Analysis of Local Perceptions on the Implementation of the Sustainable Development Goals (SDGs): A Research Study in a City in Northern Paraná

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Abstract. Over the last 60 years, the world's population has grown from approximately 2.5 billion to 7 billion people, according to the UN's World Urban Prospects Report (2014) it is projected to reach 10 billion by 2050. This paper explores the practical application of Sustainable Development Goal 11 (SDG 11) in a city in northern Paraná, Brazil. Employing a research study methodology, in-depth interviews were conducted with specialists in the field using questions structured around the specific objectives of SDG 11. The aim was to investigate the alignment of a city in Northern Paraná with the United Nations Sustainable Development Goal (SDG) 11, which focuses on making cities and human settlements inclusive, safe, resilient, and sustainable. The findings reveal that the city exhibits a commendable alignment with the objectives of SDG 11. However, the study identifies areas for improvement, offering insights into potential changes that could lead to a more comprehensive conformity to the targets outlined in SDG 11. This research not only contributes to local sustainability but also holds significant potential for replication within the same city for other SDGs or across various municipalities, serving as a valuable research framework.

Keywords: Smart cities, SDG's, Sustainable cities, SDG 11.

1 Introduction

The current global population, standing at 6.5 billion, is expected to grow to 9 billion according to projections from the United Nations. It could potentially reach 11 billion by the year 2050 (PIMENTEL & PIMENTEL, 2006). The term "Sustainable City" emerged in the mid-1990s, shortly after the first sustainability concepts were introduced.

This paper explored the dynamic intersection between Sustainable Cities, Smart Cities, and the 11th SDG. In this way, the main objective of this paper is to investigate the alignment of a city in Northern Paraná with the United Nations

Sustainable Development Goal (SDG) 11, which focuses on making cities and human settlements inclusive, safe, resilient, and sustainable.

SDG 11 focuses on improving cities and communities to promote inclusion, security, and sustainability. It is essential to implement a global urban development policy with ecological, economic, and social considerations. Its main goal is to ensure adequate housing, with an indicator to evaluate the population's access to housing. Therefore, it is important for its existence to think about government programs and planning that ensure the availability of adequate housing for all classes and people. SDG 11 promotes global agreements, aiming to transform the creation of cities into inclusive, safe, and sustainable environments (BAZZOLI & DA SILVA, 2021).

Municipal environmental management, as provided for in the Federal Constitution (Brazil, 1988) and the National Environmental Policy (Law 9.638/1981), is of great importance for the sustainability of sustainable urbanization and the fulfillment of the SDGs (OLIVEIRA *et al*., 2023). As a justification, the city where the investigation occurred is considered one of the best cities to live in northern Paraná, making the research application feasible, as there are already relevant niches on the subject for in-depth exploration in the article.

The research question was defined as follows: "How is the city currently aligning with the indicators of SDG 11 in terms of inclusivity, safety, resilience, and sustainability, as perceived by environmental specialists?"

With rapid urbanization and the pursuit of an improved quality of life, cities have faced unique challenges and opportunities. In response to these complexities, the Smart Cities paradigm has emerged as a promise of efficiency, connectivity, and improved citizens' quality of life. However, the true measure of success towards sustainable cities goes beyond the technological aspect, embracing the 11th SDG – Sustainable Cities and Communities, established by the United Nations as a compass for global sustainability (UNITED NATION BRAZIL, 2015).

2 Theoretical Background

2.1 Sustainable Development Goals (SDG)

To enable population growth more sustainably and ensure that the government guarantees the quality of life for its citizens, the United Nations (UN) created the 2030 Agenda in 2015. These objectives are known as the Sustainable Development Goals (SDGs) (UNITED NATION BRAZIL, 2015). Their primary intent is to achieve a higher quality of life and equitable development among populations.

Within the 2030 Agenda, the term sustainability pertains to environmental public policies but also encompasses responsible production and consumption of resources. It addresses issues such as reducing inequality, ensuring safe employment, eradicating poverty and hunger, and providing quality education (BLASI; GANZAROLI & DE NONI, 2022).

