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RESEARCH ARTICLE

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THE DESTINATION OF SOLID WASTE IN THE RURAL PROPERTIES OF THE CITY OF PATO BRAGADO, PARANÁ, BRAZIL

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ABSTRACT

This study aims to identify current factors and conditions factors relating to solid wastes produced in rural properties in the city of Pato Bragado, Paraná, Brazil. For this, it was necessary draw up an overview of selective collection in rural properties in the city. Thus, it was found out the disposition of materials in households in this space, researched how does the collection process and the difficulties found by residents in the question destination of solid waste. The methodology used in this study is of exploratory character with the application of a questionnaire for the residents who dwells in the rural areas of the city of Pato Bragado, and for all waste pickers of the Associação Bragadense de Catadores (ABC) (Bragadense Association of Waste Pickers). The data obtained were analyzed in a quali-quantitative way. The results demonstrate that there are no possibilities for the collection of recyclable waste in rural areas of the city. There is still the practice of burning and burying waste. When there is the collection, it is under the schedule of residents with in a particular way with the waste pickers of the ABC. The ineffective form provided the Municipal Public Authority for selective collection in these areas install the collection points in associations of residents.

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INTRODUCTION

The environmental theme as an integrated vision of the social being in time and space are fundamental concepts in projects with sustainable purposes and maintainers of natural assets, which can be used as essential tools for the quality of life and for the construction of a culture concerned with ensuring the ideal environmental standard.

Discussions around minimizing environmental impacts become constant due to the limitation of available natural resources. And, in this sense, the concern for the proper destination of solid waste has been linked to the issue of care for the environment. Therefore, establishing a critical and reflective view regarding the notions of environmental protection and the need to develop in a sustainable manner are essential, especially regarding the issues of final disposal of solid waste and the importance of using the recycling as an alternative in the process of reducing the amount of waste consumed and the proper form of disposal. Thus, this study aims to identify the current factors and conditions relating to solid waste produced in rural properties in the city of Pato Bragado in the State of Paraná. For this, an overview of selective collection in rural properties of the Municipality was elaborated, verifying the disposition of materials in the households in those spaces. It was researched how the collection process takes place, and it was pointed out, from the data collected

with the application of questionnaires, the difficulties encountered by the residents with the issue of solid waste disposal. For Latorre (2014), among countless problems raised about the environmental issue, one of the great obstacles that the world currently faces, and that has been drawing attention, is the large production of waste due to the unrestrained consumption of products that currently guide the standards of society production and consumption. This, according to the author (2014) stems from the advancement of technology we are living with such intensity, and by the fact that as our society based on the logic of consumption, from an early age we learn that we need to possess things and these things become the engine of our happiness. Therefore, unrestrained consumption has produced problems directly linked to the environment, one of these problems is the exorbitant production of solid waste and the way to dispose these materials that somehow no longer serve us, which will return to the environment in an unsustainable manner (ROCHA *et al.*, 2012). In Brazil, environmental degradation caused by solid waste disposed in untreated landfills or open-air dumps is a reality in several Brazilian cities. However, issues related to the destination of solid waste and inadequate disposal become problems when it comes to rural areas. The indicators demonstrate an urgency with the issues of urban solid waste, the waste produced in rural households that are far away tends to be forgotten by the Government and discarded according to the

viability of the residents. This urgency in dealing with issues related to solid waste produced on rural properties is because there is no collection of these materials. According to Freitas *et al* (2019), the scenario in rural locations becomes more unfavorable, the responsibility for disposing of waste is transferred to the residents, who often burn and bury or dump them in places close to rivers, or far from their homes.

