Revista Iberoamericana de la Educación, Vol - 10 No. 1, January - March 2026
e-ISSN: 2737-632x
Pgs 81-91

Comprehensive Risk Management Plan to Strengthen Resilient Territorial Planning in the Quevedo Canton, Los Ríos Province, Ecuador

How to cite:
Sánchez, D., Brambilla, D., Maridueña, M., Bejarano, L. (2026) Comprehensive Risk Management Plan to Strengthen Resilient Territorial Planning in the Quevedo Canton, Los Ríos Province, Ecuador. *Revista Iberoamericana De educación,* 10 (1).

Plan integral de gestión de riesgos para fortalecer planificación territorial resiliente en el cantón Quevedo, Provincia de Los Ríos Ecuador

Plano abrangente de gestão de riscos para fortalecer o planeamento territorial resiliente no cantão de Quevedo, província de Los Ríos, Equador

David Francisco Sánchez Aguas
Dino Marcello Brambilla Serra
Milton Rafael Maridueña Arroyave
Luz Marina Bejarano Ospina

Received: April, 2025
Approved: November, 2025

http://www.revista-iberoamericana.org/index.php/es

Universidad de Especialidades Espíritu Santo
dsanchezaguas@gmail.com
ORCID: https://orcid.org/0009-0003-6509-3324

Universidad César Vallejo
dbrambilla@ucvvirtual.edu.pe
ORCID: https://orcid.org/0009-0005-9690-7997

Universidad de Guayaquil
Universidad Bolivariana del Ecuador
Instituto Tecnológico Superior "Espíritu Santo"
milton.mariduenaa@ug.edu.ec
mrmariduenaa@ube.edu.ec
ORCID: https://orcid.org/0000-0002-8876-1896

Universidad de Guayaquil
ORCID: https://orcid.org/0000-0002-8494-0571
luz.bejaranoo@ug.edu.ec

Abstract

The study aimed to design a comprehensive risk management plan to strengthen territorial planning and urban resilience in Quevedo canton, Ecuador. A mixed methodological approach was applied, combining geospatial analysis using geographic information systems, community data collection, regulatory review, and the implementation of operational instruments based on the Incident Command System. Flood and landslide susceptibility maps were developed, identifying critical zones with high population exposure. The results showed that floods and landslides represented the predominant threats, especially in urban areas near water bodies and in sectors characterized by unplanned growth. Additionally, the analysis allowed the estimation of distances and travel times to safe zones, providing technical inputs for optimizing evacuation routes. Community strengthening strategies were incorporated through structured training processes, enabling the transformation of vulnerabilities into local capacities. The study concluded that effectively integrating risk management into land-use planning instruments significantly improves local governance, reduces exposure to hazards, and promotes safer and more sustainable urban development.

Keywords: risk_management,territorial_planning, urban_resilience, floods, Quevedo.

Resumen
El estudio tuvo como objetivo diseñar un plan integral de gestión de riesgos orientado a fortalecer la planificación territorial y la resiliencia urbana en el cantón Quevedo, Ecuador. Se aplicó un enfoque metodológico mixto que combinó análisis geoespacial mediante sistemas de información geográfica, levantamiento de información comunitaria, revisión normativa e implementación de instrumentos operativos basados en el Sistema Comando de Incidentes. Se elaboraron mapas de susceptibilidad a inundaciones y movimientos en masa, identificándose zonas críticas con alta exposición poblacional. Los resultados evidenciaron que las inundaciones y deslizamientos constituyeron las amenazas predominantes del territorio, con especial concentración en áreas urbanas próximas a cuerpos hídricos y sectores de crecimiento desordenado. Asimismo, el análisis permitió estimar tiempos y distancias hacia zonas seguras, aportando insumos técnicos para la optimización de rutas de evacuación. Se incorporaron estrategias de fortalecimiento comunitario mediante procesos formativos estructurados, lo que permitió transformar vulnerabilidades en capacidades locales. El estudio concluyó que la integración efectiva de la gestión de riesgos en los instrumentos de ordenamiento territorial contribuye significativamente a mejorar la gobernanza local, reducir la exposición a amenazas y promover un desarrollo urbano más seguro y sostenible.