In Brazil, the government established governance to implement the Sustainable Development Goals (SDGs) through Decree No. 8,892, issued on October 27, 2016. One year after its creation, in October 2017, the National Commission for the SDGs (CNODS) published its 2017-2019 Action Plan. This plan included the adaptation of the 169 SDG targets and their global indicators to the Brazilian reality as part of the Brazil's 2030 Agenda strategy. To achieve this, the Institute of Applied Economic Research (Ipea) was tasked with nationalizing the goals, while the Brazilian Institute of Geography and Statistics (IBGE) was responsible for adjusting the indicators. Both institutions were designated as permanent advisory bodies for CNODS within its governance structure (ROMA, 2019).

Specifically, in SDG 11, according to the United Nations (2015), the objective is to "Make cities and human settlements inclusive, safe, resilient, and sustainable." To achieve SDG 11, efforts must focus on strengthening urban development planning capacities, improving access to public transportation, and enhancing waste management.

2.2 Sustainable Cities and Smart Cities

The term sustainable development has become a standard reference for economic growth, social equity, and environmental protection. Over the past three decades, numerous studies on the subject have emerged, along with many sustainability challenges. Based on the conclusions on the subject, it is indicated that sustainable development is a complex and evolving process that cannot be considered finite or immutable (WĄTRÓBSKI *et al*., 2022).

Silva *et al*. (2021) highlight that Brazilian cities face several challenges in achieving sustainability, with mobility and accessibility problems being particularly serious. They argue that the development and adaptation of these cities depend on the active participation of the population, as they both cause and experience the impacts resulting from the lack of sustainability.

The expression "Sustainable City" emerged in the mid-90s from critiques of life quality, development patterns, consumption, waste, pollution, and socioeconomic imbalance (GASPARELO; STEFANI & SCHMIDT, 2022). To achieve social balance in cities, the United Nations – UN has promoted one of the Sustainable Development Goals (SDGs) specifically for cities, known as "Sustainable Cities and Communities" (SDG 11), responsible for the implementation of sustainable policies in cities. This goal requires well-executed assessments and integrated management for its incorporation into the economy, society, and the environment (KUSAKCI *et al*., 2022).

The United Nations (2015) defines Sustainable Development Goal (SDG) number 11 of the 2030 Agenda, which aims to make human settlements inclusive, safe, resilient, and sustainable, with a special focus on the most vulnerable populations (UN,

2015). This objective is divided into 10 specific targets to promote sustainability and inclusion in cities.

Although there are several indicators to measure the performance of sustainable cities, they are not always universally applicable to all municipalities. Therefore, many cities are developing their own sustainability indicators to assess issues related to quality of life more precisely (CHIESURA, 2004).

To face the different pathologies of contemporary cities, a lot of new urban models, like the Smart City model, were developed and the term is not unwell defined, but can assume different meanings (TRANOS & GERTNER, 2012). Since the 90s the concept of Smart Cities has been evolving: initially, the focus was on digital and technological aspects and ICT represented the foundation of urban intelligence. Coming after, human capital played an important role in urban development, because being smart was a synonym of being "socially inclusive" (MATTONI; GUGLIERMETTI & BISEGNA, 2015).

3 Methodology

In this section, the methodological approach employed to investigate the city's alignment with the United Nations Sustainable Development Goal (SDG) 11, aimed at fostering inclusive, safe, resilient, and sustainable cities, is outlined. In-depth interviews with three environmental specialists were chosen as the primary method of data collection. This choice was grounded in the need to gather detailed and specialized insights into the perceptions and experiences of these specialists regarding SDG 11 indicators in Maringá. This section delineates the methodological approach, explaining the rationale behind the selection of in-depth interviews and detailing the participant selection process, interview conduct, and data analysis.

To prepare the questions, an assessment of the city's environmental data was conducted, with the 11th Sustainable Development Goal (SDG) serving as the starting point, focusing specifically on sustainable cities and communities. After collecting data about the city, a list of ten questions was developed by the authors, each addressing a specific aspect of SDG 11. Prior to answering, the questions underwent review by three other sustainability experts.

With the questions prepared and revised, interviews were conducted with the specialists responsible for implementing environmental actions in the municipality, aiming to obtain answers to the proposed questions. The methodology is depicted in Figure 1.

