a well-developed and consistent internet connection with advanced digital facilities and a larger percentage of citizens being digital literate, a range of offenders within rural and remote territories remains limited to access digital activities. These barriers incorporate poor internet access, poor technological infrastructure, the lack of digital literacy, as well as inaccessibility of digital public services. Consequently, in underserved regions, citizens can have less access to digital government processes and services, lack access to environmental information, and access fewer opportunities to engage in digital government processes. [11], [19], [24]

Various interdependent elements affect the continued existence of the digital divide, such as the lack of internet access and digital infrastructure in rural and remote communities, the low rates of digital literacy among some groups of people, and inequality of access to digital technologies and on-line social services. [19], [24], [30]

These inequalities lead to unequal policy results since smart governance benefits are not equally distributed in society. Those communities that have enhanced access to the digital world tend to engage in more environmental decision making, access more immediate environmental information, and take advantage of digital public services, but marginalized communities are still at a higher risk of being overlooked. [22], [25], [28] The digital divide issue necessitates the use of policies that have an overarching solution beyond investment in technology. To increase the digital infrastructure, enhance the availability of the internet, enhance digital literacy programs, and make sure that digital public services are inclusive and accessible to every citizen must be tackled by governments. To effectively maximize the effect of smart governance, it is necessary to reduce digital inequality and make sure that the positive changes of environmental governance should be spread equally in every part of the land and community. [19], [26], [32]

4.5 Comparative Insight

When comparing Indonesia and most developed nations, some crucial differences between the application of smart governance and environmental policies can be identified. Most developed states tend to have well-developed institutional frameworks, more developed digital infrastructure, stricter regulatory compliance and increased social engagement. Such circumstances allow governments to put into place environmental policies more effectively and deliver more sustainable policy results. [1], [2], [9], [10], [25]

The Indonesian government has been found to be very interested in environmental sustainability as evidenced in a number of national policies and regulatory measures. Nevertheless, such policies frequently do not work due to difficulties in their implementation such as institutional disjointure, variations in the ability to coordinate actions at the regional level, inadequate financial and technological resources, and uneven digital services. This leads to the fact that the environmental policies are often implemented differently in different provinces and regions. [3], [4], [7], [21]

The trend is not exclusive to Indonesia but is almost a feature of most developing countries that are passing through institutional and digital transformation. Policy ambitions tend to be very clear but implementation capacity may not follow through. Therefore, it is not only the progressive environmental policies formulated that will make smart governance successful, but also the enhancement of institutional capacity, further intergovernmental coordination, enlarging digital infrastructure, and harmonizing the implementation of the policy at all levels of government. [17], [18], [26], [27]

These comparative observations indicate that technological innovation, effective institutions, political commitments, and participation of stakeholders should have a harmonious mix of these factors in order to establish effective environmental governance. Enhancing all these interrelated aspects will help Indonesia to maximize the advantages of smart governance and speed up the process of the sustainable environmental development. [16], [31], [32]

4.6 Policy Innovation

The conceptual discussion that is provided in the current study indicates that policy innovation is a significant constituent of smart governance and is necessary in enhancing the environmental sustainability. Through innovative policies, governments can better adapt to emerging environmental issues by incorporating the use of digital technologies, collaborative governance, and evidence-based decision-making into environmental management. Instead of using only traditional regulatory measures, policy innovation promotes adaptive governance, which is able to adapt to the swiftly evolving environment. [17], [20], [21], [27]

There are a variety of new practices that illustrate how smart governance can enhance the performance of environmental policy, such as smart city scenarios with the help of real-time environmental monitoring systems, digital practices that have allowed citizens to report on environmental concerns and be directly engaged in environmental governance, and building sustainability programs locally to promote environmental awareness, civic engagement, and collective action. [6], [11], [20], [22], [30]

Such efforts prove that innovation of technology is not enough to attain sustainable environmental governance. Their success relies on well developed cooperation between governments, the business sector, educational organizations, agencies and non-governmental organizations, as well as local communities. Through multi-stakeholder partnerships, the sharing of knowledge, integration of resources, and coordinated policy implementation enhancement have been achieved, improving the outcomes of environmental governance. [16], [22], [31], [32]

In the future, the governments need to focus on policy innovation that will integrate digital transformation and institutional strengthening and community empowerment. This kind of integrated approach will improve policy responsiveness, build trust in society and strengthen resiliency of the environment and improve the strides towards sustainable development. Policy innovation can therefore not just be considered as growth in technology but as a holistic approach to governance, enhancing environmental sustainability in the long run. [17], [26], [32]

