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Smart and Sustenaible Cities: A Perspective for the city of Sorriso in Mato Grosso State

Rosana Lia Ravache
Professora Doutora, UNIVAG Brasil
rosana@univag.edu.br

Priscilla Tábida Silva Enoré
Mestranda de Arquitetura e Urbanismo do UNIVAG, Brasil
prienore0@gmail.com

Pedro Nessi Snizek Junior
Professor Doutor, UNIVAG, Brasil
pedro.nessi@univag.edu.br

Angelo Palmisano
Professor Doutor, UNIVAG, Brasil
angelo.palmisano@univag.edu.br

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Cidades Inteligentes e Sustentáveis: uma perspectiva para a cidade de Sorriso no estado de Mato Grosso

RESUMO

Com o crescimento da população urbana, paralelo ao aumento da urbanização dos núcleos urbanos surgem os desafios para os quais precisam ser encontradas soluções inteligentes e sustentáveis. É usando a tecnologia como aliada no cuidado com o meio ambiente, que se alcançará um desenvolvimento urbano e consciente. Lamentavelmente, o modelo imposto às cidades, não prioriza questões essenciais para o desenvolvimento humano como infraestrutura urbana focada em pessoas e meio ambiente. A justificativa para esta pesquisa, está nas novas tecnologias, fortes aliadas das equações voltadas para o desenvolvimento urbano e questões de infraestrutura que visam o conforto social e ambiental das cidades, objetivando analisar, dentro do contexto da cidade de Sorriso, os caminhos para uma cidade inteligente e sustentável, com enfoque na mobilidade urbana, tendo em vista o elevado número de acidentes de trânsito ocorridos no núcleo urbano. Para atender a este fim, a metodologia de pesquisa utilizou a coleta de dados em campo, material documental e bibliográfico baseado em autores que abordam o tema cidades inteligentes e sustentáveis e pudessem ser relacionados com a cidade de Sorriso que tem em perspectiva tornar-se uma cidade inteligente e sustentável.

PALAVRAS-CHAVE: Desenvolvimento urbano; mobilidade urbana; tecnologia

Smart and Sustenaible Cities: A Perspective for the city of Sorriso in Mato Grosso State

ABSTRACT

With the growth of the urban population, parallel to the increase in the urbanization of urban centers, challenges arise for which intelligent and sustainable solutions need to be found. It is by using technology as an ally in caring for the environment that conscious urban development will be achieved. Unfortunately, the model imposed on cities does not prioritize issues essential to human development, such as urban infrastructure focused on people and the environment. The justification for this research lies in new technologies, strong allies of equations aimed at urban development and infrastructure issues aimed at the social and environmental comfort of cities, aiming to analyze, within the context of the city of Sorriso, the paths to a city smart and sustainable, with a focus on urban mobility, given the high number of traffic accidents occurring in the urban core. To meet this end, the research methodology used field data collection, documentary and bibliographic material based on authors who address the theme of smart and sustainable cities and could be related to the city of Sorriso, which aims to become a smart and sustainable city.

Keywords: Urban Development; Urban Mobility; technology

Ciudades Inteligentes y Sostenibles: una perspectiva para la ciudad de Sorriso en el estado de Mato Grosso

RESUMEN

Con el crecimiento de la población urbana, paralelo al aumento de la urbanización de los centros urbanos, surgen desafíos para los que es necesario encontrar soluciones inteligentes y sostenibles. Es utilizando la tecnología como aliada en el cuidado del medio ambiente como se logrará un desarrollo urbano consciente. Lamentablemente, el modelo impuesto a las ciudades no prioriza cuestiones esenciales para el desarrollo humano, como la infraestructura urbana centrada en las personas y el medio ambiente. La justificación de esta investigación radica en las nuevas tecnologías, fuertes aliadas de las ecuaciones dirigidas al desarrollo urbano y a las cuestiones de infraestructura orientadas al confort social y ambiental de las ciudades, con el objetivo de analizar, en el contexto de la ciudad de Sorriso, los caminos hacia una ciudad inteligente. y sostenible, con foco en la movilidad urbana, dado el elevado número de accidentes de tráfico que se producen en el núcleo urbano. Para cumplir con este fin, la metodología de investigación utilizó la recolección de datos de campo, material documental y bibliográfico basado en autores que abordan el tema de ciudades inteligentes y sustentables y que podrían tener relación con la ciudad de Sorriso, que aspira a convertirse en una ciudad inteligente y sustentable.

