# SUBJECTIVE ANALYSIS OF SOUNDSCAPE IN THREE AREAS IN THE BRAZILIAN CITY IN THE LEGAL AMAZON REGION.

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## Résumé

La ville de Sinop compte environ 143 000 habitants et est située au nord du Mato Grosso dans la région de l'Amazonie légale. La ville possède de grands espaces verts et certains d'entre eux subissent des altérations du paysage sonore à cause de l'urbanisation, comme le quartier Aquarela do Brasil, le Parque Florestal et l'avenue Tarumãs. Les paysages sonores de ces trois endroits ont été définis comme objets d'étude car ils présentent des typologies et des utilisations différentes, deux d'entre eux étant boisés et un autre avec peu de végétation situé au centre de la ville. L'objectif de la recherche est d'identifier les points de préservation du paysage sonore et de définir ceux qui interfèrent dans la sensation de confort des personnes à partir d'une analyse subjective. Les utilisateurs ont répondu à des questionnaires pour comprendre les paysages sonores et la relation de confort dans l'environnement qu'ils ont avec l'identification des différents sons du paysage sonore. Les résultats subjectifs impliquent des variables physiques, sensibles et psychologiques, qui sont présentées et revendiquées dans cet article. Il a été vérifié que les niveaux sonores existants dans les lieux analysés sont supérieurs à la limite imposée par la réglementation brésilienne, cependant, il existe une satisfaction de confort définie par la plupart des utilisateurs de ces espaces urbains.

**Mots clefs :** paysage sonore, bruit urbain, acoustique urbaine, confort environnemental

## Abstract

The Sinop city has about 143,000 inhabitants and is located in the north of Mato Grosso in the Legal Amazon region. The city has large green areas and some of them are suffering alterations in the soundscape through urbanization, such as the Aquarela do Brasil neighborhood, Parque Florestal, and Tarumãs Avenue. The soundscapes in these three locations were defined as objects of study because they have different typologies and uses, two of them wooded and another with little vegetation located in the center of the city. The objective of the research is to identify the preservation points of the soundscape and to define which of them interfere in the feeling of comfort of people from a subjective analysis. Questionnaires were answered by users to understand the soundscapes and the relation of comfort within the environment they have with the identification of different sounds of the soundscape. The subjective results involve physical, sensitive, and psychological variables, which are presented and claimed in this article. It was verified that the existing sound levels in the analyzed locations are above the limit imposed by the Brazilian regulation, however, there is a satisfaction of comfort defined by most users of these urban spaces.

**Keywords:** soundscape, urban noise, urban acoustics, environmental comfort.

## 1 Introduction

With the advent of the industrial revolution, new technologies have emerged that not only bring benefits, but also deterioration of the environment. On the other hand, with access to these facilities and modernity, there was an intensification of the growth in the number of pollution sources. The increase in the means of transport was evident, contributing to the increase in noise within cities [1].

Giunta et al. state that noise pollution is one of the negative consequences of human development [2], which influences the quality of life and health of the population, becoming one of the most frequent environmental problems in large and medium-sized cities.

These noise-related health problems are in part due to adaptation. People get used to the sounds generated inside cities, however, even if they do not notice their effects, the noises are still harmful to health [3].

The disorderly growth of cities, coupled with the increase in the number of urban roads, has resulted in the appearance of noise sources capable of generating great damage to the population. These sources, when in excess, result in the appearance of so-called noise pollution [4].

Medium and large cities have an intense flow of cars, which leads to an increase in noise levels, which are considered to be responsible for hearing loss. The excessive sound caused by traffic, industries, recreation areas, people talking and airplanes are part of those responsible for noise pollution [5].

Exposure to noise daily can lead to health problems, such as loss of sleep, heart rate modification, insomnia, contraction of blood vessels, among others [6].

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Currently, noise pollution is already considered by the World Health Organization (WHO) as the second-largest type of pollution in the world, losing only to air pollution [7]. However, it is the one that presents the greatest danger, due to its difficulty of perception and immediate acceptance of its effects, and can thus interfere with human health [8].

Brazil, within the scope of development to which it has been passing, is affected by this sudden change in the quality of sounds in its cities. This advent of intensification of sounds interferes directly and indirectly in the quality of life of people and may influence the state of mind or conduct our behavior [9]. Noise is associated with human activities resulting from urbanization and industrial development and is considered a pollutant [10].

These changes within the cities consequently bring about a change in the soundscape, which is nothing more than an acoustic environment as perceived or experienced and/or understood by a person or people, in a given context [11].

