URBAN ENVIRONMENTAL DIAGNOSIS: PROJECTION OF CURRENT AND FUTURE SCENARIOS

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ABSTRACT

This study deals with the urban environmental diagnosis of a stretch of the Manoela Valadares neighborhood, Municipality of Afogados da Ingazeira, Sertão do Pajeú – PE. In order to elaborate an urban environmental diagnosis of a stretch of the aforementioned neighborhood of Afogados de Ingazeira -PE from the use and occupation, the steps of defining the study area, collecting data, systematizing the data in SWOT Matrix, designing scenarios and proposing guidelines for development were followed. Initially, the study area was defined, based on the collection of information, data, and on-site visits. Thus, the study area comprised six (06) streets in the Manoela Valadares neighborhood, where accelerated urban expansion and harmful implications for the environmental balance were found. Subsequently, data and documentary information were collected, bibliographic research, field visits and complementary photographic records were carried out to support the research. After analysis and correlation of the data, information, photos and images collected, this information was systematized in a SWOT Matrix and current and future scenarios for the area, object of this study, were graphically developed. The observance of the matrix and the scenarios in an integrated way resulted in the proposition of some guidelines for the development of the studied area. Thus, it is concluded that the area presents an accelerated, continuous urban development, which prioritizes high-end residential buildings. Thus, the segregation of urban space is expanded. This urban expansion is guided by economic growth, does not consider environmental, physical-social issues, and support infrastructural elements, such as: urban mobility, accessibility, sanitation, afforestation, mixed use, public leisure equipment, among others, thus causing negative impacts that can be minimized.

Keywords: Urban expansion. Use and occupancy. Sustainability. Urbanization.

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INTRODUCTION

The twenty-first century brings with it the urgency of environmental issues, as today the negative impacts of urban development are still observed, mainly based on economic growth. This development began to be criticized in the middle of the twentieth century, in which the concept of sustainable development emerged, that is, "(...) one that meets the needs of the present without compromising the possibility of future generations meeting their own needs" (CMMAD, 1988). This new development model arises from the need to use natural heritage in a rational way, preventing it from being a source of social inequalities (BORGES, 2004).

Such a development model aims to minimize the negative impacts perceived in cities, including through the landscapes that constitute them. But what would landscape be in terms of the city? PELUSO JÚNIOR, (1991) cites that "(...) Scientific analysis decomposes the landscape into its elements and uses Geography to appreciate them together". (apud Baldin, 2021, p. 6). Therefore, the landscape can translate the development process(es) of an area under a defined time frame.

Planning the urban environmental development in the city is a transformative factor and can ensure change in development. The X World Urban Forum (UNHABITAT, 2020) affirms this condition of development change and the role of cities in the implementation of sustainable development, points out the social responsibility in relation to the promotion of this in the urbanized world and warns of the potentialities (inclusion, resilience, economic growth, sustainability and prosperity) and fragilities (poverty, gender inequality, human rights) intrinsic to cities. The scales of transformation of the natural environment are global, regional and local, however it is at the local scale that the paradigm shift can effectively happen. For SANTOS (2008), urbanization is understood as a historical product of construction and reconstruction linked to science, scientific techniques and information. It can also be understood as a process that presents two approaches: the physical-spatial approach, referring to physical growth, and the socio-cultural approach, referring to the social and behavioral relations experienced by urban agglomerations (STROHAECKER, 2007).

> Planning means trying to predict the evolution of a phenomenon or, to put it in a way that is less committed to conventional thinking, trying to simulate the unfolding of a process, with the aim of better guarding against probable problems or, conversely, with the aim of better benefiting from probable benefits" (SOUZA, 2003, apud, TOLEDO 2018, p. 37).

Urbanization has several significant impacts on society and the environment. Studying urbanization is vital to recognize the challenges and opportunities associated with the development of cities and to seek solutions to urban problems, it requires careful planning and management to ensure sustainable and inclusive urban development.

Urban environmental issues in Brazil are also mainly guided by economic growth, as well as in the Northeast and in the Pernambuco hinterland. A little less than 400 km from the capital, in the municipality of Afogados da Ingazeira, the city also experiences this change accompanied by adversity. Located in the micro-region of Pajeú, bordering 4 other municipalities, there is an altitude of 556 m, with a temperature ranging between 20°C and 36°C, occupying a territorial area of 377,696 km2, with a population of 40,241 people according to the 2022 census and a demographic density of 106.54 inhabitants/km2 and an average of 2.71 residents/residence, in which the majority is concentrated in the urban area, justifies the present study in the environmental urban area. Thus, the purpose of this research is to elaborate an urban environmental diagnosis of six streets in the Manoela Valadares neighborhood of Afogados da Ingazeira -PE from the use and occupation. This neighborhood and, consequently, the six streets, object of this study, has been undergoing an accelerated urban expansion.

The research has an interdisciplinary character. LEFF (2008) places the interdisciplinary project as a reorientation to the training of professionals based on the convergence of knowledge in a disciplinary way. The urban space itself needs a complex study, as it must be analyzed under different variables, among them, urban mobility. This research is the basis for the project entitled sustainable urban mobility in Afogados da Ingazeira, verifying that this environmental diagnosis contributes to the research process of the project title.

