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PERCEPTION OF RESIDENTS IN MANAUS ON THE URBAN AFFORESTATION

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ABSTRACT: The municipal governments, through their Environmental Secretariats, seek to invest in afforestation through public policies, educational campaigns and seedling distribution. However, the actions are inefficient, as studies on afforestation are based on inventories of species planted in public places, few studies seek to understand the population on the subject of afforestation. It is believed that the work of environmental education is of paramount importance. This study aimed to analyze the perception of afforestation of residents from different areas of Manaus, Amazonas state through an interview in the city of Manaus. Most participants were women aged 18-28 years. Most residents have completed primary education. Residents understand what urban afforestation is and the benefits of planting trees can bring, but they are not aware of the most suitable species to be buried in the city.

KEYWORDS: Environmental education; Planning; Public roads.

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PERCEPÇÃO DOS MORADORES DE MANAUS SOBRE A ARBORIZAÇÃO URBANA

Resumo: As prefeituras municipais, por meio das suas Secretarias Ambientais, buscam investir na arborização mediante políticas públicas, campanhas educativas e distribuição de mudas. Contudo, as ações são ineficientes, pois os estudos sobre arborização baseiam-se em inventários das espécies plantadas nos logradouros, poucos trabalhos buscam o entendimento da população quanto ao assunto arborização. Acredita-se que o trabalho de educação ambiental é de suma importância. O presente estudo teve como objetivo de analisar a percepção sobre a arborização dos moradores de diferentes áreas de Manaus, estado do Amazonas. Através de entrevista na cidade de Manaus/AM. A maioria dos participantes foram mulheres na faixa etária de 18-28 anos. A maioria dos moradores com ensino básico completo. Os moradores tem entendimento do que é uma arborização urbana e dos benefícios que o plantio de árvores pode trazer, contudo não tem conhecimento das espécies mais adequadas a serem plantadas na cidade.

Palavras-chave: Educação Ambiental; Planejamento; Vias Públicas.

Amazonas state has 62 municipalities distributed in 1,559,161.7 km^2, which representing 53% of the Brazilian territory. The state's administrative headquarters are in Manaus, which has an area of 11,401.1 km^2, and 229.5 km^2 of these are in the urban perimeter (IBGE, 2020). In the last census performed by IBGE, in 2010, the estimation was a population of 1,802,014 inhabitants (IBGE, 2020).

In the last ten years, Manaus has been among the most populated cities in Brazil and has one of the highest yearly growing rates, however it has suffered a decrease in the last census, the city's population density is 158.1 inhabit/km^2 (IBGE, 2020).

The urbanization process of Manaus has been strongly stimulated since the colonial period to the exploitative-extractive agricultural economy, especially of rubber (SANTOS, 2007). However, Manaus pays a very high environmental price on behalf of the urban expansion that it has been suffering along the last 20 years (NOGUEIRA *et al.*, 2007), causing environmental problems increasingly common and significant (ALMEIDA *et al.*, 2011).

The invasion of Union land characterized the territorial expansion in the capital of Amazonas. Manaus is divided in six District Zones and has 63 neighborhoods (PMM, 2010). NOGUEIRA *et al.* (2007) state that in the 1970s, the occupation of Manaus was at the margins of the creeks in the South, South-center, West and West-center zones; also that with the creation of Manaus Free Zone, the migratory process was intensified, mainly with people coming from the countryside of the state; and at the end of the 1970s, the expansion of the urban perimeter started going towards the East zone; also that until the 1980s, Manaus had approximately 37 neighborhoods plus the Industrial District, however countless communities were created from irregular occupations and then the East and North zones started being effectively occupied.

The change in a city's physical and natural environment alters the landscape and the local weather. The analyses indicate an increase of the annual average temperature in Manaus of 3.17 ± 0,53 ˚C and directly modulated by the human occupation of the Region using deforestation and urbanism (OLIVEIRA *et al.*, 2006).

The changes in big cities range from the soil physical structure, like compression and water-

proofing, to the microclimate, due to the accumulation and the reflection of the heat on the built surfaces (AGUIRRE JUNIOR, 2010), resulting in the loss of quality of life of residents, pulling them away from a harmonious relationship with the natural environment (SHAMS *et al.*, 2009).

