Overview of the physical conditions of Voluntary Delivery Stations (PEV) to improve selective collection in Manaus, Amazonas

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ABSTRACT
The 12th Sustainable Development Goal (SDG), proposed by the UN 2030 Agenda, more specifically 12.5, which seeks to reduce waste generation through prevention, reduction, recycling and reuse, faces obstacles in countries such as Brazil, where selective collection is still not carried out in 24.9% of Brazilian municipalities, as well as in 33.8% of cities in the northern region of the country. In addition, among the Municipal Solid Waste (MSW) collected in selective collection, only 4% of it is recycled in the country. Therefore, in order to increase the rate of use of waste in recycling, selective collection must be carried out. Therefore, this work aims to create an overview of the physical conditions of the Voluntary Delivery Stations (PEV) in the city of Manaus, from the update of the list of PEVs in the capital, made available by the Municipal Secretariat of Public Cleaning (SEMULSP), as well as the photographic record of the 48 stations present in the city and the creation of a form with indicators of the physical conditions of the PEV. where the incidence of collectors was quantified by urban geographical area of Manaus, by operation, by types of containers, by presence of weather cover, by presence of organic material, by physical condition and by need for maintenance. Among other results, it was obtained that 72.7% of the PEV in the capital need maintenance for the development of the selective collection process.

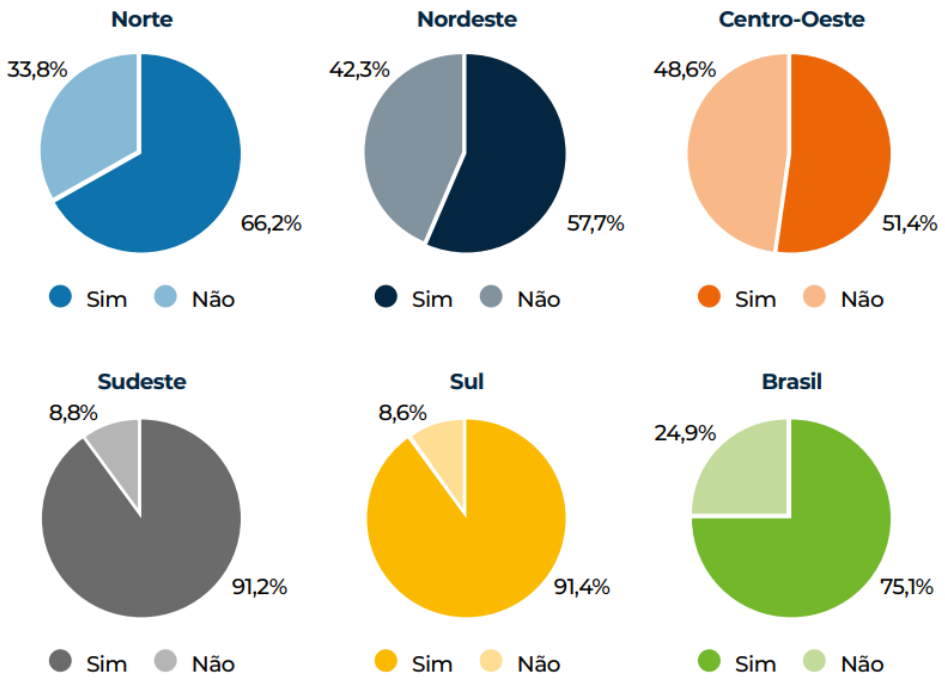
Keywords: Selective collection, Amazon, Recycling, Urban solid waste, 2030 Agenda.

1 INTRODUCTION

Faced with the main problems that threaten humanity and to promote a dignified life for all, the United Nations (UN) presented a global action plan that brings together 17 Sustainable Development Goals (SDGs), the so-called 2030 Agenda. SDG 12, entitled "Responsible Consumption and Production", more specifically goal 12.5, aims to substantially reduce waste generation through prevention, reduction, recycling, and reuse.

According to the Panorama of Solid Waste in Brazil, carried out by the Brazilian Association of Public Cleaning and Special Waste Companies (ABRELPE), each inhabitant generated about 381 kg of urban solid waste (MSW) in 2022. However, in only 75.1% of Brazilian cities there are initiatives for the selective collection of MSW generated, with an even lower average for the states in the northern region of the country (66.2%), as shown in Figure 1.