PALABRAS LLAVE: Desarrollo Urbano; Mobilidad Urbana; Tecnologia

GC Revista Nacional de Gerenciamento de Cidades
National Journal of City Management

ISSN 2318-8472, v. 12, n. 87, 2024

INTRODUCTION

Population growth generates numerous impacts on urban development, including the flow of cars on the streets, which has gradually increased, generating congestion and traffic accidents. In addition to these problems, there are those that affect the environment, due to the emission of polluting gases into the atmosphere, emitted by vehicles.

Hence the importance of searching for solutions that minimize these and other impacts, so that a city can transform into a smart and sustainable city.

According to the Urbanization article published by the Mundo Educação website (2024),

> Worldwide, urbanization gained strength with the Industrial Revolution of the 18th century, which took place in England. Over time, the phenomenon began to occur in countries today considered to have developed in a slow and orderly manner. In emerging countries, on the other hand, urbanization intensified from the second half of the 20th century, and occurred quickly and in a disorderly manner.

Human beings' ways of thinking have been and continue to be changed through the transformations the world has undergone. Today, society's demands are different and new alternatives need to be created to meet new demands.

Initially, the concept of a smart city was known as a digital city; later it gained a new nomenclature, privileging technology and, at the same time, generated social inclusion and globalization, contributing as a tool for the creation of more humanized environments.

Thus, smart cities, previously known as digital cities, are those that use infrastructure, services, information and communication strategies with necessary urban planning and management, responding to the social and economic needs of society (https://online.pucrs.br/ blog /smart-cities)

The topic is quite broad and multidisciplinary. "The biggest part of a smart cities project is not about technology, but about how technology disappears, invisible in this new urban environment," comments Carlo Ratti, director of MIT's City Lab, comparing the digital transformation now to the arrival of electricity that has occurred. a century ago.

Together, technology and sustainability must accompany smart city projects, considering that both are very important to achieve more efficiency in the development of cities.

According to Ahvenniemi et al. (2017), sustainable cities value the development of urban areas, seeking a balance between environmental protection and equity in income, employment, infrastructure, housing, transport in urban areas, among others.

The perception of the entire concept of a sustainable city seeks to cover different dimensions of an urban environment, following the different characteristics of each city, has served as motivation for public administrations to add other urban adjectives with the aim of dealing with certain segments of the city, both with the intention of attracting investments, such as developing spaces, which act as differentiators in terms of competitiveness and as justification for the implementation of public policies aligned with the project, this being the case of Smart Cities, intelligent cities (SANTOS et al. 2022).

GC Revista Nacional de Gerenciamento de Cidades
National Journal of City Management

ISSN 2318-8472, v. 12, n. 87, 2024

Among the differences that cover the different dimensions of an urban environment, municipal public policies need to develop means of conserving the urban environment and quality of life for the population.

OBJECTIVES

Thus, this article aims to analyze the concept of Smart and Sustainable City and the way it can be applied in the city of Sorriso-MT, keeping in focus the issue of urban traffic and the way in which it will be possible to intervene in the construction of a mobility project urban area that fits this concept.

The proposal, therefore, is to articulate a study that, based on the evaluation of the city by the report of the (IDSC) Sustainable Development Indexes for Cities 2024, where it is placed in 2191st place, among 5570 municipalities, with a score of 48.56 where the maximum score is 100.

By focusing on the issue of urban mobility, the traffic flow in the central area of the city was observed, based on the master plan and urban planning put into practice, to understand how to integrate digital technologies into a system that can mitigate issues related to problems of urban mobility aiming to achieve the ideal parameters required for a city to be considered Smart and Sustainable.

Methodology

Through observational analysis along the city's main avenues, the flow of traffic was observed in the morning and afternoon, on the Avenues: Blumenau, Tancredo Neves, Natalino João Brescansin, Curitiba, Porto Alegre, Brasil and Perimetral Sudoeste (Figure 1)

Figure 1: Avenues of study analysis

Source: Google Earth, edited by author, 2024

GC Revista Nacional de Gerenciamento de Cidades
National Journal of City Management

ISSN 2318-8472, v. 12, n. 87, 2024

The intersections of the main avenues (figure 2) were also observed to better understand the traffic flow and analyze the surroundings, assuming the presence of instruments that can assist in traffic safety, such as cameras, signs, traffic lights, among others.

The analyzes carried out on the avenues of the city of Sorriso are presented through photographs of the avenues created and edited with support from the Google Earth website, so that the analyzed avenues and their intersections can be highlighted.

