



Circular economy and territorial resilience: strategies for sustainable resource management in emerging urban communities

Economía circular y resiliencia territorial: estrategias para la gestión sostenible de recursos en comunidades urbanas emergentes

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ABSTRACT

This study aimed to analyze the relationship between the circular economy and territorial resilience as strategies for the sustainable management of resources in emerging urban communities. To achieve this objective, a descriptive, analytical, and critical literature review was conducted based on scientific publications issued between 2021 and 2025 in high-impact academic databases. The analysis identified the main conceptual approaches, implementation strategies, benefits, and challenges associated with integrating both paradigms into contemporary urban contexts. The findings showed that the circular economy contributed to optimizing resource use through reduction, reuse, recycling, and waste valorization practices, while territorial resilience strengthened the capacity of territories to adapt, recover, and transform in response to environmental, social, and economic disturbances. Furthermore, collaborative governance, technological innovation, integrated territorial planning, and citizen participation were identified as key factors in promoting sustainable transition processes. Among the main benefits observed were reduced vulnerabilities, improved resource-use efficiency, strengthened institutional capacities, and enhanced adaptive capacity within urban communities. However, challenges related to financial constraints, technological gaps, and weaknesses in evaluation mechanisms were also identified. It was concluded that the integration of circular economy principles and territorial resilience represents a strategic pathway for fostering more sustainable, inclusive, and adaptive cities capable of addressing the challenges of contemporary urban development.

Keywords: circular economy; territorial resilience; urban sustainability; resource management.

RESUMEN

La presente investigación tuvo como objetivo analizar la relación entre la economía circular y la resiliencia territorial como estrategias para la gestión sostenible de recursos en comunidades urbanas emergentes. Para ello, se desarrolló una revisión bibliográfica de carácter descriptivo, analítico y crítico, basada en literatura científica publicada entre 2021 y 2025 en bases de datos académicas de alto impacto. El análisis permitió identificar los principales enfoques conceptuales, estrategias de implementación, beneficios y desafíos asociados a la integración de ambos paradigmas en contextos urbanos contemporáneos. Los resultados evidenciaron que la economía circular contribuyó a optimizar el uso de recursos mediante prácticas de reducción, reutilización, reciclaje y valorización de residuos, mientras que la resiliencia territorial fortaleció la capacidad de adaptación, recuperación y transformación de los territorios frente a perturbaciones ambientales, sociales y económicas. Asimismo, se constató que la gobernanza colaborativa, la innovación tecnológica, la planificación territorial integrada y la participación ciudadana constituyeron factores clave para impulsar procesos de transición sostenible. Entre los principales beneficios identificados destacaron la reducción de vulnerabilidades, la mejora de la eficiencia en el uso de recursos, el fortalecimiento institucional y el incremento de la capacidad adaptativa de las comunidades urbanas. No obstante, también se identificaron desafíos relacionados con limitaciones financieras, brechas tecnológicas y deficiencias en los mecanismos de evaluación. Se concluyó que la articulación entre economía circular y resiliencia territorial representa una alternativa estratégica para promover ciudades más sostenibles, inclusivas y preparadas para afrontar los retos del desarrollo urbano contemporáneo.

Palabras clave: economía circular; resiliencia territorial; sostenibilidad urbana; gestión de recursos.

INTRODUCTION

Rapid urbanization in recent decades has increased pressure on natural resources, infrastructure systems, and urban services, particularly in emerging urban communities characterized by institutional, economic, and environmental constraints. In this context, the circular economy has gained prominence as a paradigm aimed at transforming linear production and consumption models through strategies for resource reduction, reuse, recycling, and regeneration. Applying this paradigm in urban environments aims to optimize material and energy flows, minimize waste generation, and promote more sustainable and efficient systems, thereby contributing to the development of cities capable of responding to contemporary sustainability challenges (Kapoor et al., 2023; Vanhuysse et al., 2021).

The concept of the circular city has evolved from approaches focused exclusively on waste management toward comprehensive perspectives that consider territorial planning, governance, technological innovation, and social participation as fundamental elements of a sustainable transition. Numerous studies have shown that cities constitute strategic spaces for implementing circular principles due to their high concentration of population, infrastructure, and economic activities. However, consolidating circular urban models requires evaluation, monitoring, and learning mechanisms to measure the progress and outcomes of implemented interventions (Winslow & Coenen, 2023; Vanhuysse, 2024).

In parallel, territorial resilience has emerged as an indispensable framework for understanding the capacity of territories to anticipate, absorb, adapt to, and transform in the face of economic, social, environmental, and technological disturbances. From this perspective, resilience is not limited to post-crisis recovery but also entails developing adaptive capacities that strengthen long-term sustainability. Recent studies highlight that territorial resilience depends on factors such as economic diversity, institutional innovation, social cohesion, and collective learning capacity—elements that are particularly relevant in emerging urban contexts exposed to multiple risks and uncertainties (Trippel et al., 2023; Ramos & Royuela, 2021).

