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## Public-Private Partnerships as a Transition Tool for Circular Cities in Light of ISO 59004

*Public-Private Partnerships as a Transition Tool for Circular Cities in Light of ISO 59004*

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### Summary

The transition of cities to Circular Economy models has been widely discussed in the international literature, but still faces operational challenges in urban contexts, especially in developing economies. The ISO 59004:2024 standard consolidates structuring principles for the implementation of circularity, emphasizing systems thinking, value generation and sharing, traceability, and resilience. This article analyzes the role of public-private partnerships as an instrument for implementing the Circular Economy in urban contexts, in light of ISO 59004. The research adopts a qualitative approach, based on bibliographic review and document analysis. The results indicate that the consolidation of urban circularity depends on institutional arrangements capable of integrating public policies, private investment, collaborative governance mechanisms, and contractual instruments aligned with socio-environmental goals. It is concluded that public-private partnerships, when structured according to the principles of ISO 59004, can act as strategic vectors of the urban circular transition.

**Keywords:** Circular Economy; Public-Private Partnerships; ISO 59004; Sustainable Cities; Urban Governance.

### Abstract

The transition of cities toward Circular Economy models has been widely discussed in international literature, yet significant challenges remain regarding its operationalization in urban contexts, particularly in developing and emerging economies. The ISO 59004:2024 standard establishes structured principles for implementing circularity, strongly systemic thinking, value creation and sharing, traceability, and resilience. This study analyzes the role of public-private partnerships (PPPs) as instruments for implementing the Circular Economy in urban environments, in light of ISO 59004.

The research adopts a qualitative, exploratory, and descriptive approach based on systematic literature review and documentary analysis of academic and institutional sources addressing Circular Economy, urban governance, and PPPs. The findings indicate that the consolidation of urban circularity depends on institutional arrangements capable of integrating public policies, private investment, collaborative governance mechanisms, and contractual models aligned with socio-environmental performance indicators. The study argues that PPPs, when structured according to the principles of ISO 59004, can function as strategic drivers of systemic urban transformation by incorporating performance-based incentives, transparency mechanisms, and long-term resilience criteria. The article contributes theoretically by articulating ISO 59004 with contemporary literature on urban governance and public-private partnerships, proposing an analytical framework that connects normative circularity principles to concrete institutional implementation tools.

**Keywords:** Circular Economy; Public-Private Partnerships; ISO 59004; Urban Governance; Sustainable Cities

## 1. INTRODUCTION

The rapid growth of urban areas has intensified environmental, social, and environmental challenges. economic factors, putting pressure on traditional production and consumption systems based on the linear model. It is estimated that cities are responsible for more than 75% of global consumption of natural resources. and for a significant portion of greenhouse gas emissions (Ellen MacArthur Foundation, 2022).



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The Circular Economy emerges as an alternative to the linear paradigm, proposing a reorganization. A systemic approach to the flows of materials, energy, and information, with a focus on environmental regeneration. Economic efficiency and social inclusion. Unlike approaches restricted to waste management, Circularity implies structural transformation in production systems and consumption patterns.

The ISO 59004:2024 standard establishes guiding principles for this transition. However, its application in complex urban systems demands institutional instruments capable of... operationalize its fundamentals (ISO, 2024).

In this context, public-private partnerships emerge as a potential mechanism for articulation between the State and the private sector for the implementation of structuring projects aimed at urban circularity.

The study seeks to answer: how can public-private partnerships contribute to... How can the principles of the Circular Economy, as per ISO 59004, be implemented in urban contexts?

## 2. THEORETICAL FRAMEWORK

### 2.1 Origin and evolution of the Circular Economy concept

The concept of Circular Economy has been developing over the last few decades as This model addresses the structural limitations of the linear economic model. The system of extraction, production, consumption, and disposal has proven incapable of responding to environmental challenges. and contemporary social issues, especially in the face of population growth and urbanization. accelerated growth and the scarcity of natural resources (Yuan, 2006; Chauhan et al., 2022).

