

**The Environmental Problems of The Road of Water Black / Areal, Rural
Area of Manaus / Amazonas**

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ABSTRACT:

The implementation of paved or unpaved branches in the State of Amazonas, in addition to allowing the flow of agricultural products and connecting rural areas to urban centers, is of social importance, as it facilitates the mobility of local residents, access to the school environment and goods. family consumption. The objective of the research was to analyze the environmental problems, from the Água Preta / Areal Branch, located on the left bank of Highway AM-010 kilometer 32, to kilometer 10 of BR-174, in the rural area of Manaus-Amazonas. The methodological procedures involved the field practice and the photographic record of the degradation conditions of the branch. The research allowed to diagnose that the branch intersects with eleven water courses, which are used by the residents, for water consumption, six of them they are forming upstream lakes due to lack of flow in the manholes that are inadequate and have little flow downstream, in addition to the silting caused by the eroded material of the branch and the extraction of sand. In this sense, the socioenvironmental problems present at the branch, are growing at an accelerated rate over ecosystems and residents have been losing their sense of belonging in relation to the branch, due to the lack of characterization of the landscape.

KEYWORDS: Silting. rural area. water courses.

1 INTRODUCTION

The implementation of paved or unpaved branches in the Amazonas State, besides allowing the flow of agricultural products and connecting rural areas to urban centers has social importance, cause it facilitates the mobility of local residents, access to the school environment and goods from family consumption

However, the opening of the branches generates negative environmental impacts in the means: biotic (removal of vegetation cover, fauna escape, etc.), abiotic (alteration of relief, soil loss, siltation of water courses, erosion, etc.), and anthropogenic (increase in the flow of vehicles, generation of solid waste, cultural impacts, etc.) in which affect the quality of life of its residents, particularly when the project to implement the extensions does not have environmental studies required by licensing agencies, and there are no regular environmental management and inspection actions.

According to Moraes (2004, p. 2) “road projects generally promote economic development and social well-being of people”, but they can also have negative effects on the local population and the environment. Thus, studies are needed that take into account the elements present in the landscape of these rural roads.

Several branches in the rural area of the Metropolitan Region of Manaus are not paved. They present, in certain stretches, several environmental problems and many do not have good traffic conditions, especially in the rainy season, between December and May, but even so they are important for the mobility of rural residents.

For Cunha et al. (2013, p. 108) “it’s in this context that the research regarding the elements present in landscapes becomes necessary”, in an attempt to mitigate the problems caused by the implementation, permanence and maintenance of unpaved rural roads.

2 OBJECTIVE

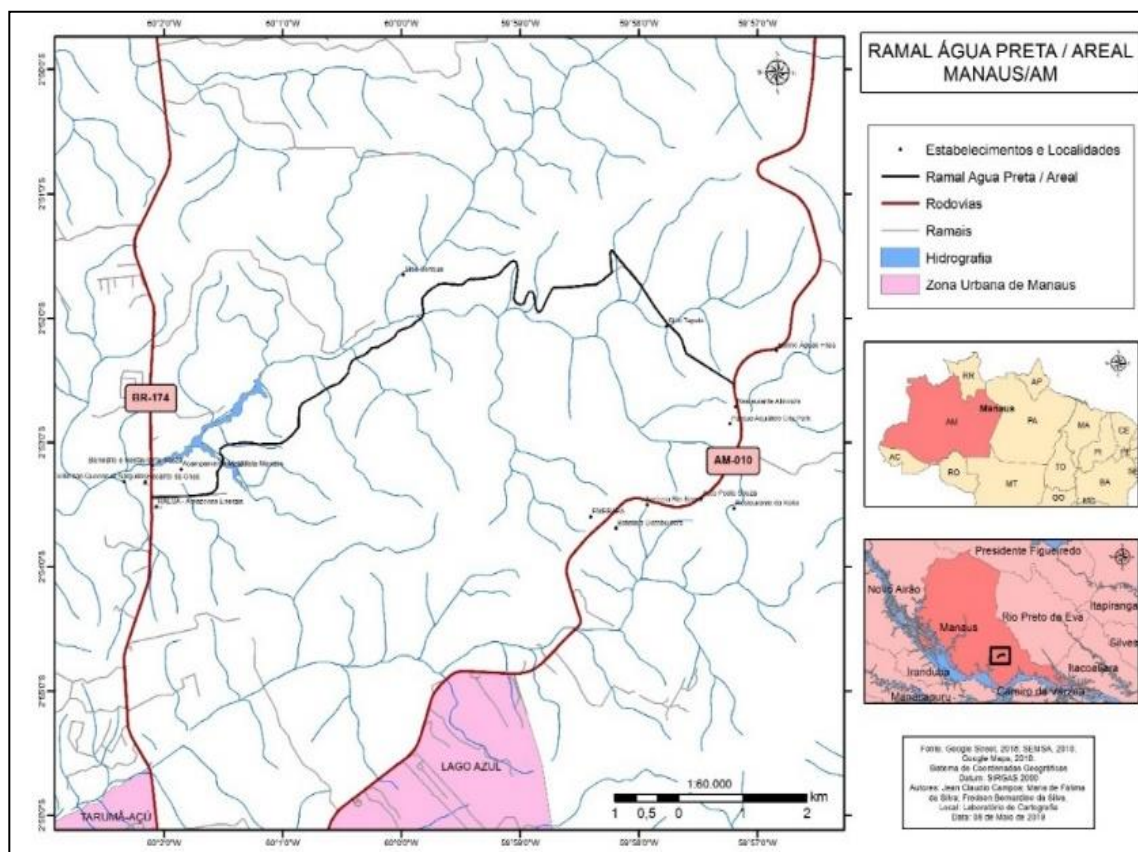
Understand the environmental degradation of the Agua Preta / Areal branch, that connects the Km 32 of the Rodovia AM-010 to Km 10 of the Rodovia BR-174, in the rural zone of the Manaus county.

