A strategic map for increasing urban resilience potential, an analysis based on *Balanced ScoreCard* of the largest textile hub in Paraná

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Mapa estratégico para o aumento do potencial de resiliência urbana, uma análise baseada no *Balanced ScoreCard* do maior polo têxtil do Paraná

RESUMO

Objetivo – Desenvolver um mapa estratégico baseado no *Balanced Scorecard (BSC)* para orientar políticas públicas voltadas à resiliência urbana e sustentabilidade ambiental.

Metodologia – Aplicação do *BSC* ao setor público, com revisão da literatura, análise legislativa, levantamento de dados e matriz *Strengths, Weaknesses, Opportunities and Threats (SWOT)* para avaliar a resiliência urbana.

Originalidade/relevância – Adaptação do *BSC* ao planejamento estratégico urbano, preenchendo uma lacuna teórica e alinhando políticas públicas à sustentabilidade.

Resultados – Criação de um mapa estratégico com objetivos alinhados às necessidades do município.

Contribuições teóricas/metodológicas – Demonstrar a viabilidade do *BSC* na gestão pública, oferecendo uma metodologia replicável para outras cidades.

Contribuições sociais e ambientais – Propostas para sustentabilidade ambiental, gestão de resíduos e maior engajamento comunitário na construção de cidades resilientes.

PALAVRAS-CHAVE: Resiliência Urbana. *Balanced Scorecard*. Planejamento Estratégico.

A Strategic Map for Enhancing Urban Resilience Potential: An Analysis Based on the Balanced Scorecard of the Largest Textile Hub in Paraná

ABSTRACT

Objective – To develop a strategic map based on the Balanced Scorecard (BSC) to guide public policies aimed at urban resilience and environmental sustainability.

Methodology – The application of the BSC to the public sector, including a literature review, legislative analysis, data collection, and a SWOT matrix to assess urban resilience.

Originality/Relevance – The adaptation of the BSC to urban strategic planning, addressing a theoretical gap and aligning public policies with sustainability principles.

Results – The development of a strategic map with objectives tailored to the municipality's needs.

Theoretical/Methodological Contributions – To demonstrate the feasibility of using the BSC in public administration, providing a replicable methodology for other cities.

Social and Environmental Contributions – The proposal of guidelines for environmental sustainability, waste management, and enhanced community engagement in building resilient cities.

KEYWORDS: Urban Resilience, Balanced Scorecard, Strategic Planning.

Mapa estratégico para el aumento del potencial de resiliencia urbana: un análisis basado en el *Balanced Scorecard* del mayor polo textil de Paraná.

RESUMEN

Objetivo – Desarrollar un mapa estratégico basado en el *Balanced Scorecard* (BSC) para orientar las políticas públicas dirigidas a la resiliencia urbana y la sostenibilidad ambiental.

Metodología – Aplicación del BSC al sector público, con revisión de la literatura, análisis legislativo, recopilación de datos y matriz *Strengths, Weaknesses, Opportunities and Threats (SWOT)* para evaluar la resiliencia urbana.

Originalidad/Relevancia – Adaptación del BSC a la planificación estratégica urbana, abordando una laguna teórica y alineando las políticas públicas con la sostenibilidad.

Resultados – Creación de un mapa estratégico con objetivos alineados a las necesidades del municipio.

Contribuciones teóricas/metodológicas – Demuestrar la viabilidad del BSC en la gestión pública, proporcionando una metodología replicable para otras ciudades.

Contribuciones sociales y ambientales – Propuestas para la sostenibilidad ambiental, gestión de residuos y mayor participación comunitaria en la construcción de ciudades resilientes.

PALABRAS CLAVE: Resiliencia Urbana, *Balanced Scorecard*, Planificación Estratégica.

1 INTRODUCTION

This paper explores the application of the Balanced Scorecard (BSC) in strategic planning for urban resilience, adapting a model originally developed for the corporate sector to the context of public administration. KAPLAN and NORTON (1997) introduced the BSC as a system that integrates several dimensions beyond the financial one for a holistic view of organizational performance. Taking this into account, the study's main objective is to use the BSC to increase levels of urban resilience focusing on environmental sustainability in a municipality where the economy is based on the textile industry in northern Paraná.

According to BIANCHI (2016), communities fail to prioritize anticipation and adaptation to disasters. Therefore, work seeks to bring a strategic perspective to improve the construction of urban resilience and coping with adverse events. MENEZES (2022) states that growing urbanization increasingly causes environmental problems and highlights the need for urban environments to become adaptable, resilient, and quickly recover from impacts, thus building their resilience.

Urban resilience is a crucial issue for the contemporary urban environment, which faces increasing challenges related to natural disasters, climate change, and sustainable development. The concept of resilience has become widely used to describe the ability of different systems, including the urban environment, to adapt and recover, as stated by BERMEJO, AJA, and FERNÁNDEZ (2022). This concept is particularly relevant in cities such as Apucarana, which is home to the largest textile hub in Paraná. The textile sector, despite being an important economic pillar, also faces sustainability issues due to waste management and the use of environmentally harmful materials, such as plastics and polymers, which can cause severe environmental impacts (DOSUNMU, 2023).

The textile hub of Apucarana, responsible for a large part of the city's economy, is closely linked to the region's economic history. This development, although important for economic growth, has also generated significant environmental impacts, such as deforestation and soil erosion (FOGARI, 2007). Today, the need for sustainable urban planning and the search for innovation are fundamental to ensuring that the city's textile sector not only prospers economically but also reduces its environmental impact.