According to Yuan (2006), the Circular Economy proposes a systemic reorganization of flows. of materials and energy, seeking to reduce the extraction of natural resources and minimize... Waste is managed through strategies such as reuse, recycling, and repurposing. Unlike In contrast to specific approaches to environmental management, the Circular Economy has a structural character. requiring profound changes in production systems and consumption patterns. Approaches such as Cradle-to-cradle and performance economics have broadened the concept by integrating regenerative design and service-based business models (Braungart & McDonough, 2002; Stahel, 2016).

Over time, the concept evolved and came to incorporate economic and social dimensions. and institutional. Chauhan et al. (2022) highlight that the Circular Economy is not limited to management. of waste, but it involves innovation, new business models, governance, and social participation. The conceptual expansion allowed the Circular Economy to be recognized as a paradigm capable to guide public policies and organizational strategies aimed at long-term sustainability.

Aquino et al. (2023) observe that, up to 2014, scientific production on Circular Economy It was relatively limited, focusing on European countries and specific industrial sectors. From 2015 onwards, however, there was exponential growth in the number of publications, reflecting the



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global recognition of the Circular Economy as a relevant strategy for sustainability

environmental and economic. Despite this progress, the authors emphasize that much of the literature...

It remains in the theoretical field, with few empirical studies applied to urban contexts.

especially in developing countries.

## **2.2 Circular Economy and Sustainability**

The relationship between Circular Economy and sustainability is central to contemporary literature. Sustainability, understood as the ability to meet present needs without...

To compromise future generations requires significant changes in modes of production and consumption and social behavior. In this sense, the Circular Economy emerges as an instrument capable of operationalize the principles of sustainability (Akomea-Frimpong et al., 2022).

The transition to sustainable models requires mechanisms that lead to the rationalization of... Resource consumption, promoting efficiency and reducing waste. The Circular Economy It contributes to this process by proposing regenerative production systems, in which waste... They cease to be seen as waste and begin to be considered inputs for new production cycles. (Zanirato, 2016), (Ronconi, 2022).

Beyond the environmental dimension, the Circular Economy presents economic implications and Relevant social issues. The reorganization of production systems can generate new jobs and stimulate... Innovation and promoting social inclusion, especially when it involves cooperatives and initiatives. community-based initiatives. Aquino et al. (2023) highlight that the Circular Economy has the potential to strengthen local economies and reduce inequalities, provided it is supported by robust public policies and appropriate governance mechanisms.

## **2.3 Circular Economy applied to the urban context**

Cities play a central role in the transition to a Circular Economy, since They concentrate a large part of the population, the consumption of natural resources, and the generation of waste. Menezes and Martins (2021) emphasize that contemporary urban challenges require approaches integrated, capable of coordinating urban planning, environmental management, and social policies.

In the urban context, the Circular Economy takes on specific characteristics, related to The complexity of urban systems and the multiplicity of actors involved. The application of Circularity in cities involves sectors such as solid waste management, sanitation, mobility, Civil construction and sustainable consumption. These sectors are interconnected and require coordination. between public policies, private initiative and civil society (ISO, 2024).

Freitas et al. (2023) observe that, in Brazil, Circular Economy initiatives are still characterized as isolated actions, with a low degree of coordination and institutionalization. The absence



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The lack of integrated strategies and clear regulatory frameworks limits the effectiveness of these initiatives and This hinders the consolidation of circularity as a structuring public policy.

Furthermore, the urban Circular Economy faces challenges related to capacity.

The institutional framework of municipalities depends on the availability of financial resources and social participation.

Kronemberger (2019) highlights that public policies aimed at urban sustainability need to be accompanied by educational and awareness-raising processes, in order to promote change.

lasting behavioral patterns.