Figure 1 - Distribution of municipalities with selective collection initiatives in Brazil and regions (%) in 2021.



Source: ABRELPE (2022).

However, of the MSW collected in selective collection, only 4% of them are recycled in the country, and a large part of them are disposed of in sanitary landfills, controlled landfills, and open-air dumps (ABRELPE, 2022), the latter option being the worst among all, where there is the simple discharge of the waste, without any control of the environmental impacts caused (Medeiros *et al*, 2002).

Frame 1 - Types of destination - MSW masses 2022. Source: ABRELPE (2022).

Destinação	Massa (t/ano)
Aterro sanitário (sem aproveitamento)	42.141.039,68
Aterro sanitário (com aproveitamento)	4.271.051,32
Aterro controlado	17.322.000,00
Lixão	12.384.226,00
Total	**76.118.317,00**

The rate of use and commercialization of solid waste for recycling increases through the practice of separating organic waste from inorganic waste (IBGE, 2000). Therefore, in order to assist in the development of the selective collection process in the city of Manaus, this work produces an overview of the physical conditions of the PEV in the capital, from the update of the list of stations in the capital, made available by SEMULSP, as well as the photographic record of the 48 stations present in the city and the creation of a form with indicators of the physical conditions of the PEV.

2 THEORETICAL BACKGROUND

2.1 SELECTIVE COLLECTION

According to Chapter 1, Article 2 of the Preliminary Report of the National Solid Waste Policy, selective collection is defined as the differentiated collection of solid waste previously selected from generating sources, in order to send it for recycling, composting, reuse, treatment and other alternative destinations, such as landfills, processing and incineration. In addition, selective collection can be carried out through PEV or door-to-door collection (Grimberg, 2003).

2.2 ENP

PEVs are identified structures, such as buckets, containers, or drum sets, strategically positioned in busy locations and easily accessible to pedestrians and vehicles. These points receive specific materials, previously separated by the waste generators, following the colors established by CONAMA Resolution 275/01: blue for paper, red for plastics, yellow for metals and green for glass. In addition, there are PEVs that allow the joint disposal of the four types of materials in a single container (Peixoto, 2005).

According to Peixoto (2005), among the advantages of the use of PEV, there is the ease of collection, with a reduction in costs with long distances, in addition to assisting in the collection in municipalities with tourist activity, whose population is usually not present in the city on days when there is collection of recyclables, and, mainly, it allows the separation and disposal of recyclables by types, facilitating further screening.

Regarding the negative aspects in the use of the PEV, there is the requisition of more containers for packaging in the generating sources, in addition to depending on the willingness of the population to travel to the PEV, requiring periodic maintenance and cleaning and being able to suffer vandalism by the community, from the deposit of organic waste and dead animals, to graffiti and fire (Peixoto, 2005).

2.3 DOOR-TO-DOOR

In this method, the collection vehicle travels through all the streets, collecting the previously separated materials that were placed in front of homes and commercial establishments on specific days. According to Peixoto (2005), the advantages of this type of modality lie in the ease of separating materials at the generating source and disposing of them on the sidewalk, in addition to the exemption from traveling to a PEV, thus obtaining greater community participation. In this type of collection, it is also possible to measure the population's adherence to the program and there is agility in the discharge at the sorting centers.

The negative aspects of this type of selective collection are the greater infrastructure of the system, with higher costs of transportation and subsequent sorting, in which a new selection of waste must be made (Peixoto, 2005).

2.4 NEED TO IMPLEMENT SELECTIVE WASTE COLLECTION

According to Grimberg (1998), the reasons that lead institutions to implement selective waste collection programs can be of a nature:

I. Environmental/geographical, due to the lack of space for waste disposal, the preservation of the landscape and the reduction of the environmental impact of dumps and landfills;
II. Sanitary, with public health inconveniences in places where there is inadequate disposal of waste;
III. Social, generating jobs and rescuing the dignity of MSW waste pickers;
IV. Economical, reducing expenses with public cleaning and implementation of new sanitary landfills;
V. Educational, reviewing consumption habits and sustainability in citizens through selective collection programs.