Thus, the mission defined to guide the strategic map and other directions of this research, and which constitutes the general objective of the study, is to "Increase levels of urban resilience based on environmental sustainability". This research will follow a structured approach, starting with preparation that includes literature review, legislative analysis and definition of the scope.

The article focuses on the construction of the strategic map, which will allow us to achieve the established mission, offering a clear framework for the development and implementation of effective public policies on urban resilience. The present article is centered on the construction of a strategic map aimed at achieving the established mission, offering a coherent framework for the formulation and implementation of effective public policies related to urban resilience.

In this context, the contribution of SANTOS, ENOKIBARA, and FONTES (2020) proves to be particularly significant, as their study reveals that urban resilience emerges as one of the most interconnected topics within national academic literature, especially when articulated with themes such as bicycle infrastructure, urban afforestation, and climate change.

2 THEORETICAL FRAMEWORK

Humanity lives its daily life without imagining the possibility of losing the comfort or ease of its daily routines, as observed by VENDRAMETTO et al. (2021). The term "resilience", originally used in physics to describe the ability of materials to return to their original state, has been expanded, as Bermejo, Aja and Fernández (2022) state. ASADZADEH et al., (2023) define urban resilience as the ability of urban systems to absorb, recover, and prepare for future shocks, whether they are economic, environmental, social, or institutional.

SCHINTLER and MCNEELY (2022) argue that urban resilience refers to adaptation and related capacities within cities as complex systems. It is the ability of cities to withstand change, rebuild after change, and create structures.

According to MAKATULAD and BILJECKI (2023), urban resilience concerns the ability of urban systems to absorb shocks, recover, and prepare for future crises, whether economic, environmental, social, or institutional in nature. This includes maintaining essential functions during emergencies, as well as the ability to adapt and transform positively after critical events. For Makatulad and Biljecki (2023), this perspective has been consolidated as a guiding principle in disaster risk reduction strategies and urban planning on a global scale.

KUMAR (2022) states that the concept of resilience has been used to capture the ability of communities to withstand shocks and stresses while maintaining essential functions and adaptability. JIANG, WANG, and MIAO (2025) define urban resilience as the ability of a city to react to and prevent risks, as well as transform challenges into opportunities.

AINA et al. (2023) affirm that urban resilience is crucial for cities to recover quickly from emergencies, being understood as the ability of a system to perform four functions in the face of adversity: planning and preparation; absorption; recovery.

The Covid-19 pandemic eloquently illustrated this issue and provided opportunities for the real-world implementation of transformative initiatives (SHARIFI; KHAVARIAN-GARMSIR; KUMMITHA, 2021), revealing the vulnerabilities of the urban environment and demonstrating the remarkable adaptability of humans.

According to SUÁREZ et al., (2024), urban resilience has become a priority in local policies to address climate change and other disturbances such as economic and health crises, like the Covid-19 pandemic. Thus, the need to develop strategies for mitigation and adaptation in society becomes evident in the face of an increasingly challenging future.

In the face of growing environmental uncertainties, the debate on resilience has gained prominence. According to Godoy and Benini (2024), cities build their resilience as they develop the capacity to resist, respond to and recover from adverse events, minimizing the impact on people and infrastructure when extreme events occur.

KUMAR (2022) emphasizes that governance is crucial for resilience, particularly through community participation, decentralized decisions, and transparency. He highlights that

effective governance involves the population in public policies and adapts strategies to local needs, contributing to the strengthening of resilience. One of the main objectives is to preserve community resilience, which is becoming one of the primary concerns in cities worldwide (SHACH-PINSLY; GANOR, 2021).

One way in which the government can reduce the risk of disasters is through the proper management of textile waste, an issue that, according to Godoy and Benini (2024), should be prioritized. In addition, planning resilient cities also implies the protection of natural ecosystems.

According to Dosunmu (2023), the incorrect disposal of plastics can cause significant damage to ecosystems, given that these materials take more than a thousand years to decompose and can release toxic substances into the soil and water. Currently, most fabrics used in the manufacture of clothing, gifts and other textile artifacts contain polymers in their composition, which increases the potential for environmental damage compared to fabrics made predominantly from natural and organic raw materials. The latter are one of the best options to produce sustainable pieces, according to Alessio et al., (2014).

SILVA, TAROUCO, and EDELWEISS (2018) state that negative social, economic, and environmental impacts can result from the spread of waste deposits in inappropriate locations. The authors view resilience as a potential tool for the social and urban development of cities and societies, as it provides local opportunities to plan alternatives and pave the way for sustainable, democratic, productive, self-organized, and creative development.

The concept of environmental sustainability emerged, according to Alessio et al., (2014), to demonstrate that it is possible to grow economically and produce without causing damage to the environment. The United Nations Conference on the Environment was the initial milestone of this concept, which has evolved significantly since then. According to the authors, the fashion industry began to consider sustainability in the 1960s, when the first concerns arose about the impact of the textile industry on ecosystems. In the 1970s, European attention turned to food quality, and it was only in the 1980s that consumers began to worry about the environmental impact of clothing production, starting the first sustainable fashion initiatives.

Godoy and Benini (2024) emphasize that reducing disaster risks in cities should be a priority for public administrations. However, building resilience is an ongoing process and depends on the collaboration between different sectors of society, united by common goals: sustainability and social equity. In this context, Oliveira et al. (2025) observe that urban flooding compromises the sustainability of cities and causes harm to the population, especially when there are unplanned settlements and land use without proper planning, which exacerbates soil impermeabilization and increases the vulnerability of urban infrastructure.

For this work, the following standards were used: ABNT NBR ISO 37100:2017 and ABNT NBR ISO 31000:2018.

