Environmental health assessment using sanitary indicators

Avaliação da salubridade ambiental com o uso de indicadores sanitários

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1 INTRODUCTION

Urban studies point out that the growth of Brazilian cities in the last decades has been intense and disorderly, and this urban growth has not been accompanied by the provision of adequate infrastructure of public services of basic sanitation, this situation compromises the environmental health since the absence or deficiency of basic sanitation services contributes to unhealthy environmental conditions.

According to Aravéchia Júnior (2010), the worsening of environmental health has occurred due to the absence of public policies that provide quality of life to the urban population in areas of irregular occupation and the lack of priority in the implementation of basic services needed for urban expansion.

In this sense the sanitary indicators become a tool that enables better management of basic sanitation services, which are reflected in the environmental health conditions. The knowledge of the environmental health conditions is relevant to subsidize governmental actions focused on the quality of life of the population, prioritizing the most urgent situations of the urban spaces analyzed (ARAVÉCHIA JÚNIOR, 2010; GAMA e ALMEIDA, 2020).

In the absence of information on the real environmental health conditions of urban areas, there is a need to undertake urban studies so that the local government can see and meet the real demands of the population in these areas.

2 OBJECTIVE

To evaluate the environmental health conditions of the community Riacho Velho located in the municipality of Marechal Deodoro through the application of sanitary indicators.

3 METHODOLOGY

This study has a qualitative-quantitative approach and is structured in three stages:

1-Characterization of the geographical area covered and data collection through the application of semi-structured questionnaires to adult residents of the town studied;

2 - Replication of the health indicators adapted by Gama (2013);

3 - Tabulating and processing data for salubrity classification, environmental classification table with reference to the literature studied.

The steps that comprise the study's stages will be explained below, going from obtaining the collection to the treatment and analysis of the data:

Regarding Stage 1 - Primary data collection, which was carried out between January and February 2022, data were collected on the basic sanitation public services provided in the region studied by applying forms with semi-structured questions prepared with the collaboration of two specialists in the sanitation area.

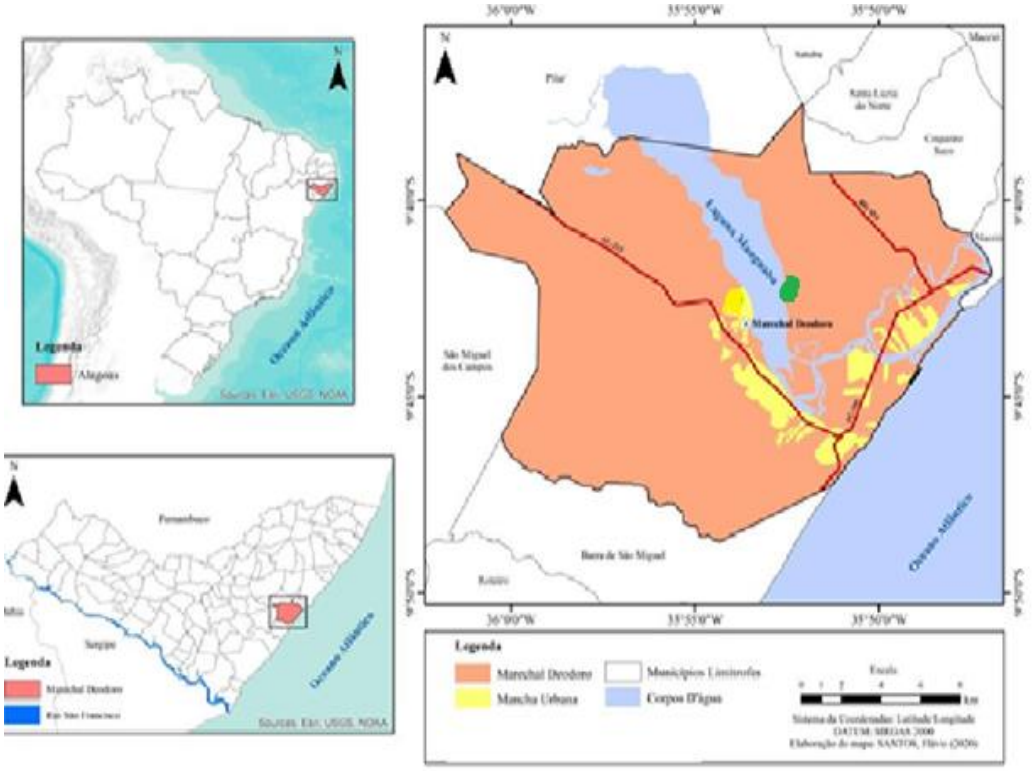
The geographical area covered: Riacho Velho is a riverside community on the shores of the Manguaba Lagoon, located in the municipality of Marechal Deodoro with approximately 600 inhabitants, its residents have fishing as their main source of income. The access to Povoado Riacho Velho is through the entrance road to the Marechal Deodoro Chloro-Chemical Pole and then left on the unpaved road to the Balneário Broma. The access to the community can also be done through the lagoon, by boats and canoes.