2.5 SELECTIVE WASTE COLLECTION IN THE CITY OF MANAUS

According to § I, article 30 of the Constitution of the Federative Republic of Brazil of 1988, it is the competence of the municipality to legislate on matters of local interest, such as public cleaning. Therefore, the Manaus City Hall, through the Municipal Secretariat of Public Cleaning (SEMULSP), provides services in relation to the selective collection and recycling process in the city.

One of the services is about 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 48 PEVs 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.

2.6 LANDFILL IN THE CITY OF MANAUS

In the city of Manaus, there is only one sanitary landfill for the final destination 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 (G1, 2023).

A new sanitary landfill will be implemented in the city, located at km 13 of the BR-174, near the Leão creek and the Tarumã-Açu river. However, this is characterized as a permanent preservation area and, because of this, the Court of Auditors of Amazonas (TCE-AM) suspended the licenses that had been granted by IPAAM for the construction and operation of this new facility (G1, 2023).

With a license approved in 2021, the new landfill was built on the source of the Leão stream, causing the silting of the water resources present in the area and placing animals, such as the tamarin, one of the most endangered animals of the Brazilian fauna, which only exist in the Amazon, in danger of contamination (Acrítica, 2023).

According to Kinnamnan (2006), the increase in waste disposed of in municipal landfills is a problem for public policy and recycling is considered a means to solve it.

3 METHODOLOGICAL PROCEDURE

In order to provide an overview of the physical conditions of the PEV in the city of Manaus, it was first necessary to carry out a literature review on the subject of selective collection, which is provided for in the previous item.

In addition, it was necessary to update the list of 48 volunteer posts made available by SEMULSP, through a PDF list at the <https://www.manaus.am.gov.br/semulsp/servicos-semulsp/coleta-seletiva-e-pontos-de-entrega/> website. This was carried out due to the lack of important information, such as street number and geographical coordinates, to find the PEV. For this, the online map software *Google Maps was used.*

In addition, in order to analyze the physical conditions of the PEV in the capital, a form was created with important indicators in the inspection of the stations, such as:

- Identification of the PEV: it was identified according to the provisions of the list made available by SEMULSP;
- Location: the street, number and neighborhood were identified;
- Collector material: whether the PEV was made of HDPE, masonry or other materials was collected.
- Existence of separation of inorganic waste: it was verified if the waste was separated only into inorganic waste, or if there was separation according to CONAMA Resolution 275/01;
- Operation of the PEV: it was observed if the post existed; if so, whether it was in operation or abandoned;
- Presence of organic material in the PEV;

- General physical condition: parts and pieces of the collector and identification of the PEV were analyzed, as shown in Chart 2;

Frame 2 - Criteria for assessing the general physical conditions of ENPs. Source: the authors.

Criteria for the assessment of the general physical conditions of ENPs		
	Collector Parts/Parts	**Collector Identification**
Bad	Missing or Damaged	Unidentified or damaged
Regular	There are no broken parts or missing parts	Impaired
Good	There are no broken parts or missing parts	Little or no identification impaired

Source: the authors.

- Need for maintenance: PEVs that had a "Poor" or "Regular" general physical condition need maintenance;
- General comments: any information that was considered important about each ENP visited.

Based on this, the 48 posts were analyzed from November 18 to 21, 2023. The present study was funded by the authors themselves, without financial support from any institution.

In this research, there was a restriction with regard to the PEV located in the Compensa neighborhood, where it was not being located on *Google Maps* through the information provided by the SEMULSP list. Therefore, in the present study, 47 of the 48 PEVs present in the city were analyzed.

4 RESULTS AND DISCUSSION

4.1 INCIDENCE OF PEV BY URBAN GEOGRAPHICAL AREA OF MANAUS

The zone with the highest incidence of PEV in the city of Manaus is the central-south, with 35.42% of the city's collectors. However, it is second to last in terms of population, only behind the central-eastern zone of the capital. In addition, it is possible to identify in Chart 3 that the most inhabited areas of Manaus, which are the North and East zones, have, respectively, only 14.58% and 6.25% of the PEV.

