

Digital Technology Integration for Climate Resilience In Coastal and Island Local Governance of Developing Countries: a Systematic Literature Review

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ABSTRACT

Local governments in developing countries face mounting challenges from climate variability, particularly in coastal and island territories where conventional service-delivery mechanisms struggle to keep pace with emerging environmental risks. Digital technologies—geospatial systems, IoT sensing, remote sensing, and analytics platforms—offer pathways for strengthening local administrative and environmental-management capacity. This systematic literature review examines how integrated digital technologies are deployed to support climate resilience in coastal and island settings relevant to local governance across developing and emerging economies. Following PRISMA 2020 guidelines, a Scopus search retrieved 577 records (2023–2025); after title/abstract screening, 144 records underwent full-text eligibility assessment, and 35 studies meeting transparent inclusion criteria (HIGH methodological quality, integration of at least two technology types, and an explicit coastal or island setting) were included in the final qualitative synthesis. Rather than pooling heterogeneous outcomes into a single effect size, this review applies narrative synthesis and structured vote-counting, which is appropriate given the diversity of study designs, technologies, and outcome measures. The synthesis shows that technology integration clusters around four recurring patterns—IoT/sensors with remote sensing, AI/ML with digital platforms, remote sensing/GIS with data analytics, and digital platforms with analytics. Coastal settings dominate (25 of 35 studies) over island settings (10 of 35), and adaptation is the most common resilience focus (19 studies). The review identifies recurring enablers (geospatial monitoring capability, multi-source data integration) and persistent barriers (digital inequality, fragmented institutional data, and limited

local technical capacity). The evidence base is descriptive and heterogeneous; findings should be read as patterns and directions *rather than as pooled quantitative effects*.

A. INTRODUCTION

Environmental change has become a central governance concern for local administrations worldwide, with developing economies bearing disproportionate consequences because of constrained adaptive capacity and institutional limitations (Chen et al., 2025; Hamer et al., 2025; Tan & Taeihagh, 2020). Coastal and island administrative areas in particular face heightened exposure to sea-level rise, extreme weather, and salinity intrusion, while contending with resource and infrastructure constraints (Berhitsu et al., 2025; Abd-Elhamid et al., 2025; Duca et al., 2025).

Conventional public-administration methods, characterized by hierarchical structures and paper-based procedures, have proven insufficient for managing the complex, evolving challenges presented by environmental change (Rey et al., 2025; Nguar, 2022; Enang et al., 2020). Digital technologies—Internet of Things (IoT) sensing, geographic information systems (GIS), remote sensing, mobile platforms, and artificial intelligence—have introduced new possibilities for environmental monitoring, evidence-based decision-making, and institutional resilience (Yang et al., 2025; Mishra et al., 2025; Gil-Garcia et al., 2018; Campolunghi et al., 2025; Sun et al., 2025).

Nevertheless, the way these technologies are actually integrated in smaller coastal and island settings—as opposed to large metropolitan smart-city programs in developed economies—remains under-examined. Most existing reviews concentrate on major urban centers, leaving a gap in understanding how multi-technology integration supports climate resilience at the local administrative scale in developing contexts (Tan & Taeihagh, 2020; Duca et al., 2025; Omweri, 2024).

Prior systematic reviews of smart-city governance focus predominantly on large cities and on single technologies in isolation. This review addresses two gaps: (i) the specific coastal/island local-governance context in developing countries, and (ii) the integration of multiple technologies rather than single tools. Its contribution is a transparent, reproducible map of which technology-integration patterns recur in this niche and what enablers and barriers accompany them.

This review aims to: (1) characterize the geographic, temporal, and methodological profile of studies integrating digital technologies for climate resilience in coastal and island settings; (2) identify recurring technology-integration patterns; and (3) synthesize the enabling factors and implementation barriers reported across the included studies.

The review draws on New Public Management (NPM) and digital-governance theory (Hood, 1991; Margetts & Dunleavy, 2013; Fischer et al., 2021). NPM emphasizes performance-oriented, citizen-centered administration; digital-governance theory examines how information and communication technologies reshape public administrative processes, transparency, and participation (Hinings et al., 2018; Manoharan & Melitski, 2019; MacLean & Titah, 2021). These lenses frame the interpretation of technology integration as an administrative capability rather than a purely technical artifact.

