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Research Article

E-Governance as an Enabler of Climate Resilience in a Climate Vulnerable State: A Qualitative Policy Analysis of The Gambia

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Abstract

Climate change poses significant challenges for The Gambia, particularly through sea level rise, coastal erosion, and increasing rainfall variability that threaten livelihoods, food security, and coastal ecosystems. Although national climate adaptation efforts have largely emphasized physical infrastructure and sectoral interventions, the potential of e governance as an engineering enabled innovation system for strengthening climate resilience remains underexplored in climate vulnerable developing states. This study aims to examine the role of e governance in supporting climate adaptation by integrating digital infrastructure, data systems, and governance processes in The Gambia. The research adopts a qualitative policy analysis approach using thematic analysis of secondary data, including national policy documents, government and international organization reports, and peer reviewed academic literature. The analysis focuses on how digital governance tools such as climate data platforms, early warning systems, and digital participation mechanisms are positioned within existing climate adaptation frameworks. The findings indicate that e governance has considerable potential to enhance climate resilience by improving access to climate information, enabling real time early warning mechanisms, strengthening data driven planning, and promoting inclusive citizen participation. However, effective implementation is constrained by critical engineering and institutional barriers, including limited digital infrastructure, unreliable electricity supply, low digital literacy, fragmented information systems, and weak inter agency coordination. This study contributes to climate governance and innovation literature by conceptualizing e governance as a socio technical, engineering enabled mechanism that transforms climate resilience from a policy aspiration into an operational adaptive capacity. The findings offer policy relevant insights for integrating engineering driven digital innovations into national climate adaptation strategies in resource constrained contexts.

Keywords: *Climate Resilience; Digital Innovation; E-governance; Socio Technical System*

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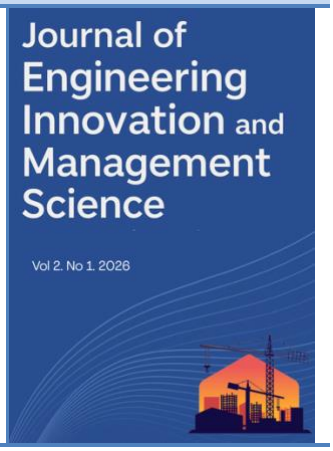


INTRODUCTION

The Republic of the Gambia, a small West African country, is widely recognized as one of the most climate vulnerable states globally. Its low lying coastal geography exposes the country to sea level rise, coastal erosion, and saltwater intrusion into freshwater systems (Agoubi, 2021; Bosserelle et al., 2022; Griggs & Reguero, 2021). These environmental stressors directly threaten coastal livelihoods that depend on fisheries, tourism, and coastal ecosystems (Huynh et al., 2021; Rubekie et al., 2022; Touza et al., 2021). Beyond coastal areas, climate change has significantly affected the agricultural sector, which remains the backbone of the national economy (Knez et al., 2022; Panja et al., 2024). Variability in rainfall patterns, increasing drought frequency, and unpredictable weather events have disrupted agricultural productivity (Abebaw, 2025; Ndlovu et al., 2020). These climatic disruptions have reduced crop yields and increased food insecurity, particularly among smallholder farmers (Derbile et al., 2022; Hadley et al., 2023; Onyeaka et al., 2024). As agriculture constitutes a primary source of income in rural areas, climate impacts translate into broader socio economic vulnerabilities (Hertel & de Lima, 2020; Li et al., 2023; Zebisch et al., 2021). Declining agricultural output has contributed to rising poverty levels among rural populations. National policy frameworks acknowledge that climate change disproportionately affects coastal and rural communities. Without effective adaptation measures, these vulnerabilities are expected to intensify over time.