OBJECTIVES

General objective: to prepare an urban environmental diagnosis of stretches of the Manoela Valadares neighborhood in Afogados de Ingazeira -PE from the use and occupation;

Specific objectives: to collect data and information on the physical-spatial and environmental dimensions of the studied area; to systematize the data in a *SWOT Matrix;* design scenarios of the study area: current and future; and propose development guidelines.

METHODOLOGY

The activities developed are listed and structured in stages:

- Stage 01 – Definition of the study area: From a preliminary study of the neighborhoods of the municipality of Afogados da Ingazeira, with appreciation of the Municipal Master Plan and perceptions obtained in *loco observation,* it was identified that the Manoela Valadares neighborhood has an accelerated urban growth and that this neighborhood is recent, with an approximate formation of 13 years. Observing the neighborhood, an area with recent residences and numerous constructions of residential use in progress was detected, which led to the definition of this area, comprised of six streets, as the object of study of this research.
- Stage 02 – Data collection: It comprised bibliographic research, data collection and information from public agencies, NGOs, etc.; graphic, photographic data (photos, aerial/satellite images, etc.) and cartographic survey of the study area, and information collected through *on-site* observation and photographic record, in order to support the research;
- Stage 03 – Systematization of the data collected in the SWOT Matrix: The data and information collected in the previous stage were correlated and systematized in the form of a matrix. The use of this methodology derives from strategic planning, and the analysis of the scenarios envisioned was divided into two environments: internal, referring to strengths and weaknesses; and external environment, referring to opportunities and threats. Therefore, the Matrix elaborated helped in the visualization of the scenario found in the study area;
- Stage 04 – Scenario projection: In this stage, the objective was to perform graphic illustrations of the profiles of the current scenarios and future scenarios, respectively, projected from the analysis of use and occupation. The current scenarios were proposed from the analysis of the landscape observed in *on-site* visits and the appreciation of current photographic records. The future scenarios were built from the evolution of the current scenarios, considering the development actions expected to happen and in progress.

All scenarios were carried out using design techniques aided by software aimed at data integration and graphic representation, the software used was Autocad, version 2021. For the construction of the scenarios, the methodology adapted from the Orla Project (2002) was used, which translates the construction of scenarios as a verification of the uses

of spaces and, for each undesirable situation of this use and resources, to develop a desired situation to be achieved.

- Stage 05 – Proposition of guidelines for development: From the correlation and analysis of the current and future scenarios (critical and ideal), the data collected and systematized in the *SWOT Matrix* were the elaborated guidelines for the development of the studied area.

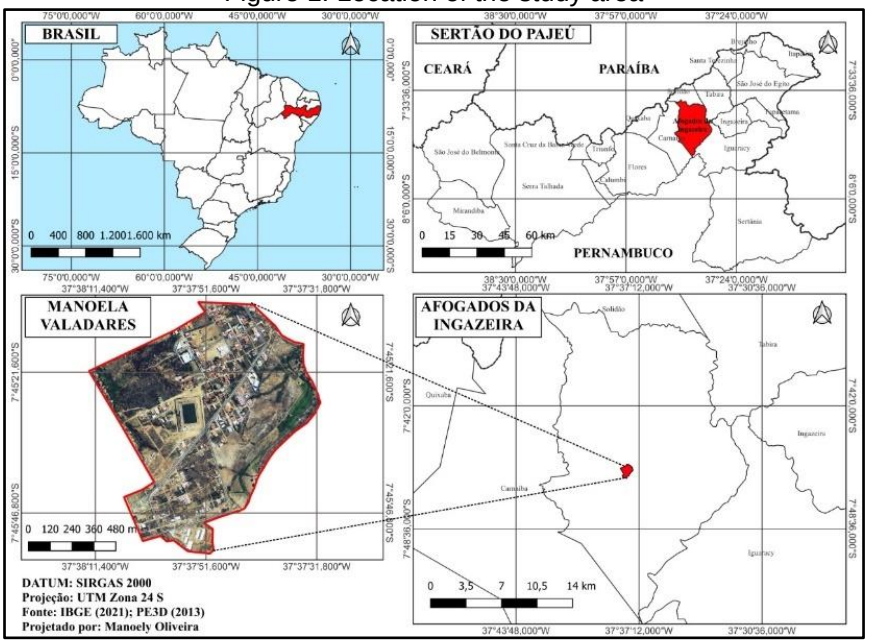
RESULTS AND DISCUSSIONS

The results presented here are linked to the objectives listed.

DEFINITION OF THE AREA OF STUDY

To choose the study area, first an analysis was made correlating the current documents, provided by the city hall, which are: land subdivision and master plan, and a visit to some previously related neighborhoods where the accelerated urban expansion is notorious. From the crossing of these data, the neighborhood of Manoela Valadares (figure 1) was listed as the neighborhood to be studied. However, considering the extension of the neighborhood, it was decided to cut the study area, restricting it to six (06) streets, also justifying this choice due to the growing number of buildings on these streets and their location, occupying a central area of the neighborhood. Nevertheless, these streets are in the middle of the process of urban expansion, which was found to be an interesting area to be the object of study of this research. The object of study, an area that comprises the six streets that make up the Manoela Valadares neighborhood, has approximately 113,915.46 m² of area, is located in a neighborhood whose predominant use is residential and houses a school, residences and construction of single-family houses mostly of high standard.