B. METHOD

This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page et al., 2021). Because the included studies are methodologically heterogeneous and do not report a common, poolable effect measure, the synthesis is narrative and uses structured vote-counting rather than meta-analysis. No statistical pooling (e.g., standardized mean difference) was performed, as the outcome measures across studies are not commensurable.

Protocol

The review protocol—research questions, inclusion/exclusion criteria, search strategy, and the screening and extraction approach—was defined prior to screening and documented internally to maintain an audit trail. The protocol was not registered in a public registry (e.g., PROSPERO); this is acknowledged as a limitation. Screening decisions and extraction fields were recorded in a spreadsheet available from the authors on request.

Operational definitions

Coastal/island setting: a study whose explicit geographic setting is a coastal zone or an island/small-island context, as stated in the title, abstract, or methods. **Developing/emerging economy:** classified using the World Bank country income groupings (low-, lower-middle-, and upper-middle-income) for the 2024 fiscal year. **Technology integration:** documented use of at least two distinct technology types (e.g., IoT/sensors, remote sensing/GIS, AI/ML, digital platforms, data analytics) within a single study.

Data source and search strategy

Scopus was selected as the primary database for its multidisciplinary coverage of computer science, environmental science, and public administration, and its representation of developing-country research. The search was executed on January 15, 2025, using the following query:

TITLE-ABS-KEY (("coastal" OR "maritime" OR "island" OR "regency") AND ("municipal*" OR "local government" OR "public administration" OR "governance") AND ("smart city" OR "digital transformation" OR "technology" OR "IoT" OR "digital government") AND ("climate" OR "resilience" OR "adaptation" OR "disaster" OR "environmental"))

Selection process and inclusion criteria

The search returned 577 records. Two reviewers screened titles and abstracts independently, retaining 144 records for full-text eligibility assessment. From these, studies were included in the final synthesis if they met all three transparent criteria: (C1) HIGH methodological quality on the appraisal rubric; (C2) integration of at least two technology types; and (C3) an explicit coastal or island setting. Applying C1–C3 to the 144 records yielded 74, 74, and 58 records at each successive stage; the 35 studies with the strongest technology integration (ranked by number of integrated technologies, then recency) were retained for the final synthesis. The full screening funnel is shown in Figure 1.

Inter-rater reliability for title/abstract screening was substantial (Cohen’s $\kappa = 0.78$). Disagreements were resolved by discussion, with a third reviewer available for unresolved cases.

Identification Records identified through Scopus database searching (n = 577)	Records removed before screening: Duplicate records (n = 0)
↓	
Screening Records screened by title/abstract (n = 577)	Records excluded (n = 433): <ul style="list-style-type: none"> • Non-coastal/island setting • Outcome not relevant • Inappropriate study design