Figure 2: Crossing of avenues

Source: Google Earth, edited by author, 2024

In addition to the analysis carried out on the avenues and bibliographical research, a technical visit was made to the Public Security Secretariat of Sorriso-SEMSEP, to obtain more information regarding traffic safety, accidents that occurred between 2017 and 2023 and what has been done to improving traffic safety.

METHOD AND ANALYSIS

Smart and Sustainable Cities

Cities have experienced enormous growth thanks to migration in recent years and the geography of migration flows is changing, as new destinations emerge around the world.

The most important consequences of increased migration typically reflect an increase in the number of people working in the informal market, an increase in urban pollution, health problems resulting from a lack of sanitation, in addition to a growing number of informal homes or in risky locations. (favelization) which, due to the lack of a broader

ISSN 2318-8472, v. 12, n. 87, 2024

support network for these populations, ends up creating a social problem that is difficult to solve.

According to Figueiredo (2016), in 2014 approximately 54% of the world's population began to live in cities. These numbers are expected to grow over the years.

The number of cars in the world is expected to increase and, which is already clear today, it will have an even greater impact on both air pollution and the economy. “It was within the sustainability problem that the idea of a “smart city” urban model emerged as a proposed solution (FIGUEIREDO, 2016, p. 3).

Cury and Marques (2017) state that, to build a smart city, it is necessary to achieve a harmonious relationship with the environment, using and reusing local and regional environmental resources in a rational way, so that it is beneficial to the population. This can be achieved, for example, through a rearrangement of the use of energy, water and space.

The term smart city, according to Cury and Marques (2017), arises from contemporary geographic approaches to urban development, through policies that recommend transformations in the territory, encouraging citizen participation and the use of various types of intelligence such as: artificial through the use of information and communication technologies-TICS. Furthermore, the search for solutions that make human life more sustainable in this environment where constant changes occur is yet another reason for the emergence of smart and sustainable cities.

With the adaptation of software, methods and integrated data organizers that have enabled the development and application capable of collecting, storing and processing georeferenced data, it has been possible to better manage information and evolve decision-making processes in the areas of transportation , environmental protection, municipal, state and federal planning.

In general, the smart cities model adopts ICT as drivers of the governance structure to improve the provision of services and value human capital. Critics analyze this branding as a model that mostly values technology in relation to human capital, however the literature presents diverse schools that sometimes defend technology as the center of urban development (restrictive and reflective schools), and sometimes center the human as the basis for development (rationalist school) (SANTOS et al., 2022, p.15).

Information and communication technologies include: cloud computing, wireless sensor networks, smart electrical grids, geographic information systems and mobile devices; These are already being used in the context of smart cities and can be used to generate even more elaborate and integrated solutions, to provide mechanisms that help in monitoring the city and making decisions (GAMA et al. 2012, p. 3).

For Bouskela (2016), these sets of digital resources, as well as broadband communication, cloud computing, smart devices and analysis programs and sensors, can capture data generated by people or devices, and process them to generate information that will be used to support decision-making, or provide a better quality of life for citizens.

Thus, for him, a Smart City has four important focuses: sustainability, as it uses digital technology to reduce costs and optimize the consumption of resources so that the current administration does not compromise their use by future generations; the transparency of inclusion, as it uses direct communication channels with citizens, as well as operating with

ISSN 2318-8472, v. 12, n. 87, 2024

open data; the generation of wealth, as it aims to offer adequate infrastructure to generate jobs that result in high quality, innovation, competitiveness and business growth; Smart Cities made for citizens, operated with digital technology to improve quality of life and quick access to efficient public services. “A transformative Smart City project begins with a detailed study of problems considered priorities and that affect the greatest number of people” (BOUSKELA, 2016, p.49).

Therefore, the concept of Smart City, in the opinion of Bouskela (2016), is based on the premise that technology is an indispensable factor for cities to undergo the desirable transformations to meet the expectations and needs of the population, considering that this concept has really played a fundamental role in the process of making urban centers more efficient, with increasingly participatory processes.

Still according to Bouskela (2016), in addition to technology, one should not think about smart cities without taking into account some aspects, such as the urban, social and environmental aspects of urban centers. Therefore, for a city to be considered smart, aspects related to improving governance, planning and infrastructure must be incorporated and pay attention to how this can reflect on human and social capital.

After this approach to the use of technology in the development of cities, we will then discuss the meaning of the SDGs, sustainable development objectives, focusing on those that emphasize urban mobility and how the municipality of Sorriso is in the city development index.

The SDGs and the Sustainable Development Index in Sorriso

The SDGs are the Sustainable Development Goals (figure 3), a global agenda established during the United Nations Summit on Sustainable Development in September 2015. This agenda is made up of 17 objectives and 169 targets to be achieved by the year 2030 (SDG STRATEGY).