3 METHODOLOGY

3.1 Study area

The entire area is under the municipal limit of Manaus – AM, rural area. The Agua Preta/Areal branch, serves as the main means of displacement of residents and workers in the sand extraction areas. The limits of the study area correspond to the following geographic coordinates, 2°52'31"S and 59°57'12"W (branch entrance AM-010), 2°51'46"S and 2°53'27"S and 60°02'06"W (exit on BR-174), approximately 12.5 kilometers long. Extending along two major intercity and interstate highways, AM-010 and BR-174, respectively, as shown in fig. 01

Figure 1 – Search area Location



Source: IBGE, 2010. ORG FÁTIMA SILVA, 2019.

The compilation level corresponded to the collection of bibliographic, cartographic and documental data, followed by their compilation and field work. The semantic level started from what was selected and correlated in the previous stages, with the realization, organization and crossing of all the information obtained, that is, it was the moment of partial analysis and review of the data. The generation of thematic maps translates the spatial aspects and environmental research and refers to the normative level, with support from field work, of photographic records.

Therefore, this work identified the characteristics of ecodynamic stability in the Agua Preta/Areal branch, considering the bibliographical, empirical and cartographic survey, in order to provide theoretical support for the development of the work. In the second stage, the

selection of available data related to the study area and its characterization, considering the aforementioned data, including the thematic map.

4 RESULTS

The branch intersects with 11 watercourses, which are used by residents for water consumption, five are small private baths, six of them are dammed in the form of lakes upstream due to the lack of flow in the manholes and little flow of water downstream, which worries some residents.

The branches are always connected to the river channels, through crossings, favoring the entry of sediments into the watercourses and the conservation of this water in rural areas must be considered. The environmental degradation problems, are inadequate manholes, the sand extraction, erosion and ravines in the bed of the branch and siltation of watercourses. The construction of these roads, it enhances the hydraulic force action of the floods as an agent for removing and transporting material towards the watercourses.

With regard to the environmental approach in geography, natural environments altered by anthropic actions for the appropriation of resources and territory can be studied based on the concept of Ecodynamic Units, by Jean Tricart (1977).

Within the scope of geographic and environmental studies, considering the concept of ecodynamic analysis, branches without maintenance, management and monitoring, present environmental fragility.

4.1 Characterization of the Agua Preta/Areal branch area

The morphostructural domain is defined by the Phanerozoic Sedimentary Basins and Cover characterized by "plateaus developed on horizontal to subhorizontal sedimentary rocks, eventually folded and/or faulted, in different sedimentation environments, arranged on the continental margins and/or inside the continent" (IBGE, 2009).

The morphoclimatic domain is the Amazon. This "macrodomain" is composed of equatorial forested lowlands, arranged in an amphitheater, enclosed between the great barrier imposed by the lowlands and the edges of the Brazilian and Guianese plateaus, as defined by Ab'Saber (2003). The compartment description of the study area is the plateau.

The study area presents altimetric variations along the branch. In the west sector (near BR-174) the altimetric level is around 25 to 65 meters, in some stretches exceeding 65 meters. In the intermediate portion of the branch, a level of 20, 86 and 100 meters is verified, based on information from the Digital Elevation Model of INPE (2011).

The average annual temperature fluctuates between 24°C and 27°C as belonging to the equatorial zone. Rains are plentiful in the area, and the climate favors the development of a rich and lush broadleaved tropical forest. Along the AM-010 highway, it largely establishes what can be characterized as the Dense Ombrophilous Forest.