Palabras Clave: gestión de riesgos, planificación territorial, resiliencia urbana, inundaciones, Quevedo.

Resumo
O estudo teve como objetivo elaborar um plano integral de gestão de riscos voltado ao fortalecimento do planejamento territorial e da resiliência urbana no cantão Quevedo, Equador. Foi adotada uma abordagem metodológica mista, que combinou análise geoespacial por meio de sistemas de informação geográfica, levantamento de informações comunitárias, revisão normativa e a implementação de instrumentos operacionais baseados no Sistema de Comando de Incidentes. Foram elaborados mapas de suscetibilidade a inundações e movimentos de massa, identificando-se áreas críticas com elevada exposição populacional. Os resultados evidenciaram que as

inundações e os deslizamentos constituíram as ameaças predominantes do território, com especial concentração em áreas urbanas próximas a corpos hídricos e em setores de crescimento desordenado. Além disso, a análise permitiu estimar tempos e distâncias até zonas seguras, fornecendo subsídios técnicos para a otimização das rotas de evacuação. Foram incorporadas estratégias de fortalecimento comunitário por meio de processos formativos estruturados, o que possibilitou transformar vulnerabilidades em capacidades locais. O estudo concluiu que a integração efetiva da gestão de riscos nos instrumentos de ordenamento territorial contribui significativamente para a melhoria da governança local, a redução da exposição a ameaças e a promoção de um desenvolvimento urbano mais seguro e sustentável.

Palavras-chave: gestão de riscos, planejamento territorial, resiliência urbana, inundações, Quevedo.

INTRODUCTION

Empirical evidence shows that territories that integrate risk management into their planning instruments exhibit higher levels of resilience to adverse events. In this sense, territorial planning ceases to be merely a technical exercise in spatial organization and becomes a strategic mechanism for protecting lives, assets, and ecosystems. The articulation between technical risk analysis and public decision-making enables the anticipation of critical scenarios, the optimization of land use, and the progressive reduction of new vulnerabilities in dynamic urban contexts such as the Quevedo canton.

Likewise, the institutional dimension of risk management plays a particularly relevant role in strengthening local governance. The existence of clear organizational structures, well-defined operational protocols, and interinstitutional coordination mechanisms contributes to improving emergency response capacity and consolidating a preventive culture within public administration. When these elements are incorporated transversally into municipal management, they promote more efficient, transparent, and collective well-being–oriented action.

Community participation represents another fundamental component in the construction of resilient territories. The inclusion of local knowledge, historical experiences, and social perceptions of risk in

diagnostic and planning processes strengthens the legitimacy of interventions and fosters active co-responsibility between citizens and institutions. In this way, communities cease to be merely recipients of public policies and become strategic actors in risk reduction and the protection of their own environment.

The incorporation of technological tools such as geographic information systems, multivariate spatial analysis, and territorial modeling adds scientific rigor to the decision-making process. These tools make it possible to more accurately visualize the spatial distribution of risk, prioritize interventions, and assess the potential impact of implemented policies. Altogether, the integration of science, planning, institutional capacity, and social participation constitutes the foundation for advancing toward a safer, more sustainable, and socially just model of urban development.

Comprehensive risk management is conceived as a systemic process that articulates risk knowledge, risk reduction, and preparedness for response to adverse events. This approach recognizes that risk is not solely a natural condition, but rather a social construct derived from the interaction among hazards, vulnerabilities, and exposure (Narváez et al., 2009). From this perspective, risk management is positioned as a strategic component of development planning, aimed at protecting lives, livelihoods, and the sustainability of territories (UNDRR, 2015).

Empirical evidence further demonstrates that territorial occupation without safety criteria significantly increases population exposure to hazards such as floods, landslides, and extreme climate events. Accelerated urbanization processes, informal settlement expansion, and pressure on fragile ecosystems generate structural vulnerability conditions that intensify disaster impacts (IPCC, 2020). In this context, territorial planning assumes an essential preventive role in reducing the generation of new risks.