The community Riacho Velho, the object of study, is highlighted in green in the municipality of Marechal Deodoro/AL (see figure 1).

The choice of working with the four components of the sanitary aspects that compose Basic Sanitation: water supply, sewage, solid waste, and urban drainage, and the option of not working with the components of environmental sanitation, which includes aspects such as vector control, water resources, and socioeconomic data (public health, income, and education) is due to the fact that it is difficult to obtain data on income and public health.

The residents who participated and answered the questionnaire applied in the study signed the Informed Consent Form and agreed to participate in the study voluntarily. Minors and those who refused to sign the ICF were excluded from the study. The questionnaire applied aimed to collect data on the reality of sanitation services in the locality studied for the composition of sanitary indicators already defined by Gama (2013). The application of the TCLE is in line with the provisions of Resolution No. 466 of December 12, 2012, of the National Health Council, which presents the standards applied to research involving human beings. The participants were told the purpose of the study, and then given the option to participate or not; confidentiality and anonymity were also assured.

Figure 1- Location map of the Riacho Velho community – Marechal Deodoro/AL



Elaboration: Adapted from Gama and Almeida, (2020).

For Stage 2 - Treatment and Analysis of the Data, the Environmental Salubrity Indicator of Maceió (ISA/Maceió) developed by Gama (2013) was used, based on the adaptation of other indicators used in the country.

Figure 2 shows the summary table of the composition of indicators and their respective goals for the composition of the ISA.

Figure 2 - Table summarizing the composition of the indicators and sub-indicators and their respective goals.

INDICATORS	OBJECTIVE	INDICATORS	OBJECTIVE
IAB - Water Supply Indicator	Survey of the number of residences that are supplied by the general network, by well and from other sources.	IRC - Waste Collection Indicator	Survey of the number of households that use collection trucks, containers, and other forms (burning, dumping in rivers or ponds) of solid waste collection and the frequency of solid waste collection.
IES - Indicator of Sanitary Sewage	Survey of the number of residences that use rudimentary fossa, septic tank, collecting system. and other sources (rivers, ponds) for the disposal of sewage and wastewater.	IDU - Indicator of Urban Drainage	Survey the number of homes that suffer from flooding and the number of homes that are on paved streets.

Source: Adapted by the authors from Gama (2013)

For the classification of the environmental health assessment of the community Riacho Velho in the municipality Marechal Deodoro/AL we used scoring ranges that were adapted by Gama (2013) *apud* Batista (2005). These ranges of environmental salubrity are presented in Figure 3 below.

Figure 3 - Table of the health situation by ISA score range d the community Riacho Velho

HEALTH STATUS	POINT
INSALUBRITY	0 - 30
POOR SALUBRITY	31 - 60
AVERAGE SALUBRIOUSNESS	61 - 80
SATISFACTORY SALUBRITY	81 - 100

Source: Adapted from Batista (2005), Dias (2003) and Gama (2013)

4 DEVELOPMENT

4.1 CONCEPTS AND DEFINITIONS OF INDICES AND INDICATORS

According to Souza (2010), indicator is that which indicates and comes from the Latin word *indicare* which means to announce, point or indicate. The indicators emerged around the 1940s, being the social indicators pioneers and responsible for the creation of other categories (BELLEN, 2006). Among the categories that influenced the creation of the Environmental Salubrity Index (ISA) are: Environmental Indicators, Sustainability Indicators, Water Quality Indicators, and Urban Sustainability Indicators. These indicators influenced the emergence of the Environmental Salubrity Indicator (ARAVÉCHIA JÚNIOR, 2010).

The indicators are quantitative information resulting from more than two primary variables. These can be temporal, spatial or environmental information (BELLEN, 2006; GAMA *et al*, 2016). According to Borja and Moraes (2003), the process of building environmental indicators involves a series of decisions, choices, and also requires an integrated understanding of the environment and an interdisciplinary approach.

According to Hamilton (1996 apud ARAVÉCHIA JÚNIOR, 2010) some issues must be observed before choosing the indicators:

- Simplicity: the indicator must adopt a simple methodology, avoiding confusing variables or making the results unreliable;
- Level of social accessibility: the database should be open and accessible. Avoiding that the use of the indicator is interrupted by lack of data;
- Objectivity: the indicator needs to be objective, making its results effective;
- Flexibility: possibility of including and removing variables;
- Relevance: the indicator aims to address and evaluate relevant issues of interest such as health, environmental quality, among others;
- Measurability: its result must be quantifiable;

- Data quality: from reliable sources;

Tunsdall (1994, apud ARAVÉCHIA JÚNIOR, 2010) highlights the main functions of indicators:

- Condition and trend assessment;
- Comparisons between places and situations;
- Assessment of conditions and trends in relation to goals and objectives;
- Provide warning information;
- Anticipate future conditions and trends.

Besides these characteristics, social or environmental indicators are useful to support public planning activities and the formulation of public policies in the different spheres of government, since the correct development and application of indicators allow a diagnosis of the reality or state of the theme under study (BELLEN, 2006 and GAMA, 2021).