In response to escalating climate risks, the government of The Gambia and its development partners have increasingly prioritized climate resilience within national development agendas. Conventional adaptation strategies, including infrastructural development and modifications in agricultural practices, continue to dominate policy responses (Belmin et al., 2023; Mamun et al., 2024). While these approaches remain essential, they are often insufficient to address the complex and dynamic nature of climate risks (Simpson et al., 2021; Stern et al., 2022). Recent studies emphasize the complementary role of governance systems in strengthening adaptive capacity (Karman, 2020; Ziervogel et al., 2022). In this regard, e governance has emerged as a promising mechanism to enhance climate response efforts. The integration of digital technologies into governance processes can improve administrative efficiency and public service delivery (Chen et al., 2021; Doran et al., 2023). More importantly, digital platforms enable the systematic collection and dissemination of climate related information (Carneiro et al., 2022; Hsu et al., 2020). Such systems support early warning mechanisms for floods, storms, and rainfall variability. Improved access to timely climate information allows communities to take proactive adaptation measures. In The Gambia, limited access to reliable forecasts often leaves farmers unprepared for seasonal climate fluctuations.

Empirical evidence from other African contexts illustrates the potential of e governance to enhance climate resilience when supported by adequate infrastructure. In South Africa, digital platforms have facilitated the sharing of real time climate data and early warnings for extreme weather events (Agbehadji et al., 2023). These systems have improved disaster preparedness and reduced climate related losses in coastal cities (Busayo & Kalumba, 2021). Similarly, experiences from Kenya

demonstrate how mobile technologies support agricultural resilience among smallholder farmers (Kamal & Bablu, 2023; Krell et al., 2021). Real time weather forecasts and early warning systems enable farmers to adjust planting schedules and farming practices (Adamides et al., 2020; Apriyana et al., 2021). Such applications highlight the role of digital governance in promoting inclusive climate resilience. Enhanced communication between governments and citizens strengthens participatory decision making processes. However, transferring these models to The Gambia presents distinct challenges. Limited internet connectivity in rural areas restricts access to digital services. Low levels of digital literacy further constrain the effective use of e governance tools among vulnerable communities.

Despite the growing body of literature on climate resilience, existing studies remain fragmented across disciplinary boundaries. Engineering oriented research has extensively examined the role of digital technologies, critical infrastructure systems, early warning mechanisms, and data driven solutions in enhancing climate resilience, often emphasizing technical performance and system optimization. In parallel, scholarship on climate governance and socio technical systems has highlighted the importance of institutional arrangements, state roles, and governance structures in steering sustainability transitions, yet frequently adopts conceptual or political perspectives with limited engagement in the operational dimensions of engineered digital systems (Sengers et al., 2021). While recent studies increasingly acknowledge climate resilience as a socio technical challenge, few empirically examine how digital governance infrastructures function as integrated systems linking engineering design, information flows, and policy processes. Moreover, the majority of existing research focuses on advanced economies or large urban contexts, leaving small climate vulnerable developing states underrepresented despite their heightened exposure to climate risks and infrastructural constraints. Consequently, there is limited policy relevant evidence on how e governance can operate as an engineering enabled socio technical mechanism within national climate adaptation frameworks in resource constrained settings. This gap underscores the need for context specific analysis that bridges engineering innovation and climate governance to explain how digital systems can be effectively integrated into climate resilience strategies in countries such as The Gambia.

Despite increasing recognition of climate risks and digital governance potential, empirical research on e-governance and climate resilience in The Gambia remains limited. Existing studies predominantly focus on physical adaptation measures or sector specific policy interventions. Few investigations examine how digital governance systems directly support climate adaptation in coastal and rural contexts. The interaction between digital infrastructure, governance processes, and community level adaptation remains underexplored. This study aims to address this research gap by examining the role of e governance in supporting climate adaptation in The Gambia. Specifically, it seeks to analyze how digital governance tools can enhance access to climate information and early warning systems. The study also aims to identify key infrastructural, institutional, and social barriers to effective implementation. A qualitative policy analysis approach is employed to synthesize insights from policy documents and academic literature. The

study conceptualizes e governance as a socio technical mechanism for enhancing climate resilience. Ultimately, the research aims to inform more inclusive and effective climate adaptation strategies in climate vulnerable developing states.