Figura 3: Símbols SDGs

Source: https://www.estrategiaods.org.br/conheca-os-ods/. Acesso em: 11/04/2024

The themes of the objectives can be divided into four main dimensions: social, which is related to human needs, health, education, improving quality of life and justice; environmental, which aims to address the conservation of the environment through actions, from solutions against deforestation, protection of forests, sustainable use of the oceans, effective measures against climate change; economic, which deals with the use and depletion

ISSN 2318-8472, v. 12, n. 87, 2024

of natural resources, waste production, energy consumption; institutional, which applies to the capabilities to put the SDGs into practice (SDG STRATEGY).

Based on the Sustainable Cities Development Index (2024), it is possible to state that the municipality of Sorriso appears with a very low overall score (at a Brazilian level), that is, 49.06 out of 100 and in the general classification, 1,860 out of 5,570.

Despite the low index, some objectives are classified as very high, such as: objective 6, drinkingwater and sanitation and objective 7, renewable and accessible energy, but 6 of them are classified as very low and 2 as low (figure 4).

Figure 4: Sustainable development index of the city of Sorriso

Level of development Sustainable | Very high - 80 to 100 | High – 60 to 79.99 | Medium – 50 to 59.99 | Low – $0 to 49.99 | Very Low – to 39.99

Source: https://idsc.cidadessustentaveis.org.br

With regard to urban mobility and more strictly the issue of traffic, SDG number 9 - Industry, innovation and infrastructure, in target 9.1 says: “Improve the country's road system, with a focus on sustainability and safety in traffic and transport, equalizing regional inequalities, promoting regional and cross-border integration [...] (SUSTAINABLE DEVELOPMENT GOALS, 2019). In this regard, the Smile index is classified as very low (INDICE OF SUSTAINABLE DEVELOPMENT OF CITIES, 2024).

Location, geographic data and history of the city of Sorriso

The Municipality of Sorriso is located in the central region of Mato Grosso (figure 5) on the banks of BR-163, approximately 398.0 km away from the capital of the State of Cuiabá (Source: https://sorriso.mt.leg. br/, 2024).

Figure 5: Location map of the city of Sorriso

GC Revista Nacional de Gerenciamento de Cidades
National Journal of City Management

ISSN 2318-8472, v. 12, n. 87, 2024

Source: Prepared by the author (Qgis e Power Point), 2024

The city's population, according to IBGE (2022), is approximately 110,635 people, with a territorial area of 9,293.629 km² and demographic density of 11.90 inhabitants/km².

Sorriso is among the ten largest cities in the State and its population is made up of migrants from all regions of the country, with the South and Northeast being the main ones (SORRISO CITY HALL).

Its colonization began in the 70s and, on December 26, 1980, the agrovila was elevated to the category of district, belonging to the municipality of Nobres. But in 1986, the political-administrative emancipation of the city took place, where the Legislative Assembly of the State of Mato Grosso when governor Júlio Campos, through Law nº 5.002/86, elevated the previously Sorriso district to the category of municipality, in 13 May 1986 (SORRISO CITY HALL).

The municipality was formed by three districts, Caravágio, 70 km from the headquarters and Primavera district, 40 km away and Boa Esperança, 140 km from the headquarters of Smile, which was emancipated in October 2023, becoming the 142nd municipality of Mato Grosso (SORRISO CITY HALL).

According to IBGE (2022), in 2021 the city's GDP per capita is R$ 131,899.11, a figure that gives it 22nd position among the 142 municipalities in the state and 118th position among Brazilian municipalities.

Regarding the environment, according to IBGE (2022), Sorriso has 12.2% of homes with adequate sewage, 86.5% of urban homes located on public roads are wooded. 30.3% of these have adequate urbanization, with the presence of drains, sidewalks, paving and curbs.

The following chapter presents as a result, observational and field research carried out in the city of Sorriso, through analysis of traffic flow and documents relating to traffic safety, with the aim of showing the evolution of what has been done in the city. city to improve the issue of traffic safety and accidents with and without deaths. And present how technology and sustainability can be allies to mitigate these problems.

RESULTS

ISSN 2318-8472, v. 12, n. 87, 2024

The city of Sorriso has shown great advances in several sectors, but in urban mobility it is clear that it is mainly focused on cars and motorcycles. Although there are large avenues, with spaces for parking cars, the availability of public transport is almost imperceptible compared to the number of cars.

The city has a large cycle path in the central median along the entire Avenida Blumenau (Figure 6), with good infrastructure and very tree-lined, widely used by cyclists and pedestrians who use it for walks and other exercises.