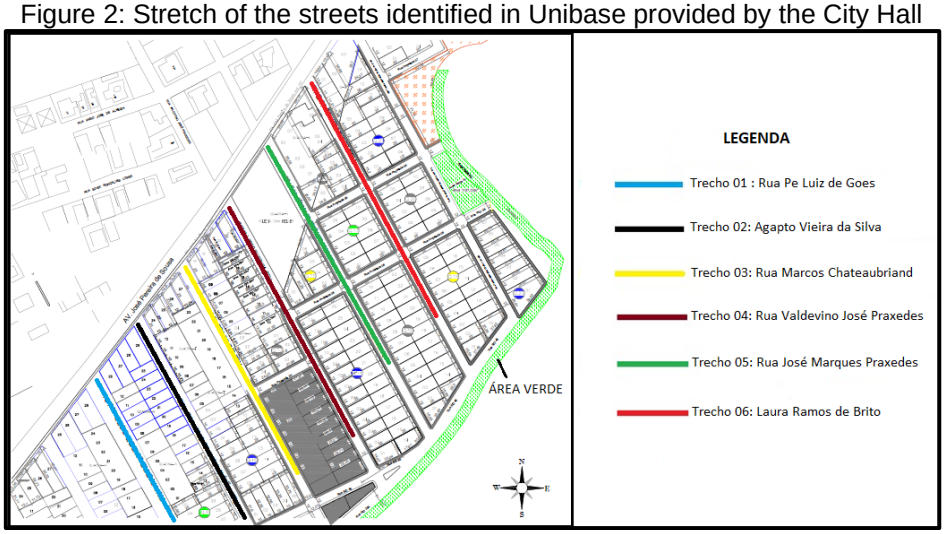
Figure 1: Location of the study area



Source: M. OLIVEIRA; P. N. SIQUEIRA; J. A. HENRIQUES; K. F. R. DAMASCENA (p.04, 2022).

The six (06) streets were divided into sections as shown in figure 2, and they are: section 01 - Padre Luiz de Goes Street; section 02 - Agapto Vieira da Silva Street; section 3 - Marcos Chateaubriand Street; section 04 - Valdevino José Praxedes Street, section 05 - José Marques Praxedes Street and section 06 - Laura Ramos Street. The streets studied have horizontal buildings with templates of up to three (03) floors, a school, residential constructions in progress and lots, which can be built. All the streets surveyed are secondary roads that access Av. José Pereira de Souza, main access road and of importance for the neighborhood.

Figure 2: Stretch of the streets identified in Unibase provided by the City Hall



Source: Adapted Unibase project – Archive of the Municipality of Afogados da Ingazeira

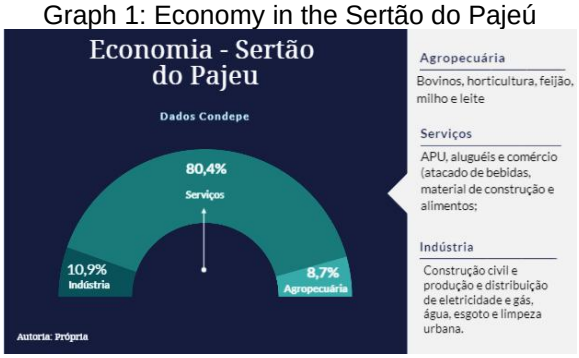
DATA COLLECTION

Municipal Socioeconomic Information

The Brazilian Institute of Geography and Statistics (IBGE), in the 2010 Census, points out the city of Afogados da Ingazeira with 71% of households with adequate sanitary sewage, 86.7% of urban households on public roads with trees and 1.3% of urban households on public roads with adequate urbanization (presence of culvert, sidewalk, pavement and curb). However, such data do not apply to the Manoela Valadares neighborhood, because in 2010 it was at the beginning of its urban expansion, with few buildings. At the time of finalization of this document, the data of the new census have not been published, not allowing an update of the data that would include the aforementioned neighborhood.

In the economic sector, the data found refer to the Pajeú region as a whole (graph 1) and are data from the survey carried out by the Human Development Council of Pernambuco (Condepe, 2014). These data indicate a greater concentration of the economy in the area of services, 80.4% (rents and trade: construction material), followed by industry, 10.9% (including civil construction) and agriculture, 8.7% - Important parameters to be considered for the municipality of Afogados da Ingazeira, especially because they are data from 2014, when the Manoela Valadares neighborhood has started its urban expansion.

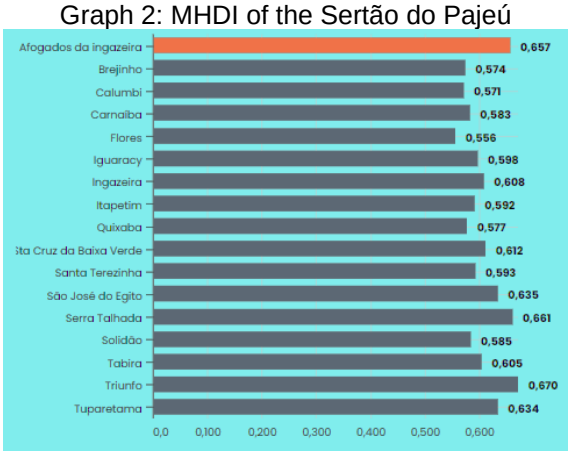
Graph 1: Economy in the Sertão do Pajeú



Source: Condepe (2014)

The Human Development Index (HDI) of the municipalities that make up the Sertão do Pajeú were shown in graph 2. Afogados da Ingazeira (0.657) occupies the third place, behind only the city of Serra Talhada (0.661) and Triunfo (0.670) (IBGE, 2010).