METHODS

Research Design

This study employs a qualitative research design based on document analysis to examine how e governance can contribute to climate resilience in The Gambia. A qualitative approach is appropriate for addressing context specific governance challenges, identifying institutional and technological opportunities, and synthesizing lessons from existing policy and scholarly sources. Document analysis enables systematic examination of how e governance is conceptualized and integrated within climate adaptation frameworks, particularly in developing country contexts where primary data may be limited. The study focuses on secondary data to analyze policy intentions, governance structures, and implementation narratives related to digital governance and climate adaptation. By drawing on diverse documentary sources, the research captures both national and international perspectives on e-governance and climate resilience. This approach is well suited for exploratory and analytical objectives rather than causal measurement. The research design emphasizes interpretive analysis to understand patterns and relationships across governance and innovation domains. Consequently, the study provides policy relevant insights grounded in existing evidence. The qualitative design aligns with established methodological guidance for policy and governance research. Overall, the design supports a comprehensive assessment of e governance integration in climate adaptation planning.

Data Sources

The study relies on secondary data obtained from multiple documentary sources to ensure analytical depth and triangulation. These sources include peer reviewed academic journal articles addressing e-governance, climate resilience, digital innovation, and climate governance, with particular attention to African and West African contexts. National policy documents from the Government of The Gambia, such as the National Adaptation Programme of Action and the Nationally Determined Contributions, are examined to assess policy commitments and strategic directions. Reports published by international organizations, including the World Bank, United Nations Development Programme, and African Development Bank, are also reviewed to provide comparative and regional perspectives. In addition, selected policy briefs and global frameworks related to digital governance and climate adaptation are included. Document selection is guided by relevance to climate adaptation, governance processes, and digital systems. Only documents available in English and accessible through academic and institutional databases are considered. Both recent publications and key foundational policy documents are included. This combination allows the study to capture institutional trajectories and contemporary developments. Collectively, these sources provide a robust empirical basis for analysis.

Data Analysis Technique

The study adopts thematic analysis to process and interpret the collected data. Thematic analysis is employed to identify recurring patterns, concepts, and relationships within policy documents and academic literature. The analysis begins with data familiarization through repeated reading of all selected documents. During this stage, key statements related to e governance, climate resilience, digital infrastructure, and policy integration are identified. Initial codes are then generated to capture meaningful units of information relevant to the research objectives. These codes are subsequently organized into broader themes that reflect governance opportunities, implementation barriers, and socio technical dynamics. The themes are reviewed and refined to ensure internal consistency and alignment with the research questions. Each theme is then clearly defined and named to reflect its analytical significance. The final stage involves interpreting the themes in relation to existing theoretical and policy debates. Comparative insights from other countries are used to contextualize findings from The Gambia. This analytical process enables systematic synthesis of evidence on e governance and climate resilience.

Analytical Focus

The analysis places particular emphasis on understanding how e governance can be integrated into climate adaptation planning in coastal and rural areas of The Gambia. Attention is given to digital governance tools such as climate information platforms, early warning systems, and mechanisms for public participation. The study also examines institutional capacity, infrastructural constraints, and coordination challenges that influence implementation outcomes. By linking thematic findings to broader governance and innovation literature, the analysis highlights how digital systems function as socio technical mechanisms for climate resilience. This focus allows the study to bridge engineering enabled digital innovation with climate governance processes. The approach supports an integrated understanding of climate adaptation beyond sectoral interventions. As a result, the study provides insights relevant to both policy design and implementation. The findings are interpreted within the broader context of climate vulnerable developing states. This enhances the transferability of lessons beyond The Gambia.