The ABNT NBR ISO 37100:2017 standard establishes guidelines for the sustainable development of communities and cities. It proposes the integration of environmental, economic and social dimensions in urban planning, aiming at balanced and sustainable development. The standard also highlights the need to establish clear and measurable objectives to monitor the progress of the initiatives adopted. Community participation is considered crucial to the success of urban resilience policies. In contrast, the standard identifies the lack of coherence in policies

and excessive dependence on external organizations as weaknesses that can compromise the effective implementation of these initiatives.

The ABNT NBR ISO 31000:2018 standard provides guidelines for risk management, applicable in various contexts, including urban resilience. It highlights the importance of integrating risk management into all organizational activities and emphasizing the inclusion of stakeholders, continuous adaptation to internal and external changes, and the importance of effective communication.

To outline city management strategies, it is necessary, according to Domingues and Chiroli (2022), to analyze the local reality, in order to anticipate the risks that the urban environment may be subjected to. YIN et al. (2024) argue that assessing urban vulnerability in a more comprehensive and human-centered way contributes to improving the cities' capacity to prevent risks, particularly those associated with landslides, which directly impacts the strengthening of urban resilience.

BECK and MITKIEWICZ (2025) believe that citizen science projects can strengthen urban resilience by promoting community empowerment and the engagement of social actors in urban planning processes. The authors highlight that citizen participation enhances social capital and the collective capacity to respond to challenges related to climate change and natural disasters, making it essential for addressing contemporary urban complexities.

2.1 Contextualization

In the early 19th century, the colonization of northern Paraná began by dividing the region into *Norte Novo* (New North), *Norte Velho* (Old North), and *Norte Novíssimo* (Brand New North) (FARIA, 2015). Between 1925 and 1927, the *Companhia de Terras Norte do Paraná* acquired land and played a crucial role in the colonization and planning of the region, influenced by European practices due to its connection with an English company. This modernist planning is visible in the urban structure of Apucarana, whose accelerated expansion between 1940 and 1960 was driven by the railway line and the peak of coffee production. The city went through three periods of development: the Pioneering Period (1934-1939), the Placement and Settlement Period (1940-1943), and the Period of Political Emancipation and Development (from 1944 onwards) (FARIA, 2015).

The economic evolution of Apucarana resulted in major changes to the natural landscape, such as intense deforestation and soil erosion due to agricultural exploitation. Despite its economic development, coffee cultivation has caused significant environmental impacts, such as deforestation for the creation of coffee plantations (FOGARI, 2007). The city became independent in 1944 and developed its first Master Plan in 1969 (APUCARANA, 2016). After the frost of 1975, coffee production was discouraged, leading to crop diversification and the modernization of the countryside.

Today, the textile sector is very important for Apucarana's industry, accounting for 13% of the city's wage bill. In the services sector, public administration and education stand out, each contributing 8% of the wage bill, according to the Paraná Development Agency (2019).

At this time of increasing vulnerability to natural disasters and climate change around the world, it is essential that cities use innovations and best practices to improve their resilience and ensure sustainable development.

3 METHODOLOGY

The method for conducting this study is based on the application of *the Balanced Scorecard* (BSC) to adapt corporate strategies to the context of urban planning, aiming at the creation of a strategic map that aligns public objectives with environmental sustainability. The Balanced Scorecard, widely used in corporate planning sectors, integrates companies' strategies beyond the financial scope. This concept was initially proposed by Kaplan and Norton (1997) as a system of measures that describes the strategy. According to the authors, the strategic planning map generated by the methodology aims to make public the value of a corporation.

For the model to perform properly, some elements are essential. Kaplan and Norton (2004) state that the method can be applied in the public sector, using basic elements such as: establishing a clear mission; ensuring that the main performance criterion is the fulfillment of this mission; defining the social impact and the objectives to be achieved.

To apply the Balanced Scorecard in this research, the mission was defined as: "Increasing levels of urban resilience based on environmental sustainability". The method was applied to a municipality that is a textile hub in northern Paraná.

Thus, just as private sector institutions fulfill their mission by meeting the needs of their target customers and stakeholders, cities must consider two main groups: shareholders, which include state and federal public bodies and local investors, and customers, which are society in general. Therefore, public policies must serve these two interest groups: shareholders and customers.

The Balanced Scorecard (BSC) provides a communication framework with indicators that demonstrate the organization's mission and strategy to both employees and society. The indicators in the model should reflect both concrete and subjective goals of the organization.

ZIMMERMAN (2015) argues that although the model was created for the corporate environment, it can be adapted to assess the future success of public administrations. The integration among the perspectives of the Balanced Scorecard is crucial for the successful application of the method. As illustrated in Table 1, these classic perspectives should be defined by the organization according to its strategies. Zimmerman (2015) and FELIX and FELIX (2011) highlight that, for public administration, the financial perspective (budget) is often considered fundamental.

Table 1 - Classical perspectives on vision and strategy

Perspective	What the institution should do
Customer	Translation of customer priorities into measures to achieve complete satisfaction.
Financial	To monitor whether the strategy contributes to achieving financial results. How does the institution want to be perceived by entrepreneurs, investors and stakeholders?
Internal Processes	To identify the essential processes to create the conditions to achieve the objectives from the customer and financial perspectives, with valuable propositions to customers.
Learning and Growth	Employee training, investments in equipment, research, systems and human resources.

The steps for consolidating the Balanced Scorecard model and developing the strategic map include Preparation and Strategic Definitions: Mission, Vision, Strategic Objectives and Strategic Map. This research followed the following steps:

1. Preparation Stage

At this stage, a literature survey was carried out to collect evidence of studies and work already carried out and the relevant standards. After verifying the economic characteristics of the region, the scope was delimited, in the context of this work, focusing on building resilience with an emphasis on the environmental axis and the area of coverage being the city of Apucarana - PR.