## **2.4 Circular Economy, Public Policies and Sustainable Cities**

The implementation of the Circular Economy in cities depends heavily on the role of the State.

as a formulator of public policies and driver of structural changes. Public policies have the

The function of creating environments conducive to innovation, establishing norms and incentives, and promoting coordination between different actors.

Sustainable Development Goal 11, which deals with cities and communities.

Sustainable urban spaces reinforce the need to make them inclusive, safe, resilient, and sustainable.

sustainable. Menezes and Martins (2021) point out that the Circular Economy contributes directly to

Achieving this goal involves promoting the efficient use of resources and reducing environmental impacts.

and the improvement of the quality of urban life.

However, Freitas et al. (2023) emphasize that the adoption of the Circular Economy as a policy

Public education in Brazil still faces significant barriers, such as institutional fragmentation and a lack of...

Performance indicators and the low level of integration between the public and private sectors. These are the challenges.

They highlight the importance of governance instruments capable of articulating interests and aligning them.

strategies.

## **2.5 ISO 59004 as a guide for the Circular Economy**

The publication of the ISO 59004:2024 standard represents a significant milestone for consolidation.

of the Circular Economy as a structured approach guided by clear principles. The standard

It establishes guidelines for the transition from linear to circular systems, emphasizing the need...

of systems thinking, value creation, traceability and resilience of ecosystems (ISO, 2024).

Systems thinking, one of the central principles of ISO 59004, recognizes that systems

Economic, social, and environmental factors are interconnected. Therefore, isolated interventions tend to...

to produce limited results, making it necessary to consider the interactions between different sectors and actors.

The generation and sharing of value constitute another fundamental principle of the standard.

According to ISO 59004, the Circular Economy should promote economic, social and...



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Environmental goals should be balanced, avoiding the concentration of gains in the hands of a few actors. This principle is particularly relevant in the urban context, where public and private interests coexist.

Resource traceability, in turn, refers to the ability to monitor resource flows of materials throughout their life cycles. This principle is essential for evaluating the effectiveness of Circular strategies and to guide data-driven decision making. However, their Implementation in Brazilian cities still faces limitations related to availability and Information integration.

## 2.6 Urban Governance and Circular Economy

Urban governance is a central element for the implementation of policies. Public initiatives focused on sustainability and the Circular Economy. Unlike traditional models. Public administration, based on hierarchical structures and centralized decision-making, is characterized by governance. Contemporary culture is characterized by its networked approach, involving multiple public and private actors and civil society (Schultz et al., 2023).

Contemporary approaches to collaborative governance highlight that sustainable partnerships They depend on legitimacy, transparency and mechanisms of shared accountability (Emerson & Nabatchi, 2015).

Kronemberger (2019) highlights that governance for sustainable development requires institutional mechanisms capable of promoting coordination, social participation, and continuity of public policies. In the urban context, this need is amplified by the complexity of the systems involved, ranging from solid waste management to territorial planning, to Mobility and land use.

The Circular Economy, by proposing a systemic reorganization of the flows of materials and energy... and information, demands governance models capable of integrating different sectors and levels of government. According to Freitas et al. (2023), institutional fragmentation is one of the main obstacles to Consolidation of the Circular Economy in Brazil, given that sectoral policies often operate in isolation, without strategic coordination.

In this sense, urban governance oriented towards the Circular Economy must be understood as a dynamic process of articulation between public policies, normative instruments and private initiatives. Menezes and Martins (2021) emphasize that sustainable cities depend on Institutional structures that promote cooperation and collective learning, allowing for adjustments. continuous strategies adopted.

From the perspective of the new institutional economy and collaborative governance, cooperation Intersectoral cooperation depends on clear contractual structures, aligned incentives, and mechanisms capable of... to reduce uncertainties and coordination costs (Williamson, 2000; Hodge & Greve, 2017). In contexts



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In complex urban environments, these elements become even more relevant, as infrastructure projects...