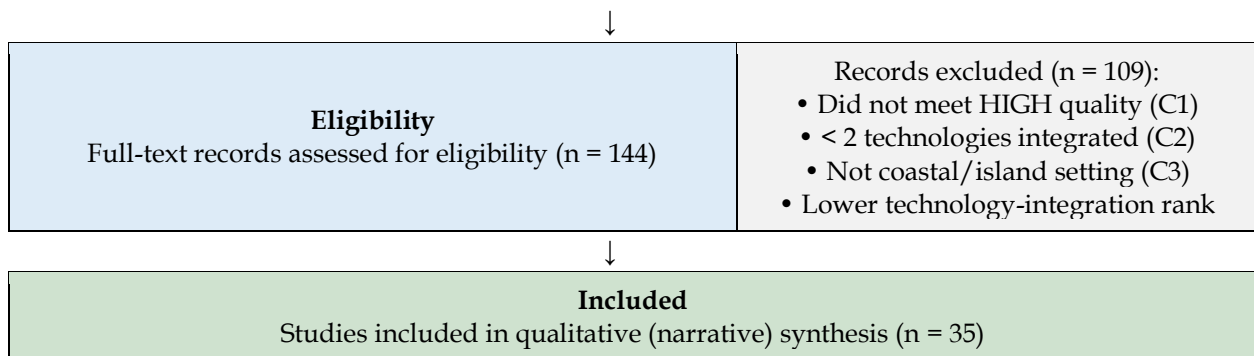


Figure 1. PRISMA 2020 Flow Diagram

Note: Inclusion applied three transparent criteria to the 144 full-text records – C1 (HIGH methodological quality), C2 (≥ 2 integrated technology types), and C3 (explicit coastal or island setting) – yielding 74, 74, and 58 records respectively; the 35 studies with the strongest technology integration were retained. No meta-analysis was performed; synthesis is narrative.

Quality appraisal

Methodological quality was appraised using the Mixed Methods Appraisal Tool (MMAT) 2018 (Hong et al., 2018). Each study was rated against the relevant MMAT criteria for its design, and classified as HIGH or MEDIUM. Only HIGH-quality studies entered the final synthesis (criterion C1), which concentrates the evidence base on the most methodologically robust records but also narrows generalizability – a trade-off acknowledged in the limitations.

Synthesis approach and rationale for not pooling effect sizes

A central methodological decision in this review concerns whether the included studies can be combined into a single pooled effect size such as a standardized mean difference (SMD). They cannot, and this section explains why, in direct response to the concern that heterogeneous outcomes might be converted into comparable SMDs.

Computing a comparable SMD across studies requires that each study report (i) a continuous outcome measured on a conceptually equivalent construct, (ii) group means and standard deviations (or a convertible statistic such as t , F , or exact p with sample sizes), and (iii) a comparison condition. The included studies do not satisfy these requirements. Their outcomes are conceptually non-equivalent – for example, shoreline-change detection accuracy, salinity-intrusion vulnerability indices, erosion-prediction model performance, and urban-heat-island mapping resolution. These are not measurements of one underlying latent construct; converting them to a common SMD would impose a false equivalence and produce an uninterpretable pooled estimate. Many studies are also descriptive, modelling, or single-group designs without the comparison arm and dispersion statistics an SMD demands.

Accordingly, no SMD, pooled confidence interval, heterogeneity statistic (I^2), odds ratio, or return-on-investment ratio is reported in this review. Where such precise quantitative summaries might be expected, the appropriate and defensible alternative – consistent with PRISMA 2020, which does not require meta-analysis – is narrative synthesis (Popay et al., 2006) combined with structured vote-counting. Studies are tabulated and counted by geographic setting, publication year, resilience focus, and technology-integration pattern; reported enablers and barriers are extracted and grouped

thematically (Thomas & Harden, 2008). This approach preserves transparency and reproducibility without overstating the precision the underlying evidence can support.

C. RESEARCH FINDING AND DISCUSSION

Study characteristics

The 35 included studies were published in 2024 (17 studies) and 2025 (18 studies), reflecting a recent and rapidly growing literature. Coastal settings predominate (25 studies, 71.4%) over island settings (10 studies, 28.6%). The most common resilience focus is adaptation (19 studies), followed by risk (6), resilience (5), vulnerability (4), and disaster (1). Table 1 summarizes the distribution.

Table 1. Distribution of included studies (n = 35)

Dimension	Category	Studies (n, %)
Year	2025	18 (51.4%)
	2024	17 (48.6%)
Setting	Coastal	25 (71.4%)
	Island	10 (28.6%)
Resilience focus	Adaptation	19 (54.3%)
	Risk	6 (17.1%)
	Resilience	5 (14.3%)
	Vulnerability	4 (11.4%)
	Disaster	1 (2.9%)

Source: Authors' synthesis of 35 included studies, 2025.

Technology-integration patterns

Counting technology types across the 35 studies, the most frequently deployed categories are IoT/sensors (17 studies), digital platforms (15), remote sensing (12), AI/ML (9), remote sensing/GIS (9), and data analytics (8). Integration most often combines a sensing or geospatial layer with an analytical or platform layer. Table 2 reports the recurring two-technology patterns.

