



Solid waste and urban cleaning in the Brazilian Amazon: Experience report

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ABSTRACT

The management of solid waste and urban cleanliness is a delicate issue in the Amazon, where, for example, all urban streams in the city of Manaus have already been polluted. Voluntary public cleaning actions and education regarding solid waste management are therefore necessary. This experiential report aims to describe the experience of Civil Engineering students from the University of the State of Amazonas in an activity of solid waste collection and urban cleaning in the Brazilian Amazon. To assess the conditions of the Tarumã-Açu stream, located in the North region of the city, the authors participated in the 78th cleaning campaign organized by the Non-Governmental Organization 'Remada Ambiental,' where the collection mainly consisted of plastic, metal, glass, and textile waste in plastic bags, with the aid of protective gloves. Approximately four tons of waste were collected, which were later disposed of in the Manaus landfill. It was identified that the waste was predominantly household and not suitable for mechanical recycling processes.

Keywords: Solid waste, Public cleaning, Amazon, Stream, Recycling.

1 INTRODUCTION

Solid waste management and urban cleaning are part of the Basic Sanitation of cities, however, they are usually not managed correctly and sustainably. In the city of Manaus, the population does not have the habit of correctly disposing of their waste, generating problems of urban drainage and pollution of water bodies. In addition, most of the waste collected is sent to the city's landfill, which has a low percentage of recycling and is close to its maximum storage capacity. That said, it is necessary that Civil Engineering students experience and understand the reality of the country and have knowledge of the social and environmental impacts, since they will be the future responsible for managing and supervising the management of solid waste and urban cleaning in Brazil.



2 THEORETICAL BACKGROUND

2.1 RECYCLING METHODS

The recycling of plastic waste can be mechanical, which is the most common process in Brazil, but it can only be applied to thermoplastics without contamination with food or mixed with other materials. The rest of the waste must be recycled chemically or energetically (Avelino, 2020). Textiles can be recycled through the industrial method of reprocessing used clothes, where fibrous material and fabric scraps form new products (Machado, 2014).

Glass, which can be recycled many times, does not lose the characteristics and qualities of ordinary glass. In addition, when manufacturing recycled glass, 70% less sand is used for its manufacture (Chaparro, 2021). Aluminum waste is widely recycled in Brazil due to cooperatives and waste pickers. The pressed blocks of cans are broken, ground, separated from other ferrous materials, and screened. Finally, paints and other contaminants are removed for the manufacture of new cans (Costa, 2022).

2.2 BASIC SANITATION IN BRAZIL AND MANAUS

Brazil is in a worrisome situation, with 50.8% of municipalities disposing of their waste in landfills. In January 2007, Law No. 11.445/07, establishing the national guidelines for Basic Sanitation, which establishes urban cleaning and solid waste management as one of the constituent elements.

According to the Constitution, it is the competence of the municipality to legislate on public cleaning. Therefore, the Manaus City Hall, through the Municipal Secretariat of Public Cleaning (SEMULSP), provides services in relation to the recycling process in the city. One of the services provided is the environmental education of the population, through actions to raise awareness about selective collection, through Cedolp (Special Commission for the Dissemination of Public Cleaning Policy). The other service is selective collection through forty-eight Voluntary Delivery Stations (PEV's) spread throughout the city, where the population, on a voluntary basis, separates the items that can be reused, as a way to reduce the amount of waste sent to the Manaus landfill.

2.3 MANAUS LANDFILL

In the city of Manaus, there is only one sanitary landfill for the disposal of urban solid waste, which is located at KM-19 of the AM-010 highway and has an environmental operating license provided by IPAAM (Institute for Environmental Protection of the State of Amazonas). In this complex, there are three types of solid waste disposal: landfilling, recycling, and organic compost production. However, according to a report carried out in 2018 by environmental engineer Leandro Laurentino, the Manaus landfill has a useful life until January 2024 and, through the intervention of the Court of Justice of Amazonas (TJAM), will have its activities migrated to a new landfill by December 2023.



3 METHODOLOGICAL PROCEDURE

The 78th edition of the Environmental Paddle Cleaning Task Force took place on October 28, 2023 from eight to eleven thirty in the morning at Marina do Davi, located on Av. Coronel Teixeira, Ponta Negra neighborhood, Manaus, Amazonas. The Environmental Paddle project takes place through the mobilization of volunteers for the collection of floating waste in the Tarumã-Açu River, developing environmental education activities and protection of rivers and springs.

For garbage collection, latex gloves and biodegradable plastic bags were used for the collection of plastic, metal, paper and other waste. The glass waste was stored in raffia bags and metal cans because it is a sharp material. In order to identify the participants, green vests were provided, while the support team wore a pink vest. All the waste collected was stored in a single place that would later be sent to the Manaus landfill. The caps, plastic bottles and aluminum cans in good condition were placed in separate bags to be placed in the SEMULSP PEV at Marina do Davi.

4 RESULTS AND DISCUSSION

At the end of the action, approximately four tons of solid waste were collected, most of which was composed of household waste, such as glass bottles, PET bottles, clothes, soda cans and others. In figure 1, it is possible to identify plastic, which was the solid waste most collected during the action. Few were found suitable for recycling, however, most were contaminated and unsuitable for the mechanical recycling process. Solid glass waste was mostly collected in the form of beverage bottles, mainly alcoholic. In addition, a large part of the waste present in the PEV in question cannot be reused, due to the inadequate disposal of organic waste from that population.

Figure 1: Residues found



Source: Own authorship (2023)

5 FINAL CONSIDERATIONS

Considering the period of extreme drought in the Rio Negro, the action was important for the collection of solid waste that was easily accessible in the region of the Tarumã-Açu stream. However, much of the material collected was sent to the city's landfill, which is close to maximum capacity. In addition,



there is an amount of waste that could be mechanically recycled, but has been placed in bags with organic waste, contaminating it and leaving it unsuitable for the specific recycling process. Therefore, it is suggested that, in the next actions, some bags with different colors should be separated to facilitate selective collection during the activity and there should be a greater number of solid waste that is suitable for the recycling process.



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