Contemporary territorial approaches to risk management increasingly incorporate cartographic tools, multivariate spatial analysis, and geographic information systems to understand the spatial distribution of risk. These methodologies make it possible to identify critical areas, recognize patterns of hazard concentration, and support technical decisions regarding land use and infrastructure location (Lavell et al., 2012).

The integration of these tools strengthens the scientific basis of urban planning. Urban resilience is built through the coherent articulation of public policies, institutional strengthening, and effective community participation. Resilient cities develop the capacity to anticipate, adapt to, and recover from adverse events without compromising their essential functioning (UNDRR, 2015). This capacity depends not only on physical infrastructure, but also on the institutional, social, and organizational capital present within the territory.

From an institutional perspective, risk management requires clear organizational structures, functional regulatory frameworks, and effective intersectoral coordination mechanisms. In the Ecuadorian context, the mainstreaming of risk management within municipal planning constitutes a legal obligation for decentralized autonomous governments (COOTAD, 2019; LOOTUGS, 2016). Compliance with this mandate strengthens local governance and the capacity to anticipate critical scenarios.

The implementation of local risk management systems also requires clear technical guidelines to guide institutional planning and operations. The guidelines issued by the National Secretariat for Risk Management and Emergencies establish the need to strengthen technical capacities, develop operational instruments, and consolidate functional structures for risk reduction at the cantonal level (SNGRE, 2022).

Social participation constitutes an essential component of contemporary risk management models. The incorporation of local knowledge, historical memory of events, and community perceptions of risk enables the construction of more realistic diagnoses and more legitimate proposals. Co-responsibility between citizens and institutions promotes social appropriation of preventive measures and strengthens the sustainability of interventions (Lavell et al., 2012).

Consequently, territorial analysis supported by statistical evidence strengthens data-driven planning. In the Ecuadorian case, official records show a high recurrence of hydrometeorological events that affect populations differently according to their location and socioeconomic conditions (INEC, 2022). The articulation of

statistical information, technical analysis, and institutional planning constitutes a solid basis for advancing toward safer and more resilient territories.

MATERIALS AND METHODS

The research was conducted using a mixed-methods approach, with a predominantly descriptive–applied orientation, aimed at generating a technically viable proposal to strengthen risk management in the Quevedo canton. The methodological design responded to the need to integrate quantitative evidence derived from territorial analysis with qualitative information obtained through community and institutional participation. This combination made it possible to understand risk not only from its physical dimension, but also from its social, organizational, and institutional components.

The unit of analysis corresponded to the cantonal territory of Quevedo, with particular emphasis on urban and peri-urban parishes that show a higher recurrence of hydrometeorological events. The study population consisted of institutional actors linked to risk management, community leaders, and population groups located in areas of greater exposure. The selection of these actors was based on criteria of territorial relevance and their significance for the construction of a comprehensive proposal.

Multiple complementary techniques were employed for data collection. A documentary review of territorial planning instruments, current regulations, and official records of hazardous events was carried out. In parallel, participatory workshops were conducted with local communities, in which tools such as community mapping, historical reconstruction of events, and collective analysis of vulnerabilities were applied. These techniques enabled the incorporation of local knowledge as a key input for the diagnostic process.

Spatial analysis constituted a central component of the methodology. Geographic information systems were used to process topographic, hydrological, land-use, and population density variables, allowing for the development of susceptibility maps for floods and mass movements. This cartographic processing facilitated the identification of critical areas and provided an objective technical basis for guiding territorial planning and risk management proposals.

In addition, an operational component oriented toward institutional strengthening was developed. Based on the diagnostic findings, proposals for response protocols and interinstitutional coordination mechanisms were designed under the Incident Command System approach. This methodological component made it possible to link technical risk analysis with the enhancement of the actual response capacities of local government and community actors.