Frame 3 - Incidence of PEV by urban geographic area of Manaus.

Manaus Area	Population (SEDECTI, 2021)	% Population by area	Quantity of PEV	% PEV per zone
South Central	191229	8,53%	17	35,42%
West	317461	14,17%	10	20,83%
North	627259	27,99%	7	14,58%
South	358649	16,00%	6	12,50%
Midwest	185696	8,29%	5	10,42%
East	560774	25,02%	3	6,25%
Total	2241068	100,00%	48	100,00%

Source: the authors.

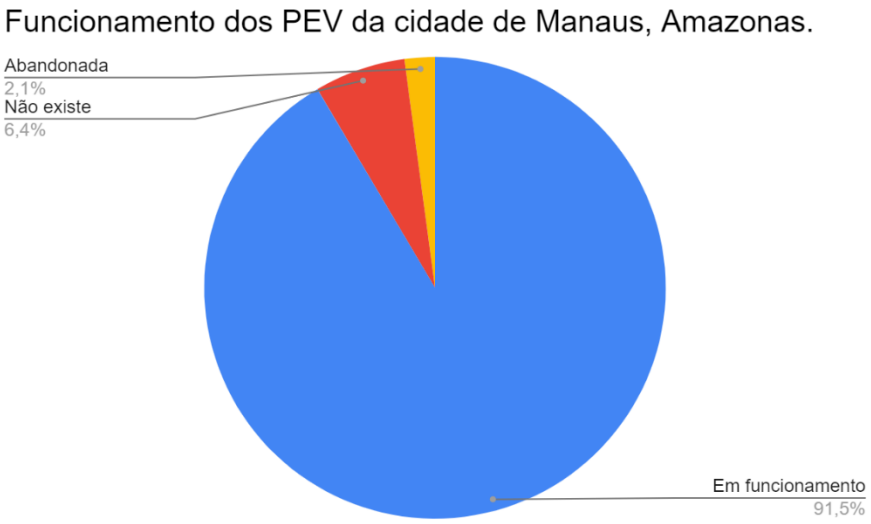
4.2 FUNCTIONING OF ENPS

In addition, it is important to quantify the operation of the PEV in the city of Manaus, because if the collectors are not in operation, there is no selective collection. As a result, it was obtained that 91.5% of the PEV in the city of Manaus are in regular operation, followed by 6.4% that do not exist. More specifically, the PEVs that were not found at the appropriate addresses provided by SEMULSP were the following:

- Hiper DB – Av. Umberto Calderaro, 1128 - Adrianópolis, Manaus/AM, 69057-021 (-3.0977290,-60.0091111)
- PEV Dom Pedro - Av. Pedro Teixeira, 52 - Dom Pedro, Manaus/AM, 69040-000 (-3.0920894, -60.0474244)
- Nova Era Supermarket - Av. Torquato Tapajós, 11559 - Santa Etelvina, Manaus - AM, 69039-125 (-2.9786245,-60.0173950)

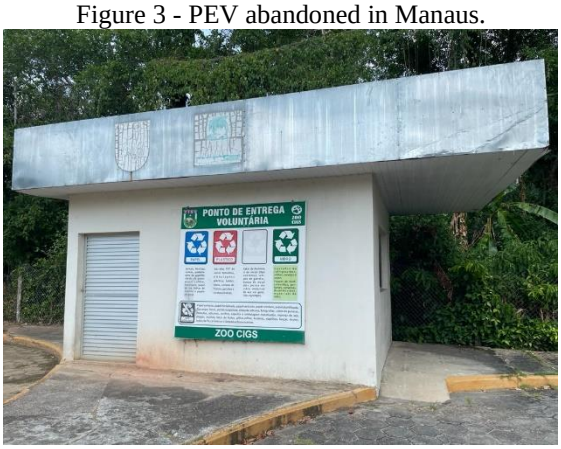
Regarding the abandoned PEVs, only the CIGS collector was found, which does not have the services of the City Hall, as can be seen in Figures 3 and 4.

Figure 2 - Operation of the PEV of the city of Manaus.