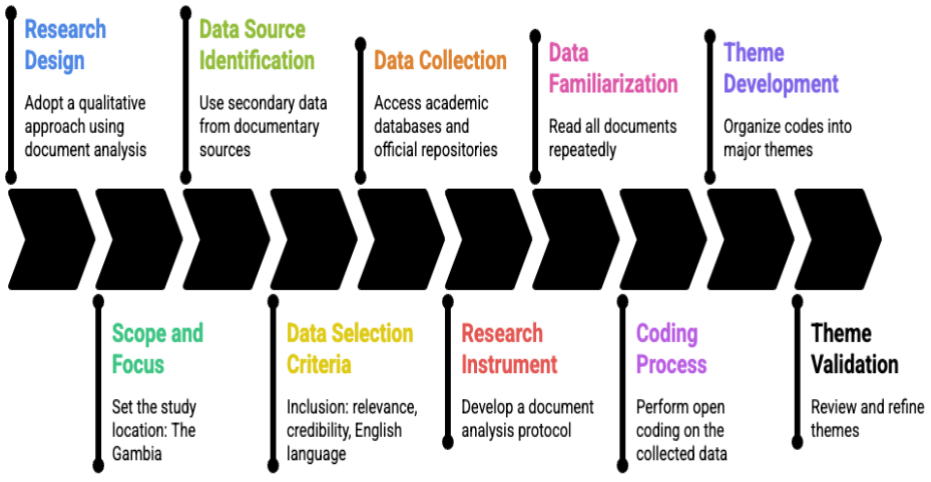


Figure 1. Research Method Flow

Figure 1. Presented the research methodology illustrated in the figure outlines a systematic qualitative approach to examining the role of e governance in enhancing climate resilience in The Gambia. The study begins with an exploratory and analytical research design based on qualitative document analysis, positioning e-governance as a socio technical mechanism within climate adaptation frameworks. Relevant data are collected from national policy documents, academic literature, and reports produced by international organizations. The selected documents are reviewed through repeated reading to identify key discussions related to climate risks, governance processes, and digital systems. An initial coding process is then conducted to capture recurring concepts such as climate information access, early warning systems, digital infrastructure, and citizen participation. These codes are systematically generated to ensure analytical consistency across data sources. Subsequently, similar codes are grouped into broader themes that reflect digital innovation opportunities, implementation barriers, and governance challenges. The interpretation and synthesis stage refines these themes through iterative analysis to strengthen coherence and relevance. The analytical focus emphasizes the interaction between digital tools, institutional capacity, and engineering enabled governance mechanisms. Finally, the methodology acknowledges limitations related to reliance on secondary data and the exploratory nature of the findings, framing the results as context sensitive and policy relevant insights.