5 ENVIRONMENTAL SALUBRITY

According to Dias (2003), environmental salubrity is understood as the environmental quality capable of preventing the occurrence of diseases related to the environment and of promoting the necessary conditions for the health of the urban and rural population. Aravéchia Júnior (2010) and Gama (2021) based on the definition of Dias (2003) state that environmental salubrity is the tuning between quality of life and environmental quality.

The authors also point out that environmental health has a direct relationship with the provision of public sanitation services, since it is directly proportional to the conditions of provision of sanitation services. Thus, it is noteworthy that the better the quality of the provision of sanitation services, the greater the environmental health of the locality, corroborating this point Dias (2003), emphasizes that environmental health is a product of the provision of public sanitation services in the locality and the society that lives there.

Silva et al (2017) and Gama et al (2022), point out that one of the ways to analyze the environmental health of a locality, is through the use of health indicators, since these better express the needs or deficiencies of the region or community analyzed .

6 RESULTS

The general environmental salubrity of the locality Riacho Velho in Marechal Deodoro/AL obtained was 56.50 points, which is comprised in the low salubrity range. This score is based on the reference table used throughout the study.

The following are the scores (figure 4) and the analysis of the results of the ISA indicators applied to the study area, accompanied by the overall ISA result.

Figure 4- Scores of the ISA indicators applied in the studied locality.

SIGLA	INDICATOR	TOP SCORE	POINTS SCORED
iab	Water supply indicator	30	30
ies	Sanitary Sewage Indicator	30	3
icr	Waste Collection Indicator	20	13,5
idu	Urban Drainage Indicator	20	10
Total ISA		100	56,5

Source: The authors (2022).

In the results obtained through the water supply indicator, it was found that 100% of urban households in the community of Riacho Velho are served by water supply by general network by the municipal urban supply service. This situation is considered adequate, since the entire population has access to treated drinking water, as recommended by FUNASA (National Health Foundation).

In the indicator of destination of sanitary sewage (IES), it was found that 92% of households in the study area dumped their waste in rudimentary cesspits and 8% used other sources, such as dumping into rivers or ponds, thus evidencing the lack of sewage collection network in the community studied. Given this picture of the sanitary sewage service, it can be said that the locality Riacho Velho lives a critical situation, since these inadequate forms of destination of sanitary sewage are reflected in the conditions of environmental health and public health for the population of the area studied.

With regard to wastewater, the study found through the data obtained that 8% of households in the studied community send their wastewater to rudimentary cesspits and 92% send this liquid waste to the street. This high number of households that send their wastewater to the street results in serious consequences for the environment and for the public health of the local population.

The indicator of solid waste collection - (Icr). According to the results obtained by this indicator, it was found that 69% of households in the community studied have the garbage collection service through the door-to-door collection truck and 31% by container. As for the frequency of collection, it was found that all residences located in the area have their solid waste collected three times a week. Thus, it is verified that the frequency of collection of solid waste occurs adequately, according to the parameters established by the National Health Foundation (FUNASA), however, according to this federal authority the ideal collection should be performed six times a week.

The urban drainage indicator - Idu: according to the data obtained by this indicator it was found that there is no flooding or inundation in the residences in the locality treated in the study carried out. With these results it is verified that the locality addressed does not present urban drainage problems with regard to the aspect of flooding and inundation. As for the paving situation, the results obtained showed that 90% of the streets of the households surveyed in the area studied are unpaved, thus most of the locality studied does not have adequate rainwater drainage infrastructure.

The total result obtained from the ISA/Riacho Velho, as previously mentioned, was 56.5 points out of 100. This value was measured through the weighted sum of the values obtained in the indicators applied. Comparing the value obtained with the table 2, which presents the salubrity ranges, it can be seen that the result obtained is in the low salubrity range. Among the basic sanitation services provided in the town studied, sanitary sewage is the one that presents the worst condition and was reflected considerably in the final result of the ISA/ Riacho Velho.

7 CONCLUDING REMARKS

This study analyzed the reality of the environmental health situation of the urban locality Comunidade Riacho velho, reflected on the basis of the health situation resulting from the provision of public sanitation services in the researched locality. As for these basic sanitation services provided in the locality, water supply was the best of the basic sanitation services provided in the community. One of the worrying points in the evaluation concerns the sanitary sewage service, since this was the worst result of the services evaluated, since most of the inhabitants of the community studied pour their liquid effluents into rudimentary cesspits, and some of them dispose of them into the Manguaba lagoon water body.

Another point observed was that most of the community's wastewater is destined for the street and runs into the open air. In view of this reality, there is a need for investment by the local government to solve this sanitary reality found in the study, a situation that puts at risk the entire population residing in the community studied. For the students who participated in the study, the experience was of great relevance, since they experienced in practice the reality of basic sanitation in a community and thus made bridges and connections with the theme basic sanitation and environmental health worked in the disciplines of their respective courses such as: Science Teaching and Environmental Education.

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