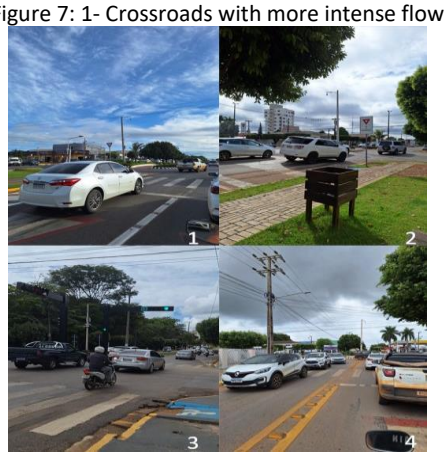
ISSN 2318-8472, v. 12, n. 87, 2024

Figure 6: Cycle path, Blumenau avenue

Source: Author's collection, 2024

With regard to the city's traffic, traffic flows in Sorriso were observed in the morning and afternoon periods on April 8, 9 and 11, 2024. In general, the flow varies between avenues, between 7:00 a.m. and 09:00h with moderate flow in most of them and more intense on Tancredo Neves and Brasil avenues. Between 11:00 and 12:00. a greater flow was observed on Perimetral Sudoeste and Av. Blumenau (Figure 7).

Figure 7: 1- Crossroads with more intense flow



1-Av. Blumenau; 2-Av. Brazil; 3- Av. Tancredo Neves;
4- Southwest Perimetral - Source: Author's collection, 2024.

In the afternoon, between 5:00 pm and 6:30 pm, a more intense flow was observed on Avenidas Curitiba, Natalino João Brescansin and Tancredo Neves (Figure 8). It was also observed that on these avenues the flow becomes more intense between 5:00 pm and 6:00 pm, decreasing between 6:00 pm and 6:30 pm.

GC Revista Nacional de Gerenciamento de Cidades
National Journal of City Management

ISSN 2318-8472, v. 12, n. 87, 2024

Figure 8: 1 Curitiba Av.; 2 Natalino João Brescansin Av.; 3 Tancredo Neves Av.

Source: Author's collection, 2024.

When analyzing the intersections of the avenues observed, it was found that almost all of them have security monitoring, using cameras (Figure 9), in addition to having several signage signs. There are traffic lights on Curitiba and Tancredo Neves avenues and, even on those where there are no traffic lights, traffic control cameras are installed.

Figure 9: Avenue intersections with the presence of monitoring cameras

1 – Crossing Av. Blumenau and Av. Tancredo Neves; 2 – Crossing Av. Porto Alegre and Av. Brasil; 3 - Crossing Av. Natalino João Brescansini and Av. Porto Alegre; 4 - Crossing Av. Brasil and Av. Curitiba; 5 – Crossing Av. Blumenau and Av. Natalino João Brescansini; 6 – Southwest Perimeter. Source: Author's collection, 2024

The intersections of avenues Tancredo Neves with Avenida Porto Alegre, Natalino with Curitiba and Curitiba with Tancredo Neves do not have cameras (figure 10).

GC Revista Nacional de Gerenciamento de Cidades
National Journal of City Management

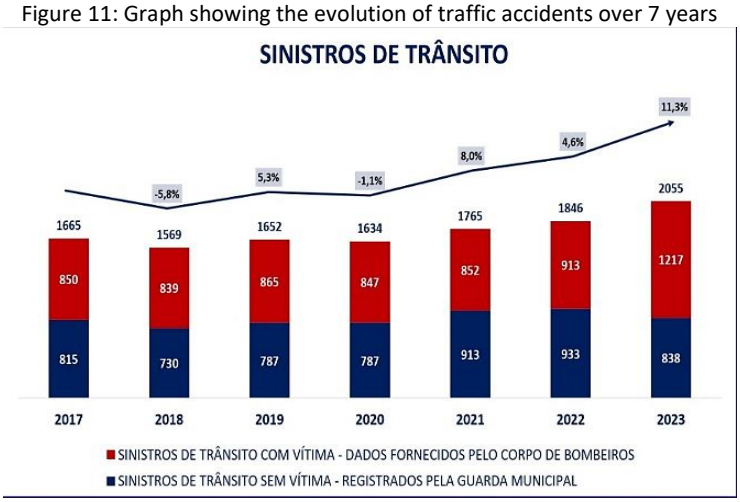
ISSN 2318-8472, v. 12, n. 87, 2024

Figure 10: Crossing avenues that do not have cameras

1 – Crossing of Av. Curitiba and Av. Tancredo Neves; 2 – Crossing of Av. Natalino João Brescansini and Av. Curitiba; 3 – Crossing of Av. Porto Alegre and Av. Tancredo Never
Source: Author's collection, 2024

Sorriso is among the cities with more than 30 thousand inhabitants where the most fatal traffic accidents occur. According to documents provided by the Public Security Secretariat of Sorriso-SEMSEP, there were many accidents between 2017 and 2023 and there were always above 1000 accidents, including with victims and without victims. Despite there being years in which the number of accidents decreased, in these 7 years accidents increased more than they decreased (fig. 11).