MATERIALS AND METHODS

The city of Pato Bragado is located in the west of the State of Paraná. For the data collection 47 questionnaires were applied, 39 were directed to individuals who live in rural areas, and eight to recyclable material pickers who work at the Associação Bragadense de Catadores (ABC). Eight people were interviewed, representing the total number of collectors who work in the Recycling Recovery Unit (UVR) in the city where ABC carries out its activities. The rural area of Pato Bragado is divided into regions known as Linhas (lines or roads). Out of the 13 lines that make up the rural areas, we selected three individuals living in the locality, thus obtaining 39 residents. The technical procedures adopted consist in a case study analyzed with a quantitative and qualitative approach. Data were translated in statistical form. For confidentiality reasons, the speeches transcripts of the respondents were characterized by the letter E, the initial word Interviewed (in Portuguese), plus the questionnaire number.

RESULTS AND DISCUSSION

To compose the panorama of solid waste in the city of Pato Bragado, it was registered that finding discarded materials is a recurrent problem in rural regions. It was found that it is common to find materials in the middle of the crop and on road, as shown in Figure 1.



Source: Kátia Cotica, March 2021.

Figure 1. Recyclable materials discarded in crops

The waste registered in Figure 1 should be destined for reuse or recycling which, in addition to contributing to the protection of the environment, financially helps those who work with the collection of these materials. According to ABIPLAST (2019), for every 1 ton of recycled material produced, 3.16 employed pickers manage to collect this volume of material in a month, and an average of 1.1 ton of plastic waste disposed of in landfills is reduced. Thus, selective collection reduces environmental degradation and helps the income of families that work with it. With regard to the production of waste on properties in rural areas of the city, inadequate disposal becomes a disadvantage. E11 mentions that among the advantages are the “peace, tranquility, lightness, leisure”. However, the “lack of internet, not having a destination for waste and recycled materials. The need to burn without wanting to. It's the garbage thrown in the streets, in the woods” (E11), becomes the great difficulties of living in the rural areas. The same disadvantage is mentioned by E12 that exposes, “Trash without proper destination”. When questioning them about how the disposal of waste is done in the city they live, 41% of respondents say they know where and how they are disposed reported that “it's there in the garbage dump” (E27). Some of the answers refer to the fact of waste being deposited anywhere, even to define what is in the landfill where it is disposed all solid waste in Pato Bragado, as

quotes E25, “I will tell you the name of the place, the landfill. And there are people who throw the garbage down here, in the springs there”. According to E24, “It doesn't pass here, it's a rural area, right! We have everything in a bag”. Also for this question, more than half of the interviewees, 59%, were unable to answer how and where waste is disposed in the city of Pato Bragado. When questioning about the selective collection process and the correct destination of solid waste, 39% of the interviewees affirm that it is properly disposed. According to E9's statement, “yes, because the collections made that go to the dump and to the recycling shed”, and in E3's opinion “the city hall has an outsourced service and the company that carries out this correct destination”. As other respondents, 23% claim that it does not occur, and 38% were unable to answer. The comments cited by respondents who claim that there is no proper disposal of solid waste is that “not because we have to burn it, and that's not right. It should be recycled” (E12), and “No. There is that garbage house and it is very small. Once I talked to the garbage man who passes by on the street, in front, and goes to Km 5, but he doesn't pick up here” (E28). When E28 mentions “in that garbage house” it refers to selective collection points installed in the associations of each Line for the collection of recycled materials. However, it was found that not every Line has a residents' association, therefore, not all of them have collection points installed. Thus, residents of lines or roads that do not have points such as the Progresso Line and the Arroio Fundo Line need to travel to the Km 13 Line Residents Association to deposit their recyclable solid waste. Still on the selective collection process and the proper disposal of solid waste, according to E19, “I don't think so, because the waste generators themselves end up not properly separating the materials. In this way, materials that do not decompose are discarded in landfills”.