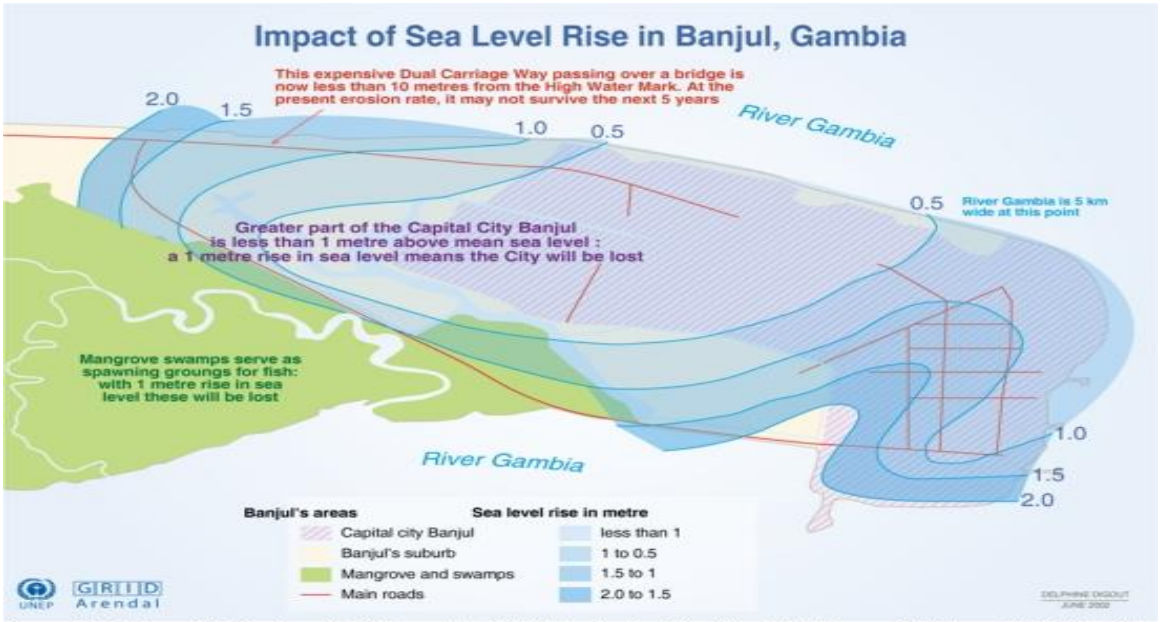
RESULT AND DISCUSSIONS

Results

The qualitative thematic analysis of policy documents, scholarly literature, and institutional reports reveals a multifaceted relationship between climate vulnerability, governance capacity, and digital innovation in The Gambia. The findings indicate that climate resilience in the country is shaped not only by environmental exposure but also by the extent to which governance systems can effectively integrate digital tools into adaptation strategies. Five overarching themes emerge from the analysis: climate change risks, the contribution of e governance to climate resilience, barriers to e governance implementation, opportunities for inclusive and sustainable development, and policy and governance challenges. These themes collectively illustrate how environmental pressures intersect with institutional structures and technological readiness to influence resilience outcomes.

Climate Change Risks in The Gambia

The findings demonstrate that sea level rise poses a critical and immediate threat to The Gambia, particularly in its low lying coastal zones. Due to the country's geographical characteristics, even modest increases in sea level are projected to inundate extensive areas, including significant portions of Banjul and surrounding settlements. Such flooding is expected to displace large numbers of residents and cause substantial damage to essential infrastructure, residential areas, and economic assets. Coastal erosion further accelerates land degradation and weakens natural protective barriers, while saltwater intrusion compromises freshwater resources and agricultural land. These environmental changes undermine the ecological functions of mangrove forests, which serve as vital buffers against flooding and support fisheries based livelihoods.



Sources: *Coastal Zone of the Gambia and th Abidjan region in Cote d'Ivoire: Sea Level Rise Vulnerability, Response Strategies, and Adaptation Option, National Assessment Results of Climate Change: Impacts and Responses*, Jallow, B.P., S. Toure, M.M.K. Barrow, and A.A. Mathieu, Mimura, N., Oldendorf Luhe, Inter-Research, Germany, 1999.

Figure 2. Projected impacts of sea level rise on Banjul, The Gambia.

The figure illustrates the extreme vulnerability of Banjul's coastal and urban areas, where large portions of the capital lie less than one meter above mean sea level. A one meter rise in sea level is projected to inundate significant urban zones, damage critical infrastructure, and result in the loss of mangrove ecosystems that function as natural coastal defenses and fish spawning habitats. This spatial visualization reinforces the urgency of anticipatory adaptation strategies and integrated coastal risk management.

The socio economic impacts of coastal hazards are particularly severe for communities whose livelihoods depend on coastal and marine resources. Flooding disrupts informal economic activities, especially those dominated by women, and limits access to markets and public services by damaging transportation networks. In addition, saltwater contamination reduces the availability of freshwater for household consumption and irrigation, increasing vulnerability to food insecurity. Beyond coastal zones, rainfall variability constitutes another major climate related risk. Long term declines in precipitation, increasing drought frequency, and irregular rainfall patterns have reduced water availability and agricultural productivity across the country. Projections suggest that future climate scenarios will further reduce water flows in the Gambia River Basin, intensifying water stress in rural areas. Although adaptive measures such as solar powered boreholes have mitigated dry season shortages, heavy rainfall events frequently compromise water quality and infrastructure. Together, these climate risks underscore the need for anticipatory, information based adaptation strategies, as summarized in Table 1.

Table 1. Climate Change Risks and Their Implications for Climate Resilience in The Gambia

Risk Dimension	Observed and Projected Impacts	Implications for Resilience
Sea level rise	Flooding of coastal zones and infrastructure, population displacement, ecosystem degradation	Requires early warning systems and coastal risk monitoring
Coastal erosion & saltwater intrusion	Loss of mangroves, freshwater contamination, reduced agricultural land	Necessitates integrated coastal governance and data driven planning
Rainfall variability	Reduced crop yields, water scarcity, increased drought and flood risks	Demands climate information systems and adaptive water management

E Governance as a Tool for Enhancing Climate Resilience

The analysis reveals that e governance can play a pivotal role in strengthening climate resilience by enhancing access to timely and reliable climate information. Digital governance systems facilitate the systematic collection, management, and dissemination of climate data, which is essential for effective early warning and risk communication. In settings where climate hazards are increasingly unpredictable, such systems enable institutions and communities to anticipate risks rather than respond solely after disasters occur. Evidence from comparable African contexts indicates that mobile based climate information platforms help farmers adjust planting decisions, crop selection, and resource management in response to anticipated weather conditions.