The urban soundscape contributes to the perceived quality of the urban environment and brings an identity to each place seen in Figure 1. Cities are composed of a junction of distinct soundscapes, each outdoor space has unique urban characteristics.
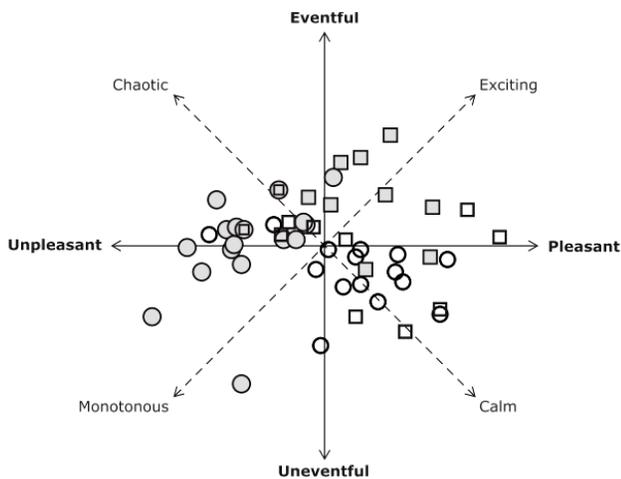


**Figure 1:** Example of a sound landscape classification [12]

Sound beyond the negative effects can provide positive effects, improving mood, bringing an affective memory to mind, or bringing relaxation [13].

Just pleasant sounds are not enough to bring well-being. The context in which the person is inserted is a fundamental part of the interpretation of the soundscape. The visual characteristics, infrastructure, and activities that are being performed have a great influence on this interpretation. Currently, the soundscape cannot be considered in a categorization only acoustic, its evaluation must consider a range of factors beyond the acoustic [14], such as the visual context [15], as the social context [16] and the individual interpretations [17], and can be seen in the diagram in Figure 2.

This study was conducted in the Legal Amazon region in Sinop city, which is located in the north of the state of Mato Grosso, is an agro-industrial hub and has been expanding gradually and rapidly, standing out for its economic strength
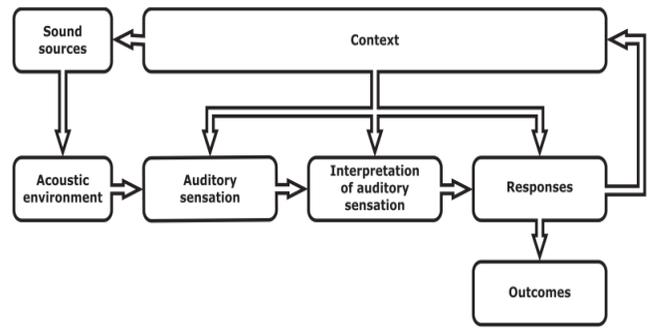


**Figure 2:** Elements in the perceptual construct of soundscape [14].

and attracting new companies and residents, growing about 10% per year [18].

The increase in population, homes, commerce, vehicle traffic, night noises, promotes an acoustic environment different from the initial one. In this context, the change in the landscape of Sinop brought with it new visual and sound characteristics.

At the same time that it has transformed in its urban context in which it has also modified its original sound environment, the city of Sinop still has quiet areas of significant environmental value for the preservation and contemplation of nature.

The concern with the well-being of the human being has increased, consequently, the search for laws and guidelines, to guide the management of urban spaces and identify how the characteristics of the environment influence the quality of life of people, end up appearing, such as those used for noise management through the European Directive 2002/49/EC [19].

More current standards, to bring a congruence of existing approaches, such as ISO/BS 12.913-1:2014 [15], ISO/TS 12.913-2:2018 [20] and ABNT NBR 10.151:2019 [21] provide, the first two guidelines to be followed in the study of sound landscape and the third the instructions for measurements in external areas.

Since Sinop city has spaces with distinct characteristics, the need to qualify them was seen.

Based on the above considerations, it became essential to carry out specific studies to identify and describe the impact on the soundscape traces and its consequences for individuals. In this article, the proposed classification (subjective) will be operated employing questionnaires applied to the users of the studied sites. This study will serve to identify areas where there is still a sound landscape suitable for preservation, in addition to highlighting critical areas.

**Objective**

The main objective of this study is to subjectively characterize the soundscape of three areas within the urban environment of a medium-sized Brazilian city within the region of the Legal Amazon to point out the area that should be preserved and/or that requires adaptation and structural interventions.

## 2 Standards

Holtz claims that until the beginning of the 20th-century countries created their laws and guidelines for noise management [22], but with the digital era reaching the 1990s there was a process of global integration, so some countries began to share the same norms.

European countries made strong progress in noise studies through legislative initiatives and multinational efforts. This led them to be a reference in the subject.