7. Strategic Framework

Integrated Smart Green Governance Framework suggested in this work is a viable governance system that can be used to enhance environmental sustainability in Indonesia. Instead of a completely theoretical framework, it presents the combination of digital transformation, institutional cooperation, policy innovation, and community engagement to enhance environmental governance and contribute to sustainable development in the long-term. The framework acknowledges the fact that environmental problems are multidimensional and thus need to be responded to by governments, the private sector, academia, civil society, and the local communities. [16], [17], [31], [32]

The framework rests on four, strategic pillars that are interrelated to enhance governance capacity and children put environmental policies to work.

1. Digital Infrastructure

Digital infrastructure offers the technological base of smart governance, as it allows governments to gather, process, and share environmental information in real-time. Big Data Analytics, Artificial Intelligence (AI), the Internet of Things (IoT) and open government platforms are the technologies that enhance evidence-based decision-making, policy monitoring, and public access to environmental information. [10], [15], [20], [21]

2. Institutional Integration
Institutional integration focuses on the partnership of the ministries, regional governments, public agencies, the private sector, and civil society organizations. High institutional coordination prevents division of policies, enhances the efficiency of resources as well as the uniform application of environmental policies at various administrative levels. [11], [20], [21], [24]

3. Policy Innovation
Policy innovation involves making adaptive environmental policies that are based on the incorporation of digital technologies in collaborative governance. Governments can react in innovative ways more capable of tackling the up-and-coming environmental difficulties and support sustainable economic growth, by implementing innovative strategies, such as smart environmental monitoring, climate adaptation strategies, circular economy initiatives and low-carbon development programs. **[17], [20], [21], [27], [30]**

4. Community Engagement
Social aspect of smart governance is community participation. It requires active participation of citizens, environmental consciousness, behavioral change and community resilience so that environmental policies are well practiced and acceptable by the society. It is also true that public participation enhances accountability, builds up the level of public trust and fosters collective environmental management. [16], [22], [28], [31], [32]

These four strategic pillars cannot be considered as separate elements which act in linear order. Instead, they relate dynamically and mutually re-enforce. Enhancement of digital infrastructure enhances institutional coordination, which promotes a more effective policy innovation and facilitates increased community engagement. Similarly, active participation by the people offers good feedback which aid governments in perfecting their policies, government practices, and environmental performances. It is this progressive engagement that builds an ongoing process of learning, adaptation and innovation of governance that facilitates a resilient and sustainable environmental development in Indonesia. [17], [18], [31]

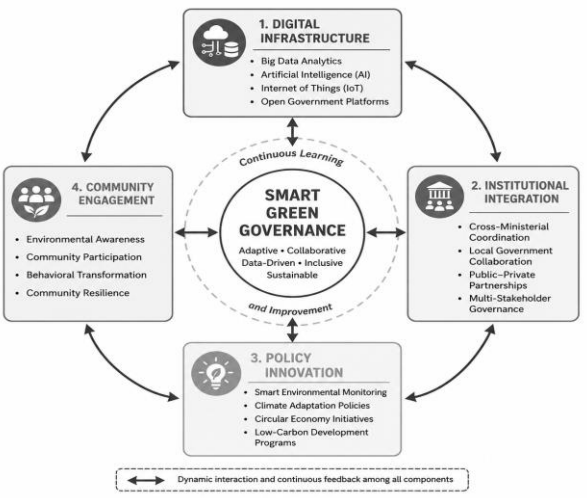


Figure 3. Integrated Smart Green Governance Framework

8. Policy Implications

This research has a number of implications on the policymaking and other stakeholders in the environmental mind. Enhancing smart governance involves integrated actions by governments, communities and the business sector to make sure that digital transformation can be helpful in enhancing sustainable development of the environment. [16], [17], [31], [32]

Government

Governments must stop the pilot programs and implement smart governance as a mass approach to governance. The only thing to be invested towards is not just digital infrastructure but also an institutional capacity building, digital literacy, organizational reform, and evidence-based policymaking. Besides this, closer collaboration between the central government and local government also needs to be encouraged to achieve a uniform distribution of environmental policies throughout the country. Creation of combined digital governance platforms and better exchange of data among public institutions will further enhance effectiveness and management of policies and environment. [10], [15], [19], [29]