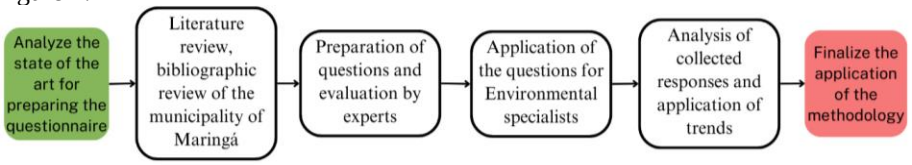

Fig.1. Application of Methodology.

This article is exploratory in nature, aiming to familiarize readers with the themes of the 11th Sustainable Development Goal (SDG). Additionally, it was a cross-sectional study, with data collected at a single moment for analysis. The questions were answered by a group of three people, specialists in urban development, from the municipality of Maringá. The sample chosen to participate in the interviews was characterized as non-probabilistic and selected for convenience, as the participants were available and knowledgeable about the proposed subject.

The survey was conducted in the city of Maringá, a metropolitan area located in northern Paraná. The city has a territorial area of approximately 487 km², a population of around 400,000 inhabitants, a population density of 841 people/km², a youth educational enrollment rate of 98.4%, a Human Development Index (HDI) of 0.808, low infant mortality with 7.29 deaths per 1000 births, and a per capita GDP of R$46,507.74 (IBGE, 2022).

Regarding the city's environment, it has 83% of households with ideal sanitary sewage systems, 97.3% of households located on tree-lined public streets, and 90.6% of households located on urbanized public streets, meaning they have drainage systems, sidewalks, pavement, and curbs. Maringá holds the 21st position as the greenest city out of 399 municipalities in Paraná and the 806th position out of 5,570 when compared to cities across Brazil (IBGE, 2022).

3.1 In-depth Interview Questions

The questions developed for the interview based on the 11th SDG are listed below.

11.1. Question: How does the city of Maringá understand itself as the nucleus of its metropolitan region in light of policies on access to housing and basic services in municipalities bordering its territory? How does the city hall contribute to the population's access to housing and basic sanitation safely and at an affordable price? (Sarandi, Paiçandu and Marialva).

11.2 Question: How does the city government position itself regarding the current monopoly on public transport in the city? In addition to the TCCC, does the municipality of Maringá have any projects to serve the population in terms of public transport? Is there any plan on the part of the municipality to encourage the implementation of new modes of public transport in the city, on an urban and metropolitan scale? (BRTs, VLTs, Train) What actions guarantee safe, accessible and sustainable public transport, especially for populations in vulnerable situations (women, children, people with disabilities and the elderly)?

11.3 Question: What policies to encourage social housing does the city hall envisage in the municipality's master plan? What are the municipal government's plans for the acquisition of new homes through the "my house my life" assistance project, COHAB, or another project? That guarantees affordable, safe and sustainable housing for people in vulnerable situations? Is there a zoning provision for ZEIS (Special Zone of Social Interest) in central regions of the city?

11.4 Question: How and with what tools does the city hall plan to promote local culture both in the calendar of events and in notices promoted by the city's secretary of culture? Is there anybody that manages Maringá's cultural heritage? What instruments does the environment department use to preserve natural heritage?

11.5 Question: Given the problem with falling trees during storms in the city, what prevention measures has the municipality of Maringá taken or intends to take? For damage reduction, is there a post-disaster action plan? Is there assistance for people in vulnerable situations? Is there any afforestation and tree management plan in the municipality? If so, how is it managed?

11.6 Question: Are there sustainable selective collection measures in the municipality? Does the city hall offer support to people in vulnerable situations to install the sewage system? In addition to the afforestation project (is the project in operation? In which instance?) is there any other project that is concerned with air quality, related to per capita gas emissions? How does the city government inspect and monitor the municipality's industrial and commercial hub? Is there any municipal legislation that provides legal punishment for environmental problems caused by private initiatives?

11.7 Question: What actions ensure that the municipality's public spaces are safe, accessible, green and especially inclusive for women, children, the elderly and people with disabilities? Are there projects to build more public places with the same purpose? Is there any urban policy that manages the study and implementation of new public spaces in the city? Does the city hall believe that the current distribution of public spaces meets the demographic density and socioeconomic conditions of neighborhoods far from the central region?