Applied to The Gambia, similar digital platforms could reduce uncertainty during agricultural seasons and improve preparedness for climate related shocks in both rural and coastal areas. Coastal residents could benefit from real time alerts on sea level fluctuations and flooding risks, allowing them to undertake precautionary measures. The findings also highlight that e governance enhances institutional coordination by enabling information sharing across sectors such as agriculture, disaster management, water resources, and urban planning. By integrating data flows across institutions, digital systems support more coherent and timely decision making. Moreover, the analysis underscores the significance of e participation mechanisms in promoting inclusive climate governance. Digital platforms provide channels for citizens to share local knowledge, report climate impacts, and contribute to adaptation planning. This is particularly relevant in The Gambia, where financial and logistical constraints limit direct engagement between policymakers and remote communities. By expanding participation beyond conventional top down approaches, e governance can support more context sensitive and socially inclusive adaptation strategies. The principal functions of e governance in climate resilience are summarized in Table 2.

Table 2. Summary of Household RWH System Components and Functions

E Governance Function	Key Contributions	Expected Outcomes
Climate information systems	Real time data sharing and forecasting	Improved preparedness and anticipatory adaptation

Early warning platforms	Alerts for floods, storms, and rainfall extremes	Reduced disaster impacts
E participation mechanisms	Citizen engagement and feedback	Inclusive and responsive climate policies

Barriers to E Governance Adoption in The Gambia

Despite its potential benefits, the findings indicate that the implementation of e governance in The Gambia is hindered by several interrelated constraints. Limited digital infrastructure remains a primary challenge, particularly in rural and climate vulnerable areas where internet connectivity is inconsistent or unavailable. Unreliable electricity supply further compromises the functionality and reliability of digital platforms, leading to frequent disruptions in service delivery. These infrastructural deficiencies also discourage private sector investment in digital solutions, slowing the expansion of governance related technologies.

Human capacity limitations represent an additional barrier. Low levels of digital literacy, especially among older populations and smallholder farmers, restrict effective engagement with digital governance tools. Many rural residents lack the skills needed to access, interpret, and apply digital climate information. Within public institutions, insufficient technical expertise constrains the development and maintenance of integrated digital systems. Financial limitations further exacerbate these challenges, as restricted budgets limit large scale investment in digital infrastructure and innovation. Collectively, these barriers reduce the reach, sustainability, and effectiveness of e governance initiatives, as summarized in Table 3.

Table 3. Barriers to E Governance Adoption in The Gambia

Barrier Type	Description	Implications
Infrastructure	Poor internet and unstable electricity	Limited reach of digital services
Human capacity	Low digital literacy and technical expertise	Reduced system utilization
Financial	Budgetary constraints	Delayed or partial implementation

Opportunities for Inclusive and Sustainable Development

In contrast to the identified constraints, the results also highlight several opportunities to leverage e governance for inclusive and sustainable development. The widespread availability of mobile networks and basic digital technologies offers relatively low cost entry points for expanding digital participation. Social media and mobile communication tools already function as informal channels for civic engagement, suggesting potential for scaling formal e governance initiatives.

The demographic structure of The Gambia presents an additional opportunity, as a large proportion of the population is young and actively engaged with digital technologies and climate related initiatives. This youthful population represents a valuable resource for driving innovation and digital transformation. Capacity building programs focused on digital skills, climate literacy, and technological innovation could strengthen human capital and foster long term resilience.

Furthermore, partnerships with private sector actors, particularly telecommunications providers, offer opportunities to expand digital infrastructure through targeted incentives and regulatory support. These opportunities are summarized in Table 4.

