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CHAPTER 015

# STUDIES OF ENVIRONMENTAL IMPACTS ON OPEN-AIR DUMPS IN RURAL LOCATIONS IN THE MUNICIPALITY OF PARINTINS/AM

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## ABSTRACT

This article investigates the environmental impacts of "junk dumps" in rural areas of the municipality of Parintins - AM, focusing on the rural locality of Zé Açu. The junk dump represents a significant environmental problem in rural areas, where the improper disposal of waste causes a negative impact on the environment and people's quality of life. To carry out this study, we applied the inductive method, with techniques such as questionnaire application, *on-site observation*, handling of geotechnologies, with Drone and Gps (*Global Positioning System*) and geoprocessing programs, to map, analyze and locate the dumps. It was found that the community of Bom Socorro do Zé Açu faces a great challenge in relation to junk dumps, which causes problems both in the environment and also for the public health of local residents, with the dumping of solid waste in areas close to the community. These cause great impacts to local residents, such as on the soil, watercourse near these addicted dumps, as well as impact the ecological cycle of animals and plants, in addition to attracting disease vectors, such as rats, flies, cockroaches, and others. We emphasize that it is essential that there is an integrated and adequate management of solid waste in this location, including collection, awareness of residents and appropriate treatment of garbage, to minimize these impacts and promote a healthier and more sustainable environment in these rural communities in the municipality of Parintins -AM.

**Keywords:** Trash cans. Parintins. Waste. Solid. Environment.

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## INTRODUCTION

Studies on the environmental impacts of open-air dumps have been widely disseminated in both national and international contexts. Although there is a National Solid Waste Policy (PNRS), instituted by Law No. 12,305/2010, which establishes the closure of "dumps" (irregular disposal of solid waste) in Brazil and the adoption of environmentally appropriate final disposal methods, compliance with standards and deadlines for the closure of dumps still presents itself as a great challenge, especially for municipalities in the face of the transition to more appropriate waste management systems. It is in this context of analysis that the present research aims to analyze the environmental impacts caused by an open-air garbage dump in a community belonging to the locality of Zé Açu, in the municipality of Parintins/AM

In recent years, due to the great growth of the population and along with the change in eating and consumption habits, its production of solid waste has been greatly increasing, which causes problems with the treatment and final disposal of this waste, affecting communities over time.

The article aims to analyze the environmental impacts caused by irregular dumping in rural areas in Zé Açu in Parintins in the state of Amazonas. These cause great impacts on local residents, such as on the soil, watercourse near these addicted dumps, as well as impacts on the ecological cycle of animals and plants, in addition to attracting disease vectors, such as rats, flies, cockroaches, and others.

The rural locality of Zé Açu is located southeast of the municipality of Parintins, about 14 km from the municipal headquarters, and is composed of seven rural communities, according to data from the municipal secretary of production of Parintins (2013). We decided to make a geographical cut and chose the community, Bom Socorro, Boa Esperança and Paraíso to be part of the research.

The belonging of the focal communities (Bom Socorro, Paraíso and Boa Esperança) to this locality occurs, mainly, due to their proximity to the Zé Açu lake. Both those that are directly on the banks (Bom Socorro and Paraíso) and the one that is more distant, in this case the community of Boa Esperança, but which have a direct relationship with the lake due to their proximity to the main community, Bom Socorro.

We conclude that the advancement of technology and modernity has brought significant changes to traditional rural populations, transforming their habits, customs and beliefs. The change in the consumption pattern in rural communities results in an increase in the generation of solid waste, including plastic packaging, food scraps and other disposable materials, as well as high consumption, especially in relation to industrialized

food, which play a significant role in this process of increase and inadequate disposal of waste. This process has been causing environmental and ecological imbalances, which put the socio-environmental sustainability of rural Amazonian communities at risk.

## MATERIALS AND METHODS

The research was carried out through fieldwork, with *an on-site* visit to collect the geographic coordinates of the location of the dumps, which were later inserted into *ArcGIS geoprocessing programs*, from which the maps were made.

We also use the Environmental Impact Assessment (MAIA) methodology, which is a set of rules and procedures that govern the performance of environmental impact studies, whether administrative or technical.