Urban green areas play a role of extreme importance for the quality of life in major cities, simultaneously acting over physical and mental health of the human being, mitigating the feeling of oppression amidst the big transformations in the cities, contributing for the air purification, the reduction of noise pollution, aesthetic harmony (GRAZIANO, 1994; GONÇALVES and PAIVA, 2004).

The main goal of this paper was to analyze the perception on afforestation of residents from different areas in Manaus, Amazonas, as well as, through the perception of people from Manaus, to know the benefits and problems related to urban afforestation, and to exhibit the Manaus people preference of afforestation standards.

METHODOLOGY

This study had a descriptive approach, of the qualitative and quantitative types, and was performed in the city of Manaus/AM, in the six district zones.

In each district zone, squares with arboreal vegetation were defined as reference points. 21 places were selected, in the South-center zone: Praça Domingos Russo, Conjunto Petros, Praça de Alimentação do Parque das Laranjeiras, Praça Nossa Senhora de Nazaré. In the South zone: Praça Francisco Queiroz, Praça Antônio Plácido de Souza, Praça Heliodoro Balbi, Praça da Saudade. In the East zone: Praça do Conjunto Colina do Aleixo, Campos Bahia, Praça Tiradentes. In the North zone: Praça Padre Pedro Vignola, Conjunto Ribeiro Jr. In the West zone: Praça Ismael Benigno, Praça Duque de Caxias, 1° BIS, Praça do CIGS. In the West-center zone: Praça do Pró-Menor Dom Bosco, Praça Santos Dumont, Cavalaria, Conjunto Kissia (Picture 1).

The technique of individual interview was used with an average duration of 30 minutes, applicating a form as an instrument, with open and closed questions, composed by two parts: socio-demographic data and data on afforestation.

The form was applied with four residents that live around the square and other four living 500 m from the court in North-South and East-West directions.

The inclusion criteria for the research were: to live around the square or 500 m from it; to be 18 years old or more, any gender and literate. And the exclusion criterion was to present an illness that precluded them from participating in the research.

The quantitative data were disposed in a data bank created in Microsoft Excel and analyzed by means of descriptive statistics.

The qualitative data was analyzed with the Content Analysis technique (BARDIN, 2004), employing the enunciation technique, according to the following organization: For the interpretation of the *corpus* constituent elements, the chosen method was the content analysis, using the pronunciation analytical technique with thematic transversality. The examination of information was sequenced in three chronological poles: *pre-analysis*: floating reading of the documents' material; *material exploration*: clippings encoding, aggregation and enumeration of the records' units; *results treatment and interpretation*: process of classification of elements in interest categories for analysis.

Picture 1 – Identification of data collect points in the city of Manaus/AM.
= Square as reference point; ■ = Form application point. Squares: 1ºBis, Campo do Bahia, Cavalaria, Conj. Petro, Conj. Kissia, Conj. Ribeiro Jr., Antônio Plácido de Souza, Conj. Colina do Aleixo, Domingos Russo, Heliodoro Balbi, Ismael Benigno, N. Sra. de Nazaré, Pe. Pedro Vignola, Conj. Tiradentes, Saudade, CIGS, Pq. das Laranjeiras, Francisco Queiroz, Pró-Menor Dom Bosco, Santos Dumont, Duque de Caxias

The technical and methodological phases of the content analysis are sequenced in three chronological poles: pre-analysis, material exploitation and results and interpretation treatment.

POLE I - PRE-ANALYSIS PHASE - Stage that organizes the analyzed material, with floating reading of the statements under the orientation of completeness, representativeness, homogeneity and pertinence, to constitute the *corpus*.

COMPLETENESS RULE: It refers to the contemplation of all *corpus* constitutive interviews.

REPRESENTATIVENESS RULE: It refers to the contemplation of all constitutive corpus interviews.

HOMOGENEITY RULE: Choosing precise criteria are complied, without escaping the theme (afforestation) and research objectives.

PERTINENCE RULE: The records archive adequates to the objectives prescribed by the analysis.

POLE II - MATERIAL EXPLORATION PHASE - It consists of elaborating the chosen operations in the texts in record units (semantic level: theme; linguistic group: word and sentence) for categorization and codification.