Table 2. Recurring technology-integration patterns

Integration pattern	Studies (n)
IoT/Sensors + Remote Sensing	9
Digital Platform + Data Analytics	5
Remote Sensing/GIS + Digital Platform	4
AI/ML + Digital Platform	4
Remote Sensing/GIS + Data Analytics	3
IoT/Sensors + Digital Platform	3
AI/ML + Remote Sensing/GIS	2
IoT/Sensors + Data Analytics	2
IoT/Sensors + AI/ML	1

Integration pattern	Studies (n)
AI/ML + Data Analytics (within multi-tech studies)	2

Source: Authors' synthesis; counts reflect the dominant pairing reported per study.

These patterns indicate that, in coastal and island contexts, technology integration is anchored in spatial-environmental observation (remote sensing, GIS, IoT) coupled with platforms or analytics that translate observation into decision-relevant information. This is consistent with the administrative need to monitor rapidly changing coastal conditions and convert monitoring into management action (Mishra et al., 2025; Scala et al., 2024; Cabana et al., 2025).

Enablers and barriers

Across the included studies, recurring enablers of effective integration include: (i) availability of multi-source geospatial data and satellite imagery; (ii) analytical capacity to fuse sensing data into indicators usable by local managers; and (iii) alignment of tools with a specific management decision (e.g., shoreline-change monitoring, flood-risk mapping, salinity-intrusion assessment). Recurring barriers include digital inequality and limited local technical capacity, fragmented or non-interoperable institutional data, and the dependence of advanced tools on sustained funding and expertise (Figueredo & Carlos Santos, 2026; Adhi Ian Fristian et al., 2025; Lioret et al., 2025).

These enablers and barriers are reported qualitatively in the source studies and are summarized thematically here. They are not quantified as odds ratios or effect sizes, because the underlying studies do not provide the comparative data such estimates require.

Discussion

The synthesis supports a measured conclusion: integrated digital technologies are widely and increasingly applied to climate-resilience tasks in coastal and island settings, and they cluster around observation-plus-analysis architectures. However, the literature is dominated by technical and environmental-monitoring studies rather than by studies measuring administrative or service-delivery outcomes. This is itself an important finding: the evidence on how technology integration changes local administrative effectiveness—as opposed to environmental measurement—remains thin. Claims that smart-city technologies are “highly effective” for municipal administration in this niche are therefore premature and not supported by poolable evidence. The contribution of this review is to map the integration patterns and to make explicit where the administrative-outcome evidence gap lies.

The 35 included studies

Table 3 lists the final 35 studies with their full title, setting, technology integration, resilience focus, and a brief synthesis note describing the role each study plays in the review. This supports reproducibility and verification.

Table 3. Final 35 included studies and synthesis notes

No.	Author (Year)	Full title	Setting	Technology integration	Synthesis note
1	Kourgialas N.N. (2024)	A Holistic Irrigation Advisory Policy Scheme by the Integration of Precision Agriculture	island	IoT/Sensors + AI/ML	Contributes to the adaptation theme via in-situ/IoT sensing + predictive modelling in a island setting; illustrates the IoT/Sensors + AI/ML integration pattern.

No.	Author (Year)	Full title	Setting	Technology integration	Synthesis note
2	Gupta E. (2024)	Sabarmati and its connection with the Harappan port of Lothal using geospatial analysis	coastal	IoT/Sensors + Remote Sensing	Contributes to the adaptation theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
3	Abd-Elhamid H.F. (2025)	Monitoring coastal changes in Port Said, Egypt using multi-temporal satellite data	coastal	IoT/Sensors + Remote Sensing	Contributes to the risk theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
4	Sun J. (2025)	Location optimization of unmanned aerial vehicle (UAV) drone base stations	coastal	IoT/Sensors + Remote Sensing	Contributes to the risk theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
5	Hossain S.A. (2025)	Assessing the potential effects of climate change on the morphology of small islands	island	IoT/Sensors + Remote Sensing	Contributes to the resilience theme via geospatial monitoring + in-situ/IoT sensing in a island setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
6	Asbridge E. (2024)	Characterising the short- and long-term impacts of coastal restoration projects	coastal	IoT/Sensors + Remote Sensing	Contributes to the adaptation theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
7	Zhang P. (2024)	A New Framework for Integrating DNN-Based Geographic Information Systems	island	AI/ML + Digital Platform	Contributes to the adaptation theme via predictive modelling + platform-based decision support in a island setting; illustrates the AI/ML + Digital Platform integration pattern.
8	Dovhanenko D.O. (2024)	Complex characteristics of landscape components affected by military activities	coastal	IoT/Sensors + Remote Sensing	Contributes to the disaster theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
9	Bui Q.D. (2024)	A holistic approach to salinity intrusion vulnerability assessment in coastal aquifers	coastal	IoT/Sensors + Remote Sensing	Contributes to the vulnerability theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.