Table 4. Opportunities for E Governance to Support Inclusive Development

Opportunity	Enabling Factors	Potential Benefits
Mobile platforms	Widespread GSM networks	Improved access to climate information
Youth engagement	Large young population	Innovation and digital leadership
Public–private partnerships	Private telecom sector	Accelerated digital infrastructure development

Policy and Governance Challenges

Finally, the analysis identifies persistent policy and governance challenges that limit the effective integration of e governance into climate adaptation frameworks. National climate policies do not explicitly define the role of digital governance in building climate resilience, resulting in fragmented and inconsistent implementation across sectors. The absence of clear policy linkages between climate adaptation strategies and digital governance initiatives reduces institutional coherence and accountability.

In addition, weak inter agency coordination constrains the effectiveness of digital platforms, as climate data and decision making responsibilities remain dispersed across institutions. The findings emphasize the need for centralized climate data management systems that enable information sharing among government agencies, private sector actors, and communities. Without stronger policy alignment and institutional coordination, the transformative potential of e governance is unlikely to be fully realized. These governance related challenges are summarized in Table 5.

Table 5. Policy and Governance Challenges Affecting E Governance Integration

Challenge	Description	Implication for Resilience
Policy misalignment	Limited linkage between climate and digital policies	Fragmented implementation
Institutional coordination	Weak inter agency collaboration	Inefficient data use and decision making
Governance capacity	Limited strategic oversight	Underutilization of digital tools

Discussion

The findings of this study corroborate earlier research that identifies coastal flooding, sea level rise, and rainfall variability as dominant climate risks in small developing states. While previous studies have largely concentrated on physical exposure and sectoral impacts, this research demonstrates that climate risks in The Gambia are amplified by limited access to timely and actionable information. In contrast to conventional adaptation studies that prioritize infrastructural interventions, the present findings highlight the strategic role of digital governance systems in

enabling anticipatory and coordinated responses (Mehvar et al., 2021; Scott et al., 2020; Triyanti et al., 2020). The results show that e governance functions not merely as an administrative modernization tool but as an operational mechanism that supports early warning dissemination, cross sector coordination, and community preparedness. This perspective aligns with broader socio technical frameworks that view resilience as an outcome of interactions between technology, institutions, and social actors. The emphasis on e participation further distinguishes this study from earlier governance research that often treats communities as passive recipients of policy interventions (Fritz et al., 2024; Shunglu et al., 2022). By illustrating how digital platforms can facilitate bottom up feedback and local knowledge integration, the study challenges top down models of climate adaptation. The findings suggest that inclusive digital engagement is particularly important in geographically dispersed and resource constrained contexts. Moreover, the results indicate that the effectiveness of e governance depends on its ability to translate climate data into locally meaningful guidance (Hartanto et al., 2021; Teng & Wang, 2021). This insight advances existing knowledge by linking information accessibility directly to adaptive decision making. Consequently, climate resilience emerges not only as a physical or environmental condition but also as a function of governance capacity. This reframing contributes to a more holistic understanding of adaptation processes in climate vulnerable states.

The study also advances the literature by critically comparing the Gambian context with experiences from other African countries where digital governance has supported climate related decision making. While prior research often presents successful cases of mobile platforms and digital warning systems as transferable solutions, the findings here demonstrate that such transferability is contingent on socio technical readiness. The identification of infrastructural, human capacity, and fiscal constraints highlights why digital solutions may underperform in small developing states despite proven effectiveness elsewhere. This contrasts with more optimistic accounts that emphasize technological potential without sufficiently addressing implementation conditions (Blut & Wang, 2020). By foregrounding digital literacy, institutional coordination, and policy coherence, the study deepens understanding of why governance innovation requires more than technological availability. The results also contribute conceptually by framing e governance as an engineering enabled system whose performance depends on reliability, accessibility, and interoperability. This approach bridges a gap between engineering oriented resilience research and governance focused adaptation studies. Methodologically, the thematic synthesis provides an integrated analytical lens that connects climate risks, governance functions, barriers, and opportunities within a single framework. The emphasis on coastal and rural contexts further strengthens the contribution by addressing areas often overlooked in national level analyses. Importantly, the study highlights the role of demographic structure, particularly youth engagement, as a catalyst for digital transformation and adaptive capacity. This insight adds a social innovation dimension to discussions of digital governance and climate resilience. Overall, the research contributes to the advancement of knowledge by demonstrating that effective climate adaptation in developing states requires the co evolution of digital systems, institutional arrangements, and social capacity.