11. a Question: Is there an integration project between urban, peri-urban and rural areas of the city of Maringá? How does the city hall manage the city's urban expansion? How does zoning foresee these changes in urban and rural territories? What are the municipal policies regarding the provision of urban equipment and infrastructure in its territory as a whole?

11. b Question: How does the city of Maringá see itself as a catalyst for a metropolitan region? What are your commitments to your neighboring municipalities regarding the long-term sustainable and inclusive development of your metropolitan region? Is there monitoring of the age of the city's trees, seeking to know the highest risk areas and with the aim of preventing future disasters?

11. c Question: Does the municipality envisage any project or program to support countries, regions and cities in conditions of socioeconomic vulnerability? Is there a partnership project for technical and financial assistance in less developed municipalities in the Maringá region, aimed at the sustainability and resilience of cities?

The interviews with the three environmental specialists took place individually, with an average duration of one and a half hours each. The interviews were recorded with the participants' consent and conducted by the authors.

After the interviews were conducted, they were transcribed to facilitate content visualization. Following transcription, a qualitative analysis of the question responses was carried out during periodic meetings held by the authors. The responses were tabulated and cross-compared to reach a synthesis of the three lines of thought of the environmental specialists, present in Topic 4.

4 Results and Discussion

Analyzing the specialists' responses, similarities and differences were noted in areas such as transportation, housing, cultural promotion, environmental conservation, waste management, and disaster prevention.

Addressing Target 11.1, specialists recognized the need for a comprehensive urban development plan. Specialist 1 emphasized Sarandi's role in mobility, Specialist 2 highlighted Maringá's Housing Department initiatives, and Specialist 3 emphasized the municipality's role in social agglomeration. Streamlining sanitation access in older areas and reducing waiting times for subsidized housing were noted concerns, addressing residents' financial burdens.

Regarding Target 11.2, unanimity existed in acknowledging Maringá's prioritization of transportation. Specialist 1 detailed specific measures like Wi-Fi and air conditioning, while Specialist 2 brought attention to transportation vouchers for various groups. Specialist 3 hinted at potential public tenders for competition in public transportation. Concerns were raised about the transportation system's monopoly by a private company, emphasizing the importance of reevaluating the contractual framework for improved service quality and competition. Additionally, there is a call to exert pressure on the state governor to operationalize city railway lines.

For Target 11.3, collaboration in urban development plans was emphasized by all specialists. Specialist 1 provided insights into ongoing master plan revisions. Specialist 2 focused on challenges in constructing new residences in the central area, and Specialist 3 reiterated the municipality's role. Proposed improvements aim to expedite waiting lists and provide temporary accommodations for those in need, emphasizing a housing construction plan and dignified living conditions for vulnerable populations.

In Target 11.4, all specialists recognized the city's cultural initiatives. Specialist 1 emphasized extensive research, Specialist 2 highlighted cultural events like the Maringá International Literary Festival, and Specialist 3 mentioned support for various cultural events. Suggestions include enhancing the promotion of cultural projects, ensuring transparency in funding allocation, and revitalizing cultural spaces.

Concerning Target 11.5, unanimous recognition was given to Maringá's urban afforestation plan. Specialist 1 provided detailed information on tree identification, while Specialist 2 focused on recent storm-related challenges. Specialist 3 highlighted the city's afforestation master plan. Suggestions include clarifying the compensation

process for property damage during severe weather and addressing gaps in responding to fallen trees.

In addressing Target 11.6, all specialists acknowledged the success of Maringá's waste management initiatives. Specialist 1 emphasized international partnerships. Specialist 2 focused on the city's extensive sewage network, and Specialist 3 mentioned social assistance programs. Proposed improvements include refining support structures for vulnerable populations and enhancing the dissemination of online maps to increase public awareness.

Regarding Target 11.7, unanimity existed in recognizing Maringá's master plan priorities. Specialist 1 highlighted successful projects related to squares and sports facilities. Specialist 2 emphasized successful projects in revitalizing squares and public spaces for children, and Specialist 3 provided insights into the city's recognition as a primary urban settlement. Suggestions include increased community involvement, measurable goals, and regular progress tracking.