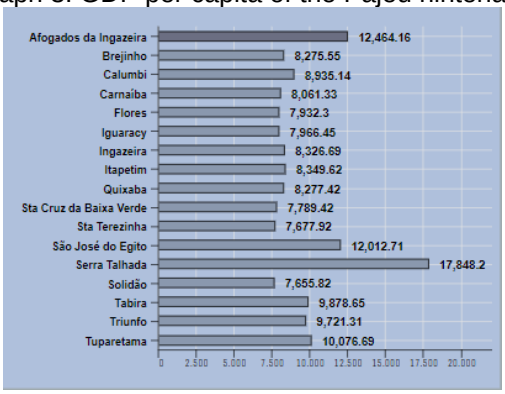
Graph 2: MHDI of the Sertão do Pajeú



Source: Adapted IBGE (2010)

In relation to the Gross Domestic Product (GDP) that guides the understanding of a country's economy, its growth indicates that there is a balance between the sum of production. According to the IBGE, GDP per capita is the GDP divided by the number of inhabitants. In graph 3, the 2019 IBGE data on the GDP *per capita of the* cities that make up the Pajeú hinterland were arranged, pointing out that Afogados da Ingazeira occupies the second place, with 12,464.16, succeeding the city of Serra Talhada with 17,848.20.

Graph 3: GDP per capita of the Pajeú hinterland



Source: Adapted IBGE (2019)

Municipal Documents

For this research, some municipal documents were analyzed. From the knowledge of the laws of the Land Parceling, in force, of the municipality of Afogados da Ingazeira, a cut was made to the data referring to the Manoela Valadares neighborhood. Therefore, it was observed that it is part of "Zone 3 – Residential Zone 1 (ZR1)", a zoning that defines urban parameters that focus on rules to be followed in relation to that neighborhood.

Still referring to the above-mentioned Legislation, some articles and items were listed here, by way of illustration, which are:

Article 6 – the obligation for the subdivision of the land to fulfill its social function in relation to the norms relating to: a. Physical, b. environmental and landscape conditions; c.

Conditions of access, circulation and infrastructure; d. Conditions of environmental comfort; e. Relationship between public and private spaces; f. Vegetation cover; g. "*Non-building*" areas, when applicable.

Article 7 – The subdivision of the land and urbanization must be organized, strategically planned together with structuring elements: a. Road system; b. Water, sewage and energy infrastructure networks. And integrating elements: a. Housing; b. Productive spaces; c. Public spaces; d. Social equipment.

Article 1 – The land subdivided must meet the urban requirements and public interest, in accordance with federal and municipal legislation in accordance with the zones classified by law.

Article 19 - First Paragraph - In the allotments, at least 15% of the total area of the land shall be allocated to squares, parks, green areas and community facilities and up to 20% to the road system in accordance with the Master Plan and Land Use and Occupation.

Article 20 – Standard court length of 120 m. In exceptional cases up to 160 m.

In Complementary Law number 005, also of December 18, 2008, the current precedent provides for the sustainable development of the municipality of Afogados da Ingazeira and establishes the Master Plan and Use and Occupation Law. This Law repeats many points of the urban parameters, but also points out fundamental points for the sustainability of the municipality. Table 1 shows, in summary, the urban parameters of the study area, taken from the annexes of the aforementioned law.

Table 1: Urban parameters of the ZR1 neighborhood

Parameters	ZR1
Public areas: - Community facilities and green areas (squares, parks, etc.). - Road system:	Minimum: 15% of the allotment Minimum: 7.5 or 50% of the 15% in continuous area. Standard: Up to 20%.
Lot: Occupancy of the lot:	- Minimum area: 300 m²; *For ZR1 of existing lots: minimum tested of 8m and minimum area of 200 m² - Minimum tested: 10 m; - Maximum height: Ground + 2 pavements; - Minimum initial clearances: frontal: 5 m; Side: 1.5 m Depths: 2 m - Green area index: 10% - Green area fee of the lot: 10%; - Maximum lot occupancy rate: 70%; - Maximum density: 160 inhabitants/ha
Blocks:	- Standard size/face: 120 m; - Maximum size/face: 160 m.

Source: Adapted from Complementary Law numbers 004 and 005 of the municipality of Afogados da Ingazeira (2008)

INFRASTRUCTURE

According to the technical text of the University of São Paulo (USP, 1997), Urban infrastructure can be conceptualized as a technical system of equipment and services necessary for the development of urban functions, and these functions can be seen under the social, economic and institutional aspects.

According to the state database (BDE), the 2010 survey shows that about 75% of the population makes up the urban area of the city of Afogados da Ingazeira. The municipality is going through an urban expansion driven by civil construction, and during this process, there is a great influence generated by the implementation of the Federal Institute of Pernambuco (IFPE), *Campus* Afogados da Ingazeira, in 2010, as an enterprise that boosted urban expansion in the Manoela Valadares neighborhood and attributed value to that neighborhood. In 2010, the neighborhood had few residences and few allotments. Real estate speculation was small and the lots were devalued.

The neighborhood undergoes a great appreciation and rapid growth, expands and fills with buildings. However, infrastructure development has not kept pace with this growth. The problems arising from accelerated urbanization, the result of the development process still strongly committed to economic growth, become evident, such as sanitary sewage, drainage, accessibility, urban mobility, afforestation and green islands, the need for urban leisure equipment (such as squares and parks), the treatment of civil construction waste, among others, they are negative impacts that must be considered and solved with public policies.