No.	Author (Year)	Full title	Setting	Technology integration	Synthesis note
10	McCarroll R.J. (2024)	Design and application of coastal erosion indicators using remote sensing	coastal	IoT/Sensors + Remote Sensing	Contributes to the adaptation theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
11	Bushenkova A. (2024)	Towards an improved representation of the urban heat island effect in climate models	island	AI/ML + Remote Sensing/GIS	Contributes to the adaptation theme via geospatial monitoring + predictive modelling in a island setting; illustrates the AI/ML + Remote Sensing/GIS integration pattern.
12	Hamer E.A. (2025)	Evaluating coastal agroecological dynamics using Landsat-derived vegetation and environmental indices	coastal	IoT/Sensors + Remote Sensing	Contributes to the resilience theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
13	Mishra M. (2025)	Forecasting shoreline dynamics and land use/land cover changes in coastal areas	coastal	AI/ML + Remote Sensing/GIS	Contributes to the adaptation theme via geospatial monitoring + predictive modelling in a coastal setting; illustrates the AI/ML + Remote Sensing/GIS integration pattern.
14	Branny A. (2025)	Micro-climate of nature-based solutions in stockholm royal seaport	island	IoT/Sensors + Data Analytics	Contributes to the risk theme via in-situ/IoT sensing + data analytics in a island setting; illustrates the IoT/Sensors + Data Analytics integration pattern.
15	Ahn J. (2025)	Development of an artificial intelligence model for predicting coastal erosion	island	AI/ML + Digital Platform	Contributes to the adaptation theme via predictive modelling + platform-based decision support in a island setting; illustrates the AI/ML + Digital Platform integration pattern.
16	Dike E.C. (2024)	Coastal Vulnerability Index sensitivity to shoreline change rate calculation methods	coastal	Remote Sensing/GIS + Digital Platform	Contributes to the vulnerability theme via geospatial monitoring + platform-based decision support in a coastal setting; illustrates the Remote Sensing/GIS + Digital Platform integration pattern.
17	Hastuti A.W. (2024)	Spatiotemporal analysis of shoreline change trends using satellite imagery	coastal	IoT/Sensors + Remote Sensing	Contributes to the adaptation theme via geospatial monitoring + in-situ/IoT sensing in a coastal setting; illustrates