The data were collected through GPS and Drone that made the aerial photographs and the mapping of the locations, as well as an environmental diagnosis questionnaire and photographs of the site, Environmental Analysis methodologies were also used to analyze the main impacts caused by the open air dump in the Zé Açu locality. Below we present the location map of Zé Açu, in the municipality of Parintins/AM.

Figure 01: Location map


Source: Fieldwork, 2024.

The locality of Zé Açu, located southeast of the municipality of Parintins, about 14 km from the municipal headquarters, is composed of seven rural communities, according to data from the municipal secretary of production of Parintins (2013). We decided to make a geographical cut and chose the community of Bom Socorro, as the main locus of the

research, because it is the largest in terms of population and also where the largest garbage dump in this area is located.

## SOLID WASTE AND ENVIRONMENTAL IMPACTS IN RURAL AREAS

To discuss solid waste, it is first necessary to define its concept. Based on Brazilian legislation: "solid waste is defined as "Material, substance, object or discarded good resulting from human activities in society..." (BRASIL, 2020, p.11). According to the definition, solid waste includes everything from domestic waste to industrial waste, and this definition is necessary to provide guidance and instructions for waste management policies and also for the proper treatment of these materials to protect the environment and public health.

The production of solid waste in rural communities is directly linked to those responsible for this production, that is, to its generators. To analyze the production of solid waste, it is crucial to consider not only the direct generators of this waste (such as families, grocery stores, and agricultural and livestock activities), but also the external factors that influence this production. About this approach, Capanema points out:

> In rural areas, the potential sources of solid waste generation are diverse, ranging from agricultural production waste to household waste. With the change in the consumption pattern of rural communities, it is observed that the composition of rural household waste is increasingly similar to urban solid waste, with an increase in the disposal of plastics, metal cans, batteries, tires, light bulbs, electronic devices, etc. (CAPANEMA, 2014 *apud* BRASIL, 2020, p.13).

The change in the consumption pattern in rural communities has resulted in an increase in the generation of solid waste, including packaging, glass, cans, food scraps and other disposable materials, as well as high consumption, especially in relation to food, play a significant role in this process.

Article 3 of Law No. 12,305, of August 2, 2010, defines that "solid waste generators: individuals or legal entities, under public or private law, who generate solid waste through their activities, including consumption" (BRASIL, 2010). This refers to those who dispose of goods that no longer interest them and that are discarded.

In this way, the increase and inadequate disposal of solid waste in Brazil represent an active social problem that has been affecting society as a whole due to the impacts on public health, the environment, quality of life and also the sustainable development of the country, since the impact of solid waste on the sustainable development of the country is due to environmental degradation that will compromise not only natural resources, but also

natural resources.  but also the health of the population and the ability to maintain an ecological balance necessary for sustainable growth and thus affects society in general.

When we mention impacts, we involve a series of meanings and connotations, where it is important to highlight that none of the authors addressed in this work intends to end the discussions or fix their concepts as definitive. On the contrary, they are the first to say that this discussion is far from being concluded. Thus, at first, we will mention Coleto Assis (2020), in his work details to clarify the concept of environmental impacts, which cites that:

> [...]. For Coleto Assis (2020, p.19) Environmental impacts represent the consequences, damages, or effects that environmental aspects cause to nature. From this perspective, the National Council for the Environment (Conama), through Conama Resolution No. 1, of January 23, 1986, defines environmental impact as any alteration of the chemical, physical and biological properties of the environment (BRASIL, 1986A).

The author above alludes that environmental impacts can be caused by different forms of energy or matter resulting from human activities. Its impacts can provide direct or indirect compromise to the health, safety and well-being of people, as well as impact economic activities, the aesthetics of the environment, sanitary conditions, fauna and the quality of natural resources.

Environmental aspects refer to actions that interact with the environment and cause changes, while environmental impacts are the consequences of these changes.

Following this line of reasoning, the authors Marchi and Fernandez (2018) complement the analysis by stating that the impacts of open-air dumps are significant, Unregulated dumps are causing great impacts over time in the Bom Socorro community, and this community is home to the largest uncontrolled dump among the communities near the Zé Açu lake.