According to E23's report, the disposal of waste,

it is very inadequate for several reasons. First, because the landfill is not licensed. As far as I know, for about 10 years there has been a protocol with the IAP and with the rejection of this protocol by the IAP only now came to light. I wonder about the slowness of this, how slow it is, why they didn't answer before, right? Only by force of the Public Ministry, which is now on top of this issue of landfills, maybe that's it, I don't know, but anyway, the city that has a landfill allocating its waste, not only the municipality but the region, several in the region, without licensing, with a questionable area, (because landfill must have ponds to collect this slurry, recirculate this slurry), it's on top of a stone area with the slurry leaking from the side, with a well made, a tank to collect the slurry, in a totally wrong way, without geomembrane, there is no legislation in the municipality, (authorization in the chamber to bring waste, tailings from other cities in the region to Pato Bragado), that is, wrong zoning, without licensing and without municipal authorization. Is the city's destination wrong? All aspects are wrong. That's why it's a strong no at that point there. (E23, 2020)

E23's speech exposes a situation in of Pato Bragado that goes beyond the inappropriate disposal of waste by individuals, it is a problem that goes beyond the issue of individual separation or social practices, because it denounces the irregularity of the Public Power in the face of adequate treatment with the waste. The issue raised by interviewee E23 about the irregular licensing granted by the IAP (Instituto Ambiental do Paraná) to landfills is discussed and alluded to in the media. Numerous environmental licenses were granted irregularly, and these violate Federal Law 12,305/2010 of the PNRS (National Policy for Solid Waste). According to the IAT, Water and Land Institute (2021) there was a notification and inspection in some municipalities in western Paraná with the aim of making improvements in landfills. “Most of these places inspected are characterized as open-air dumps. Some have already been fined.” (INSTITUTO ÁGUA E TERRA, 2021, s.p.). The city of Pato Bragado, which has two landfills, was on the list of 11 municipalities that were surveyed, and according to the IAT publication, “All municipalities were notified to appear at the IAT office in Toledo to present their plans for improvement and will be invited to sign these

agreements in the form of Environmental Inspection Reports (RIA).” (INSTITUTO ÁGUA E TERRA, 2021, s.p.). It is noteworthy that a landfill is characterized as a dump is because it does not receive any form of maintenance and control. Once, the sanitary landfills receive treatment, soil waterproofing, leveling and sealing, and drainage for the leachate. The leachate is defined according to the Michaelis dictionary as the liquid that flows from the garbage, according to its definition slurry, in Portuguese “cho-ru-me¹: 4. Ecol. Liquid residue of decomposing organic matter that runs off from the garbage.” (MICHAELIS DICTIONARY, s.p.) and that, according to Fogaça (2020, s.p.), it is “toxic liquid”. In addition, “there are also open monitoring wells close to landfills so that the quality of the water can be constantly assessed and checked for possible contamination” (FOGAÇA, 2020, s.p.) which was cited by E23 as an irregular construction that “it's on top of a stone area with the leachate leaking from the side, with a well-made, a tank to collect the leachate, in a totally wrong way, without a geomembrane”.

E23's description of the place is the description of a garbage dump, which deposit solid waste in the open air, piling everything up, without treatment, and without maintenance. This way of handling solid waste contaminates the environment, polluting the air, water, and soil, in addition to creating vectors that transmit diseases such as leprosy and hepatitis A and diseases resulting from the toxicity of waste and its contamination in water and food, such as dysentery and giardiasis, among others. Some complaints about the landfill that residents expose during the survey are that there are many plastic bags scattered nearby, as mentioned by E30, “The right thing would be for everything in its place. The same way up there is the dump, and the neighbors always have little packages flying over on their land”.

In addition to having materials disposed of on the properties in front of the landfill, the plastic bag is one of the issues raised by the interviewees, as they are a problem they face in their homes. Plastic bags become a setback, as quoted by E31 “they should give a right destination. Thing shouldn't be lying around, without a correct place, thrown. It's in the fields and streets, the little bags... many animals eat, and it spoils the agricultural equipment”.

One of the most pertinent questions for the interviewees was to report whether solid waste collection includes the rural areas of the Municipality.

According to survey data, 49% of respondents claim that yes, solid waste collection includes rural areas, and according to E18 “we take the garbage, or better, the solid waste to the residents' association, then the city collects it through an outsourced company”.