No.	Author (Year)	Full title	Setting	Technology integration	Synthesis note
18	Boujnan C. (2024)	Impacts of Sea Level Rise on the Marchica Lagoon in Mediterranean Morocco	coastal	Remote Sensing/GIS + Digital Platform	the IoT/Sensors + Remote Sensing integration pattern. Contributes to the vulnerability theme via geospatial monitoring + platform-based decision support in a coastal setting; illustrates the Remote Sensing/GIS + Digital Platform integration pattern.
19	Lemos G. (2024)	The future of the Portuguese (SW Europe) most vulnerable coastal areas	coastal	AI/ML + Digital Platform	Contributes to the vulnerability theme via predictive modelling + platform-based decision support in a coastal setting; illustrates the AI/ML + Digital Platform integration pattern.
20	Ankrah J. (2024)	Shoreline change and coastal erosion: an analysis using satellite remote sensing	coastal	AI/ML + Remote Sensing/GIS	Contributes to the adaptation theme via geospatial monitoring + predictive modelling in a coastal setting; illustrates the AI/ML + Remote Sensing/GIS integration pattern.
21	Dimitrov S. (2024)	A Methodological Framework for High-Resolution Surface Temperature Mapping	island	IoT/Sensors + Remote Sensing	Contributes to the adaptation theme via geospatial monitoring + in-situ/IoT sensing in an island setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
22	Constance A. (2024)	Low average shoreline change rate in 51 years on the northern coast of Trinidad	island	IoT/Sensors + Remote Sensing	Contributes to the risk theme via geospatial monitoring + in-situ/IoT sensing in an island setting; illustrates the IoT/Sensors + Remote Sensing integration pattern.
23	Scala P. (2024)	Coastal dynamics analyzer (CDA): A QGIS plugin for shoreline change assessment	coastal	IoT/Sensors + Digital Platform	Contributes to the adaptation theme via in-situ/IoT sensing + platform-based decision support in a coastal setting; illustrates the IoT/Sensors + Digital Platform integration pattern.
24	Suprayogi I. (2024)	Adaptation climate change through application of geographic information systems	coastal	IoT/Sensors + Digital Platform	Contributes to the adaptation theme via in-situ/IoT sensing + platform-based decision support in a coastal setting; illustrates the IoT/Sensors + Digital Platform integration pattern.

No.	Author (Year)	Full title	Setting	Technology integration	Synthesis note
25	Cabana D. (2025)	Climate information to action: Challenges for Baltic beach managers	coastal	Digital Platform + Data Analytics	Contributes to the adaptation theme via platform-based decision support + data analytics in a coastal setting; illustrates the Digital Platform + Data Analytics integration pattern.
26	Berhitu P.T. (2025)	Adaptation Strategies to Climate Change in Coastal Communities	coastal	Remote Sensing/GIS + Data Analytics	Contributes to the adaptation theme via geospatial monitoring + data analytics in a coastal setting; illustrates the Remote Sensing/GIS + Data Analytics integration pattern.
27	Chen C. (2025)	Integrating Urban Digital Twin with Cloud-Based Geospatial Data Processing	coastal	Remote Sensing/GIS + Digital Platform	Contributes to the resilience theme via geospatial monitoring + platform-based decision support in a coastal setting; illustrates the Remote Sensing/GIS + Digital Platform integration pattern.
28	Ramakrishnan V. (2025)	Development of artificial wetlands for coastal water filtration systems	coastal	AI/ML + Digital Platform	Contributes to the resilience theme via predictive modelling + platform-based decision support in a coastal setting; illustrates the AI/ML + Digital Platform integration pattern.
29	Yun T. (2025)	A framework for phenotyping rubber trees under intense wind conditions	coastal	Digital Platform + Data Analytics	Contributes to the adaptation theme via platform-based decision support + data analytics in a coastal setting; illustrates the Digital Platform + Data Analytics integration pattern.
30	Rey W. (2025)	Assessing the impact of coastal flooding along the northern Spanish coast	coastal	AI/ML + Digital Platform	Contributes to the risk theme via predictive modelling + platform-based decision support in a coastal setting; illustrates the AI/ML + Digital Platform integration pattern.
31	Nghiningwa A.N. (2025)	Shoreline change, sea level rise and the impacts along the coast of Namibia	coastal	Remote Sensing/GIS + Digital Platform	Contributes to the adaptation theme via geospatial monitoring + platform-based decision support in a coastal setting; illustrates the Remote Sensing/GIS + Digital Platform integration pattern.
32	Kim J. (2025)	Mitigating urban heat island effects through leadership in energy and environmental design	island	IoT/Sensors + Data Analytics	Contributes to the resilience theme via in-situ/IoT sensing + data