Author concept addressed as follows:

> [...] Open air dump (dump): place of inadequate disposal of solid waste in the environment, contaminating the atmosphere, soil, groundwater and surface water, with no form of environmental safety, including the presence of animals and collectors. (MARCHI AND FERNANDEZ, 2018, p 18).

However, the author treats these dumps and names them as clandestine dumps that can be observed in the communities studied, where the absence of adequate signage and insufficient environmental education contribute to the problem. The repetition of inappropriate habits by residents leads to a vicious cycle, normalizing incorrect disposal practices. Such behavior results in serious environmental impacts, such as contamination, reduction of natural resources, and pollution of water and soil resources, in addition to attracting disease vectors. These impacts affect both the residents themselves and the

visitors who frequent the locality known for its exuberant landscape composed of rivers, lakes, streams and white sand beaches.

A problem of the city in small rural villages that increasingly has consumption similar to that of urban areas both in the qualitative sense and increases the quantitative. Thus, similarities in the environmental impacts that affect the environment are observed, especially as vectors of diseases

## RESULTS AND DISCUSSIONS

The lack of solid waste collection in rural areas makes residents find places for disposal, thus facilitating the appearance of dumps, generating the accumulation of waste in these areas, which began with small amounts, about ten fifteen years ago. This solid waste that over time has increased in volume resulting in several environmental, social and economic problems for the riverside dwellers of the Zé Açu locality. We see in figure 02 one of the garbage dumps in the Bom Socorro community.

Figure 2: Junk bins

Source: Fieldwork, 2024.

It was observed that the junk dumps are found in small quantities, extending from areas close to watercourses to the mediations of the residences of some residents. In these places it is common to find a large amount of cardboard boxes, plastic bags and disposable cups. This suggests that the waste may originate from commercial outlets that are dumping their garbage inappropriately, especially given the significant presence of cardboard boxes.

In addition, the presence of these wastes in inappropriate areas not only harms local aesthetics, but also contributes to the pollution of waterways and can generate public health problems due to the accumulation and decomposition of these materials.

When observing figure 02, we realize that the vegetation is located very close to the polluted areas, which is negatively impacting the forest area. The bin shows a large amount of waste, including cardboard, plastic bags, and PET bottles. These materials not only contribute to local environmental degradation, but can also affect the fauna and flora of the region.

The proximity of vegetation to areas of garbage accumulation can lead to soil and water contamination, harming the health of plants and animals. In addition, the slow decomposition of these materials, especially plastics, can release toxic substances into the environment, increasing damage to the local ecosystem. In addition to this waste being dumped in inappropriate places, some of these dumpsters are burned. This practice is very common and poses a great risk to the health of people living nearby. The burning of this waste releases air pollutants, such as dioxins that are highly harmful to the health of residents, and can cause respiratory problems and other serious diseases. In addition, the emission of toxic smoke contributes to the degradation of air quality, negatively impacting the local environment, as well as, in large proportions and in dry periods in the summer, can aggravate the risk of fires in the area.