Such ideals are in line with the Brazilian commitment in the 2030 Agenda of the United Nations (UN), and refer to the Sustainable Development Goals (SDGs), instituted in 2015 by the United Nations General Assembly, more precisely to goals 06, 09 and 11; which deal with sanitation, sustainable cities and communities, and infrastructure.

Analysis of sidewalks and streets

To guide the construction of sidewalks, the 2008 complementary municipal law provides that sidewalks must have a width of 2 m on each side. This dimension is the same as that contained in the Brazilian Standard (NBR 9050, 2020), which deals with accessibility to buildings, furniture, spaces, and urban equipment. It is noted, as shown in Chart 1, that the width of the sidewalk is divided into what the NBR classifies as lanes of use.

Chart 1: NBR 9050 service ranges

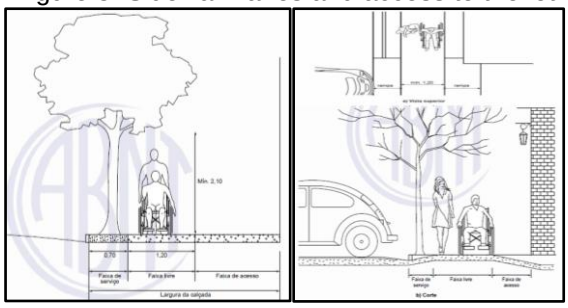
Service range	It serves to accommodate furniture, flower beds, trees and lighting or signaling poles. On the sidewalks to be built, it is recommended to reserve a service lane with a minimum width of 0.70 m.

Free lane or ride	It is intended exclusively for pedestrian circulation, must be free of any obstacle, have a transverse slope of up to 3%, be continuous between lots and be at least 1.20 m wide and 2.10 m free.
Access Strip	It consists of the space of passage from the public area to the lot. This lane is only possible on sidewalks with a width greater than 2.00 m. It serves to accommodate the access ramp to the adjacent lots under authorization from the municipality for buildings already built.

Source: Adapted NBR 9050:2020

Below, figure 3 (a) is presented, taken from NBR 9050 for visualization of the cut-off strips. The rule also provides for vehicle access to lots, circulation and parking spaces, which must be done in such a way as not to interfere with the free pedestrian lane, without creating steps or unevenness, as shown in figure 3 (b). And that only in the service and access lanes is the existence of ramps allowed.

Figure 3: Sidewalk lanes and access to the lot



Source: NBR 9050.

Despite the existence of the 2008 installment law and NBR 9050, during a field visit, some irregularities were observed in relation to the lanes of use and width of the sidewalks. In figure 4, these irregularities are exposed, where it can be seen that about 50% of the sidewalks follow the Municipal Law, with a width of a little over 2 m, as shown in table 2. However, composing them with vases of plants, trees that are not for this purpose, added to the absence of adequate pruning, inappropriate use as vehicle parking, trash cans and lack of appropriate ramps, existence in this area of stairs, jambs, overflow of reservoir with exit to sidewalk, etc. were some of the inconsistencies recorded. As a result, the free width for locomotion is very reduced or non-existent.

Figure 4: Irregularities in some sidewalks

Source: The author

Another characteristic that prevents the accessibility of residents (autonomy for all, in commuting) and hinders mobility (conditions for the movement of loads and people in the urban space) is the high presence of buildings without any protection and inadequate storage of materials on public roads, and a considerable number of buildings in situations of abandonment (figure 5).

Figure 5: Active and abandoned buildings

Source: The author

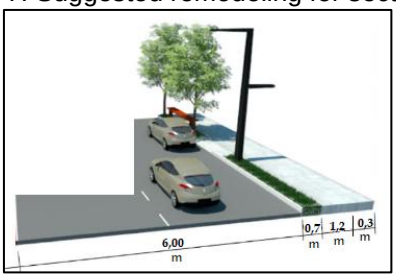
Regarding the width of the streets, about 66.7% are within the minimum range (8 m), with emphasis on the stretch that comprises Padre Luís de Campos Góes street, which has a width of more than 12 m, figure 6.

Figure 6: Rua Pe Luiz de C. Goes

Source: The author

By adapting section six (06) of Laura Ramos Street, which is smaller in width, as shown in figure 7, it is possible to remodel the available space by configuring the street and sidewalk for better space in accordance with NBR 9050, with sidewalks subdivided into three lanes: service, for the implementation and installation of trees, lampposts, seats, green floor for water infiltration; sidewalk for passersby; and access to the property. Following the model shown in figure 7, the remodeling suggestion can be replicated and adapted to the other streets, as most streets are wide and have no pavement, the residential use of the neighborhood predominates, there is room to widen the sidewalks and relocate existing trees and poles to the service lane. Regarding the floors, they must meet the characteristics of coating, slope and unevenness, as described in NBR 9050 (2020).

Figure 7: Suggested remodeling for section 06

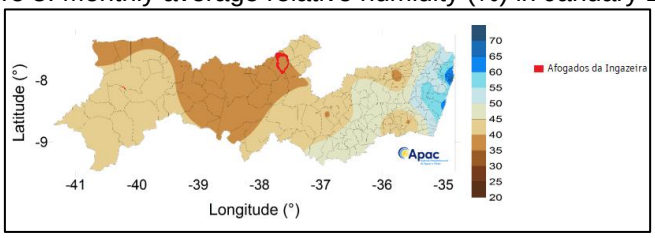


Source: Adaptaded from Maropo, et al (2019) (figure 19).