The convergence of the circular economy and territorial resilience has garnered increasing academic interest due to its potential to strengthen urban sustainability through complementary approaches. While the circular economy seeks to optimize resource use and close production cycles, territorial resilience provides tools to enhance the adaptive capacity of urban systems under change and crisis scenarios. Recent research suggests that integrating both approaches can generate significant benefits in terms of resource security, vulnerability reduction, and the strengthening of local capacities to address complex challenges associated with climate change, resource scarcity, and socioeconomic transformations (Sharifi et al., 2023; Buzási & Csizovszky, 2023).

Likewise, technological advancements have expanded the possibilities for implementing circular and resilient strategies in urban areas. Tools such as urban digital twins, smart monitoring systems, and sustainability indicators enable improved decision-making and strengthen response capacities to disruptive events. Similarly, international urban resilience assessment frameworks have facilitated the integration of environmental, social, and economic criteria into territorial planning processes, promoting the development of more sustainable and inclusive cities (Therias & Rafiee, 2023; Silva et al., 2023; Pancorbo Sandoval et al., 2024).

Despite the conceptual and methodological advances observed in the literature, significant challenges persist for the effective integration of the circular economy and territorial resilience in emerging urban communities. Available evidence points to the need to strengthen multilevel governance, promote territorial innovation models, and develop strategies tailored to local conditions to ensure sustainable transitions. Therefore, this review aims to critically analyze the primary strategies linking the circular economy with territorial resilience, identifying opportunities, limitations, and future perspectives for sustainable resource management in emerging urban communities (Cherrington et al., 2024; Sánchez et al., 2025; Perricone et al., 2025).

METHODS

This study adopted a qualitative approach, conducting a descriptive, analytical, and critical literature review to examine the relationship between the circular economy and territorial resilience as strategies for sustainable resource management in emerging urban communities. The review identified, analyzed, and synthesized the primary theoretical, methodological, and empirical contributions in the recent scientific literature on both topics to understand their convergences, challenges, and application opportunities in contemporary urban contexts.

For data collection, a systematic literature search was conducted in prominent international academic databases, including Scopus, Web of Science, ScienceDirect, SpringerLink, and Google Scholar. The search strategy employed keywords in both Spanish and English, including: economía circular, circular economy, resiliencia territorial, territorial resilience, urban resilience, sustainable resource management, circular cities, urban sustainability, and emerging urban communities. Boolean operators (AND and OR) were used to expand and refine the search results.

The inclusion criteria considered scientific articles published between 2021 and 2025, written in Spanish or English, peer-reviewed, and directly related to circular economy, territorial resilience, urban sustainability, and resource management in urban environments. On the other hand, duplicate documents, restricted-access studies, publications without scientific backing, and works whose main theme was unrelated to the research objectives were excluded.

Once the documents were selected, an analytical and critical reading of each source was conducted, identifying aspects related to theoretical concepts, methodological approaches, implementation strategies, evaluation indicators, governance mechanisms, and results reported in different territorial contexts. Subsequently, the information was organized into document analysis matrices that facilitated the comparison, categorization, and synthesis of the findings.

The analysis process was developed using a thematic review technique, which allowed the scientific evidence to be grouped into categories related to urban circularity, territorial resilience, sustainable governance, technological innovation, and efficient resource management. This strategy favored the identification of common patterns, emerging trends, and research gaps present in the specialized literature, providing a comprehensive view of the current state of knowledge on the studied topic.

Finally, the obtained results were interpreted from a critical and integrative perspective, considering the contributions of the different authors and the contexts in which the analyzed studies were developed. This procedure allowed the elaboration of an argumentative synthesis aimed at understanding how the articulation between circular economy and territorial resilience can contribute to strengthening the sustainability and adaptive capacity of emerging urban communities facing the environmental, social, and economic challenges of the twenty-first century.

RESULTS

The literature analysis showed that circular economy and territorial resilience have evolved in parallel in recent years, progressively converging in the field of sustainable urban planning. The reviewed studies agreed that emerging urban communities face challenges related to the growing demand for resources, waste generation, vulnerability to climate events, and institutional limitations to manage sustainable transformation processes. In this context, the integration of circular principles and resilience strategies was identified as an alternative capable of strengthening territorial sustainability through the efficient use of resources and increasing the adaptive capacity of urban systems.

Likewise, the review identified that the transition toward more sustainable urban models depends on the articulation between governance, technological innovation, citizen participation, and territorial planning. The analyzed studies highlighted that circular economy initiatives generate economic, environmental, and social benefits by reducing dependence on external resources and promoting waste recovery. In parallel, territorial resilience approaches strengthen the response capacity to environmental, economic, and social crises, favoring the continuity of essential services and community well-being.