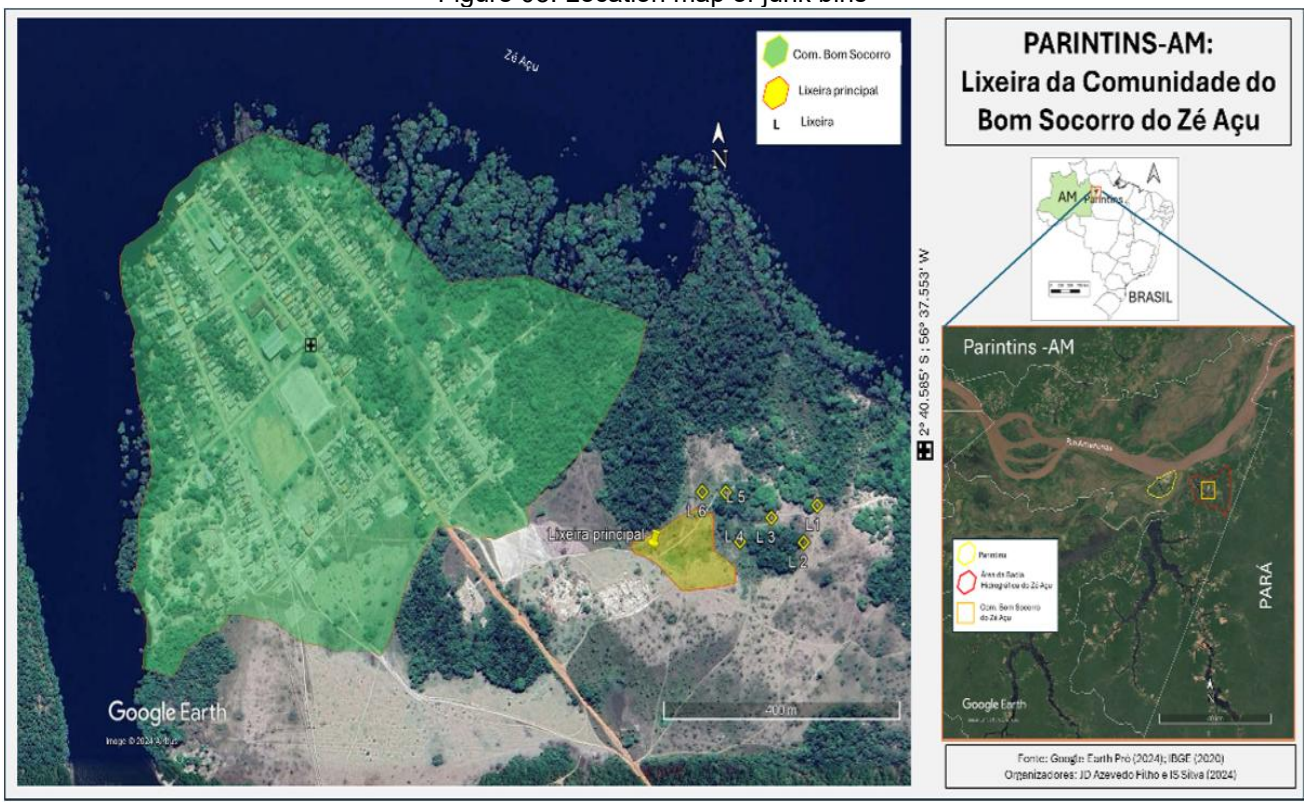
In this trash can we can see a large amount of glass bottles mixed with organic waste, cardboard, PET bottles, plastic packaging, even hospital syringes. These materials, which should have specific destinations, are being deposited in the same place, resulting in soil and water contamination, and interfering with the *animals* ' habitat. The presence of these residues not only generates a bad odor, but also represents a serious risk to people's health.

## MAPPING OF JUNK DUMPS IN THE COMMUNITIES OF ZÉ AÇU PARINTINS/AM

We mapped the junk dumps, using *Drone*, which allowed us to capture detailed aerial images of the affected areas. Allowing a visual analysis of the environmental and social impacts of the sites. These captured images were used to size the dumpsters and map their precise location in the communities. The geographic coordinates of the junk bins were collected using *GPS devices*.

These coordinates were processed in *ArcGIS* geoprocessing software, where a thematic map was created, where the distribution of the junk bins can be visualized, as shown in figure 03 below. This mapping is essential for the implementation of effective waste management strategies and for the formulation of policies aimed at solving these problems.

Figure 03: Location map of junk bins




Source: Fieldwork, 2024.

Map 03, above, shows exactly where these junk dumpsters are, taking into account that these affected ones have been growing constantly and along with it all the negative impacts. The smaller addicted trash cans are in the smaller markers demarcating the smaller trash cans, which are the vicious trash cans 01, 02,03,04,05,06. The larger part in yellow, the main trash can houses several materials that cause major problems. The part known as Areal, the final destination of all waste from the residents of the Bom Socorro community, is the area with the greatest environmental impact.

Figure 04: Aerial photograph of the main Trash Bin

Source: Fieldwork, 2024.

In the figure above we can see the large size of the garbage dumps, in the community of Bom Socorro do Zé açu Parintins/AM, with large extensions of waste disposed of inappropriately.