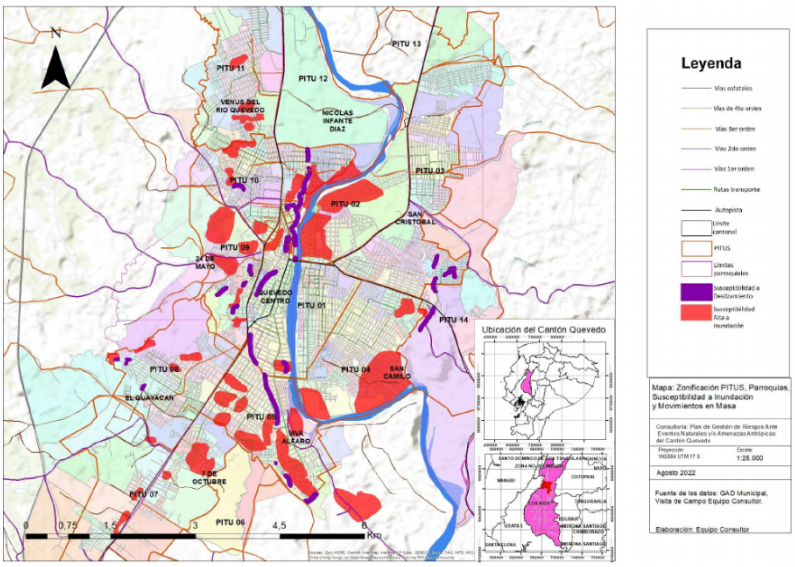
Data analysis was carried out through the triangulation of documentary information, cartographic results, and participatory findings. This strategy allowed for the validation of coherence among the different levels of information obtained and strengthened the consistency of the results. The integration of qualitative and quantitative techniques contributed to the construction of a methodologically robust proposal, contextualized to the territory and aligned with the principles of resilient urban planning..

RESULTS

The main finding revealed that floods and landslides constituted the most significant threats to the territory. Cartographic representations were developed to spatially identify areas of highest susceptibility, particularly in sectors close to river channels and densely populated urban areas. This analysis made it possible to understand the territorial distribution of risk and to establish technical priorities for intervention planning.

In order to spatially visualize the distribution of risk across the territory, a flood and mass movement susceptibility map was developed through the processing of topographic, hydrological, land-use, and population concentration variables. Figure 1 shows the territorial distribution of areas with the highest levels of susceptibility, highlighting a significant concentration in sectors near river channels and in densely populated urban areas, which reinforces the structural nature of risk in the current configuration of the canton.

Figure 1
Flood and Landslide Susceptibility Map in the Quevedo Canton



Source: Author's Own Elaboration [Data obtained from (SINERGY, 2022, p. 13)]

In addition to the geospatial analysis, a participatory process aimed at strengthening community capacities was developed. The application of a structured methodology made it possible to collect historical information on adverse events, identify local perceptions of risk, and collectively construct basic community.

Table 1 presents a synthesis of the community-based methodology applied, highlighting the articulation between training contents, strategic objectives, and expected outcomes in terms of social empowerment and the strengthening of local risk management.

Table 1
Community-Based Methodology Applied for Capacity Building

Tema	Contenido	Duración	Objetivo
Sensibilización comunitaria	Narrativas, experiencias previas, reflexión colectiva	4 horas	Empoderar sobre la importancia del manejo adecuado del riesgo
Perfil histórico	Construcción de calendarios y matrices de eventos	4 horas	Generar información local sobre niveles de riesgo
Figuras de amenazas	Elaboración participativa de mapas locales	4 horas	Visualizar peligros existentes según registros históricos
Recursos y capacidades	Identificación comunitaria de fortalezas	4 horas	Ubicar recursos estratégicos del territorio
Plan de acción	Diseño del plan comunitario de respuesta	4 horas	Generar procedimientos operativos locales

Source: Author's Own Elaboration

The results confirm that risk management cannot be addressed solely from a reactive perspective focused on emergency response after an event has occurred. The evidence obtained shows that territories incorporating preventive criteria into their planning processes exhibit greater capacity to reduce exposure and mitigate the impacts of hazards. This approach reinforces the idea that anticipation constitutes a fundamental principle for territorial sustainability.