As the years went by, standards emerged, improving the methods and approach of research/studies in this area.

### 2.1 Green paper

The Green Paper was a document drawn up in Brussels in 1996 by the Commission of the European Communities and initiated the study of acoustics within cities on the European continent.

The document reveals the low relevance of noise pollution to the detriment of other types of pollution. The main objective of the document was to encourage an open debate on public policies concerning noise control, to exchange knowledge, bring more relevant information and attitudes seen as beneficial to the population.

This document was the initial stimulus for the first steps to be taken regarding noise management in cities.

### 2.2 European directive

After the first steps to be taken in 1996, in 2002 the European Parliament together with the Council of the European Union published Directive 2002/49/EC [19]. This Directive aims at defining a common approach to avoid, prevent or reduce, as a matter of priority, the harmful effects of exposure to environmental noise, including annoyance.

According to Directive 2002/49/EC protection against noise, part of Community policy, aims at increasing the level of protection of health and the environment. There was a need for research with criteria that would enable concrete measures and actions to be taken to guide the development and assist in the directives that were already in force, for this Directive/49/EC came to light.

This directive has an objective character, without spaces for dubious interpretations, facilitating research in general, since all studies governed by it offer only one type of approach.

### 2.3 International Organization for Standardization: ISO 12.913-1:2014 and ISO/TS 12.913-2:2018

The field of study on the sound landscape has evolved to include several aspects around the world. There is a multiplicity of opinions about its definition and purpose. For this reason, there was a need for a norm that could serve as a congruence between all lines of studies on the subject.

In this context, the ISO 12.913-1:2014 standard [15] aims to provide a basis for communication between disciplines and professions involving the soundscape. According to the standard, the soundscape is based on people's perception, so it works with perceptual construction, related to a physical phenomenon.

Furthermore, in part two ISO/TS 12.913-2:2018 [20], it explains the pertinent factors for the measurement and reporting in studies about soundscape, as well as for the planning, design, and management of the soundscape.

This standard has the requirements and supporting information for data collection and reporting with the bias in the study and investigation of the soundscape, harmonizing data collection.

It also has explanations of the descriptors, such as soundwalk, questionnaire, interview guide, the taxonomy of sound sources, and binaural measurements. It is necessary to clarify that these descriptors need to follow some normative frameworks.

### 2.4 Brazilian Association of Technical Standards: ABNT NBR 10151:2019

The NBR 10151:2019 standard [21] establishes the conditions for conducting studies on external and internal noise, being holistic.

As the present study focuses on external noise, the standard exposes specifications of the noise measurement method, application of corrections in the measured levels.

It is worth mentioning that this standard establishes the procedure for measuring and assessing sound pressure levels in external and internal environments for inhabited areas; procedure for assessing total, specific and residual sound; procedure for assessing tonal, impulsive, intermittent and continuous sound; limits of sound pressure levels for environments outside buildings, in areas of human occupation.

## 3 Method

Methods of studying the soundscape are under development. Accordingly, this study was based on ISO 12913-1:2014, ISO/TS 12.913-2:2018, and ABNT NBR 15151:2019 [15, 20, 21].

The study had a subjective approach with the application of questionnaires to the users of the sites and for comparison with the current standard was made the measurements in situ.

### 3.1 Object of study

The survey was conducted in the Sinop city, located north of Mato Grosso (11° 51' 51" S, 55° 30' 09" W) in the region of Legal Amazon. According to Ferreira [23], the city was founded in the 1970s, when Colonizadora Sinop S.A. acquired approximately 500,000 hectares of land, located 500 km from Cuiabá on the BR 163 highway (Cuiabá-Santarém), and created Gleba Celeste.

Due to the great demand and migration to the west of the country, in less than seven years Governor Frederico Campos signed Law 4.156/79, which elevated Sinop to the category of municipality.

Currently, it has an estimated population of 142,996, according to IBGE [24]. Despite being young, the city is in constant development, going through great urban changes.

Within the urban sound landscape of the city, significant changes were observed such as the decrease of green and silent areas seen in the case of Avenida Tarumãs, formerly one of the most forested in the city which underwent a reform that extracted much of the vegetation, as shown in Figure 3.

The areas where the study was conducted are green reserve R-11 (Parque Florestal); the green area in the neighborhood Aquarela do Brasil; and Tarumãs Avenue. These areas are shown in Figure 4.



**Figure 3:** Tarumãs Avenue, before and after (NORTÃO NOTÍCIAS, 2014) (1 e 2); (SKYSCRAPERCITY, 2010) (3); (ANÚNCIOSABZ,2017) (4).