Implication

The findings of this study carry important implications for policy, governance, and innovation in climate vulnerable developing states. First, the results suggest that climate adaptation strategies should move beyond a predominant focus on physical infrastructure and explicitly integrate e governance as a core component of resilience planning. Strengthening digital infrastructure, climate information systems, and early warning mechanisms is essential to enable anticipatory and data driven decision making, particularly in coastal and rural areas. Second, the study highlights the need for institutional reforms that improve inter agency coordination and establish centralized climate data management systems to enhance policy coherence and implementation efficiency. Third, capacity building initiatives aimed at improving digital literacy among farmers, women, and local communities are critical to ensure inclusive access to digital governance tools. In addition, leveraging the country's youthful population and fostering public–private partnerships can accelerate digital innovation and expand the reach of e governance services. Finally, the findings imply that effective climate resilience requires the co development of technological systems, institutional capacity, and social inclusion, positioning e governance as an enabling mechanism that transforms climate adaptation from reactive responses into proactive and sustainable governance practice.

Limitation and Suggestion for Further Research

This study has several limitations that should be acknowledged when interpreting the findings. The analysis relies exclusively on secondary data sources, including policy documents and existing literature, which may not fully capture local perceptions, implementation dynamics, or community level experiences related to e governance and climate adaptation. As a result, the findings are interpretive and exploratory rather than evaluative. The study also focuses on The Gambia as a single case, which may limit the generalizability of the results to other national contexts. Future research could address these limitations by incorporating primary data collection methods, such as interviews, surveys, or participatory approaches, to capture stakeholder perspectives and lived experiences. Comparative studies across multiple climate vulnerable countries would further strengthen understanding of how socio technical and governance conditions influence e governance effectiveness. In addition, future research could examine the performance and outcomes of specific digital tools, such as early warning systems or mobile based climate advisory platforms, to assess their direct impacts on adaptive behavior. Longitudinal studies are also recommended to evaluate how digital governance initiatives evolve over time and contribute to sustained climate resilience.

CONCLUSION

This study concludes that climate resilience in The Gambia is not solely determined by physical exposure to climate hazards but is strongly influenced by governance capacity and the effective use of digital systems. The findings demonstrate that sea level rise and rainfall variability pose significant and interconnected risks to coastal and rural livelihoods, while existing adaptation efforts remain constrained by limited information access and institutional fragmentation. E

governance emerges as a critical socio technical mechanism capable of enhancing climate resilience by improving climate information dissemination, enabling early warning systems, and fostering inclusive citizen participation. However, the effectiveness of e governance is contingent upon adequate digital infrastructure, institutional coordination, and human capacity. Persistent barriers related to connectivity, digital literacy, and financial constraints limit the operationalization of digital governance in The Gambia. At the same time, opportunities associated with mobile technologies, youth engagement, and public–private partnerships provide pathways for strengthening digital adaptation capacity. Overall, the study underscores that integrating e governance into climate adaptation frameworks can transform climate resilience from a reactive policy objective into a proactive and sustainable governance practice in climate vulnerable developing states.

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AUTHORS CONTIBUTIONS STATEMENT

Wally A. Sowe was solely responsible for the entire research process, including the conceptualization of the study, development of the research design, data collection and document analysis, thematic data interpretation, and manuscript preparation. The author conducted the literature review, synthesized policy and scholarly sources, and developed the analytical framework linking e-governance and climate resilience. The author also performed critical revisions of the manuscript and approved the final version for publication, taking full responsibility for the integrity and accuracy of the work.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript. All contributions were conducted independently and without any financial, commercial, or institutional influence that could be perceived as a potential conflict. The research was carried out solely for academic and professional purposes.

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