Figure 11: Graph showing the evolution of traffic accidents over 7 years



Source: Image provided by the Public Security Secretariat of Sorriso-SEMSEP, 2024

Through the results obtained, it was possible to identify that accidents without victims occur more often with cars and accidents with victims mostly occur with motorcycles. In 2021, 96% were motorcycle traffic accidents (fig. 12).

Figure 12: Total accidents with victims in 2021

Source: Record provided by the Public Security Secretariat of Sorriso-SEMSEP, 2024

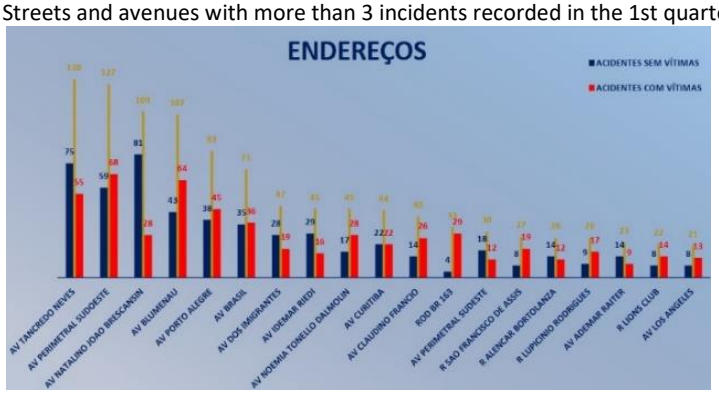
GC Revista Nacional de Gerenciamento de Cidades
National Journal of City Management

ISSN 2318-8472, v. 12, n. 87, 2024

According to fire department records for the first half of 2023, there were 544 accidents with victims who were taken to hospital. Of these, 100% had motorcycles involved.

Among the avenues where the most accidents occurred in 2021, Avenida Tancredo Neves was the one with the highest number of records. The one with the highest number of victims was Avenida Blumenau (figure 13)

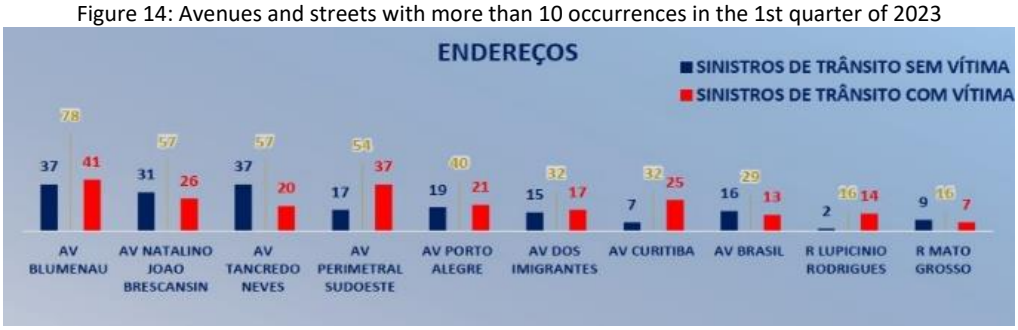
Figure 13: Streets and avenues with more than 3 incidents recorded in the 1st quarter of 2021



Source: Records provided by the Sorriso Public Security Secretariat-SEMSEP, 2024

In 2023, accidents occurred most on Avenida Blumenau, according to Public Security reports for the 1st quarter (figure 14).