The basins are partially sectioned by slowly positively moving arches that individualize (Pires, 1998). Known as the Iquitos Arch between the Acre and Solimoes basins, the Purus Arch between the Solimoes and Amazonas, the Gurupa Arch that separates the Amazonas Basin from the Marajo basin.

According to Ab'Saber (2003, p. 68), the water courses of the Agua Preta/Areal branch have a black coloration. they are native rivers of the region, unpolluted by other domains in nature (...).

In the Agua Preta/Areal branch, it is verified in its soil composition, the presence of clayey yellow oxisol, sandy texture yellow latosol, quartz sand and Manaus sandstone formation, appearing in the lower areas of the relief and in the flat parts.

According to Guerra (1999, p.233), the influence of the terrain topography on the erosive intensity is verified mainly by the slope and length of the ramp (length of the slope). These factors directly deny the speed of the floods.

It was observed that the slope contributes to surface runoff, the branch always goes towards the bottom of the valley, the intersection with the water courses changes the water quality, through all kinds of material that are carried by the rainwater.

According to older residents, in 1968, the first residents arrived, from Ceara, Alagoas, Pernambuco, Maranhao and also from other municipalities in Amazonas, Coari, Carauari, among others. They began to inhabit the part of the Agua Preta branch (at the time only one footpath)³. It was only in the 70s that the construction of the branch began, without any technical support and with the labor of the residents. They deforested, cleaned, built bridges and manholes and patrolled. Several families got their plots of land, each one had their own house to live with their family and make their gardens.

The construction of branches, in most of time is the only link, between the main road and your place of residence. Nunes (2003) describe the back roads as dirt roads, also called rural roads, agroways or even municipal roads, of great economic and social importance for rural communities.

The Agua Preta/Areal branch also favored the sand extraction in the area, intensified the erosive process, the transport of sediments, siltation and dam in the water courses, due to inadequate manholes. All these factors are linked to anthropic actions. Figure 02.

Figure 2 - DJI Phantom4PRO OBSIDIAN drone image, from 07/15/2019, showing details of abandoned sand pits being used for fish farming



Source: Field survey. Photo: SILVA, M. F. 2019.

Among the degradations seen in the study area, it's possible to affirm that the sand extraction for civil construction, that is irregularly extracted in several places, deforestation, the inappropriate disposal of solid waste on the banks of the branch, siltation of watercourses and erosion remain constantly growing.

Being a cheap resource, accessible and available resource along the Água Preta/Areal branch, the sand extraction is the activity that most degrades the environment in the study area. Part of the changes that occurred in the area were due to human interventions in a disorderly way, generating consequences, many of them irreversible. Figure – 03 Watercourses in the Agua Preta Areal branch.

Figure – 03 Watercourses in the Agua Preta Areal (a) Upstream watercourse (b) Downstream silting watercourse.

(a)



(b)



Source: Field survey. Photo: SILVA, M. F. 2019.

Another degradation factor are the ravines, which appear along the slopes and contribute with a large amount of sediment to the siltation of these watercourses. According to the Geosciences Dictionary (2009) "silting is the technical name given to the detrital sediments deposition accelerated process in a lowered area".

The ravine erosion, is owing to the concentration of large water amounts in a given local, that end up opening a ravine (OLIVEIRA, 1988), that end up opening a ravine (OLIVEIRA, 1988). The ravine is a very advanced state of erosion by furrows, caused by large concentrations of runoff, which pass through the same furrow, expanding it in depth and extension (GONÇALVES, 2002).

Erosion caused by rainwater in the bed and on the edges of dirt roads have continue been the one of the factors that most degrade this environment, together with the sand extraction.

The Rainwater is one of the most important climatic elements in soil erosion, and is responsible for causing the ravine process. For Hancock and Evans (2006) a ravine is an incision

along a drainage line that shows clear signs of degradation, with a headboard constituting a break well defined in the slope. There are several factors that influence and interfere in the soil erosion, from precipitation, topography, to physical and chemical properties

The depth and width variables that the ravines reach are strictly related to the nature of the type of soil on which they develop, and in the Água Preta/Areal branch, they are constantly recovered, to not reach a disproportionate size. They can appear during a rain, or spend months evolving, the formation of these ravines depends mainly on the amount of surface runoff that may occur.

5 CONCLUSION

The research found a series of processes of environmental problems occurring simultaneously in the different environments that make up the Água Preta/Areal rural zone branch in Manaus. The new rural subdivisions and sites have been an area of housing and resource exploration, with sand extraction being the main activity, without an environmental license.

In this impactful activity, the following stand out: erosion and soil disturbance; siltation, interference in the flow and morphology of igarapes; igarapes and soil contamination owing to solid waste disposal.

At first, from brief spatial correlations of information, the branch presents stretches of environmental instability, mainly in the vegetation areas of campinarana and, consequently, in the sand extraction areas, contributing to increase environmental fragility.

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