POLE III - RESULTS TREATMENT AND INTERPRETATION - Submitting the explored material to an interpretative and contextualized treatment in analysis categories and subcategories.

The ethical and legal aspects of the research comply with Resolution n. 466/2012 (CNS, 2012). Thus, all the interviewees' study objectives and voluntary participation nature were explained individually. The ones who accepted participating in the research were oriented to read the Informed Consent and sign it.

This research was submitted to the Research Ethics Committee of Amazonas Federal University/UFAM, in 2016. The favorable position was obtained by the Ethical Appreciation Presentation Certificate (CAAE) under n. 64336117.2.0000.5020

RESULTS

Interviewees' socio-demographic profile

Out of the total of participants (n=168), 94 were women (56%) and 74 were men (44%). The interviewees' age had its more extensive distribution in the age range between 18 and 28 years old, men had a percentage of 60.8% and women, 63.8% (Table 1).

Table 1 – Interviewees distribution according to gender and age range. Manaus, 2017

Age (years)	Men	Women
18-28	45 (60.8%)	60 (63.8%)
28-38	12 (16.2%)	13 (1.,8%)
38-48	8 (10.8%)	9 (9.6%)
48-58	5 (6.8%)	6 (6.4%)
58-68	2 (2.7%)	3 (3.2%)
68-78	2 (2.7%)	1 (1.1%)
78-88	-	2 (2.1%)
Total	**74**	**94**

On education, it is observed that most men and women have more that the primary education (Table 2), however the number of women (26.6%) that have completed higher education is almost three times higher than the men (12.2%). The participants' education level was advantageous for understanding the question son the perception of urban afforestation in the city.

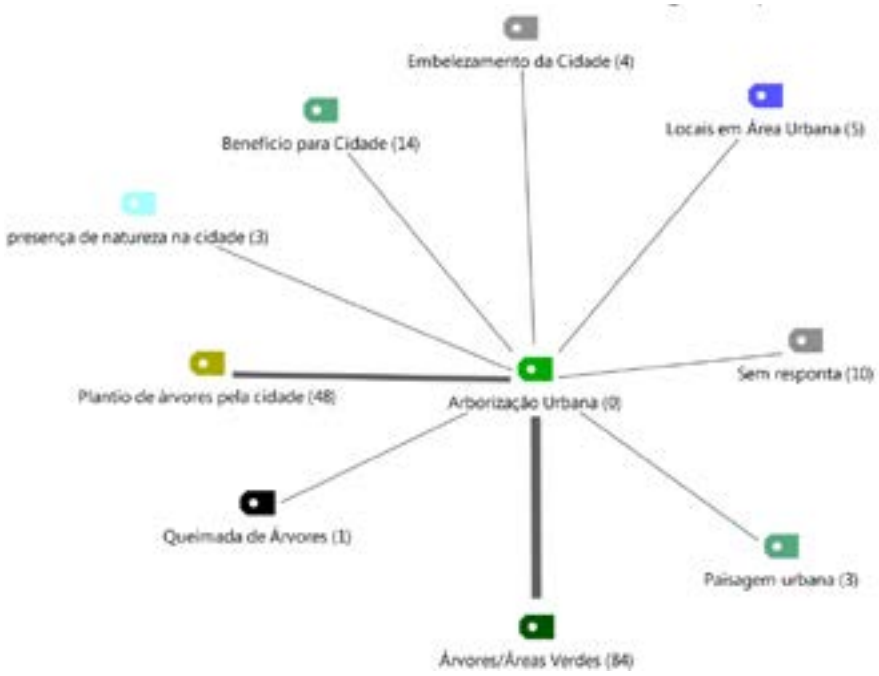
Table 2 – Interviewees distribution according to education. Manaus, 2017

Education	Men	Women
Never studied	-	2 (2.1%)
Completed elementary school	1 (1.4%)	2 (2.1%)
Did not complete elementary school	-	-
Completed high school	31 (41.9%)	25 (26.6%)
Did not complete high school	3 (4.1%)	2 (2.1%)
Completed higher education	9 (12.2%)	25 (26.6%)
Did not complete higher education	30 (40.5%)	38 (40.4%)
Total	**74**	**94**

Perception of residents in Manaus on the urban afforestation

When asked what is "urban afforestation", most interviewees answered that it was the group of trees and green areas in the city, 28% understood urban afforestation as the planting of trees that are put in the metropolitan area, which befits the afforestation concept (Picture 2); according to Oliveira (2005), who defines as "urban afforestation is every vegetal covering present in cities, constituted by trees that are in sidewalks, central seedbeds, parks and public squares".