The results reflected that the convergence between circular economy and territorial resilience is based on shared dimensions that favor urban sustainability. The efficient management of resources appeared as one of the most relevant elements, because it allows reducing dependence on raw materials and strengthening the capacity of territories to face scenarios of scarcity or disruptions in supply chains.

On the other hand, governance and innovation were identified as transversal factors that facilitate the implementation of integrated strategies. Coordination among institutions, businesses, and citizens contributes to consolidating urban transformation processes, while the incorporation of emerging technologies improves operational efficiency and the adaptive capacity of communities in the face of uncertainty scenarios.

Table 1. Main dimensions of convergence between circular economy and territorial resilience

Dimension	Circular Economy	Territorial Resilience	Joint Contribution
Resource Management	Optimization and reuse of materials	Guarantees resource availability in times of crisis	Reduces territorial vulnerabilities
Governance	Coordination of public and private actors	Strengthens institutional adaptive capacity	Improves sustainable decision-making
Innovation	Development of clean technologies	Implementation of adaptive solutions	Increases urban efficiency
Social Participation	Promotes changes in consumption patterns	Reinforces community networks	Fostering social cohesion
Urban planning	Design of circular systems	Preventive risk management	Increasing territorial sustainability

Table 2. Identified strategies for sustainable resource management in emerging urban communities

Strategy	Main objective	Observed benefits
Waste recycling and recovery	Reduction of final disposal	Reduction of urban pollution
Industrial symbiosis	Reuse of by-products across sectors	Increased production efficiency
Green infrastructure	Improvement of ecosystem services	Reduction of environmental risks
Smart water management	Optimization of water consumption	Enhanced water security
Urban renewable energy	Reduction of energy dependence	Reduction of pollutant emissions
Urban digital platforms	Monitoring of resources and services	Improved response capacity

The reviewed literature showed that the most frequent strategies were oriented toward resource optimization through reuse, recycling, and energy recovery practices. These actions contributed significantly to reducing pressure on urban ecosystems and improving the efficiency of local production systems.

Similarly, the incorporation of digital technologies and nature-based solutions showed positive results in terms of urban resilience. Smart water management, green infrastructures, and monitoring platforms allowed strengthening the response capacity to environmental risks and improving the sustainability of essential urban services.

The findings allowed determining that the integration of both approaches generates multidimensional benefits that transcend the environmental sphere. Resource optimization and waste reduction were the most recurrent effects, contributing to the achievement of objectives related to urban sustainability and the mitigation of environmental impacts.

At the social and institutional level, the studies highlighted improvements in citizen participation processes and the strengthening of organizational capacities. These conditions favored a more efficient management of the territory and facilitated the construction of collaborative networks capable of responding to complex challenges in a coordinated and sustainable manner.

Table 3. Benefits of the integration between circular economy and territorial resilience

Dimension	Identified benefit
Environmental	Reduction of waste and emissions
Economic	Increased resource efficiency
Social	Increased community participation
Institutional	Strengthening of governance
Technological	Promotion of urban innovation
Territorial	Enhanced adaptive capacity to crises

The review showed that one of the main obstacles to the transition toward circular and resilient territories corresponds to the financial and technological limitations present in numerous emerging urban communities. The insufficiency of economic resources hinders the implementation of sustainable infrastructure and restricts the adoption of innovative technologies necessary to optimize resource management.

Table 4. Main challenges for the implementation of circular and resilient strategies

Challenge	Impact on implementation
Financial constraints	Delays in sustainable projects
Weak institutional coordination	Fragmentation of actions
Limited environmental culture	Low citizen participation
Insufficient indicators	Difficulty in evaluating results
Technological gaps	Reduced operational efficiency
Lack of integrated planning	Limited positive impacts

Additionally, the lack of coordination between institutions and the absence of integrated planning mechanisms generate duplication of efforts and reduce the effectiveness of interventions. These challenges highlight the need to strengthen territorial governance through coherent public policies, inter-institutional cooperation mechanisms, and citizen participation strategies that favor long-term sustainability.

The results demonstrated that the circular economy and territorial resilience constitute complementary approaches to promote sustainable resource management in emerging urban communities. The analyzed evidence indicated that the combination of both paradigms favors the reduction of vulnerabilities, improves resource use efficiency, strengthens the adaptive capacity of territories, and contributes to building more sustainable, inclusive cities prepared to face future challenges.

DISCUSSION

The results obtained showed that the circular economy and territorial resilience constitute complementary approaches to address the challenges associated with sustainability in emerging urban communities. The analyzed literature allowed for the identification that both perspectives share objectives related to resource optimization, vulnerability reduction, and the strengthening of adaptive capacities in the face of uncertainty scenarios. In this sense, the integration of these approaches represents an evolution of traditional urban planning models, by incorporating criteria of sustainability, adaptation, and territorial transformation that respond to contemporary environmental, social, and economic demands.