**Figure 4:** Locations of the study areas.

## 3.2 Soundwalk

In the spaces defined for the study, walks were carried out to identify the residual noise that attracted more attention according to ISO/TS 12913-2:2018 [20]. The entire accessible area of the environments was covered, without or with the minimum interference in people's behavior.

The measured points were chosen as they presented interesting characteristics analyzed during the soundwalk in the environment.

Each environment had some points needed for the assessment. The Aquarela Brasil neighborhood had five points (Figure 5), Forest Park and Tarumãs Avenue had six points (Figure 6 and 7).



**Figure 5:** Positioning of measuring points in the Aquarela Brazil neighborhood.



**Figure 6:** Positioning of acoustic measurement points in the Parque Florestal.



**Figure 7:** Positioning of the acoustic measurement points on Tarumãs Avenue.

## 3.3 Equipment

For the acoustic measurements of the studied sites, the sound pressure levels (Leq) were measured, and the weighted sound pressure level (LAeq) was calculated using the sound level meter model G4, Type 2270, from the company Brüel & Kjær (Figure 8), installed 1.5 m from the ground, with the aid of a tripod, because according to Rodrigues (2015) this is the average height of the human ear, following the recommendations established by NBR 10.151:2019 [21].

**Figure 8:** B&K 2270 Sonometer.

The duration of the measurements at each point was ten minutes (Laeq, 10 min), measuring traffic noise where necessary, with these data a noisy assessment of the acoustical environment was made concerning what the standard establishes.

The measurements were performed on weather-friendly days, avoiding precipitation that could interfere with the final result.

### 3.4 Data collection

Along with measurements, behavioral notes of people were taken, as well as photographic surveys and filming of the environment in question according to ISO/TS 12913-2:2018 [20].

The notes also included the sound events heard during the measurements and the characteristics of the landscapes in different environments.

To understand the influence of urban aspects on the quality of the sound landscape of these environments, points were measured in regions where the sound of traffic could directly interfere with the sound quality of the environment.

To assess the quality of the environment or the soundscape two types of subjective assessments were performed, one by the researcher and the other by the user.

Behavioral observation of the users who were inserted in the acoustic environment, the activities they performed, in addition to observing the time of execution of such activity, was performed.

The classification of the soundscape was obtained utilizing a questionnaire to obtain an understanding of their relationship with the sound environment according to ISO 12913-2:2018 [20]. There were a total of 180 questionnaires, sixty in each place studied.

The understanding and perception of the soundscape, the motivation of the visit, length of stay, neighborhoods of origin, and how often they attended the site were addressed in their surveys.

The questionnaires applied had open and objective questions. The objective answer questions limit the respondent to a set of answers provided, while the open-ended questions allow the respondent freedom of response, without influence from the researcher [25].

The closed-ended questions present greater objectivity and ease in systematizing the collected information [26], but to have greater reliability regarding the quality of the sound environment, the open-ended questions are necessary because spontaneous answers are obtained from users.

### 3.5 Measurements

The measurements were carried out, together with the application of the questionnaires, on different days of the week (Table 1) targeting the days with user flow.

**Table 1.** Dias de medições realizadas.

| Place | Day 1 | Day 2 | Day 3 | Day 4 |
|-------|-------|-------|-------|-------|
| **Aquarela do Brasil** | 21/04/18 | 22/04/18 | 28/04/18 | 29/04/18 |
| **Parque Florestal** | 23/04/18 | 25/04/18 | 28/04/18 | 29/04/18 |
| **Avenida Tarumãs** | 21/04/18 | 22/04/18 | 28/04/18 | 29/04/18 |

The measurements were taken at the points defined during the exploratory walk of the environment.

### 3.6 Analysis of the results

The values obtained in the measurements were compared with the values recommended in ABNT NBR 10151:2019 [21] for the comfort of individuals (Table 2). It is worth noting that the Aquarela do Brasil neighborhood and the Forest Park fall into category 2 (Daytime 50 dB and Night 45 dB) while Avenida Tarumãs fall into category 4 (Daytime 60 dB and Night 55 dB).

The subjective data were carefully analyzed and interpreted, establishing the characterization of the soundscape users of each environment studied.

Through this description obtained through the responses of the individuals, the subjective judgment of the Soundscape was established.

## 4 Results

The results were analyzed separately. The data collected with the measurements were used to identify whether or not the guidelines of the NBR 10.151:2019 standard was framed. The data obtained through the questionnaires were analyzed to define the soundscape users' understanding of each environment studied.

### 4.1 Acoustics characterization

The acoustic characterization of the study sites was based on the results obtained from measurements at the points chosen through the exploratory walk.