Picture 2 – Conception on "urban afforestation" by residents of the city of Manaus, 2017

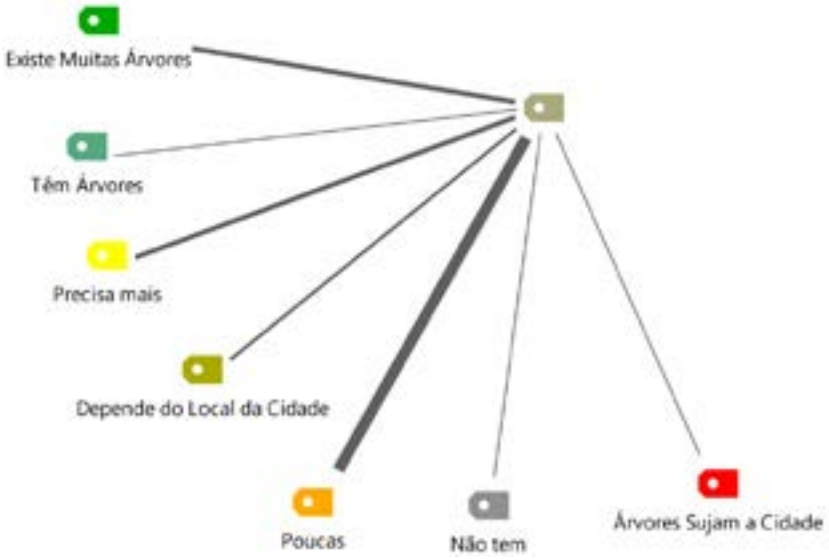


Other terms on urban afforestation were spoken by the interviewees, like: 8% understand afforestation as a way to bring benefits to the city; 3.4% see it as the presence of nature in the urban environment, others see it as the embellishment of the city (2.3%); and 8.3% did not have any knowledge of the term urban afforestation (Picture 2).

The interviewees believe that the afforestation of the city is precarious, because most answered that there are few trees. However, another part answered that there are a lot of trees. In studies performed by Lins Neto *et al.* (2016) in Manaus on 2014; the population also considered the afforestation precarious, with the worst assessments by residents of North and East zones.

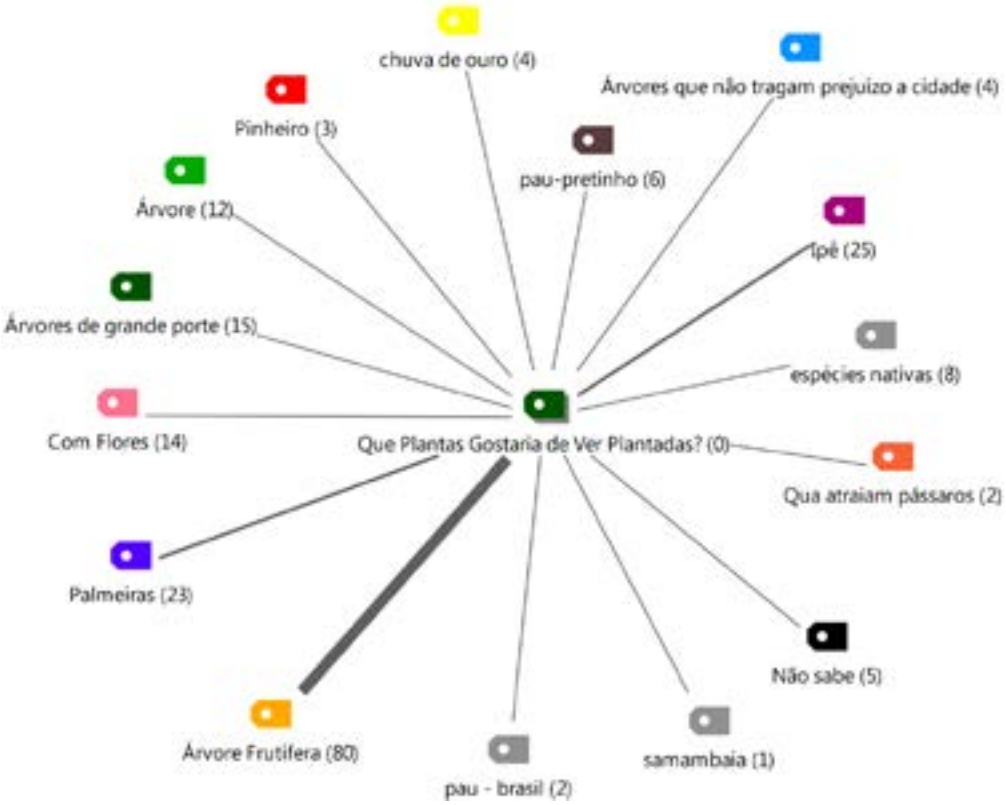
According to the city population's perception, the residents also notice the inadequate distribution of trees because there are places with a lack of green areas (Picture 3).