Afforestation

Due to the location of the municipality, the climate is semi-arid, hot, with temperatures ranging from 20°C to 36°C (IBGE, 2010) and has a very variable relative humidity (RH) with the presence and absence of rain. The average annual rainfall varies between 501 mm and 750 mm (Condepe, 2014). According to the climate bulletin of the Pernambuco Water and Climate Agency (Apac) of January 2023, the average RH, in the afternoon, in the hinterland, varied around 40% (figure 9) and average temperature of 34° C. In periods of drought, this value drops to around 35%. However, according to the Center for Climate Emergency Management, the World Health Organization (WHO) states that the ideal RH would be around 60%. In 2021, the National Institute of Meteorology (INMET) released an alert situation for the Pernambuco hinterland with a UR forecast of 30% to 20% for that year.

Figure *8*: Monthly average relative humidity (%) in January 2023



Source: Adapted Apac

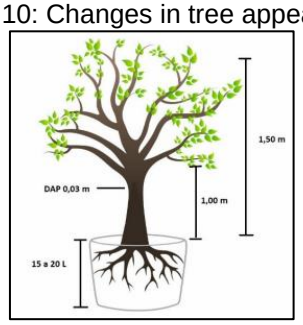
Despite the little rain and low humidity that characterizes the Caatinga biome, the region has native trees that have adapted to the adverse climate, resisting and helping to mitigate the high feeling of heat and dry weather. But the amount of trees in the stretches, as shown in figure 9 (a, b), is quite insufficient, what is suggested is to expand the afforestation throughout the study area, generating shade and softening the thermal sensation.

Figure 9: Examples of adopted afforestation

Source: The author

In the hinterland of Pajeú, a city that shares the same UR as Afogados da Ingazeira, Serra Talhada, in 2019, prepared a municipal afforestation plan in conjunction with the Federal Rural University of Pernambuco, developing a manual of the types of trees indicated for the location, distances, recommended and non-recommended species (among these is the "Neem", very popular in the urban area of Afogados da Ingazeira). And when in the form of a seedling, for planting, it has to present the physical characteristics exemplified in figure 10. Orientation not observed in some sections, as shown in figure 9 (b).

Figure 10: Changes in tree appearance



Source: Municipal plan for urban afforestation of Serra Talhada

Some of these specifications are pointed out in NBR 9050 (Brasil, 2020), in which it expresses that vegetation and its protections must not interfere with the routes and areas of circulation of people and the vegetation cannot present roots that damage the pavement, as well as other characteristics that can cause injuries, such as thorns and toxic principles.

Urban Cleaning and Solid Waste Management

One of the consequences of lack or poor planning is in relation to the waste generated. A study with georeferenced data on civil construction waste in the neighborhood in 2022, carried out at IFPE *Campus* Afogados, pointed to 204 points of irregular disposal. This and other problems observed are shown in Table 2.

Table 2: Identified Shortcomings – Urban Cleaning and Waste Management

ITEM	SHORTCOMINGS
Management	- Lack of broad and active management;
Household Solid Waste (RSD)	- Lack of quality control of discarded waste; - Lack of a public garbage dump distribution plan;
Selective Collection	- Lack of a selective collection plan in the Municipality;

Inert Waste and RCC	- Lack of a CCR recycling program; - Lack of a specific project for Inert Waste and RCC; - Lack of municipal regulation regarding destination;
Pruning Residues	- Inadequate disposal; - Not used as "biomass" or in fertilization techniques;

Source: Adapted from the Municipal Plan for Basic Sanitation (PMSP) - Afogados da Ingazeira (2014)

During the visits to the stretches, information was obtained that it is a naturalized procedure for residents to deposit garbage on the corner of the avenue to facilitate the collection that is carried out by the municipality, three (03) times/week. (Figure 11)

Figure 11: Irregular waste disposal

Source: The author

The issue related to waste in the study area must be worked on by the government, reinforcing garbage collection, if possible encouraging selective collection and, mainly, solving the issue of civil construction waste that is a constant in the area, since it is an area potentially full of works and that mostly disposes of its waste inappropriately, only hiring local carters to take construction waste away from the neighborhood, to clandestine landfills or areas without environmental protection. Despite the existence of a sanitary landfill in the municipality, it is not suitable for the treatment of industrial waste.

Urban Drainage and Stormwater Management

Because the streets are not yet paved, this contributes a lot to the permeabilization of water in the soil. However, it was observed that the urban drainage is poorly dimensioned/inadequate (figure 12) and/or not identified in other sections, not complying with the current municipal laws (cited in Articles 6 and 7, in point 4.2.2). The observations are listed in Table 3.