Sustainability involves multiple stakeholders, long-term risks, and high interdependence.

institutional.

Furthermore, urban governance needs to incorporate monitoring mechanisms and Evaluations capable of measuring results and guiding decision-making. The absence of indicators Clear and integrated standards make it difficult to assess the performance of Circular Economy policies and compromises its legitimacy before society (Freitas et al., 2023).

## **2.7 Public-private partnerships as an instrument for circular transition**

Public-private partnerships are institutional arrangements that allow...

Cooperation between the State and the private sector in the provision of services and infrastructure of interest. public. These arrangements involve the sharing of risks, investments, and results, and may to contribute to efficiency and innovation in urban management (Gomyde et al., 2020).

In the context of the Circular Economy, public-private partnerships have the potential to... To enable projects for waste management, recycling, composting, and resource reuse. By integrating the technical and financial capabilities of the private sector with public objectives of In terms of sustainability, these partnerships can accelerate the circular transition (Girard, 2019).

However, the literature indicates that the effectiveness of public-private partnerships depends on milestones. Clear regulations, monitoring mechanisms, and alignment with public policies. The absence These elements can compromise the generation of public value and limit social benefits. environmental aspects of partnerships (Onukwulu et al., 2023).

In light of ISO 59004, public-private partnerships should be guided by the principles of Value sharing and systems thinking. This implies considering not only feasibility. economic aspects of the projects, but also their long-term social and environmental impacts (Aktaÿ & Aktaÿ, 2021).

## **2.8 Public-private partnerships in the context of urban governance**

In the field of urban sustainability, public-private partnerships have been employed to To enable investments in waste management, sanitation, energy, and mobility. By integrating financial resources and technical expertise from the private sector combined with long-term public objectives, these Partnerships can contribute to greater efficiency and innovation in urban management. (Mascarenhas, 2018).

However, the literature highlights that public-private partnerships are not universal solutions. and present risks when poorly structured. Freitas et al. (2023) point out that the absence of Alignment between public and private objectives can result in asymmetries in the distribution of



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benefits, compromising the generation of public value.

In the context of the Circular Economy, these risks become even more relevant, since...

Environmental and social benefits do not always translate immediately into financial returns.

Thus, structuring public-private partnerships for urban circularity requires models.

contractual and regulatory aspects that consider positive externalities and long-term objectives.

(Gomyde et al., 2020).

The structuring of public-private partnerships geared towards the Circular Economy should consider

both the foundations of the new institutional economy and the principles of collaborative governance

contemporary, ensuring alignment of incentives, transparency and value sharing.

(Williamson, 2000; Hodge & Greve, 2017; Emerson & Nabatchi, 2015).

## **2.9 Public-private partnerships as an instrument of the Circular Economy**

The Circular Economy demands significant investments in infrastructure, technology, and

Innovation, which often exceeds the financial capacity of municipal governments.

In this context, public-private partnerships emerge as a potential instrument to enable...

Circular transition, especially in Brazilian cities (Prendeville, 2018). PPPs allow

risk and investment sharing (Hodge & Greve, 2007).

According to Zanirato (2016), sustainability requires mechanisms capable of leading to

Rationalizing resource consumption and reorganizing production systems. Partnerships

Public-private partnerships can contribute to this process by promoting technological solutions and models.

Business models aligned with circularity. In the context of urban circularity, they can enable projects.

sustainable infrastructure, waste management, renewable energy and resource reuse

(Girard & Nocca, 2019).

The application of public-private partnerships to the Circular Economy should be guided by...

principles established in ISO 59004. The principle of value creation and sharing, by

For example, this implies that the economic, social, and environmental benefits of the partnerships are distributed.

in an equitable manner among the actors involved (International Organization for Standardization, 2024).

Another relevant principle is systems thinking, which requires partnerships to consider the...

impacts of their actions on the different components of the urban system. Management projects of

Waste, for example, should be integrated into environmental education and social inclusion policies.

urban planning, avoiding fragmented solutions (Kronemberger, 2019).