Picture 3 – Perception of Manaus' residents on the number of trees planted in the urban environment, 2017



On the species that the residents would like to see planted in Manaus (Picture 4), 47.6% answered that they would like fruitful species; 8.9% said big trees and 6% answered that any arboreal species could be implanted on the streets, with no preference; 13.7% had a choice on palm trees; 1.7% on pine trees; 2.3% on golden shower trees; and 0.5% on ferns. Other referenced species were ipê (14.8%) and pau-pretinho (4.5%), which are species indicated for the afforestation according to the Urban Afforestation Development Plan of Manaus (PMM, 2012).

Picture 4 – Plants indicated by Manaus's residents, preferably to plant on the urban environment, 2017

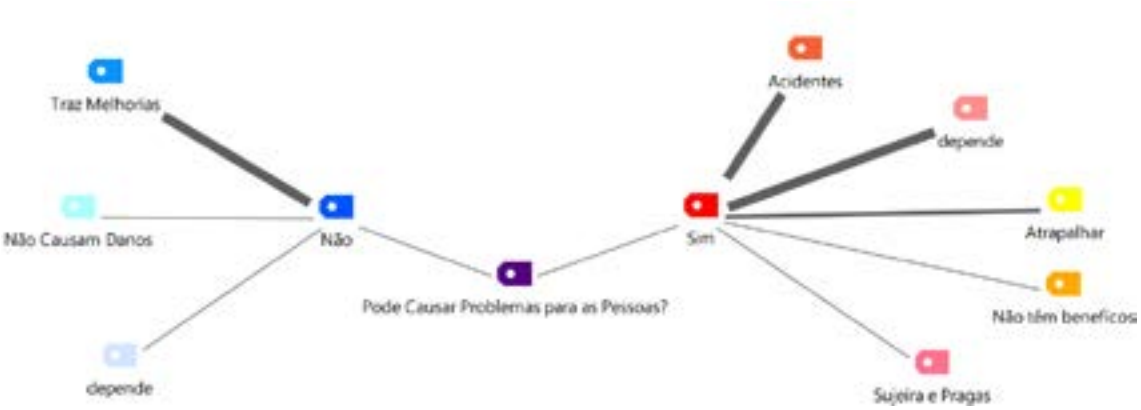


According to França *et al.* (2012), the use of inadequate species in the afforestation of the city brings several problems, such as deterioration of the sidewalks, streets, and houses. It may cause conflicts with the power grid, and the excessive plantation of some species diminishes the floristic diversity on the city's arboreal patrimony.

Manaus' residents present different opinions on the problems of the planted trees (Picture 5). A part of the residents answered that the trees do not cause problems, they only bring improvement, as said several times because they calm the weather in the city. Another part of the residents answered that the trees could cause problems, such as accidents and get it the way of traffic; some people justified that it depends on the species and the place where the tree was planted.

In the research performed in Manaus in 2014, the interviewees said the main risk in the urban afforestation is the "falling risk" and > 50% of the interviewees acknowledged the thermic comfort and shadow as a benefit from the trees (LINS NETO *et al.*, 2016).