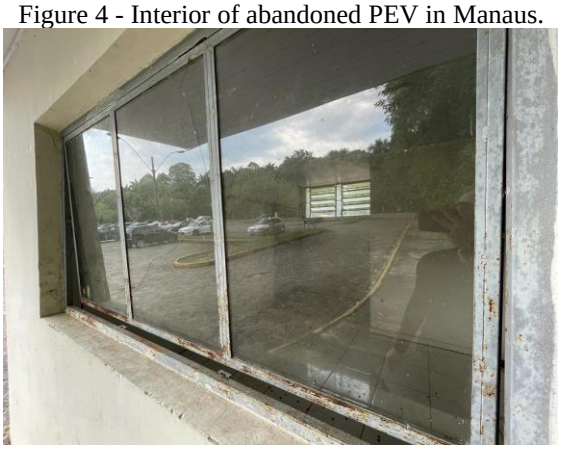
Source: the authors.

Figure 3 - PEV abandoned in Manaus.



Source: the authors.

Figure 4 - Interior of abandoned PEV in Manaus.



Source: the authors.

4.3 IDENTIFICATION IN ENPS

It was also analyzed which PEVs were identified, as it is important for the population to be able to identify the collector so that they can carry out the selective collection, and it was found that 93.18% of them were identified.

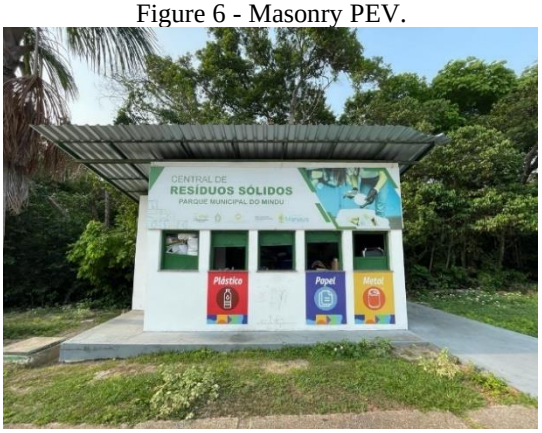
4.4 TYPES OF COLLECTORS

In addition, it is important to analyze which four types of collectors are present in the capital. The most common is HDPE containers (81.8% of PEVs), followed by masonry containers (4.5% of PEVs) and others (13.6% of PEVs), illustrated in Figure 5 to 8.

Figure 5 - HDPE PEV.

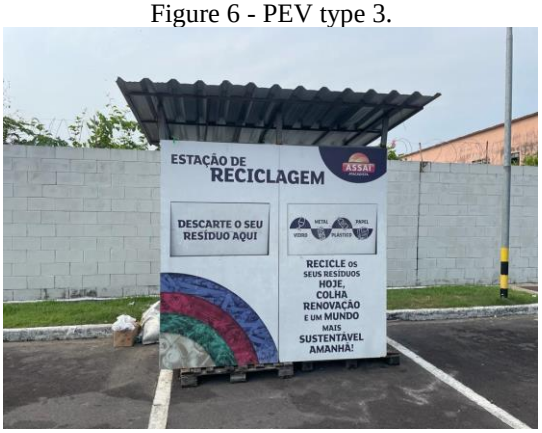
Source: the authors.

Figure 6 - Masonry PEV.



Source: the authors.

Figure 6 - PEV type 3.



Source: the authors.

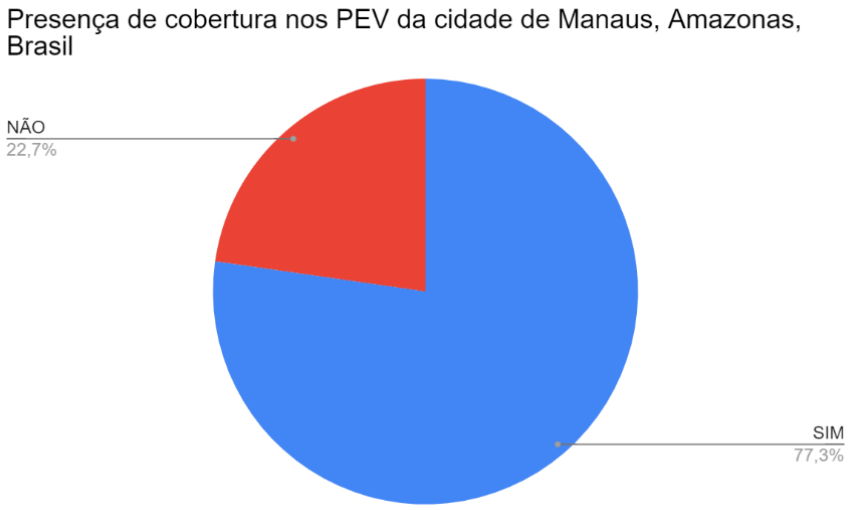
Figure 7 - PEV type 4.