The image of the dump in the Bom Socorro do Zé Açu community shows disposals that are increasingly close to urban waste, for example, packaging of food products such as: cardboard boxes, cans and a lot of plastics

## USE OF ENVIRONMENTAL IMPACT ASSESSMENT MODELS IN THE JUNK DUMPS OF ZÉ AÇU PARINTINS/AM

We applied environmental impact assessment models where, through direct observation and using standardized questionnaires, we verified the main impacts that junk dumps cause to the environment in the communities studied. Chart 1 shows the model of the applied evaluation.

Impact assessment is a crucial process to ensure that projects, policies, or activities are developed in a way that minimizes negative effects and maximizes positive effects on the environment. These models were important for us to acquire significant results for the research.

We used the *Check List* model, which presents a list of the most relevant impacts of the dump, associating the affected environmental characteristics and the degree of impacts. This was fundamental to make the list of aspects and requirements in evaluation processes, which helped in the identification and verification of the potential impacts in a comprehensive and organized way of the dumpsters studied. As well as, the matrices and

interaction networks, were the tools that helped to map and evaluate the intensity and extent of the impacts of different activities or projects. Allowing for a more detailed and comparative analysis of potential impacts. These methodologies facilitated the quantification and prioritization of impacts, offering a visual representation of impacts and their interactions, which can help in communicating the results of the study. In summary, both the *Chick List* and the impact matrices and interaction networks are fundamental tools to carry out impact evaluations efficiently and effectively, ensuring a comprehensive and structured analysis of the effects of projects and activities such as the study of the Zé Açu locality.