For Target 11.a, specialists unanimously discussed integration projects, zoning laws, community gardens, and clear perimeter distances. Specialist 1 focused on preventing conflicts related to pesticide use, and Specialist 2 discussed the successful operation of the zoning law. There is an underscored need for educational programs and strategic partnerships to enhance awareness.

In addressing Target 11.b, all specialists recognized partnerships and technical committees for disaster prevention. Specialist 1 highlighted preventive measures broadly, Specialist 2 discussed the tree monitoring team at IAM, and Specialist 3 provided insights into Maringá's role in managing the metropolitan region. Suggestions include community training programs and collaboration with environmental agencies.

Concerning Target 11.c, all specialists acknowledged partnerships with other countries and support for less privileged municipalities. Specialist 1 emphasized Maringá's goal-oriented plan for partnerships, Specialist 2 discussed Maringá's leading role during the pandemic, and Specialist 3 provided insights into special international partnerships. Suggestions include knowledge exchange platforms and fostering a culture of appreciation for collaborative initiatives.

5 Final Remarks

The primary goal of this paper was to investigate the alignment of a city in Northern Paraná with the United Nations Sustainable Development Goal (SDG) 11, which focuses on making cities and human settlements inclusive, safe, resilient, and sustainable.

The in-depth interviews aimed to derive potential insights and directions. It was possible to observe that there is evidence in this study that the city of Maringá is a municipality that can be considered an example for the surrounding cities. Through in-depth research, specialists in the field were able to provide insights and answers for environmental improvements that the municipality can undertake.

Regarding the research question, to determine how the city is currently aligning with the indicators of SDG 11 in terms of inclusivity, safety, resilience, and sustainability, as perceived by environmental specialists, it was understood that Maringá is making significant progress towards alignment with these indicators in the municipality. As mentioned earlier, efforts should focus on strengthening urban development planning capacities, improving access to public transportation, and enhancing waste management. However, some factors still require improvement, such as access to housing for people in vulnerable situations.

Based on the obtained responses, it was possible to conclude that the city has almost full coverage of basic sanitation. We have highlighted some proposals for the municipality to provide greater subsidies for underprivileged individuals who still lack access. Regarding public transportation, there is an agreement with a private company that provides services for 20 years. However, the municipality is making efforts to enhance cycling lanes and potentially introduce railway transportation options.

In terms of housing for the underprivileged, the city has several projects aimed at forming partnerships with private companies and the municipality itself to reduce the waiting list of homeless individuals to nearly zero. In the realm of cultural promotion, Maringá is a strong hub. However, we have noted that there is a need for increased transparency regarding expenditures. Despite some issues related to older trees in the city, responses from specialists indicate that the municipality has already taken action in response to tree falls.

In summary, Maringá is a city at the forefront of environmental responsibility, boasting a robust waste management system and a commitment to climate action. Collaborative initiatives, such as "Cooking Oil Zero" and strategic partnerships, underscore the city's dedication to sustainability. While addressing gaps in sewage systems and industrial compliance, there's a need to enhance support for vulnerable populations in waste management.

Maringá is excelling in meeting the targets of the 11th SDG, with potential for even greater compliance through proposed enhancements. By fully embracing the 11th SDG, the city can further its transformation into an inclusive, safe, resilient, and sustainable environment.

It is worth noting that the in-depth research methodology was suitable for implementing the interviews, as it provided detailed answers to each question and addressed various doubts of the authors regarding the implementation of the 11th SDG goals in the municipality.

Despite encountering difficulties, some members of the municipal administration resisted responding to the questions, primarily due to time constraints and, in some cases, a lack of interest in promoting science. However, the specialists who participated in the survey were highly cooperative and made significant scientific and professional contributions to the development of the article.

In conclusion, given that sustainability is a topic that should always be under study, this work can serve as a model for future scenarios. Other authors may replicate it to apply the goals of different SDGs in the municipality of Maringá or to conduct similar assessments of SDG 11 in other municipalities, both within Brazil and abroad.

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