## 2.10 Challenges of public-private partnerships for circular cities in Brazil

Despite its potential, the use of public-private partnerships for the implementation of Circular Economy in Brazil faces significant challenges. Freitas et al. (2023) highlight that the Most initiatives occur in isolation, without integration into broader urban strategies. or with structural public policies.

Among the main challenges identified are regulatory instability and a lack of The technical capacity of municipalities and the difficulty in measuring the environmental and social benefits of... circular initiatives. These factors increase the perceived risk for private investors and limit the scale of partnerships (Veleva and Bodkin, 2018).

Furthermore, the absence of traceability systems and integrated data makes it difficult to... Monitoring the performance of public-private partnerships. ISO 59004 emphasizes the importance traceability as a tool for evaluating the effectiveness of circular strategies, but Its implementation in Brazilian cities is still in its early stages (International Organization for Standardization, 2024).

## 2.11 Governance, PPPs and the application of ISO 59004

ISO 59004 provides an important framework for structuring public-private partnerships. private companies geared towards the Circular Economy. By establishing clear and integrated principles, the standard can to assist public and private managers in designing projects aligned with sustainability and shared value generation (ISO, 2024).

The adoption of ISO 59004 in the Brazilian urban context requires adaptation to local realities. considering institutional and financial limitations. However, its application can contribute to to reduce the fragmentation of public policies and promote greater integration among the actors involved. (Silva 2024).

Urban governance guided by ISO 59004 should prioritize coordination. Interinstitutional cooperation, transparency, and social participation. These elements are fundamental for to ensure that public-private partnerships effectively contribute to the transition of cities towards to the Circular Economy (Tsaligopoulos et al., 2022).

## 3. MATERIALS AND METHODS

This study adopts a qualitative approach, of an exploratory and descriptive nature. based on a systematic literature review and document analysis. The methodological choice This is justified by the need to deepen the theoretical understanding of the Circular Economy, of

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urban governance, public-private partnerships, and the principles established by ISO 59004, seeking to articulate these elements into an analytical model applicable to the urban context.

The bibliographic research proved adequate as it allowed for the systematization of concepts, Identifying recurring problems in the literature and critically analyzing the strategies identified.

for the implementation of the Circular Economy in cities, especially through arrangements collaborative institutions.

As sources of analysis, scientific articles indexed in the Scopus and Google databases were used.

Scholar and Elsevier, in addition to institutional and regulatory documents relevant to the topic. The studies