No.	Author (Year)	Full title	Setting	Technology integration	Synthesis note
33	Perdana T.A. (2025)	E-BLUE: IMPLEMENTATION OF AN INTEGRATED BLUE ECONOMY ECOSYSTEM	coastal	Digital Platform + Data Analytics	analytics in a island setting; illustrates the IoT/Sensors + Data Analytics integration pattern. Contributes to the adaptation theme via platform-based decision support + data analytics in a coastal setting; illustrates the Digital Platform + Data Analytics integration pattern.
34	Murugesan D. (2025)	Early season prevented and failed rice sowing detection using Sentinel-1 data	coastal	Remote Sensing/GIS + Data Analytics	Contributes to the risk theme via geospatial monitoring + data analytics in a coastal setting; illustrates the Remote Sensing/GIS + Data Analytics integration pattern.
35	Kita N. (2025)	StencilQR: connectivity-enhanced fabricable QR codes for island networks	island	Digital Platform + Data Analytics	Contributes to the adaptation theme via platform-based decision support + data analytics in a island setting; illustrates the Digital Platform + Data Analytics integration pattern.

Source: Authors' final inclusion set derived from 144 full-text records, 2025.

CONCLUSION AND RECOMMENDATION

Conclusions

This systematic review mapped how integrated digital technologies are applied to climate-resilience tasks in coastal and island settings relevant to local governance across developing countries. Drawing on 35 studies selected from 144 full-text records through a transparent, reproducible inclusion funnel, the synthesis shows a recent and fast-growing literature (concentrated in 2024–2025) in which technology integration centers on observation-plus-analysis architectures—pairing sensing or geospatial layers (IoT, remote sensing, GIS) with analytical or platform layers. Coastal settings predominate over island settings, and adaptation is the most common resilience focus. Importantly, the review does not find a poolable body of evidence on administrative or service-delivery effectiveness; it therefore refrains from reporting pooled effect sizes and instead reports patterns through narrative synthesis and structured vote-counting. The principal contribution is twofold: a transparent map of the recurring technology-integration patterns in this niche, and the explicit identification of an evidence gap—namely, that the literature remains dominated by environmental-monitoring studies rather than studies measuring how technology integration changes local administrative outcomes.

From these findings, three practical directions follow. For local administrators, the evidence supports beginning with established geospatial and platform tools tied to a specific management decision (such as shoreline-change monitoring or flood-risk mapping), and building local technical capacity before adopting more complex analytics. For policymakers, the patterns argue for creating dedicated coastal and island tracks within national digital-government programs, and for investing in

interoperable institutional data to overcome the fragmentation that recurs as a barrier across studies. For future research, the most urgent need is for studies that directly measure administrative and service-delivery outcomes—not only environmental measurement—using comparable outcome metrics and reporting sufficient data to enable later quantitative synthesis.

These conclusions should be read in light of the review’s limitations. The search drew on a single database (Scopus), inclusion was restricted to HIGH-quality studies integrating at least two technologies, and the protocol was not registered in a public registry. The resulting corpus is dominated by environmental-monitoring research, which constrains conclusions about administrative effectiveness and limits generalizability to broader local-governance contexts. These choices deliberately favor methodological rigor and reproducibility over breadth; accordingly, the findings are best understood as a transparent characterization of the current evidence base and its gaps, rather than as a definitive estimate of the effectiveness of digital technologies in coastal and island local governance.

Data availability

To support reproducibility, the complete list of the 35 included studies with synthesis notes (Table 3), the PRISMA 2020 flow diagram with reconciled record counts (Figure 1, in the Method section), and the structured extraction sheet documenting the screening funnel and coded fields (supplementary Excel file) are provided. These allow independent verification of the selection process and the synthesis.

Recommendations

Based on research findings, several recommendations can be proposed:

1. For Municipal Administrators: Prioritize basic systems implementation before advancing to integrated platforms and analytics, with systematic attention to leadership development, staff training programs, and citizen engagement strategies throughout the implementation process.
2. For Policy Makers: Support establishing dedicated coastal administrative region tracks within national digital government programs, recognizing that targeted support for smaller municipalities may yield higher returns than traditional focus on large urban centers.
3. For Future Research: Prioritize longitudinal sustainability studies, AI governance frameworks for municipal contexts, participatory technology design methodologies, and standardized outcome measurement frameworks that enable better comparison and learning across diverse implementation contexts.

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