In the course of the answers, a description of the picture of how solid waste is handled in rural areas was obtained, which indicates that taking the waste to the recycling collection point established in the associations is unfeasible for many, as stated by E6 “we have to take it to the house, at the association. But we end up not taking it”, and E27, “Some come to the association sometimes. We just don't”. As also described by E24, “we don't have any. We sell the tin cans, we earn R\$ 3,00 per Kilogram², and a collection time was enough to pay for the light, and now it will be enough to pay for the water. If you throw a paper in front of us, we gather it and burn it. We can't run and dispose it correctly, it's not possible”.

When asked about the forms of disposal of solid waste adopted in their properties, three types of answers were obtained. Those that separate the waste and take it to the collection points, as reported by E19, “They are packed in plastic bags and sent to the predetermined collection place and from there to the UVR unit of the municipality. The Bragadense Association of Collectors” as shown in Figure 2.



Source: Kátia Cotica, March 2021.

Figure 1. Disposal of recyclables on the properties

According to E1, solid waste on their property is separated. The report is that, “Every day we put them in bags and put them in the shed... Every day there is garbage”. According to E21 “now we gather in the shed and then we take it there to the association. This now, because before we burned everything. Then, a man passed by and bought the cans and the bags”. Also, according to E5, “we got in touch with one of the members of the recycling cooperative, he comes to the property to collect”. The answers that separate the waste and discard it in the municipal landfill, as described by E20, “the bag with separated materials. Then they take everything there to the municipal dump”, and commented by E25, “we put them in bags that the dump directions itself gives. One thicker and one thinner, we ship everything. That was a short time ago. Before, everything was placed in the Itaipu area. Even poison bottle. It does not rot there”. Finally, the answers that direct us to the practices of burning and burying, as described by E21, “we keep it and burn. Organic waste goes to the crops. The can bags, we sell”, and by E24, “paper and plastics, we burn. Cans are sold, and what is not suitable for burning is stored in the shed, as is the case with glass. We are waiting for someone to collect”. According to E12 “fire and hole”, as registered in Figure 3. It was found that many individuals use a ditch as a deposit for solid waste disposed on the properties. These ditches are built to extinguish solid waste produced in their homes, being burned or buried. There is no consideration for recycled materials that can be reused. By recording this practice in rural properties, it is evident how much this issue needs to be discussed, as the act of burning and/or burying releases harmful toxins to the environment and human health, due to lack of knowledge of these factors, this practice is common in rural areas.



Source: Kátia Cotica, March 2021.

Figure 3. Waste burning location

According to the Municipal Public Authority of the City of Pato Bragado, the collection of domestic solid waste exclusively serves the urban area on specific days. In rural areas, the domestic solid waste management plan is only available in topics and corresponds to the implementation of recyclable collection points in rural areas, with recyclable collection taking place every two weeks (PATO BRAGADO, 2014, p.88). The solution found by the Municipal Government for the issue of solid waste from rural properties was the implementation of a selective collection post in the Lines or Roads Residents' Associations. These collection points were only implemented on April 28, 2020, six years after the elaboration of the Integrated Solid Waste Plan in Pato Bragado. Despite the Municipal legislation implementing these selective collection points in specific spaces for rural properties to deposit recycled materials, and defining

¹Leachate. Noun. Liquid that takes in substances from the material through which it passes, often making the liquid harmful or poisonous. (Cambridge Dictionary Online. <https://dictionary.cambridge.org/pt/dicionario/ingles/leachate>)

²Is equivalent to paying \$0,52 the kilogram of the tin can.

that it is prohibited to burn in the open, bury, throw in rivers, wells or water bodies, and it is also prohibited to “deposit and bury polluting, pathogenic, toxic, flammable, etc. residues in the soil. that may change the physical, chemical and biological conditions of the environment” (PATO BRAGADO, 2014, p. 93-94), the inconvenience of improperly disposing of these wastes still happens. This fact is due to the impossibility for some properties to transport such materials to other places, and also due to the lack of knowledge of the existence of such collection points. As well as a result of cultural factors, since the act of burning/burying is mainly caused by the lack of knowledge of harmful factors and the lack of alternatives about the destination. The reports are described as the simplest way to solve the problem of solid waste in properties where the Public Power does not collect, and where it is not feasible to take it to the collection points. They burn and then bury what is not fully disintegrated, as exemplified by E28 “*what burns, I burn near the banana trees. I made a square with bricks*”.