Figure 14: Avenues and streets with more than 10 occurrences in the 1st quarter of 2023

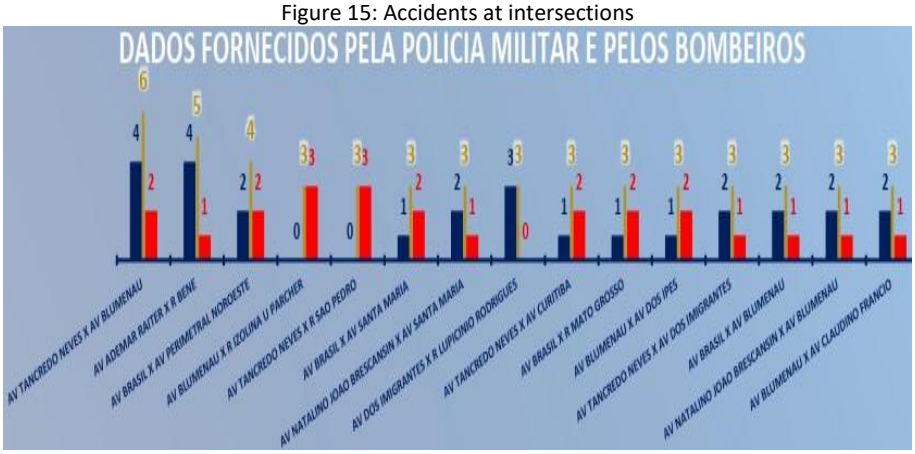


Source: Records provided by the Sorriso Public Security Secretariat-SEMSEP, 2024

Despite the apparent reduction between the 1st quarter of 2021 and the 1st quarter of 2023, as shown in the graph in figure 14, 2023 recorded the highest number of accidents in the last 7 years. The intersection between Avenida Tancredo Neves and Avenida Blumenau had the highest number of accidents (figure 15).

ISSN 2318-8472, v. 12, n. 87, 2024

Figure 15: Accidents at intersections



Source: Records provided by the Sorriso Public Security Secretariat-SEMSEP, 2024

When relating the records obtained from the Public Security Secretariat of Sorriso-SEMSEP, with the field research carried out on some of the main avenues, it was found that most accidents occur on the busiest avenues, such as: Av. Tancredo Neves, Av. Blumenau , Av. Natalino João Brescansin and Perimetral Sudoeste, which were the most observed due to their greater traffic flow.

Still according to the records obtained, it was found that the majority of accidents occur between 5:00 pm and 7:00 pm, identified as times of greatest traffic flow.

As the city grows, the number of cars and motorcycles and the number of accidents increase in parallel. According to SEMSEP in 2021 there were 24.692 cars and 17.642 motorcycles, considered the most used vehicles in the city. In 2023, in the first quarter, the number of cars rose to 26.612 and the number of motorcycles to 19.148.

Although several measures have been taken to mitigate the safety problems that have been occurring for a long time in the city's traffic, the municipal traffic department frequently holds traffic education lectures, traffic stops and educational campaigns, in addition to the implementation of equipment such as cameras security, new traffic lights and obvious signage.

During the research it was possible to observe that the city has great potential to adopt methods and instruments necessary for a smart city, as due to the large number of traffic accidents the city already makes use of more technological systems such as cameras that monitor 360°.

Botton (2020) suggests that, for the development of smart cities, it is necessary to work with the idea of conceiving urban planning supported by municipal public management which, in turn, will maintain the balance of regional and municipal resources in order to meet personnel demands and information and communication technology equipment - ICT, compatible with urban governance shaped towards a strategy of better quality of life for the population, adapting urban mobility to new projects to mitigate traffic accidents.

Bouskela et al. (2016), believes that there are solutions that can help with traffic issues through technologies such as: AIs (Artificial Intelligence), data modeling, analytics tools, geographic information systems (GIS) and programs with which researchers develop systems that work to reduce traffic congestion and accidents, changing the opening and closing times

ISSN 2318-8472, v. 12, n. 87, 2024

of traffic lights, or using intelligent signage with alert emissions, or through mobile applications.

Another alternative are “smart traffic lights” which, according to Neto (2016), using this technology, it became possible to extend the condition of traffic-demand traffic lights to networks, also known as real-time traffic lights that need be centralized, as the processing of data collected by the detectors is done on a central computer, equipped with software capable of carrying out all traffic signal calculations. Based on the algorithms generated by this central equipment, the best times for signaling each location are defined and times vary depending on traffic demand. This system, in addition to increasing safety, reduces pollutant emissions and fuel consumption, due to reductions in the number of stops.

However, there is the disadvantage of not having national technology and the implementation cost is relatively high, combined with the disadvantage of not having national technology, which makes the implementation cost more expensive. Even so, it is still an alternative to be considered when implementing a smart city (NETO, 2016).

CONCLUSION

The search for new, more efficient and sustainable solutions has become increasingly necessary, as population growth is visible and with it the city's demands increase. In order to reach the level of a smart city, it is necessary to find alternatives for urban development, through technology and sustainability.