A SWOT matrix was developed based on guidelines from the literature, identifying strengths, weaknesses, opportunities and threats related to urban resilience. A second SWOT matrix was then created using official data from the city of Apucarana and Atlas Brazil, highlighting the main economic, social and environmental characteristics of the city to guide this work.

2. Strategic definitions:

MISSION: "To increase levels of urban resilience based on environmental sustainability". According to Kaplan and Norton (2004), the mission should be highlighted at the highest level of the map, configuring a comprehensive purpose and communicating clearly throughout the organization.

VISION: According to Zimmerman (2015), vision refers to the idealization of the institution's future, what it wants to achieve and how it intends to be perceived. The vision must be clearly expressed and formulated in an inspiring way, being imaginable, desirable, viable, focused, precise and communicable.

STRATEGIC MAP: At this stage, the perspectives that best align with the mission and strategic objectives were defined, allowing the organization to achieve its vision. The perspectives were defined based on standards, legislation, and literature. It is easy to find works that delimit the perspectives into "internal processes", "customers", "Financial" and "Learning and Growth". According to Kaplan and Norton (1997), the strategic objectives must be allocated in a clear and intuitive way, facilitating understanding by the entire corporation and stakeholders. However, when dealing with the urban environment and its context, it is important to highlight that building resilience requires a collective effort, involving both the

government and society, through multisectoral partnerships (Chiroli et al., 2023). Thus, for this work, words that are more relevant to the theme were chosen, which consider and reinforce the importance of joint actions between the government and society.

4 RESULTS AND DISCUSSIONS

A SWOT matrix was created to understand the region based on the guidelines listed in the literature, which is exemplified in Table 2. In this way, the authors' considerations on what is characterized as strengths, weaknesses, opportunities and threats were listed, with concepts and definitions present in literature. It was discovered that there are few authors who address the weaknesses of local ecosystems when it comes to building resilience.

Table 2 - Strengths, weaknesses, opportunities and threats as described and present in literature

Contexts described in the literature	
STRENGTHS: Waste Management and Sanitation (Chiroli et al., 2023); Adoption of Mitigation Strategies (Fallmann and Emeis, 2020); Innovation Capacity (Fallmann and Emeis, 2020); Goal Setting (ABNT NBR ISO 37100:2017); Community Engagement (ABNT NBR ISO 37100:2017); Infrastructure Innovation (ABNT NBR ISO 37100:2017); Investment in Research and Development (R&D) (ABNT NBR ISO 37100:2017); Contingency Plans (ABNT NBR ISO 31000:2018)	WEAKNESSES: Lack of Recognition of Challenges (Chiroli et al., 2023); Lack of Communication (ABNT NBR ISO 31000:2018)
OPPORTUNITIES: Increased Awareness about Climate Change (Fallmann and Emeis 2020); Areas closer to the river and, therefore, more vulnerable where it is possible to notice the precariousness of the sidewalks and the absence of asphalt, curbs and gutters. On the other hand, in these areas the circulation of cars is low and the community, especially children and young people, take advantage of the opportunity to play and practice collective activities (VENDRAMETTO et al., 2021); Interinstitutional Collaboration (ABNT NBR ISO 31000:2018)	THREATS: Lack of Disaster Response Capacity (Chiroli et al., 2023) Social and Economic Inequality (Fallmann and Emeis, 2020)

Based on the first survey, a second SWOT matrix was carried out with official data from articles of the Apucarana city hall website (https://www.apucarana.pr.gov.br/site/), as well as reports from Atlas Brazil to list its main characteristics, represented in Table 3.

Table 2 - Strengths, weaknesses, opportunities and threats identified in the municipality of Apucarana

Identifications made on the official website of the municipality of Apucarana	
STRENGTHS: The municipality has a structured waste management and sanitation policy; strong investments in innovation, research and development; areas near rivers used as leisure facilities; existence of groups and collectives of organized civil society in search of common objectives such as: APLs, Associations, Collectives, Councils.	WEAKNESSES: The municipality does not have a clear way of communicating its objectives; the municipality does not have a contingency plan; the municipality does not have a disaster communication channel; the municipality does not have a clear protocol for the population to respond to disasters.
OPPORTUNITIES: The municipality has laws and organized civil groups focused on innovation; the municipality has worked to structure and operate community groups; the municipality has innovative capacity and news that shows interest in building a "smart street"; last year, lectures were held on the topic of "climate change".	THREATS: Social and economic inequality; the municipality does not have clear risk mitigation measures; areas near rivers are marginalized and lack adequate infrastructure.

After surveying the bibliography and creating the SWOT matrices, four perspectives that were most aligned with the scope of the research were listed: People; Education and Awareness; Innovation and Technology; Public Policies and Urban Planning. Table 4 lists the perspectives and authors who cite the relevance of this theme in their works in the literature.