Thus, when asking about how the collection of solid waste would bring benefits to their family and the environment, it was found that it is unanimous among the interviewees how the disposal of solid waste becomes an inconvenient and uncomfortable issue, as the destination is the responsibility of the residents, who make every effort to dispose of it properly. However, for some it becomes unfeasible to gather the materials and send them to another point, as it is a place for raising dangerous animals and possible transmissible diseases, as provided by E23, “*uncollected garbage becomes a source of disease. It transmits vectors such as rodents and cockroaches, as well as visual and olfactory pollution*”.

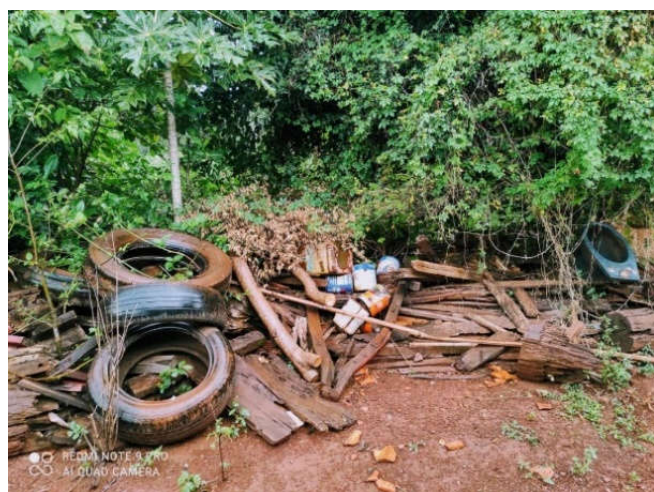
For E22, the benefit that the collection of waste on her property would bring is that everything would be clean and organized, according to the report “*for sure, to keep everything clean. It's not nature that creates the garbage, it's us who create it*”, and “*Absolutely! If there is collection, there will be no burning and the soil will not be contaminated either*” (E12). Besides that, they wouldn't need to save until they reach a certain amount, as E32 exemplifies, “*for us it was going to be a good one. No need to keep stocking in bags*”. According to E28, the benefit would help in the inconvenience of taking waste to the points, “*yes, because it didn't need to burn and pollute the environment, because there's nothing to do. There's a lot of garbage and how are we going to take all this garbage in our bags if I don't even have a car?*”, and the same for E34, “*better if it was collected on the properties, avoiding inconvenience in taking it to the proper location*”.

In addition to the recyclable materials that the properties produce and do not always dispose properly, we also sought to carry out a survey on the disposal of pesticide packaging, an item widely used in rural areas. It should be discarded according to the recommendations of Decree 4.074 of January 4, 2002, which provides the rules for the disposal of empty packaging and leftover pesticides. According to Decree 4.074/2002, empty pesticide containers must meet technical specifications for disposal. These recommendations are presented in the package inserts, which indicate that after use, the farmer must wash and return the product with their respective lids to the establishments where they were purchased within one year from the date of purchase. When verifying whether the properties interviewed have the proper disposal of pesticide containers, the results obtained show that 77% of respondents correctly dispose of them, carrying out the triple washing process and forwarding it to the responsible company. However, 13% who use pesticides do not dispose of the packaging correctly. And 10% do not use pesticides on their properties. It is also worth mentioning that, according to E25 “*down here in the little stream that when it rained and the stream overflowed, the vials of poison would show up, and the fish would die. We talked to the environment department*”.