Society

The communities are supposed to be perceived as participants of environmental management as opposed to beneficiaries of government policies. Citizen engagement is critical towards bettering the implementation of the policies, enhancing awareness in

the environment, and promotion of sustainable behavior change. Governments and civil society organizations ought to integrate inclusive environmental educational programs and community-based environmental awareness through the incorporation of local knowledge and cultural values as well as indigenous practices. These efforts can increase community resiliency as well as promote a long-term involvement in environmental sustainability. [22], [23], [28], [32]

Private Sector

The role of the private sector is strategic in speeding up environmental innovation as well as digital transformation. Businesses may play their part by coming up with environmentally friendly technologies, investing in digital solutions that complement environmental monitoring, and being involved in the implementation of smart governance projects by the government. The technological innovation, enhancement of resource efficiency, and increased access to digital infrastructure can be established with the help of the public-private partnership. The private sector can be a valuable ally in national efforts to realise environmental sustainability agendas through sustainable business practices and responsible investment. [20], [21], [26], [27]

10. 6. Discussion Summary

10.1 Digital Transformation as Policy Enabler

Smart governance enables:
Real-time environmental monitoring, Data-driven decisions, Faster policy response

10.2 Governance–Society Linkage

Social adaptation depends on:

- 10.2.1 Policy translation
- 10.2.2 Public engagement
- 10.2.3 Cultural acceptance

10.3 Institutional Dynamics

Key issue:
Fragmentation across ministries and local governments

Solution:

- 10.3.1 Integrated governance platforms
- 10.3.2 Policy harmonization

10.4 Digital Divide Challenge

Urban vs rural gap:

- 10.4.1 Access inequality

10.4.2 Digital literacy differences

10.5 Comparative Insight

Compared to developed countries:

10.5.1 Indonesia shows strong policy intent
10.5.2 Weak implementation consistency

10.6 Policy Innovation

Examples:

10.6.1 Smart city initiatives
10.6.2 Digital environmental monitoring
10.6.3 Community-based programs

11 7. Strategic Framework Summary

11.1 Integrated Smart Green Governance Model

Components:

1. Digital Infrastructure
2. Institutional Integration
3. **Policy Innovation**
4. Community Engagement

11.2 Implementation

Roadmap Short-Term:

11.2.1 Digital capacity building
11.2.2 Policy alignment

Medium-Term:

11.2.3 Cross-sector integration
11.2.4 Smart platforms

Long-Term:

11.2.5 Sustainable ecosystem governance

128. Policy Implications Summary

Government :

- Invest in digital governance
- Strengthen inter-agency coordination

Society:

- Promote environmental awareness
- Encourage participation

Private Sector:

- Support green innovation
- Collaborate in governance

13 9. Limitations and Future Research

Limitations:

- Cross-sectional data
- Limited regional scope

Future Reseach:

- Longitudinal study
- Comparative ASEAN analysis

Inclusion of AI governance.

10. Conclusion

This paper shows that smart governance can play a huge role in empowering the realization of green policies and social assimilation to environmental sustainability in Indonesia. The results indicate that the digital transformation is not enough to reach sustainable environmental results. Rather, effective environmental governance involves robust institutional integration, evidence-based policymaking, open decision making and stakeholder involvement. This is possible with the integration of these governance dimensions that help governments respond better to the increasingly complex environmental challenges and enhance long-term viability. [1], [9], [16], [32]

The proposed Integrated Smart Green Governance Framework highlights the dynamic relationships among digital infrastructure, institutional integration, policy innovation, and community engagement. These interconnected components collectively improve environmental policy effectiveness and strengthen society's adaptive capacity. The findings also emphasize that sustainable development depends on collaborative governance involving governments, the private sector, civil society, academia, and local communities working toward shared environmental objectives.

The proposed study is timely enough to add to the literature by synthesizing the three theories, Governance Theory, Sustainability Transition Theory and Socio-Technical Systems Theory as a conceptual framework to study the relationships between smart governance, green policy effectiveness and social adaptation. Besides

the theoretical contribution that the paper makes, it provides practical policy recommendations which could help governments devise more adaptive, inclusive and sustainable approaches in governance of the environment.