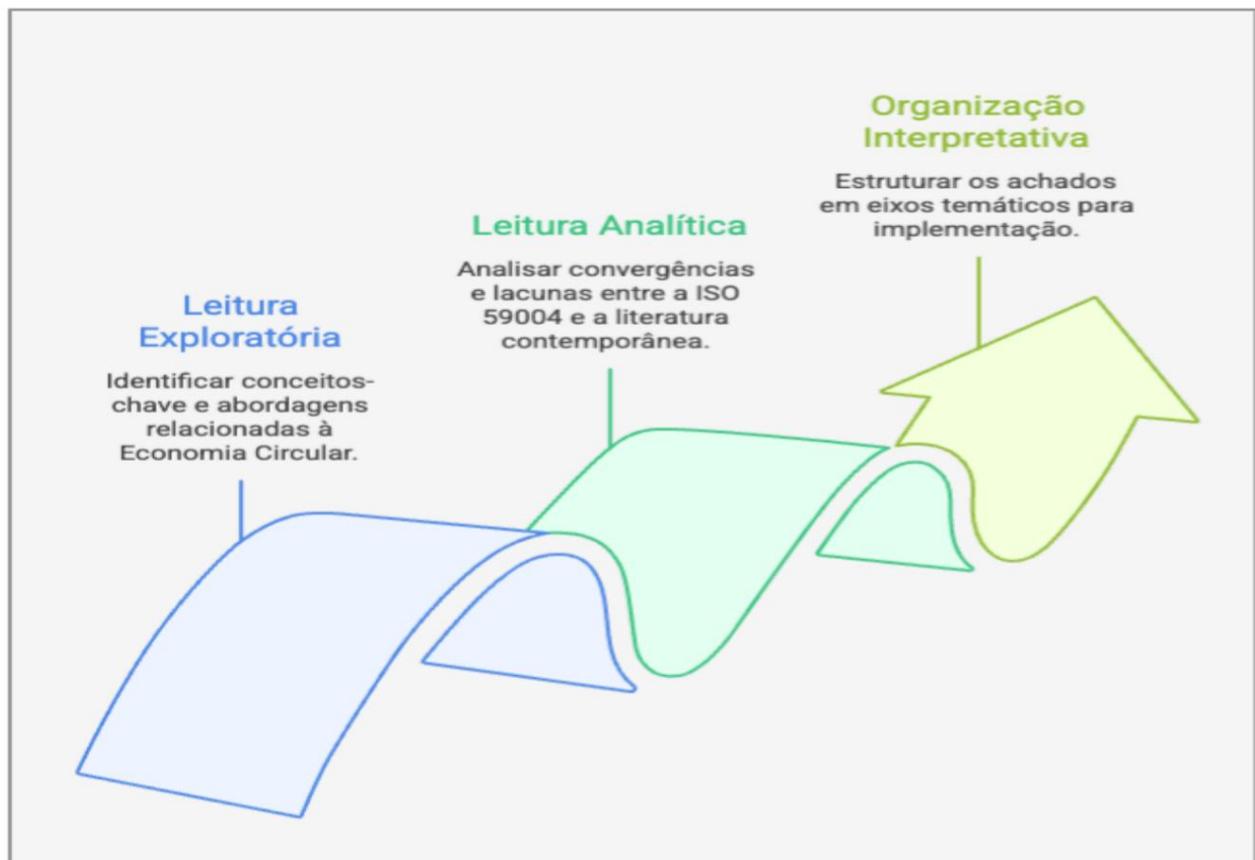
They were selected based on their relevance to the research objective, considering criteria of

Thematic relevance, timeliness, and theoretical contribution.

The methodological procedure was developed in three complementary stages: reading

Complementary, analytical reading and interpretive organization, as shown in Figure 1:

**Figure 1:** Methodological procedure



Made with Napkin

**Source:** Author with AI assistance (Napkin software)

The analysis was conducted through qualitative content interpretation, prioritizing the A critical articulation between different authors and theoretical perspectives. The results presented do not They are guided not by statistical measurement, but by conceptual systematization and argumentative discussion. with the purpose of contributing to the understanding of the role of public-private partnerships in



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implementation of the principles of the Circular Economy, as established by ISO 59004, in urban contexts.

As a methodological limitation, the absence of applied empirical research stands out, which This restricts the analysis to the theoretical-conceptual field. For future research, it is suggested that... comparative case studies and the construction of specific indicators for evaluating Circularity in urban projects structured through PPPs.

#### 4. RESULTS AND DISCUSSION

Qualitative analysis of the literature allowed us to identify structural convergences between the The principles of the Circular Economy established by ISO 59004 form the foundation of governance. urban planning and the potential of public-private partnerships as an implementation tool in urban contexts.

The results indicate that the transition to circular cities depends less on the existence of isolated initiatives and more the capacity for institutional coordination between public policies, Private investments, contractual instruments, and monitoring mechanisms. Circularity. Urban planning thus emerges as a systemic arrangement and not as a sectoral solution.

It was observed that the principle of systems thinking, as outlined in ISO 59004, is found... Conceptual adherence in the literature on collaborative governance. However, in practice, the Implementation is still occurring in a fragmented way. Waste management, sanitation, or other projects... Sustainable infrastructure often operates in isolation, without connection to... Integrated urban planning or social inclusion policies. PPPs demonstrate potential for Overcoming this fragmentation can be achieved by structuring strategies with intersectoral goals and environmental indicators. integrated into the contract.