To verify if this problem is an issue that the Public Authorities are not aware of, the interviewees were asked if, through the residents' association or other organized groups, they had already asked the Public Authorities for a more appropriate destination for solid waste

on the properties of rural areas. Thus, 28% answered yes, “*it has been asked many times. Almost politicking. And a few days ago, cages were placed in the associations. We were tired of performing acts for something to happen*” according to E1. To E10, “*we have already requested that there be collection, that's why we started to take garbage in the park, because we don't have where to take it, nor where to dispose it*”. However, 62% of respondents said no, because “*the collection is already taking place*” (E17). The remaining 10% of respondents were unable to answer this question.

When investigating which type of solid waste that respondents produce on their properties to survey the proper disposal of types of waste, the results indicate that plastic is the item with the highest incidence of production, being cited by 59% of respondents. Respondents mention that “*the supermarket plastic bag. We need to go back to the old way, of clothed bags. It's a toothpaste in a bag, a soap in another. This garbage is terrible*” (E25). According to data from the Plastic Atlas (2020), Brazil ranks fourth in the rank of plastic waste production in the world. The production of plastic waste in Brazil is around 11 million tons per year, for all sectors of goods and services. Next, paper was cited as waste produced with 24%, glass with 15% and the option “others” cited by 2% of respondents. In this option, they mention the disposable diaper as the type of waste most produced on the property. The greatest difficulty found in the households interviewed, regarding the issue of the destination of solid waste, is the non-collection, as they need to keep it in bags and are not able to take it in large quantities to the points established for collection, as explained by E14 “*when there's no collection, we don't know what to do with it. Rural area produces a lot of waste*”. And, as described by E34 and E17, “*the distance to take the garbage to the collection point*” (E34) and “*there is a lot of time until it is the collection date*” (E17), as recorded in Figure 5. For some respondents, the difficulty is in eliminating waste, according to E30, “*the worst problem is the glass and cans of chocolate, coffee, it doesn't burn, right. Then it has to be piled up in someplace*”. And, according to E15, “*the only thing is that we have to find a way to consume, bury and burn. They talk about dengue, but all this garbage is thrown, what should we do*”. According to E14's speech, “*when there's no collection, we don't know what to do with it. Rural area produces a lot of waste*”.



Source: Foto Kátia Cotica, March 2021

Figura 2. Waste pile location

When the respondent claims that “in the interior it produces a lot of garbage”, one describes a reality of everyday life for the planet, and of countless homes. The fact is that a lot of waste is really produced, and, in Pato Bragado, ABC withdraws its income from recycled materials from selective collection, thus, the collection of these materials in the rural areas would significantly contribute to these workers, in addition to helping residents with an existing problem on their properties. When questioning the ABC's recycled material pickers about solid waste in rural areas, the data collected indicate

that 25% believe that the collection does not include such areas. For the waster picker E6, *“the collection in the rural area is the same as in the city, but rural garbage has more mixed materials”*, that is, for the respondent in rural areas, waste is not separated in the same way that the urban population separates it. The highest response rate for this question is not knowing how waste collection works in these areas, with 38% of respondents checking the option “I don't know how to answer”. Only one individual commented that selective collection in rural areas is carried out every 15 days with the collection of waste that is left in the associations of each line in the rural areas of the city of Pato Bragado. However, according to him, this practice has begun a short time ago, and the materials were stored by the owners in their homes, and when they reached a certain quantity, scheduled the collection of these materials with the ABC Association.

CONCLUSION

When describing an overview of the solid waste scenario in rural properties in Pato Bragado, it was found that the current destination conditions for selective collection are not carried out. When recording and collecting data, it is clear how much it is necessary to discuss and formulate measures related to the disposal of solid waste in rural properties in the city. The data collected show that there is a neglect of solid waste by the population residing in these spaces, which often burns and buries the materials as an alternative, not considering the risks that this practice induces. And also, a negligence on the part of the municipal government that did not adopt effective measures to carry out selective collection on rural properties.

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