Table 4 - Suggested perspectives for research according to literature

Perspectives	Authors and standards	Standards
People	Chiroli et al., (2023); Vendrametto et al, (2021);	ABNT NBR ISO 37100:2017; ABNT NBR ISO 31000:2018
Education and Awareness	Chiroli et al., (2023); Alessio, Araujo, Lopes and Schulte, (2014)	ABNT NBR ISO 37100:2017
Innovation and Technology	Chiroli et al., (2023); Fallmann and Emeis (2020);	ABNT NBR ISO 37122:2020
Public Policies and Urban Planning	Chiroli et al., (2023); Vendrametto et al., (2021); ABNT NBR ISO 37100:2017; ABNT NBR ISO 31000:2018	ABNT NBR ISO 37100:2017; ABNT NBR ISO 31000:2018

After defining the perspectives, a survey of strategic objectives was carried out to achieve the vision and fulfill the mission according to the perspectives listed in Table 5. As instructed by Zimmerman (2015), the "SMART" method was used to validate the objectives, which consists of evaluating whether the objective is clear and objective (SPECIFIC); whether the objective is measurable (MEASURABLE); whether the objective is possible due to the factors and reality of the organization and other variables (ATTAINABLE); whether the objective is related to a demand, some pain in society or problem (RELEVANT); and whether the objective is programmable, or if it is possible to develop an achievable schedule (TIME).

Table 5 - Objectives present in literature

People	Public Policies and Urban Planning	Innovation and Technology	Education and Awareness
Community Engagement: Foster community participation in the planning and implementation of resilience initiatives, ensuring that local voices are heard and that solutions meet the specific needs of the population (Chiroli et al., 2023).	Development of Sustainable Master Plans: Create and implement master plans that consider environmental resilience, integrating aspects such as land use, mobility, green infrastructure and water resource management (Chiroli et al., 2023).	Ensure that urban resilience strategies consider social equity, promoting the inclusion of all communities in access to resources and participation in decision-making processes (Fallmann and Emeis, 2020).	Water Conservation: Promote water conservation practices, such as rainwater harvesting and greywater reuse, to reduce pressure on urban water resources (Chiroli et al., 2023).
Multi-stakeholder Partnerships: Establish partnerships between governments, the private sector, NGOs and communities to develop and implement resilience projects that integrate different perspectives and resources (Chiroli et al., 2023).	Ecological Zoning: Using zoning to protect ecologically sensitive areas and promote sustainable land use, ensuring that vulnerable areas are preserved, and that urban development occurs in a controlled manner (Chiroli et al., 2023).	Use of Green Technologies: Encourage the adoption of green technologies, such as solar energy, wind energy and energy efficiency systems, to reduce the carbon footprint of cities (Chiroli et al., 2023).	Training Programs: Develop training programs for citizens and public managers on sustainability and resilience practices, promoting a culture of environmental responsibility (Chiroli et al., 2023).

Governance with local public authorities for flood prevention actions. (Vendrametto et al., 2021)	Restoration of riparian forests; decontamination of streams; implementation of leisure and sports centers, ensuring the preservation of riverbanks; implementation of squares or water parks; implementation of green infrastructure (green streets/paths; stormwater pond/retention basin; constructed wetland/ wetland, dry pond; rainwater bed; rain garden; bio-swales and permeable pavement); (VENDRAMETTO et al., 2021)	Monitoring and Evaluation: Implement monitoring systems that use real-time data to assess the effectiveness of resilience and sustainability policies, enabling continuous adjustments and improvements (Chiroli et al., (2023).	Awareness Campaigns: Carry out awareness campaigns on the importance of environmental resilience and how citizens can contribute, encouraging active community participation (Fallmann and Emeis, 2020).
Governance actions between local institutions and public authorities with the aim of achieving problem resolution in a more continuous, collective and collaborative manner. (Vendrametto et al., 2021)	Sustainable Drainage Systems: Implement sustainable drainage systems (SUDS) that utilize techniques such as rain gardens and permeable pavements to manage stormwater and reduce flood risk (Chiroli et al., 2023).	Promote the application of urban climate and sustainability research into planning and design practices, ensuring that decisions are informed by up-to-date scientific data (Fallmann and Emeis, 2020).	People are increasingly aware of the need to adopt sustainable practices according to (Alessio et al., 2014)
Community Engagement: A community is defined by an arrangement of responsibilities, activities and relationships (ABNT NBR ISO 37100:2017).	Creation of Green Corridors: Develop green corridors that connect parks, recreational areas and natural habitats, promoting biodiversity and improving air and water quality (Chiroli et al., 2023).	Digital transformation: Digital transformation is essential for sustainable development, emphasizing the integration of technologies, access to information and innovation in services (ABNT NBR ISO 37100:2017).	
Vulnerability Reduction: Minimize the risks and vulnerability of communities to natural disasters and climate change (ABNT NBR ISO 37100:2017).	Sustainable Waste Management: Implement waste management programs that prioritize reduction, reuse and recycling, in addition to promoting composting and the circular economy (Chiroli et al., 2023).		

Stakeholder Inclusion: Involving stakeholders in an appropriate and timely manner results in improved awareness and informed risk management (ABNT NBR ISO 31000:2018).	Continuous Improvement: Continuously monitoring and adapting the risk management framework to address external and internal changes is crucial for resilience (ABNT NBR ISO 31000:2018)		
Adaptation and Learning: Organizations must learn from past experiences and adapt their approaches, promoting innovation and resilience. (ABNT NBR ISO 31000:2018)	Contingency Plans: Percentage of contingency plans implemented and tested. (ABNT NBR ISO 31000:2018)		

After an analysis of the objectives raised and the adherence to the needs listed in the SWOT matrix that illustrated the current reality of the city, a refinement was made to better adhere to these objectives.