**Table 2.** Limits of sound pressure levels according to the types of inhabited areas and the period.

| Tipes of Areas | Daytime | Night |
|---|---|---|
| 1- Area of rural residences | 40 dB | 35 dB |
| 2- Strictly residential urban or hospital or school area | 50 dB | 45 dB |
| 3- Predominantly residential mixed área | 55 dB | 50 dB |
| 4- Mixed area with predominance of commercial and/or administrative activities | 60 dB | 55 dB |
| 5- Mixed area with predominance of cultural activities, leisure and tourism | 65 dB | 55 dB |
| 6- Predominantly industrial area | 70 dB | 60 dB |

For the Aquarela do Brasil neighborhood, data were obtained at five points within the limits of the green recreation and leisure area (Fig. 5). In the Parque Florestal (reserve R-11) six points were evaluated (Fig. 6), of which five were located on the trails and one on the access road. In Tarumãs Avenue, data collection was performed in six points (Fig. 7) distributed in the spaces where there is recreation during the weekends.

The land occupation around the Aquarela do Brasil neighborhood and the Parque Florestal is exclusively residential, while on Tarumãs Avenue it is a mixed area (commercial and residential use) [27].

It was found that the roads around the two green areas have a relatively low traffic density, while on Tarumãs Avenue the flow is very high being responsible for the high sound levels.

When comparing the measured data with the values that ABNT NBR 10151:2019 recommends [21], only the Parque Florestal fits, whereas Tarumãs Avenue exceeds 15 dB(A) of the standard value.

### 4.2 Subjective anaysis

During the measurements, the researcher took notes of the sounds perceived.

In the Aquarela do Brasil neighborhood the sounds identified were: birds singing, people talking, children shouting, sounds of playground toys, waterfall sounds and traffic sounds (light); in the Forest Park the predominant sounds were those of nature: sounds of birds, sounds of wild animals, wind beating on leaves, people chatting low and traffic sounds (light); on Tarumãs Avenue the sound of traffic completely dominates the soundscape along with sounds of music, sound cars, and people chatting.

Sixty questionnaires were applied to each study site, totaling 180 surveys conducted, to have a more accurate sample.

The amount concerning the total number between men and women had little difference, 97 females (53.8%) and 83 (46.2%) males. It was noted that in the watercolor neighborhood and Tarumãs Avenue there were mostly female visitors (58.3% and 63.3% respectively) and in the Parque Florestal mostly male (60%) as shown in Figure 9.
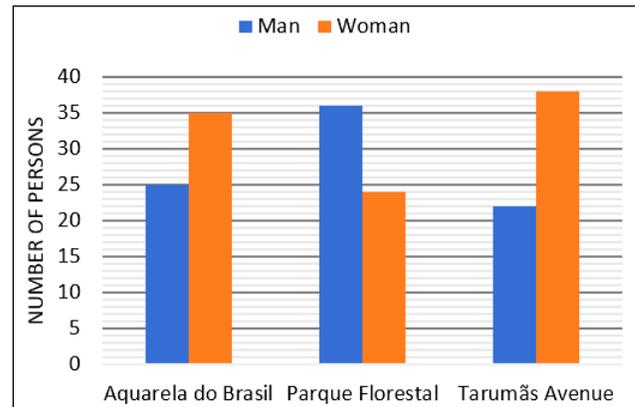


**Figure 9:** Gender of visitors in research places.

Concerning age groups, it was found that the majority of the visitors interviewed were young people between 15 and 29 years of age, as can be seen in Figure 10, showing us that the search for leisure, entertainment, or tranquility is, for the most part, among young people.
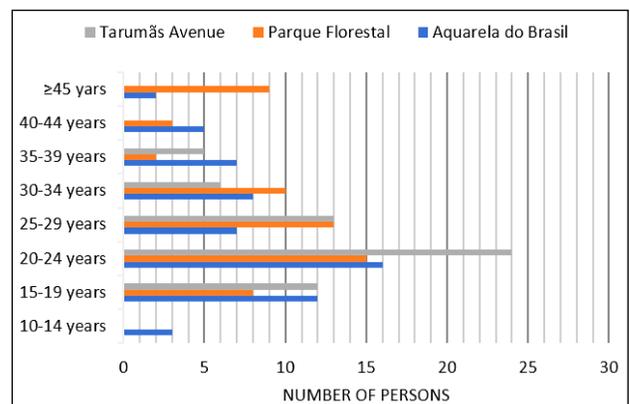


**Figure 10:** Age range of visitors.

The users of the places when asked about the frequency with which they visit the place, in their majority answered go at least once a month, 37 (61.7%) questioned in Parque Florestal and Tarumãs Avenue, as well as 46 (76.7%) in Aquarela do Brasil, as we can see in Figure 11.