Within this theme, the article's axis was urban mobility, focused on the traffic system, and the way in which smart urban centers can help with issues such as vehicle flow, congestion and traffic accidents. The study was carried out in the city of Sorriso due to it being one of the cities in Mato Grosso with a population of over 30 thousand inhabitants where the most accidents with and without deaths occur.

During a technical visit to the city's Public Security Secretariat, it was possible to understand how the monitoring of the city's avenues and main streets works, carried out with 360° cameras installed at avenue intersections, to monitor the causes of the increase in accidents and with this data, seek to create new signaling and traffic control systems to mitigate these causes.

However, it was concluded that, perhaps in the medium and long term, with the support of research, new methods and technologies based on the principles of a smart city, in addition to public policies that meet these needs with urban planning professionals and municipal public managers focused on for the implementation of these systems, it will be possible to provide a plausible solution that contributes to the control of urban mobility.

REFERENCIAL BIBLIOGRÁFICO

AHVENNIEMI, H., Huovila, A., Pinto-Seppa, I., & Airaksinen, M. What are the diferences between sustainable and smart cities? **CITIES** - The International Journal of Urban Policy And Planning, vol. 60, 2017.

BOUSKELA, M.; Casseb, M.; Bassi, S.; De Luca, C.; Facchina, M. **Caminho para as Smart Cities**: da gestão tradicional para a cidade inteligente. BID, 2016.

ISSN 2318-8472, v. 12, n. 87, 2024

BOTTON, G. Z.; SILVA PINHEIRO, L. K.; TEIXEIRA VIDA, E.; MEIRA VASCONCELOS, A.; CARLOS DE JESUS LOPES, J. **As ferramentas tecnológicas das Cidades Inteligentes voltadas para a redução dos acidentes de trânsito**. Encontro Internacional de Gestão, Desenvolvimento e Inovação (EIGEDIN), v. 4, n. 1, 30 out. 2020.

CURY, M. J. F; MARQUES, J. A. L. F. **A cidade inteligente**: uma reterritorialização. Redes – Santa Cruz do Sul: Univercidade de Santa Cruz do Sul, v. 22, n. 1, 2017.

ESTRATÉGIAS ODS.ORG. **O que são os objetivos de desenvolvimento sustentável**. Disponível em: https://www.estrategiaods.org.br/conheca-os-ods/. Acesso em: 11/04/2024.

FIGUEIREDO, M. P. de. **Cidades Inteligentes no contexto Brasileiro**: A importância de uma Reflexão Crítica. IV enanparq-Encontro da Associação Nacional de Pesquisa e Pós-Graduação em Arquitetura e Urbanismo. Porto Alegre, 2016.

GAMA, K.; ALVARO, A.; PEIXOTO, E. **Em Direção a um Modelo de Maturidade Tecnológica para Cidades Inteligentes**. In: SIMPÓSIO BRASILEIRO DE SISTEMAS DE INFORMAÇÃO (SBSI), 8, 2012, São Paulo. Anais [...]. Porto Alegre: Sociedade Brasileira de Computação, 2012. p. 513-518.

IPEA – Instituto de Pesquisa Econômica Aplicada - **Índice de Desenvolvimento Sustentável das Cidades (IDSC)** Sorriso-MT. Disponível em: https://idsc.cidadessustentaveis.org.br/profiles/ 5107925/ Acesso em: 11/04/2024.

IPEA – Instituto de Pesquisa Econômica Aplicada - **Objetivos de Desenvolvimento Sutentável**. Objetivo 9- Industria, inovação e infraes-trutura. Disponível em: https://www.ipea.gov.br/ods/ ods9.html. Acesso em: 11/04/2024

MUNDO EDUCAÇÃO. **Urbanização.** Disponível em: https://mundoeducacao.uol.com.br/ geografia/urbanizacao.htm Acessado em 11/04/2024

NETO, J. C. **Semáforo:** Ser ou não ser inteligente? Uma comparação entre o controle semafórico em tempos fixos e o em tempo real. Notas Técnicas: Companhia de Engenharia de tráfego. São Paulo, 2016.

PUC ONLINE. **Cidades Inteligentes**. Disponível em: https://online.pucrs.br/blog/cidades-inteligentes. Acessado em 11.04.24.

SANTOS, E.L dos S; FRANZ, N.M; SIMÃO, A.G; TERNOSKI, S; SILVA, C.L da; SANTOS, G.D. Cidades inteligentes e sustentáveis: percepções sobre a cidade de Curitiba/PR a partir dos planos plurianuais de 2014 a 2021. **Urbe.** Revista Brasileira de gestão Urbana-PUC/PR, 2022.