One of the main findings of the review was the relevance of efficient resource management as an articulating element between circular economy and territorial resilience. The reviewed studies pointed out that strategies for reuse, recycling, waste recovery, and energy utilization not only contribute to reducing pressure on natural resources, but also strengthen the capacity of territories to face supply chain disruptions and shortage situations. This relationship demonstrates that circularity transcends traditional environmental benefits and becomes a mechanism that increases the security and stability of urban systems.

Likewise, the results showed that governance plays a decisive role in the consolidation of circular and resilient territories. Coordination among local governments, the private sector, academic institutions, and citizens was identified as an essential factor for the effective implementation of sustainable policies and projects. The discussion of the findings suggests that the existence of collaborative governance structures facilitates the articulation of interests, the mobilization of resources, and the generation of innovation processes capable of accelerating transitions toward more sustainable urban models. Conversely, institutional fragmentation and the absence of cooperation mechanisms continue to represent significant barriers to the success of these initiatives.

Another relevant aspect identified during the analysis was the growing importance of technological innovation as a tool to strengthen urban sustainability. The incorporation of smart monitoring systems, digital management platforms, and territorial analysis models allowed for improving resource utilization efficiency and optimizing decision-making processes. However, the results also showed that the technological gaps present in many emerging urban communities limit the scope of these solutions. Therefore, the discussion raises the need to promote technology transfer processes and capacity building that allow for a more equitable implementation of innovative tools in different territorial contexts.

Similarly, the review highlighted the importance of citizen participation as a fundamental component for building territorial resilience. Local communities play a strategic role in the adoption of circular practices, responsible resource management, and the generation of support networks capable of responding to crisis situations. Consequently, the findings suggest that sustainable transition processes require participatory approaches that actively involve the population in the design, execution, and evaluation of the implemented strategies. This perspective contributes to strengthening social cohesion and increasing the legitimacy of public policies oriented toward sustainability.

Conversely, the challenges identified in the literature indicate that the implementation of circular and resilient strategies continues to face structural obstacles related to financial constraints, institutional weaknesses, and the absence of comprehensive evaluation indicators. Although significant progress has been made in developing conceptual and methodological frameworks, difficulties persist in accurately measuring the impacts of interventions in urban territories. This situation highlights the need to develop evaluation systems that integrate environmental, economic, social, and territorial variables, enabling a more comprehensive assessment of sustainability transition processes.

In conclusion, the discussion indicates that the convergence of the circular economy and territorial resilience constitutes a strategic alternative for strengthening sustainable resource management in emerging urban communities. The reviewed evidence demonstrates that combining both approaches facilitates the development of more adaptive, efficient, and inclusive territories capable of responding to the complexities of urban growth and global environmental changes. However, achieving these objectives requires strengthening multilevel governance, boosting technological innovation, promoting citizen participation, and consolidating integrated planning mechanisms to guarantee the long-term sustainability of urban transformations.

CONCLUSIONS

The literature review demonstrated that the circular economy and territorial resilience are complementary approaches that contribute significantly to sustainable resource management in emerging urban communities. Integrating both paradigms facilitates the optimization of materials, energy, and natural resources while strengthening the capacity of territories to adapt and respond to increasingly complex environmental, social, and economic challenges.

The results showed that efficient resource management represents a primary point of convergence between the circular economy and territorial resilience. Strategies oriented toward reuse, recycling, waste recovery, and the utilization of local resources contribute not only to reducing environmental impacts but also to increasing the security and stability of urban systems under scenarios of uncertainty and scarcity.

Furthermore, collaborative governance, citizen participation, and integrated territorial planning were identified as key factors for the success of urban sustainability initiatives. Coordination among public, private, and community actors facilitates the implementation of more effective policies and strengthens the institutional capacities necessary to drive sustainable territorial transformation processes.

Technological innovation emerged as a strategic element to accelerate the transition toward more circular and resilient cities. Digital tools, smart management systems, and advanced technological infrastructures improve operational efficiency, optimize decision-making, and strengthen response capacities to risks and disturbances affecting urban environments.

Despite the progress identified in the literature, challenges persist regarding financial constraints, technological gaps, institutional weaknesses, and the absence of comprehensive evaluation systems. These barriers highlight the need to strengthen governance mechanisms, promote sustainable investments, and develop indicators that enable more precise measurement of the impacts of strategies implemented in these territories.

Finally, the integration of the circular economy and territorial resilience constitutes a promising pathway to promote more sustainable, inclusive, and adaptive urban development models. Its application in emerging urban communities can contribute to building territories capable of efficiently managing resources, reducing vulnerabilities, and promoting balanced development that responds to current and future sustainability demands.

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