The integration of hazard cartography with community capacity-building processes has proven to be an effective strategy for constructing territorial resilience. Spatial analysis provides technical rigor for the identification of critical areas, while social participation strengthens the appropriation of preventive measures. This articulation between technical knowledge and local expertise promotes more legitimate, inclusive, and operational risk management.

Likewise, urban planning based on technical criteria allows public investment to be directed toward priority areas, optimizing the use of limited resources. When decisions regarding infrastructure, urban facilities, and basic services consider information derived from risk analysis, the effectiveness of public policies increases. In this way, territorial planning is consolidated as a key instrument for reducing structural vulnerabilities.

These findings are consistent with international approaches that promote risk governance as a central component of sustainable development. Risk management ceases to be an isolated function of specific technical units and becomes a cross-cutting responsibility of public institutions. This vision fosters intersectoral coordination and the strengthening of organizational capacities across different levels of government.

Furthermore, the results show that building urban resilience requires continuous processes rather than isolated interventions. The combination of technical diagnosis, institutional strengthening, and community participation generates more favorable conditions for sustaining preventive actions over time. In this way, comprehensive risk management is consolidated as a structural axis of safe and sustainable territorial development.

CONCLUSIONS

The study demonstrates that the design and implementation of a comprehensive risk management plan constitutes a strategic tool for strengthening territorial planning in urban contexts characterized by high exposure to hydrometeorological hazards. The integration of technical, social, and institutional approaches makes it possible to overcome traditional reactive logics and move toward preventive models oriented to territorial sustainability.

The results confirm that the incorporation of geospatial analysis, community-based participatory processes, and structured operational protocols significantly improves institutional and social capacity to anticipate, respond to, and adapt to emergency scenarios. This methodological articulation fosters a more comprehensive understanding of risk and contributes to evidence-based public decision-making.

Furthermore, the effective articulation between risk management and territorial planning instruments enables the progressive reduction of population exposure, guides the location of critical infrastructure, and promotes safer urban development. Risk management ceases to be an isolated component and becomes consolidated as a cross-cutting axis of local planning.

The analysis allows us to conclude that the construction of territorial resilience is a systemic, dynamic, and long-term process that requires technical continuity, sustained political will, and active citizen participation. Its consolidation depends on the capacity of local governments to institutionalize risk management as a permanent public policy.

REFERENCES

COOTAD. (2019). Código Orgánico de Organización Territorial, Autonomía y Descentralización. Asamblea Nacional del Ecuador.

INEC. (2022). Anuario de estadísticas de gestión de riesgos y emergencias en el Ecuador. Instituto Nacional de Estadística y Censos.

IPCC. (2020). Climate change and disaster risk management. Intergovernmental Panel on Climate Change.

Lavell, A., Narváez, L., Pérez, G., & Maskrey, A. (2012). La gestión del riesgo de desastres: Un enfoque basado en procesos sociales. Facultad Latinoamericana de Ciencias Sociales.

LOOTUGS. (2016). Ley Orgánica de Ordenamiento Territorial, Uso y Gestión de Suelo. Registro Oficial del Ecuador.

Narváez, L., Lavell, A., & Pérez, G. (2009). La gestión del riesgo de desastres: Un enfoque basado en procesos sociales. Secretaría General de la Comunidad Andina.

SINERGY. (2022). Proteccion Industrial Ecuasinergy S.A. Obtenido de https://www.emis.com/php/companyprofile/EC/Proteccion_Industrial_Ecuasinergy_SA_es_13765828.html

SNGRE. (2022). Lineamientos para la gobernanza de la gestión de riesgos de desastres en los gobiernos autónomos descentralizados municipales y metropolitanos. Servicio Nacional de Gestión de Riesgos y Emergencias.

UNDRR. (2015). Marco de Sendai para la reducción del riesgo de desastres 2015–2030. Oficina de las Naciones Unidas para la Reducción del Riesgo de Desastres.