The time in a certain place tends to be relevant when it comes to sound perception and when questioned about the length of stay in the place, most of them remain between one and two hours in the three places studied, is shown in Figure 12.
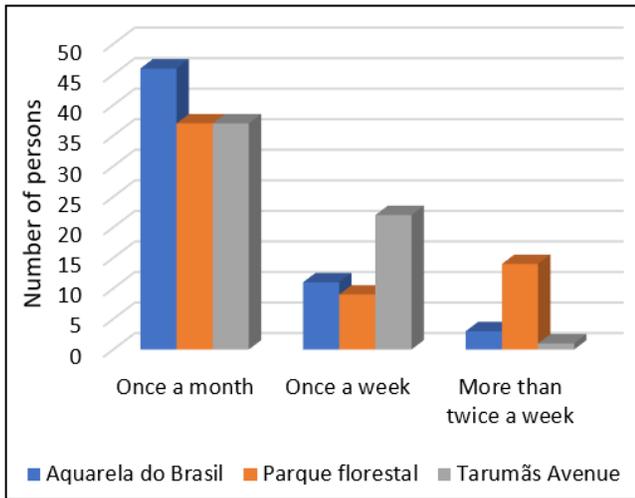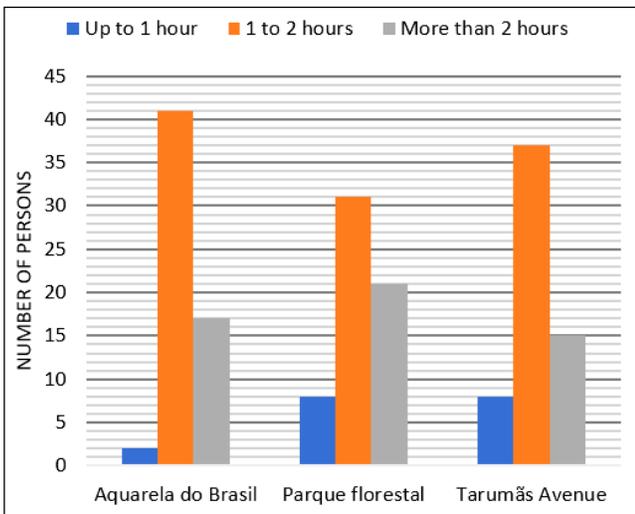
**Figure 11:** Frequency of visits.



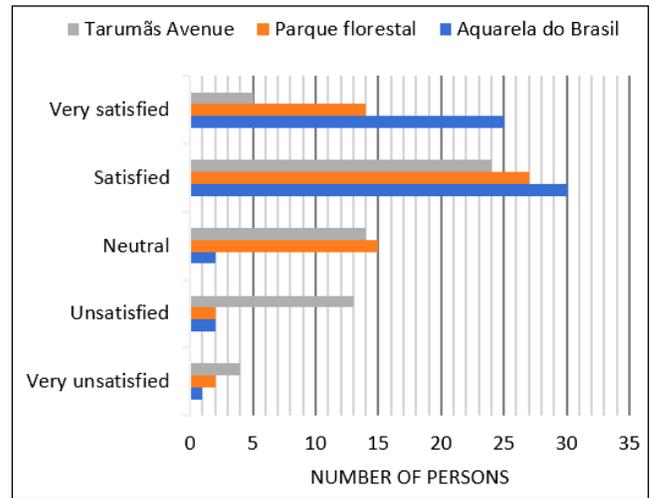**Figure 12:** Time spent in place.



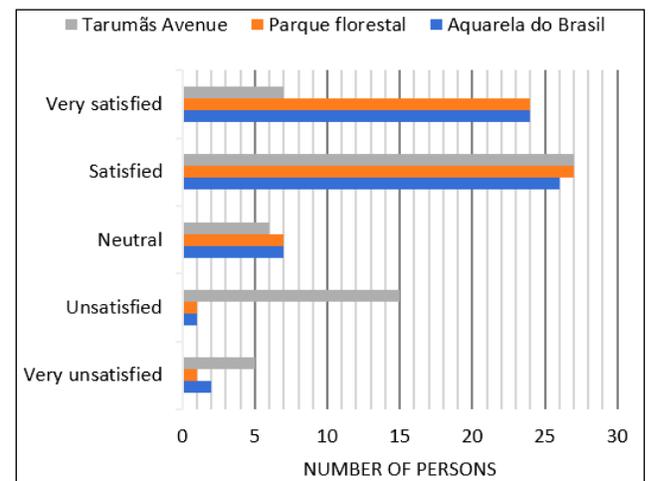**Figure 13:** Level of satisfaction with the infrastructure of the place.