Table 3: Identified Shortcomings – Urban Drainage and Rainwater Management

ITEM	SHORTCOMINGS
Management	- Disintegrated management, with deficiencies in the executive and managerial structure of the drainage system; - Lack of a Rainwater Drainage Master Plan - Lack of basic and executive projects necessary for the implementation of the Pluvial Drainage Master Plan; - Absence of Land Use and Occupation Law with notes for the rainwater drainage system; - Lack of a municipal basic sanitation information system;
Infrastructure and Maintenance	- Lack of a plan for cleaning and maintenance of manholes - Streets without proper drainage (absence of wolf mouths); - Lack of plumbing
Institutional Planning and	- Lack of training programs; - Absence of programs, plans and projects aimed at expanding and

Training	improving the system; - Lack of specific staff, equipment and resources for management. - Lack of educational campaigns and environmental awareness with schools and the community in general;
Security and Inspection	- Need for effective action by the Municipal Council of Civil Defense; - Lack of inspection of clandestine sewage connections in the rainwater drainage network;

Source: Adapted from the Municipal Plan for Basic Sanitation (PMSP) - Afogados da Ingazeira (2014)

Figure 12: Inadequate urban drainage

Source: The author

Sewage Disposal

The most used method in the neighborhood to treat its effluent is septic tank and dumping on public roads, a situation illustrated in figure 13.

Figure 13: Irregular sanitary sewage

Source: The author

Table 4 shows other specific problems observed.

Table 4: Shortages identified by the technical team – Sanitary sewage

ITEM	SHORTCOMINGS
Management	- Lack of broad and active management;
Universalization	- Lack of universalization of sanitary sewage services;
Treatment	- Effective hydraulic treatment structures are not used.
Maintenance and Operation	- Reduce the amount of irregularly discarded sanitary sewage discharges that interfere with environmental quality; - Implementation of a project to identify irregular sanitary sewage systems; - Creation of a local maintenance team and also reserve equipment and/or materials. - Promote a policy for the implementation of sustainable sanitary sewage systems as an alternative source.
Surveillance	- Increase the inspection of irregular discharges of sanitary effluents, contributing to environmental quality; - Increase inspection and awareness projects for the population aimed at reducing water pollution; - Application of environmental education policies.

Source: Adapted Municipal Plan for Basic Sanitation (PMSP) - Afogados da Ingazeira (2014)

SWOT MATRIX MODELING

The data and information collected were systematized in a matrix format (Chart 2) according to the methodology previously described.

Chart 2: Matrix SWOT

Indoor Environment		
	Forces	**Weaknesses**
Economy	- Heated real estate market; - Increase in properties under construction of high standard.	- High acquisition cost of real estate; - Little economic increase
Infrastructure	- Sectorized streets; - Privileged geographical location in the neighborhood; - About 33% of sidewalks with width within the minimum required by municipal law. - Width of most streets, within the minimum required by the master plan; - Potential for fixed housing; - Potential increase in landscapes; - Potential to implement service, access and free lanes on sidewalks.	- Maximum use of the land; - Absence of pavement in about 80% of the streets; - Poor artificial lighting; - Streets with steep slopes; - Unordered growth; - Impaired ventilation by high walls; - Far from the shopping center; - High walls encourage insecurity; - Predominance of plants that favor erosion; - Inefficient sanitary sewage; - Sidewalks/sidewalks not accessible 2nd NBR 9050; - Little afforestation/vegetation. - Ineffective urban drainage; Absence of leisure spaces and green areas; - Absence of cycle tracks.
Socio-environmental	- Potential to develop/implement sustainable projects; - Make the environment accessible for people with disabilities; - Plant trees that enhance the scenery and soften the climate - Space for the implementation of parks and shared living areas; - Potential to house accessible sidewalks.	- Expansion of spatial segregation with exclusively high-end residences; - Absence of effective sewage treatment; - Absence of an adequate place for solid waste collection; (see figure*) - Absence of green and leisure areas; - Low rate of afforestation; - High presence of common solid waste; - Absence of sustainable practices; - Irregular disposal of construction waste; - Abandoned buildings, raising insecurity; - Devaluation of the natural landscape; -Joint management of common waste and construction
Territorial	- Streets away from the shopping center; - Surroundings: school and stadium.	- Predominant residential use.

External Environment		
	Forces	**Weaknesses**
Economy	- Potential occupational increase; - Located in a municipality with diversified commerce and services in the primary sector and logistics and micro-regional service hub; - Located in the municipality with the 2nd largest GDP in Pajeú; - Civil construction investors who are from other cities.	- Surrounding city with the highest development and GDP. - There are bordering allotments, more affordable purchasing value; - Growing real estate speculation throughout the municipality.
Infrastructure		- There is another neighborhood with effective effluent collection and treatment
Socio-environmental	- Located in a city with an average MHDI; - Parallel to the children's school; - Bills that reorganize the residential area in a sustainable way; - Insertion of municipal environmental policy.	- Surrounding city with the highest MHDI and diversified access to health;
Territorial		- Accelerated migratory process.

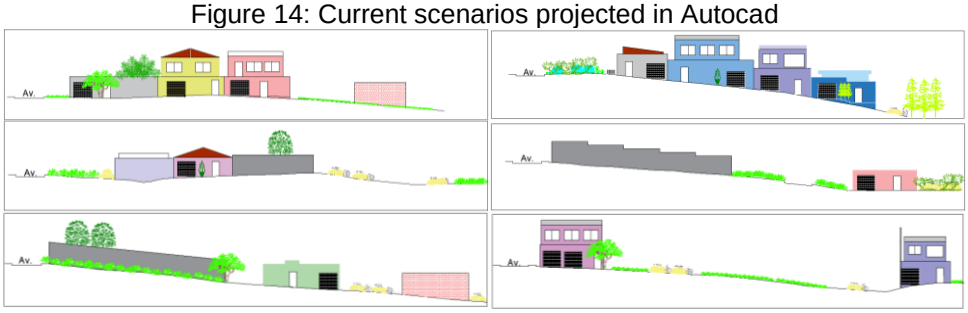
Source: The author

SCENARIOS

Scenario 01: Projection of Current Stretches

The current scenarios were built based on data collection, photos and on-site visits. It was possible to verify that the absence of infrastructure makes the issue of accessibility difficult. The lack of vegetation and shade in the study area is notorious and has a negative impact on the landscape, also affecting the thermal quality of the area. The buildings are horizontal and the height does not exceed three floors. The walls are high and the predominance of residential use is a reality, which culminates in the feeling of insecurity that accompanies the feeling of the landscape of large expanses of concrete, with little vegetation, and which imprints a static, unsafe and segregating landscape, as can be seen in figure 14.