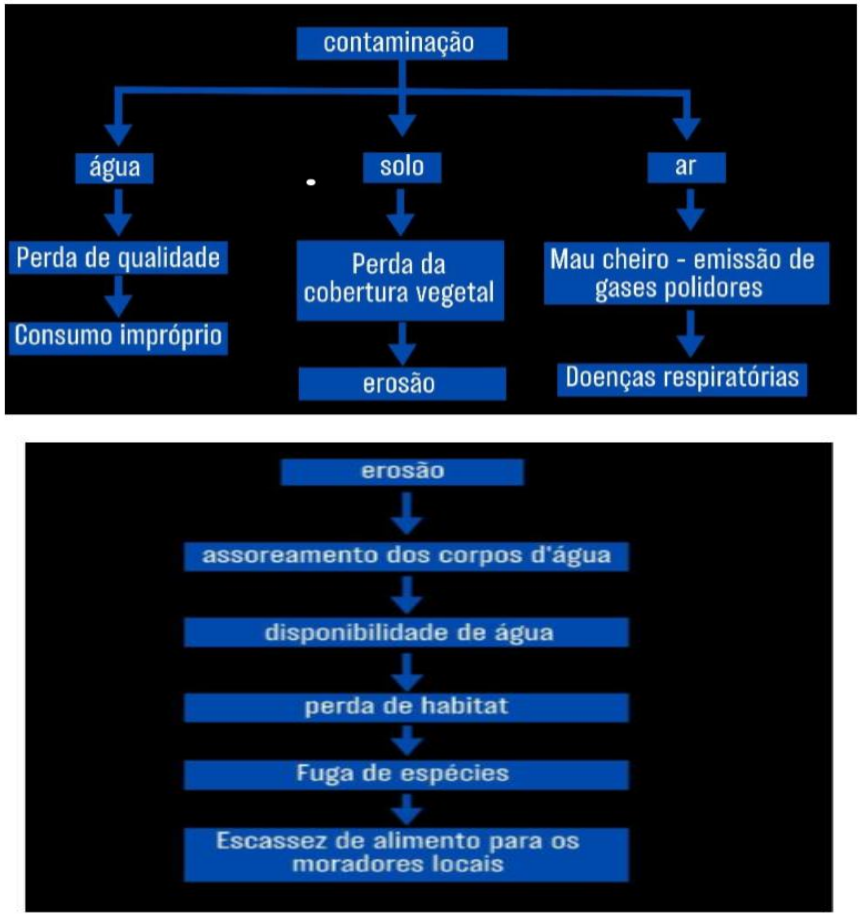
Table 1: CHICK LIST Model Result

| MODELO DE CHECK LIST PARA A AVALIAÇÃO DE IMPACTOS AMBIENTAIS NA AREA DA LIXEIRA E VOÇOROCAS NA LOCALIDADE DO ZÉ AÇÚ | | |
|---|---|---|
| ASPECTOS AMBIENTAIS | PRINCIPAIS PROBLEMAS OBSERVADOS | GRAU DE IMPORTANCIA |
| Solo e subsolo | Solo está degrado e o subsolo está com chorume. A erosão no solo é devido a falta da vegetação | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| Ar | Mal cheiro, gases tóxicos, fumaça | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| Água | Esgotamento dos cursos de água no rio próximo a comunidade | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| Social/ Cultural | Degradação do meio social e cultural devido a população jogar lixo por todo espaço. | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | E a desvalorização do local para futuros compradores. | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| Paisagem | A paisagem está muito devastada devido o lixo no local o meio está modificado. | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| Flora e Fauna | Sofrem impactos, por conta do lixo no local, no qual a lixeira pode atrair animais ou plantas invasoras no qual esses animais ou plantas podem devastar o habitat local. | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | Redução da Biodiversidade, fragmentação do Habitat | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |
| | | ( ) Pouco importante<br>( ) Importante<br>(X) Muito importante |

Source: Fieldwork, 2024

In the table above, we can see the various impacts caused by garbage dumps in environmental aspects such as: soil and subsoil, air, water, sociocultural, flora and fauna, all considered very important.

Figure 6: Trash Impacts Interaction Networks




Source: Fieldwork, 2024

In figure 6 above, we can see the results of the interaction network model, where it is possible to relate a sequence of impacts, actions. It is where the contamination of soil, water and air is evident, leading to based on certain consequences such as loss of water quality, loss of vegetation cover, diseases, among others.

Table 2 : Result of the INTERACTION MATRIX model

| MODELO DE MATRIZ DE PARA A AVALIAÇÃO DE IMPACTOS AMBIENTAIS NA ÁREA DA LIXEIRA E VOÇOROCAS NA LOCALIDADE DO ZÉ AÇÚ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ações Impactantes do Objeto de Estudo | Sistema Ambiental Impactado | | | Caracterização do Impacto | | | | | | |
| *Fase de Implantação* | MF | MB | MA | CAR | MAG | DUR | ES | IMP | TEMP | ESC |
| Alterações Paisagísticas | X | X | X | - | PP | DM | EL | G2 | TP | |
| Degradação da Paisagem | X | X | X | - | PP | DL | EL | G2 | | |
| Emissão de Gases/Poluição do ar | | | | - | PP | DC | EL | G1 | | |
| Emissões de odores | | | | - | PP | | EL | G1 | | |
| Perda de Cobertura Vegetal | X | | | - | MG | | DL | G2 | TP | |
| Lançamento de Poeiras | | | | | | | | | | |
| Poluição e depreciação da qualidade do solo | X | | | - | MG | | DL | G2 | TP | |
| Alteração Morfológica do Terreno | X | | | - | MG | | DL | G2 | TP | |
| Aumento dos processos erosivos | X | | | - | MG | | DL | G2 | TP | |
| Redução da capacidade de sustentação da fauna | X | | | - | MG | | DL | | TP | |
| Modificação da Drenagem Natural | X | | | - | MM | | DL | G1 | TP | |
| Risco de acidentes empregados | X | | | - | MG | | DL | G2 | TP | |
| Desconforto ambiental | | | | - | | | | G2 | TP | |
| Redução da biodiversidade nativa | | | | - | MG | | DM | G2 | TP | |
| Contaminação e poluição das águas | X | X | | - | PP | | | G1 | TP | |
| Riscos à saúde | | | | - | | | | G2 | TP | |
| Atração de vetores de doenças: ratos, baratas, moscas. | | | | - | MG | | DL | G2 | TP | |
| Desvalorização de terrenos Vizinhos | | | | | | | DM | G2 | TP | |
| Legenda: **Meio Físico**- MF; **Meio Biótico**- MB; **Meio Antrópico**-MA( Marcar um X) ; **Caráter**- **CAR**: Benéfico (+) ou Adverso (-); **Importância: Grau 1, Grau 2; Magnitude**- **MG**: pequena (PP), Média (MM), Grande (MG); **Duração – DUR**: Duração Curta (DC), Duração média (DM), Duração longa (DL); **Escala**- **ES**: Local (EL); Regional (ER); **Temporalidade**- **TEMP**: Temporário (TT), Permanente (TP); Fonte: adaptada pelos autores r (2024) | | | | | | | | | | |