Picture 5 – Manaus residents' perception on the problems caused by trees on the urban environment 2017



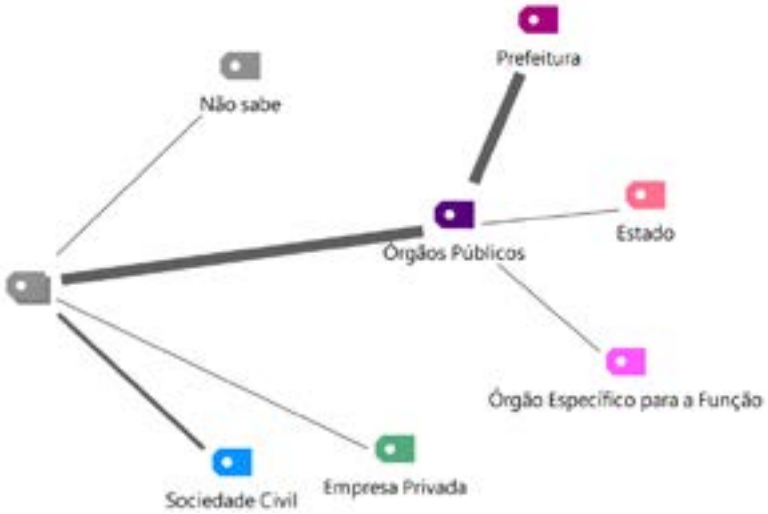
According to Ribeiro (2009), the size of the treetop must be considered before planting a tree, thus assuring that there is space and physical conditions available for its development, avoiding confrontations with buildings, vehicles, urban furnishing and pedestrians.

According to Rodrigues *et al*. (2010), an improper planting or species that are not adequate to the urban perimeter can occasion damages to the urban frame. One way to be aware the population on which species are indicated for the urban afforestation is by making campaigns on the theme.

Manaus residents clearly understand the public authority - city hall is responsible for the afforestation cares of the city. Only one part of the interviewees said it is a competence of the civil society (Picture 6).

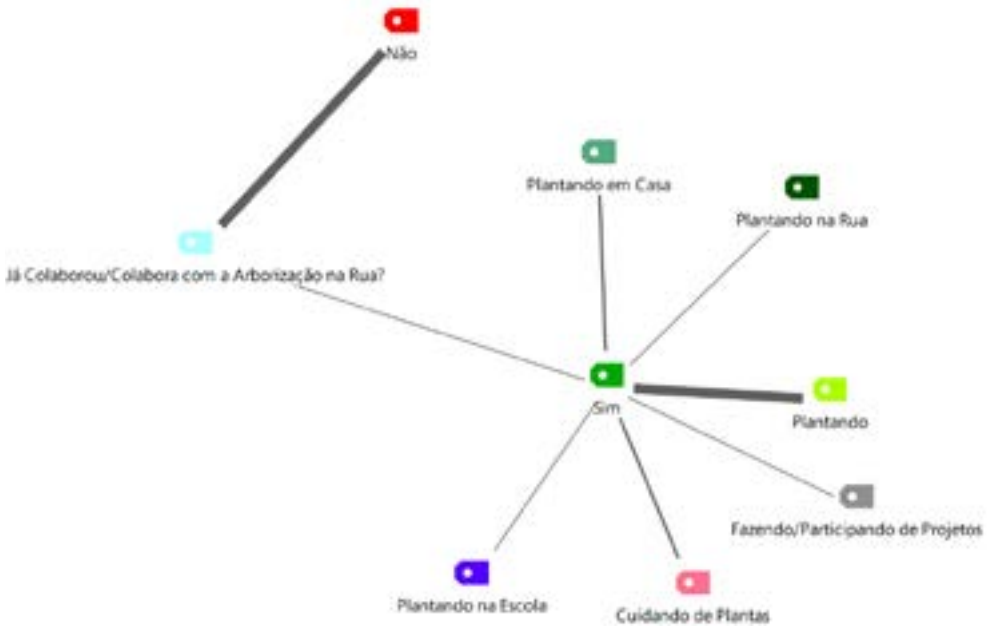
Indeed, the public authority is responsible for the city's afforestation, however the society must participate in this process by getting involved in actions that aim to improve and protect the trees in the urban space. According to Malavasi and Malavasi (2001), aside from executing the urban afforestation, city halls should also take care of its maintenance, because this competence lies on the development plans and laws related to using the soil in cities and metropolitan regions, which should observe the principles and limitations provided in Art. 2, single paragraph of the Forest Code that was added by Law 7.803/89.