Table 6 - Strategic objectives most in line with the reality of the municipality of Apucarana

Perspective	Purpose and author
People	Foster pro-resilience community participation and engagement (Chiroli et al., 2023; ABNT NBR ISO 37100:2017; ABNT NBR ISO 31000:2018)
People	Establish partnerships between pro-resilience agencies, NGOs and civil society groups (Chiroli et al., 2023; Vendrametto et al., 2021)
People	Ensuring social equity (Fallmann and Emeis, 2020)
Education and Awareness	Promote water conservation practices (Chiroli et al., 2023)
Education and Awareness	Develop training programs for citizens and public managers on sustainability and resilience practices (Chiroli et al., 2023; Alessio et al., 2014)
Innovation and Technology	Encourage the adoption of green technologies (Chiroli et al., 2023)
Innovation and Technology	Promote the application of research on urban climate and sustainability in planning practices (Chiroli et al., 2023; Fallmann and Emeis, 2020; ABNT NBR ISO 37100:2017)
Public Policies and Urban Planning	Promote the development of Sustainable Master Plans, with proposals for green infrastructure and pollution control initiatives (Chiroli et al., 2023; Vendrametto et al., 2021)
Public Policies and Urban Planning	Implement waste management programs (Chiroli et al., 2023
Public Policies and Urban Planning	Continuously monitor and adapt the risk management framework to address external and internal changes (ABNT NBR ISO 31000:2018; Chiroli et al., 2023; Fallmann and Emeis, 2020)
Public Policies and Urban Planning	Develop a contingency plan for risks and disasters (ABNT NBR ISO 31000:2018)

Therefore, with the conclusion of the strategic objectives, perspectives, mission and values, it is possible to draw up a strategic map for the municipality of Apucarana, thinking about fulfilling the mission of "Increasing levels of urban resilience based on environmental sustainability".

It is concluded that the strategic map for the city of Apucarana with the objective of "Increasing levels of urban resilience based on environmental sustainability" can be composed of objectives, perspectives, values and mission. Thus, the design of the strategic map of Apucarana, although it can be conceived in different ways, considering this research, would be as shown in Figure 1.

Figure 1 – Suggestion of a strategic map for the municipality of Apucarana with the aim of increasing levels of urban resilience based on environmental sustainability.
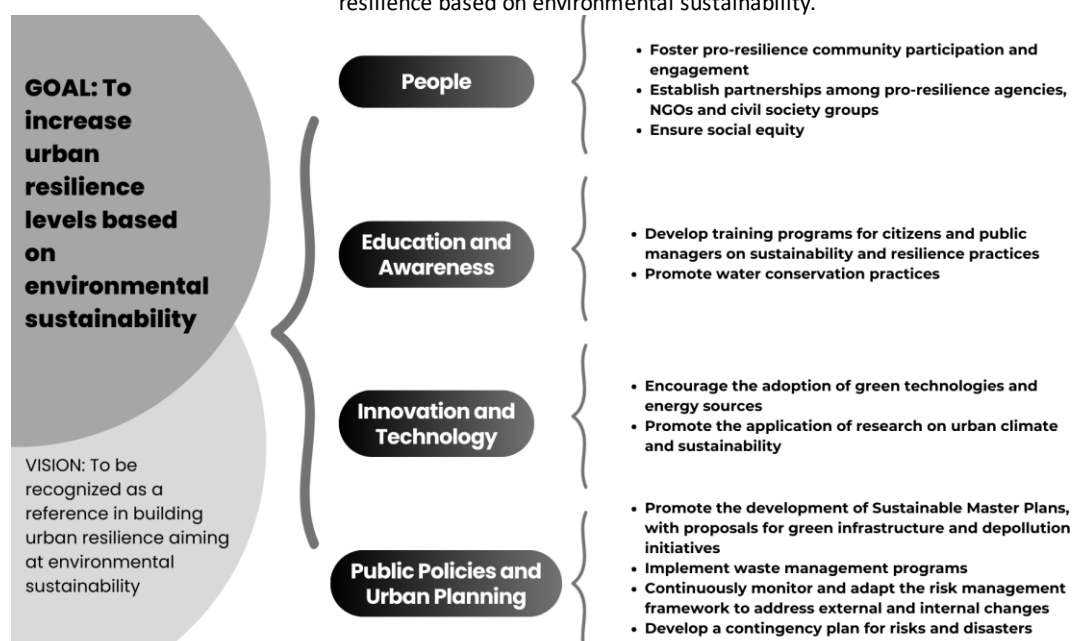
5 CONCLUSION/FINAL CONSIDERATIONS

This research was consolidated with the construction of a strategic map for the city of Apucarana with the objective of "Increasing the levels of urban resilience based on environmental sustainability", composed of the objectives, perspectives, values and mission related to the current urban reality. The Balanced Scorecard contributed methodologically to the construction of the strategic map, just as the literature review helped to understand the most important elements for building urban resilience with a focus on environmental sustainability.

Thus, it is expected that the map will contribute to the definition of strategic objectives of the public and private institutions participating in the initiative, especially those that do not yet have a mission and values clearly aligned with the construction of urban resilience. It is also expected that this map can serve as a basis for decision-making regarding the resilience of cities and urban centers. Although this study presents significant progress, public administration may face challenges related to policy integration, limited resources, and political resistance, factors

that should be carefully considered, with a focus on operational barriers and the role of leadership, in future studies.

It is worth highlighting that this research can be expanded by creating, implementing and monitoring results and performance indicators, allowing for continuous analysis of the effectiveness of the strategies outlined.

Building urban resilience in Apucarana involves combining risk mitigation strategies and innovation in the textile sector. The use of sustainable raw materials, efficient waste management and the implementation of sustainable development standards can significantly contribute to making the city more resilient, minimizing environmental and social impacts and ensuring a sustainable future for future generations.

REFERENCES

AGÊNCIA PARANÁ DE DESENVOLVIMENTO. **Programa Municipal de Atração de Investimentos (PMAI).** Curitiba: Letradê Comunicação e Design, 2019.