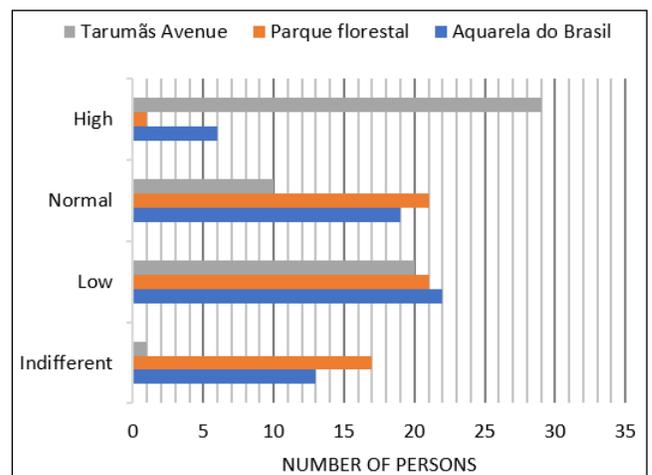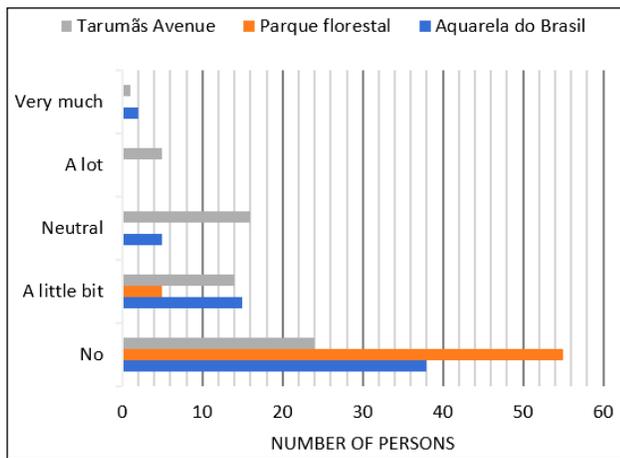**Figure 14:** Level of satisfaction with the aesthetic beauty of the place.



**Figure 15:** Sound perception of the place.

Regarding the quality of the infrastructure of the site (Figure 13) and the visual beauty (Figure 14), most of the interviewees were satisfied, however, there was a drop in satisfaction concerning Tarumãs Avenue.

They were asked to assess the volume of sound in the environment. The Tarumãs Avenue was the worst evaluated in this sense, having been considered by 29 people (48.3%) as the place with high volume. While the other two areas studied were characterized by low or normal volume, shown in Figure 15.

There was the questioning as to the inconvenience generated by the sound of the environment, the numbers showed that 55 people (91.7%) do not suffer any inconvenience in the Forest Park, in the neighborhood Aquarela do Brasil this number already drops to 38 people (63.3%) and last and most discrepant, on Avenida Tarumãs, 24 individuals (40%) of those interviewed say they are not disturbed by the volume of the sound as can be seen in Fig. 16.

Through the analysis of open-ended questions that aimed to understand the perception of sound quality and the degree of enjoyability by individuals, it was found that 54 respon-

dents (90%) in the Forest Park, 32 visitors (53%) in the neighborhood Aquarela do Brasil and 29 individuals (48.3%) on

**Figure 16:** Nuisance from the sound of the place.

Tarumãs Avenue felt an improvement in the sound environment compared to urban sounds. However, 31 of the 60 interviewees (51.7%) on Tarumãs Avenue said that the sound was a little or very exaggerated.

Through the analysis of open-ended questions that aimed to understand the perception of sound quality and the degree of enjoyability by individuals, it was found that 54 respondents (90%) in the Forest Park, 32 visitors (53%) in the neighborhood Aquarela do Brasil and 29 individuals (48.3%) on Tarumãs Avenue felt an improvement in the sound environment compared to urban sounds. However, 31 of the 60 interviewees (51.7%) on Tarumãs Avenue said that the sound was a little or very exaggerated.

### 4.3 Discussion

The background sounds that make up the soundscape do not contribute to the overall experience of the environment. Therefore, if these sounds are not perceived by the people in the environment, this will not provide a bad understanding of the sound environment. These background sounds do not attract the attention of individuals and are not taken into account in their assessment of the environment, obviously, in some circumstances.

When the sound landscape prevents activities within the environment, such as communication, having a disturbance profile, it causes a bad understanding, consequently, a negative assessment will be made.

Soothing soundscapes contribute to a positive overall experience but must meet the expectations created by individuals. The context in which this soundscape appears will determine whether the person will have positive impressions. However, the soothing soundscape is influenced by the background sounds and is capable of turning an initial positive understanding into a negative one.