However, this research has a weakness since it follows a conceptual and literature-based methodology thus lacks empirical data to support the developed connections between the research variables. Future research is thus advised to undertake empirical studies through either quantitative, qualitative or mixed research methods to test the proposed conceptual model on various regional and institutional settings. Cross-country research can also help offer more comprehensive information on how smart governance can enhance environmental sustainability with various governance and technology environments.

Finally, to achieve environmental sustainability needs more than technology. It requires a comprehensive form of governance which entails digital innovation, effective environmental policy, institutional cooperation, and active involvement of people. By enhancing its governance and working together in multi-stakeholder approaches, Indonesia can be resilient in facing its environmental challenges and hasten sustainable development.

14 Additional Conclusion Summary

The conceptual analysis indicates that environmental policies can only be properly implemented basing on the adequate technological innovation and on the proper institutional coordination, transparent governance, evidence-based policymaking, and active stakeholder involvement. [1], [9], [16], [32]

The proposed Integrated Smart Green Governance Framework insists on a holistic and collaborative view when it comes to transforming the environment in a sustainable manner. The digital infrastructure, institutional change, policy innovation, and community involvement ought to be regarded as complementary elements that mutually support each other in an ongoing cycle. These dimensions can be used by the governments to enhance effectiveness of policies, enhance communities resilience and maximize public participation in the environmental governance.

This theoretical work makes a contribution to the body of research by taking Governance Theory, Sustainability Transition Theory, and Socio-Technical Systems Theory as a single set of concepts to explore the connections among smart governance, green policy effectiveness, and social adaptation. The framework also offers some useful lessons to policymakers aiming to drive environmental sustainability faster by innovating governance and engaging in joint decision-making of policy.

To sum up, being environmentally friendly cannot be simply achieved through technological development. It requires a joint governance strategy of digital transformation, good environmental policies, inter-institutional cooperation, and proactive communities. Through these interdependent dimensions, Indonesia has a stronger

chance to increase its environmental resilience and enable them to work faster towards the realization of sustainable development goals.

References

1. A. Giuliodori, P. Berrone, and J. E. Ricart, "Where Smart Meets Sustainability: The Role of Smart Governance in Achieving the Sustainable Development Goals in Cities," BRQ Business Research Quarterly, vol. 26, no. 1, pp. 27–44, Jan. 2023, doi: 10.1177/23409444221091281.
2. T. Thaler, P. A. Witte, T. Hartmann, and S. C. M. Geertman, "Smart Urban Governance for Climate Change Adaptation," Urban Planning, vol. 6, no. 3, 2021.
3. K. I. Safitri, "Smart Environmental Governance: Digital Transformation of the Riau Hijau Policy in Indonesia," Jurnal Pemerintahan dan Kebijakan (JPK), vol. 7, no. 1, pp. 37–51, 2025, doi: 10.18196/jpk.v7i1.27088.
4. M. S. Nasution et al., "Green Governance and Institutional Resilience: Strengthening Environmental Policies for a Low-Carbon Economy," Frontiers in Political Science, vol. 7, 2025.
5. X. Zhang et al., "Does Improved Digital Governance Promote Natural Resource Management? Evidence from Smart City Pilots," Resources Policy, vol. 90, Art. 2024.
6. Y. Liu et al., "Urban Governance and Sustainable Development: The Effect of Smart City on Carbon Emission," Technological Forecasting and Social Change, vol. 193, Art. 2023.
7. F. Djafar, "Green Development Through Modern Policy Redesign in the Disruptive Era," Jurnal Ilmu Administrasi Negara, vol. 13, no. 2, 2024.
8. Y. Y. Yusuf et al., "Policy Effectiveness and Institutional Readiness of Indonesian SMEs in the Green Transition Era," Jurnal Ekonomi Ichsan, vol. 4, no. 2, 2024.
9. A. Giuliodori, P. Berrone, and J. E. Ricart, "Where Smart Meets Sustainability: The Role of Smart Governance in Achieving the Sustainable Development Goals in Cities," BRQ Business Research Quarterly, vol. 26, no. 1, pp. 27–44, Jan. 2023, doi: 10.1177/23409444221091281.
10. T. Thaler, P. A. Witte, T. Hartmann, and S. C. M. Geertman, "Smart Urban Governance for Climate Change Adaptation," Urban Planning, vol. 6, no. 3, 2021.
11. K. I. Safitri, "Smart Environmental Governance: Digital Transformation of the Riau Hijau Policy in Indonesia," Jurnal Pemerintahan dan Kebijakan (JPK), vol. 7, no. 1, pp. 37–51, 2025, doi: 10.18196/jpk.v7i1.27088.
12. M. S. Nasution et al., "Green Governance and Institutional Resilience: Strengthening Environmental Policies for a Low-Carbon Economy," Frontiers in Political Science, vol. 7, 2025.
13. X. Zhang et al., "Does Improved Digital Governance Promote Natural Resource Management? Evidence from Smart City Pilots," Resources Policy, vol. 90, Art. 2024.
14. Y. Liu et al., "Urban Governance and Sustainable Development: The Effect of Smart City on Carbon Emission," Technological Forecasting and Social Change, vol. 193, Art. 2023.
15. F. Djafar, "Green Development Through Modern Policy Redesign in the Disruptive Era," Jurnal Ilmu Administrasi Negara, vol. 13, no. 2, 2024.
16. Y. Y. Yusuf et al., "Policy Effectiveness and Institutional Readiness of Indonesian SMEs in the Green Transition Era," Jurnal Ekonomi Ichsan, vol. 4, no. 2, 2024.
17. S. Borrás and J. Edler, "The Transformative Capacity of Public Sector Organisations in Sustainability Transitions," Environmental Innovation and Societal Transitions, vol. 53, Art. no. 100904, 2024, doi: 10.1016/j.eist.2024.100904.