AINA, Y. A. et al. Digitalization and smartification of urban services to enhance urban resilience in the post-pandemic era: the case of the pilgrimage city of Makkah. **Smart Cities**, v. 6, n. 4, p. 1973–1995, 2023.

ALESSIO, M. A. et al. Algodão orgânico na produção sustentável. **ModaPalavra e-Periódico**, v. 7, n. 14, p. 136-150, 2014. Disponível em: https://www.revistas.udesc.br/index.php/modapalavra/article/view/5106/0. Acesso em: 08 jul. 2024.

APUCARANA. Portal Oficial de Apucarana. Disponível em: https://www.apucarana.pr.gov.br/site/. Acesso em: 30 ago. 2024.

ASADZADEH, A. et al. Capacitating urban governance and planning systems to drive transformative resilience. **Cities**, v. 136, p. 104260–104270, 2023.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. **ABNT NBR ISO 31000:2018 – Gestão de riscos – Diretrizes**. Rio de Janeiro: ABNT, 2018.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. **ABNT NBR ISO 37100:2017 – Desenvolvimento sustentável de comunidades – Vocabulário**. Rio de Janeiro: ABNT, 2017.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. **ABNT NBR ISO 37122:2020 – Desenvolvimento sustentável de comunidades – Indicadores para cidades inteligentes**. Rio de Janeiro: ABNT, 2020.

ATLAS BRASIL. **Atlas Brasil**. Disponível em: http://www.atlasbrasil.org.br/. Acesso em: 30 ago. 2024.

BECK, D.; MITKIEWICZ, J. A systematic literature review of citizen science in urban studies and regional urban planning: policy, practical, and research implications. **Urban Ecosystems**, v. 28, p. 85, 2025.

BERMEJO, A. D.; AJA, A. H.; FERNÁNDEZ, A. S. Resiliencia urbana: discurso e institucionalización de un concepto. **Ciudades**, n. 25, p. 1-18, 2022. Disponível em: https://revistas.uva.es/index.php/ciudades/article/view/5561. Acesso em: 08 jul. 2024.

BIANCHI, R. C.; ZACARIAS, G. M. Cidades resilientes: a importância do fortalecimento das comunidades. **Revista Ordem Pública e Defesa Social**, v. 9, n. 1, p. 247-259, jan./jun. 2016. Disponível em: https://rop.emnuvens.com.br/rop/article/view/123. Acesso em: 08 jul. 2024.

CHIROLI, D. M. G. et al. Resilience in urban areas: a systematic review based on ISO 37123. **International Journal of Disaster Risk Reduction**, v. 96, p. 103960, 2023.

DOMINGUES, T. N.; CHIROLI, D. M. G. Cidades resilientes: um modelo de ações inovadoras voltado a eventos hidrológicos. **Revista Gestão e Sustentabilidade Ambiental**, v. 11, n. esp., p. 104-123, jan. 2022. Disponível em: https://portaldeperiodicos.animaeducacao.com.br/index.php/gestao_ambiental/article/view/12391. Acesso em: 08 jul. 2024.

ESCRITÓRIO NACIONAL DE ADMINISTRAÇÃO PÚBLICA. **Gestão da Estratégia com o uso do BSC**. Apostila. Diretoria de Desenvolvimento Gerencial, Programa Gestão Estratégica. Revisão e Adaptação: ZIMMERMAN, F.; SILVA, A. L.; UCHÔA, C. E. Brasília, 2015. 76 p.

FALLMANN, J.; EMEIS, S. How to bring urban and global climate studies together with urban planning and architecture?. **Developments in the Built Environment**, v. 1, p. 100023, 2020. Disponível em: https://www.sciencedirect.com/science/article/pii/S2666165920300193. Acesso em: 08 jul. 2024.

FARIA, M. C. C. **Apucarana – Processo de Ocupação e Colonização**. **VII Congresso Internacional de História**, 2015. Disponível em: http://www.cih.uem.br/anais/2015/trabalhos/1430.pdf. Acesso em: 05 jun. 2024.

FÉLIX, R.; FÉLIX, P. P.; TIMÓTEO, R. Balanced Scorecard: adequação para a gestão estratégica nas organizações públicas. **Revista do Serviço Público**, v. 62, n. 1, p. 51-72, jan./mar. 2011. Disponível em: https://revista.enap.gov.br/index.php/RSP/article/view/61. Acesso em: 08 jul. 2024.

FOGARI, E. R. G. **Norte do Paraná: um estudo dos movimentos de ocupação histórica**. Maringá: UEM, 2007. 85 p.

GODOY, J. A. R.; BENINI, S. M. Resiliência urbana: políticas para enfrentar desastres naturais e mudanças climáticas. **Revista PPC – Políticas Públicas e Cidades**, v. 13, n. 1, p. 01-18, 2024. Disponível em: https://journalppc.com/RPPC/article/view/775/487. Acesso em: 08 jul. 2024.

HERZOG, C. P.; ROSA, L. Z. Infraestrutura Verde: Sustentabilidade e resiliência para a paisagem urbana. **Revista LABVERDE**, v. 1, p. 92-115, 2010. Disponível em: https://revistas.usp.br/revistalabverde/article/view/61281. Acesso em: 15 jul. 2024.

JIANG, W. et al. Can telecommunications infrastructure enhance urban resilience? Empirical evidence from a differences-in-differences approach in China. **Environment, Development and Sustainability**, v. 27, p. 2379–2410, 2025.

KAPLAN, R. S.; NORTON, D. P. **Balanced Scorecard, Mapas estratégicos, convertendo ativos intangíveis em resultados tangíveis**. 15. reimp. Rio de Janeiro: Elsevier, 1997.