Source: Fieldwork, 2024

Given the data obtained in the field, it is possible to carry out an analysis of the impacts caused by the dump in the region. It is evident that the natural areas have suffered significant negative changes due to the presence of the garbage dump, causing damage to the local ecosystem and, consequently, affecting the quality of life of the region's residents. It is clear that measures must be taken in order to minimize these damages, and the support of environmental agencies is shown to be one of the most viable alternatives for the preparation of action plans. Through environmental education lectures, it is possible to sensitize the population about the importance of preserving the environment, addressing topics such as the correct disposal of waste, the impacts of pollution on the ecosystem and sustainable practices that can be adopted on a daily basis. In addition, the implementation of an efficient selective collection and recycling system is essential for reducing waste deposited in the dumpster. Only through joint efforts and a holistic approach will it be possible to minimize the damage caused by the dump and promote a more sustainable future for the region.

The environmental impacts caused by open-air dumps are significant and lead to the degradation of the landscape. Originally, these areas would be cleared forests, without human interference. Over time, due to the lack of suitable places to dispose of garbage, people began to dump waste in the forest, negatively impacting the environment.

These dumps also affect the quality of life and health of the people who live nearby. The waste attracts disease-carrying animals, such as rats, and can contaminate food and water with leachate.

The loss of native biodiversity is evident, with the presence of gullies resulting from human action and natural agents, such as rain, sun and wind. The removal of vegetation exposes the soil, making it vulnerable to erosion, high temperatures, and strong winds.

In addition, the devaluation of the land is a problem. Areas that have been used as dumps become less attractive to buyers and residents, due to possible water contamination, the presence of sick animals and the unviability of crops on contaminated soil.

## FINAL CONSIDERATIONS

The present study analyzed the garbage dumps addicted in rural communities in the municipality of Parintins, more specifically the case of the locality of Zé Açu, which presents the main environmental impacts of the inadequate dumping of solid waste in vegetation areas, which has been generating significant problems for the soil, air, fauna and flora, and also risks to the health of the local population.

However, human behavior in relation to garbage is intrinsically linked to cultural and social issues, where the "out of place" becomes both a material and a symbolic problem. We can observe in this study that the perspective by demonstrating that the garbage cans, when misused, become critical points of disorder in the space where they are located, as in the case of the communities belonging to Zé Açu, reinforcing unsustainable practices and perpetuating cycles of pollution.

Thus, it is necessary to reconsider new approaches, new attitudes to reduce the growing production of solid waste. Among the changes to reduce the amount of garbage and avoid burning would be the reuse of discarded objects. However, more actions are needed from the government and research institutions, such as universities, in order to carry out information, sensitization and environmental awareness campaigns in these areas, so that people can mobilize for changes in attitudes towards solid waste.

Working on environmental education with residents and students from the local school is one of the suggestions that could be adopted as a way to mitigate the problem of

garbage in the community, instigating them to environmental awareness, seek change, analyze their behaviors on the subject, since environmental education does not only involve the physical environment,  but also the human side, since the environment is destroyed and degraded, and the people who suffer the consequences are the people, who need it for survival.

Furthermore, public policies aimed at waste management would alleviate this problem, because with the collaboration and planning of the municipal government for the communities that need such action, it would reduce environmental impacts.

The implementation of environmental education programs and projects is crucial to raise awareness among the local population about the negative impacts of improper waste disposal. Awareness should involve all age groups and be continuous, addressing not only public health issues, but also environmental and economic impacts. In addition to the creation and implementation of specific public policies for waste management in rural areas, as these are essential for the control and reduction of the problem.

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