Another relevant result relates to the generation and sharing of value. The literature evidence suggests that traditional PPP contracts tend to prioritize economic efficiency and return on investment. financial, while ISO 59004 proposes a balance between economic, social, and environmental value. Analysis indicates that the incorporation of socio-environmental metrics, ESG indicators, and models of Variable compensation can align public and private incentives, bringing PPPs closer to the logic of Shared value.

The traceability of resource flows proved to be a critical element. The absence of data Integrated, digital systems and standardized indicators limit the ability to monitor impacts and It compromises the transparency of circular initiatives. The implementation of the principle of Traceability depends on administrative modernization and the incorporation of technologies. monitoring, especially in municipalities with less technical capacity.

Regarding resilience, it was found that PPPs have structural compatibility with

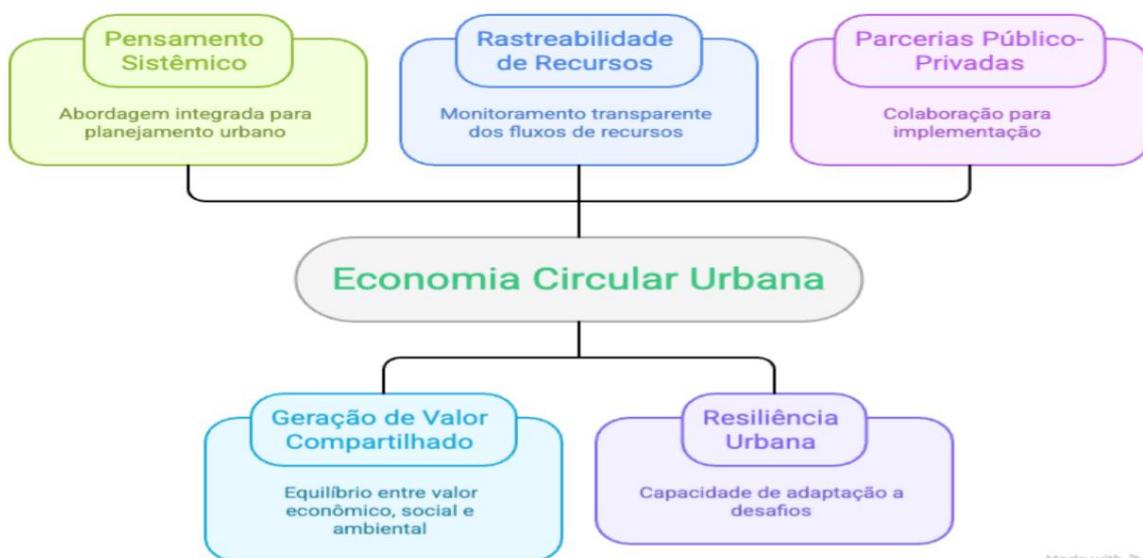
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Long-term projects are necessary for the circular transition. However, regulatory instability, Legal uncertainty and institutional fragility increase risks and reduce investment appetite. Private. Urban resilience, in this context, depends on regulatory stability and planning. consistent strategy.

In summary, the results indicate that there is theoretical coherence between the principles of ISO 59004 and the use of PPPs as an instrument for implementing the Circular Economy. However, There are significant gaps between regulatory formulation and practical implementation. PPPs are not... Automatically generates circularity vectors. Its effectiveness depends on a contractual design aligned with... systemic principles, collaborative governance mechanisms and robust instruments of monitoring.