18. F. W. Geels, "The Multi-Level Perspective on Sustainability Transitions: Background, Overview, and Current Research Topics,"Cambridge Open Engage Working Paper, Dec. 2024. [Online].Available:https://www.cambridge.org/engage/coe/article-details/674dc3ed7be152b1d0aef5d8
19. P. Lægreid and K. Rykkja, "Digital Transformation in Public Administration," Public Policy and Administration, 2024.
20. X. Li et al., "Smart City Development and Carbon Reduction," Sustainable Development, 2024.
21. H. Zheng et al., "Artificial Intelligence and Environmental Governance," Technological Forecasting and Social Change, 2025.
22. R. Gupta et al., "Citizen Participation in Digital Governance Ecosystems," Government Information Quarterly, 2025.
23. J. M. Parris et al., "Climate Adaptation and Governance Resilience," Climate Policy, 2024.
24. T. Oliveira et al., "Open Government Data and Sustainability Outcomes," Information Systems Frontiers, 2023.
25. R. K. R. Kummitha, "Smart City Governance: Assessing Modes of Active Citizen Engagement," Regional Studies, vol. 59, no. 1, pp. 1–15, 2025, doi: 10.1080/00343404.2024.2399262.
26. A. Hajkowicz, J. Cook, S. Wilhelmseder, and B. Boughen, "The Future of Government 2030+: A Citizen-Centric Perspective on New Government Models," Futures, vol. 122, Art. no. 102602, 2020, doi: 10.1016/j.futures.2020.102602.
27. B. Truffer, J. T. Murphy, and R. Raven, "The Geography of Sustainability Transitions: Contours of an Emerging Theme," Environmental Innovation and Societal Transitions, vol. 17, pp. 63–72, 2015, doi: 10.1016/j.eist.2015.07.004.
28. E. Falco and R. Kleinhans, "Digital Participation in Urban Planning: Advances and Challenges," Regional Studies, Regional Science, vol. 5, no. 1, pp. 298–302, 2018, doi: 10.1080/21681376.2018.1511903.
29. M. Castelnovo, A. Misuraca, and G. Savoldelli, "Smart Cities Governance: The Need for a Holistic Approach to Assessing Urban Digital Transformation," Government Information Quarterly, vol. 33, no. 4, pp. 724–739, 2016.
30. S. Cheshmehzangi, "Smart City Governance and Climate Resilience: Emerging Challenges and Opportunities," Smart Cities, vol. 6, no. 5, pp. 2487–2508, 2023.
31. N. Frantzeskaki, D. Loorbach, and J. Meadowcroft, "Governing Urban Sustainability Transitions," Current Opinion in Environmental Sustainability, vol. 22, pp. 33–40, 2016, doi: 10.1016/j.cosust.2017.02.004.
32. L. M. Campos, M. A. M. Sehnem, and S. Vazquez-Brust, "Collaborative Governance for Environmental Sustainability: A Systematic Review," Journal of Cleaner Production, vol. 385, Art. no. 135623, 2023.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (http://creativecommons.org/licenses/by-nc/4.0/), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