KUMAR, R.; MEHANY, M. S. A standardized framework for quantitative assessment of social resilience and its improvement measures. **Socio-Economic Planning Sciences**, v. 84, p. 101275, 2022.

MACATULAD, E.; BILJECKI, F. Sendai digital twins for disaster risk management: A systematic literature review. **International Journal of Disaster Risk Reduction**, v. 102, p. 104310, 2023.

MENEZES, M. G.; CHIROLI, D. M. G. Cidades resilientes: uma revisão sistemática considerando os pilares de desenvolvimento sustentável. **XII Seminário de Extensão e Inovação; XXVII Seminário de Iniciação Científica e Tecnológica da UTFPR**, Santa Helena: UTFPR, 2022. Disponível em: https://www.even3.com.br/anais/seisicite2022/528810. Acesso em: 08 jul. 2024.

OLIVEIRA, W. N. M. de et al. O impacto da implantação dos Sistemas Urbanos de Drenagens Sustentáveis (SUDS) em um bairro central de uma cidade de grande porte de Minas Gerais. **Revista Nacional de Gerenciamento de Cidades**, v. 13, n. 88, 2025.

SANTOS, M. F. N. dos; ENOKIBARA, M.; FONTES, M. S. G. de C. Tendências de estudos em Infraestrutura Verde no Brasil. **Revista Nacional de Gerenciamento de Cidades**, v. 8, n. 67, p. 88–107, 2020.

SCHINTLER, L. A.; McNEELY, C. L. Artificial intelligence, institutions, and resilience: Prospects and provocations for cities. **Journal of Urban Management**, v. 11, p. 256–268, 2022.

SHACH-PINSLY, D.; GANOR, T. A new approach for assessing secure and vulnerable areas in central urban neighborhoods based on social-groups' analysis. **Sustainability**, v. 13, n. 3, p. 1174, 2021.

SHARIFI, A.; KHAVARIAN-GARMSIR, A. R.; KUMMITHA, R. K. R. Contributions of smart city solutions and technologies to resilience against the COVID-19 pandemic: a literature review. **Sustainability**, v. 13, n. 14, p. 1–28, 2021.

SILVA, A. S.; TAROUCO, F. F.; EDELWEISS, R. K. Cidades resilientes, sociedades regenerativas. **Revista Nacional de Gerenciamento de Cidades**, v. 6, n. 39, p. 1–12, 2018.

SUÁREZ, M. et al. A holistic index-based framework to assess urban resilience: Application to the Madrid Region, Spain. **Ecological Indicators**, v. 166, p. 112293, 2024.

VENDRAMETTO, L.; JACOBI, P.; GIATTI, L. Resiliência urbana em uma perspectiva sistêmica: o caso do Plano de Bairro do Jardim Pantanal. **arq.Urb**, v. 32, p. 82-93, 2021. Disponível em: https://revistaarqurb.com.br/arqurb/article/view/547. Acesso em: 08 jul. 2024.

YIN, Z. et al. Enhancing landslide hazard prevention: Mapping urban vulnerability considering the effects of human factors. **International Journal of Disaster Risk Reduction**, v. 91, art. 103905, 2024.

STATEMENTS

CONTRIBUTION OF EACH AUTHOR

• **Conception and Design of the Study:** Letícia do Nascimento Idalgo, who had the central idea of the study and helped define the objectives and methodology.

• **Data Curation:** Thallita Puzi Ferrassa, who organized and verified the data to ensure its quality.

• **Formal Analysis:** Dr. Daiane Maria de Genaro Chiroli, who performed the data analysis, applying specific methods.

• **Funding Acquisition:** Dr. Daiane Maria de Genaro Chiroli, who obtained the financial resources necessary for the study.

• **Research:** Letícia do Nascimento Idalgo, who conducted data collection or practical experiments.

• **Methodology:** Dr. Daiane Maria de Genaro Chiroli and Thallita Puzi Ferrassa, who developed and adjusted the methodologies applied in the study.

• **Writing - Initial Draft:** Letícia do Nascimento Idalgo, who wrote the first version of the manuscript.

• **Writing - Critical Review:** Thallita Puzi Ferrassa and Dr. Daiane Maria de Genaro Chiroli, who reviewed the text, improving clarity and coherence.

• **Review and Final Editing:** Dr. Daiane Maria de Genaro Chiroli, who reviewed and adjusted the manuscript to ensure it met the journal's standards.

• **Supervision:** Dr. Daiane Maria de Genaro Chiroli, who coordinated the work and ensured the overall quality of the study.

CONFLICT OF INTEREST STATEMENT

We, **Letícia do Nascimento Idalgo, Thallita Puzi Ferrassa, and Daiane Maria de Genaro Chiroli**, declare that the manuscript titled "**Strategic Map for Increasing Urban Resilience Potential: An Analysis Based on the Balanced ScoreCard of the Largest Textile Hub in Paraná**" is as follows:

1. **Financial Relationships**: We do not have/have financial relationships that could influence the results or interpretation of the work. (If applicable, specify here: "This work was supported by the Coordination for the Improvement of Higher Education Personnel – Brazil (CAPES) – Funding Code 001 and by the Araucária Foundation for the Support of Scientific and Technological Development of the State of Paraná – FA").
2. **Professional Relationships**: We do not have/have professional relationships that could impact the analysis, interpretation, or presentation of the results. No relevant professional relationships related to the content of this manuscript have been established.
3. **Personal Conflicts**: We do not have/have personal conflicts of interest related to the content of the manuscript. No personal conflicts related to the content have been identified.