Picture 6 – Residents understanding of the responsibility to care for the urban afforestation in Manaus, 2017



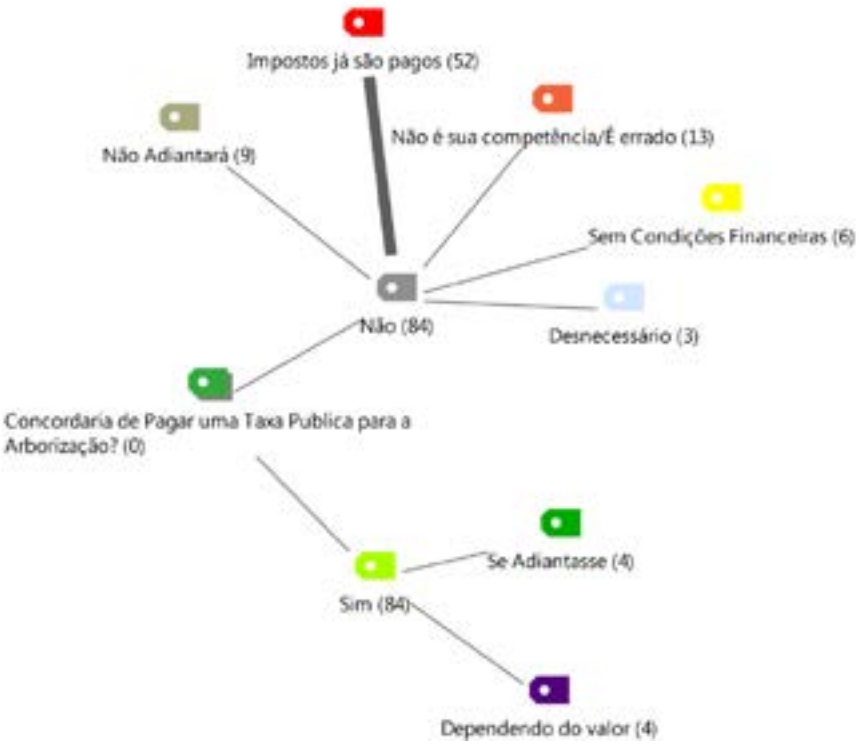
Although the residents know that the urban afforestation is Manaus' city hall duty, many people collaborate planting at home, on the street, at schools; other people answered that they help take care of the plants and participating in projects (Picture 7).

Picture 7 – Collaboration to urban afforestation by residents of Manaus, 2017



And finally, the interviewees were consulted about the possibility to contribute paying a public fee for the urban afforestation of Manaus (Picture 8). The opinions were different, 50% of the interviewees would not pay the price; most of them claimed that they already spend a lot of taxes; other reasons were that it is not the population's competence, it would not make a difference, and some pledged that they do not have financial conditions for that. The other 50% that would agree to pay the fee explained that they would do it depending on the value and and investment in the city's afforestation.

Picture 8 – Manaus residents' opinion about paying a financial fee to use in the urban afforestation, 2017



CONCLUSIONS

The population can notice the importance of afforestation in cities, and the benefits that it brings. However some answers were inconsistent, the majority can be explained by lack of information and orientation about the theme from the interviewees.

Most of the negative factors mentioned by the population were the bad distribution of the arboreal individuals throughout the city.

Urban afforestation needs planning so it does not bring problems for the city and its population; the species to be planted are crucial for for exploiting the afforestation. Manaus has a development plan that provides the species indicated for the city's afforestation.

The population must notice the significance of choosing individuals and adequate handling, so there is a real improvement in people's quality of life.

The city hall making campaigns about urban afforestation distributing pamphlets is a vital tool to instruct the population on using the urban afforestation correctly.

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