The soothing soundscape can be stimulating as well as calming. When these stimuli can awaken good feelings, understanding becomes positive.

Perceptions are individuals. At the same time that the soundscape can bring about good stimuli or relaxation, it is also capable of causing the opposite effect.

Through this understanding, when subjectively evaluating the soundscape, the responses will not always be those

initially foreseen. The perception of the soundscape is fluid and can change all the time.

The three soundscapes studied have distinct characteristics.

• Aquarela do Brasil: has green areas, sounds of nature, good infrastructure for leisure, children screaming, people talking, traffic sounds, noises of playground toys;

• Tarumãs Avenue: intense traffic sounds, a lot of music with high sound level, the sound car passing by, horns, people talking and little infrastructure;

• Parque Florestal (reserve R-11): dense green area inside the city, sounds of nature, people talking low, background sounds of light traffic, has good infrastructure, leisure areas, wild animals.

Taking into account that 53.8% of the answers obtained through the questionnaires were female and 46.2% male, besides, the vast majority of the respondents were young people between 15 and 29 years old. Consequently, the profile was drawn and it can be stated that the answers were mostly obtained by young women between 15 and 29 years old.

The frequency of visits and stays at the study sites becomes relevant so that we can determine from the answers whether people are getting used to the noises and disregarding their influence on their evaluation to the detriment of the activities carried out. The result of the study shows that the minimum stay by most visitors is two hours in both quieter environments (Parque Florestal) and noisier environments (Tarumãs Avenue).

It is necessary to highlight that the soundscape is something beyond objective measurements and framing in a certain classification. The infrastructure and visual beauty of the places are parameters that play a very important role in the perception of the sound environment.

The results show that most visitors are satisfied with what they are offered in the environments. However, Tarumãs Avenue has up to 33.3% disapproval in these matters.

Analyzing the results of the evaluation of the sound perception of the environment, interesting results were obtained, mainly concerning Tarumãs Avenue.

As expected, the Forest Park offers a very attractive infrastructure and visual aspect, and still has a place with little noise from the urban environment.

The Aquarela do Brasil neighborhood because it is a planned neighborhood, offers a good infrastructure and attractive visual aspect, having, in general, a positive evaluation in this aspect, which also contributed concerning the nuisance most say not to feel or a little, even their sound levels are high.

When evaluating the answers obtained on Tarumãs Avenue, which does not have an adequate infrastructure to attend visitors and a visual aspect that does not please 33.3% of visitors, it was concluded that only 20 people (33.3%) also feel uncomfortable with the noise in this environment. Of the total 60 interviewees, 24 (40%) do not feel uncomfortable at all. Reflecting what encompasses the soundscape (social and visual context, feelings, activities, and individual interpretations).

# 5 Conclusion

This study was based on a subjective analysis of soundscapes, based on the subjectivity of the general understanding of the environment.

The values obtained in the measurements at the different measurement points in the study place show that most of them are in disagreement with what ABNT NBR 10.151:2019 determines [21] and also with what WHO determines.

The place with the highest disagreement is Tarumãs Avenue which has 67 dB (A), due to the high level of traffic besides the music of the vehicles. This shows that the hypothesis that urban development effectively influences in the deterioration of the urban sound environment of the places studied is a fact. However, the results assume that the soundscape would have a negative impression on individuals, but it was the other way around.

The low influence of urban sounds inside the Parque Florestal reflects in the good evaluation of the users regarding the discomfort inside the environment, which in turn has large green belts helping in the sound attenuation and the perception of sounds from nature.

The Aquarela do Brasil neighborhood suffers the influence of urban sounds, at the same time that it has green areas, these do not have a high density not directly influencing the decrease of the sound intensity, however, it helps in the visual improvement and consequently in the positive interpretation of the environment by the great majority of the visitors.

The large amount of noise generated in Tarumãs Avenue was not able to reveal this environment as a negative sound landscape, however, its high sound levels resulted in a bad evaluation by 1/3 of users. The context of fun and entertainment had in this environment overcame the nuisance generated by the noise and also the lack of infrastructure and visual aesthetics.

It is worth noting that even in most places being judged as pleasant in sound aspects, the attention must be maintained. People can get used to the noise and stop taking it into account in their judgments of the environment, however, the negative influence on health remains active.

The only soundscape, taking into account the permitted levels and individual assessments, that should be preserved would be the Parque Florestal.

The other two (Aquarela do Brasil and Tarumãs Avenue) would require public policies, in addition to structural interventions, which would enable the adaptation of the sound environment to the values standardized by NBR 10151:2019.

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