Figure 14: Current scenarios projected in Autocad

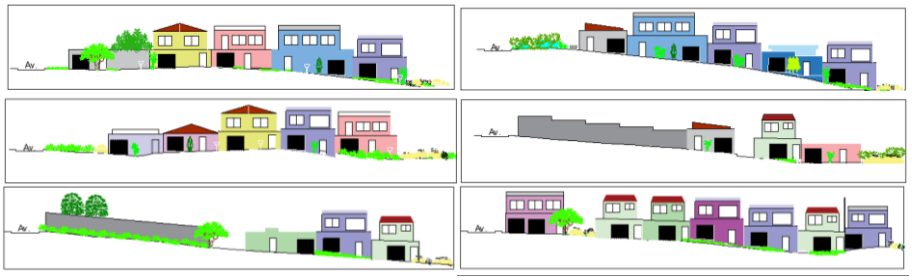


Source: The author

Scenario 02: Future Projection of the Stretches

The projection of future scenarios was built based on the assumption of the continuity of the current development, without any type of improvement in the development process (Figure 15).

Figure 15: Future scenarios projected in Autocad



Source: The author

Scenario 03: Sustainable Future Projection of the Stretches

To design the sustainable future scenarios (Figure 16), development guidelines were implemented, prioritizing an urban environment that is in harmony with the natural environment. Thus, the scenario found presents more green areas, tree covers, selective collection of waste at strategic points for each street, adequate collection for construction waste, hoardings as protection in buildings, greater spacing between buildings, remains horizontal with templates of up to three floors, the walls do not need to be so high and do not need to be closed. There is a relationship between public space and private space (sidewalks and lots). In this scenario there is a public space for leisure. There was no change in altitude in relation to the slope, as well as in the pre-existing properties. (Figure 16)

Figure 16: Sustainable future scenarios projected in Autocad

Source: The author

The proposed scenario corroborates the concept of "tradition of living well", presented in the book by architect Armando de Holanda, Roadmap to build the northeast (2018), where "the so-called sustainable architecture must have a continuity with cultural practices, particularly including our relationship with the climate of the region permeating its

continuity with the city, making the trees extend articulated with streets, houses and squares". In this way, the sustainable scenario invites new buildings to harmonize with the urban space.

DEVELOPMENT GUIDELINES

From images, the systematization of matrix data and the construction of scenarios, it was possible to observe paths for the development of this area. These paths are intended to support public policies and are here called guidelines and are presented below:

1. Promote accessibility, adapting sidewalks and streets, to the standards of NBR 9050. In the case of adaptation to existing sidewalks, adopt at least the service lanes and sidewalk lanes; adequacy of sidewalk heights (without steps following the slope of the streets), etc.
2. Keep the real estate market warm, also contemplating medium-sized properties;
3. Pave the streets with high permeability material;
4. Adequately illuminate the streets;
5. Implement adequate sanitation infrastructure; collection, transportation and treatment of sanitary sewage; and urban drainage;
6. Carry out an urban cleaning in relation to the tangled vegetation, waste and mainly, a program for the collection, treatment and recycling of civil construction waste;
7. Implement public equipment, such as a square and/or park as an environment for coexistence and social interaction, with the suggestion of a water source to help with the relative humidity of the air, with afforestation;
8. Implement a program of afforestation and green areas, in the study area, which are consistent with the climate;
9. Install community trash cans for selective collection;
10. Promote environmental education policies and/or campaigns

CONCLUSION

The research came to the conclusion that the urban expansion of the study area is based on accelerated economic growth. It is not based on the principles of sustainability. The area expands rapidly, but its urban infrastructure does not keep up with this growth, nor is there prior and effective planning for the growth of this area, despite the current master plan, it is necessary to update it to the new requests of the area.

The neighborhood as a whole, and specifically, the six streets, object of this study, have availability of lots for construction, houses mostly high-end residences, however there

are few commercial and leisure facilities that support the neighborhood. Urban mobility and accessibility are very impaired or non-existent. Sidewalks and streets are not adapted to current standards, NBR 9050 or municipal standards. There are no cycle lanes on the main roads, adjacent to the study area, nor public transport.

Urban infrastructure is precarious and does not keep up with urban expansion in terms of basic sanitation (sanitary sewage, urban cleaning and solid waste management), precarious urban lighting; little afforestation, etc.

The analysis made in this research understands that to change this scenario it is necessary to implement urgent measures, which guide the use and occupation of this area from the perspective of sustainability, where urban expansion happens in line with the expansion of urban infrastructure and a whole logic of expansion of equipment that subsidizes this growth, from an environmental, social, economic and physical-spatial point of view, such as: leisure and green roof equipment, neighborhood commerce equipment, among others.

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