Figure 2 presents the conceptual model of Urban Circular Economy adopted in this study. structured around five interdependent dimensions that support the transition to more sustainable cities. sustainable and resilient. At its core, the Urban Circular Economy is understood as a A systemic approach to reorganizing resource flows within the territory. Around it, the following stand out: if: Systems Thinking, which guides integrated urban planning; Traceability of Resources, which promote transparency and monitoring of flows; Public-Private Partnerships, essential for enabling the implementation of the initiatives; the Generation of Shared Value, which balances economic, social, and environmental dimensions; and Urban Resilience, which strengthens the The system's ability to adapt to challenges. The model shows that the effectiveness of Urban circularity depends on the simultaneous articulation of these elements.

Figure 2: Implementation of sustainable practices in cities



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Source: Author with AI assistance (Napkin software)

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If ISO 59004 represents the normative reference for transformation, PPPs can to establish the operational mechanism. However, without integrated governance, clear indicators and Despite the alignment of incentives, the transformative potential remains limited.

## FINAL CONSIDERATIONS

The aim of this study was to analyze how public-private partnerships They can contribute to the implementation of the principles of the Circular Economy, as established. According to ISO 59004, in urban contexts. Based on the theoretical review and qualitative analysis carried out, It was found that the transition to circular models in cities does not depend solely on the existence of from isolated initiatives, but above all from the consolidation of institutional arrangements capable of integrating Public policies, private investment and social participation.

The literature shows that the Circular Economy goes beyond the environmental dimension and involves... Structural changes in production systems, consumption patterns, and governance models. In the urban context, this complexity is amplified by the multiplicity of actors, sectors, and interests. involved. Thus, the application of the principles of ISO 59004, especially systems thinking, The generation and sharing of value, traceability, and resilience are proving fundamental for Avoid fragmented approaches and promote integrated interventions.

There are initiatives aligned with the principles of the Circular Economy, particularly in areas such as waste management and environmental policies. However, such initiatives still lack greater support. Strategic articulation and institutionalization. It was observed that there was a lack of integration between policies. Sectoral differences and the limited monitoring and evaluation tools hinder the consolidation of a long-term urban circular strategy.

In this scenario, public-private partnerships emerge as a relevant instrument for Collaborative governance. By enabling the sharing of risks, investments, and capabilities. Technically, PPPs can accelerate the implementation of structuring projects focused on circularity. However, its effectiveness depends on clear regulatory frameworks and transparency mechanisms. Defining performance indicators and aligning public and private objectives. Without these. These elements pose a risk of asymmetries in the distribution of benefits and in the prioritization of returns. financial benefits are prioritized over socio-environmental impacts.

In light of ISO 59004, PPPs should be designed not only as financial instruments. or contractual, but as strategic vectors of systemic transformation. This implies structuring contracts and institutional arrangements that consider positive externalities, promote the generation of Shared value and incorporate traceability mechanisms and continuous evaluation. Governance Urban planning guided by circularity requires inter-institutional coordination, transparency, and active social participation.



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As academic contributions, this study broadens the debate on the operationalization of Circular Economy in the Brazilian urban context, by articulating ISO 59004 with the instrument of public-private partnerships. Theoretically, this study contributes by linking ISO 59004 with the Literature on urban governance and public-private partnerships, proposing an analytical model that connects normative principles of circularity to concrete institutional instruments of implementation.

From a practical standpoint, it provides subsidies for public and private managers to structure projects aligned with the principles of circularity, especially in medium-sized municipalities that They face financial and institutional limitations.

Among the limitations of the research, the focus on a single case study stands out, which restricts... The generalizability of the results. Future research could expand the analysis to other cities. Brazilian companies, compare different PPP models applied to urban sustainability and develop Specific indicators for evaluating circularity in urban projects.

It can be concluded that the transition to circular cities requires more than just good intentions or Specific initiatives. Requires strategic vision, integration of public policies, and sector engagement. Private and societal participation. When guided by the principles of ISO 59004, partnerships Public-private partnerships can play a central role in this process, acting as catalysts for... Innovation, sustainability, and the generation of shared value in Brazilian cities.

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