Source: the authors.

4.5 PRESENCE OF COVERAGE IN ENPS

The presence of cover in PEVs is also important, as it is more likely that a collector that is unprotected from the weather will have a longer time interval between maintenance. In the case of Manaus, 22.7% of the PEVs are unprotected against rainfall.

Figure 8 - Presence of coverage in the PEV of the city of Manaus.



Source: the authors.

4.6 PRESENCE OF ORGANIC MATERIAL IN ENPS

The presence of organic material in PEVs can be an indicator of the correct use of collectors by the population. In the case of Manaus, organic material was found in 36.4% of them.

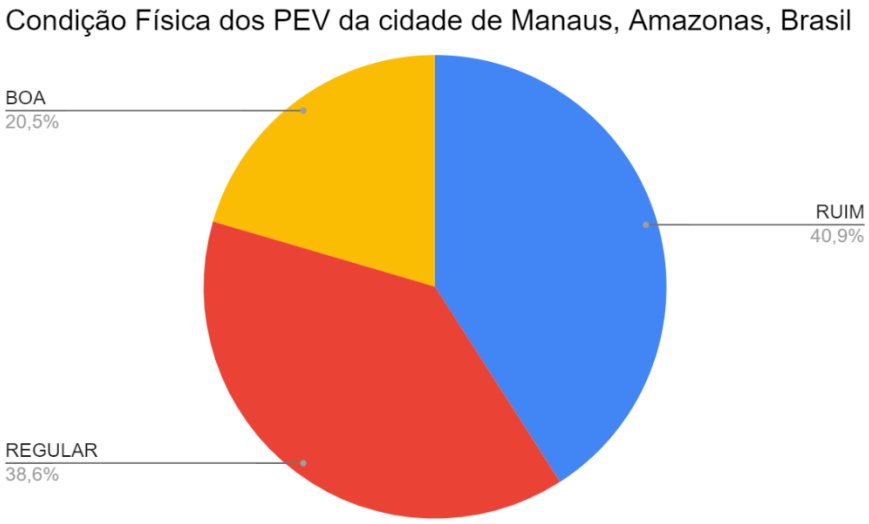
Figure 9 - Presence of Organic Material in the PEV of the city of Manaus.

Source: the authors.

4.7 PHYSICAL CONDITION OF ENPS

The physical condition of the PEV in the capital of Amazonas was quantified and 40.9% of them are in poor condition, followed by 38.6% in regular condition and 20.5% in good physical condition.

Figure 10 - Physical condition of the PEV in the city of Manaus.



Source: the authors.

Among the main problems found in the physical integrity of the collectors, there was a large presence of broken lids in HDPE containers, as can be seen in Figure 12 to 15.

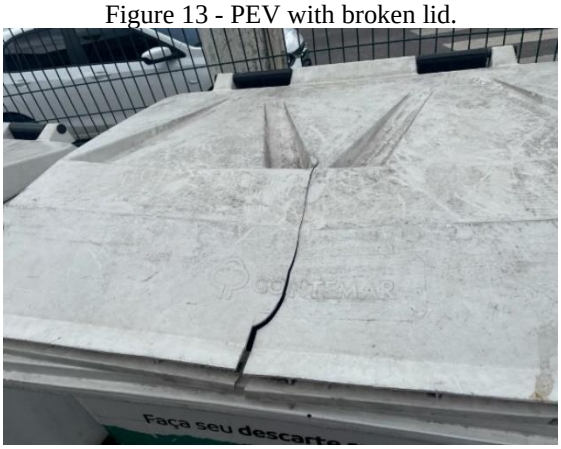
Figure 11 - PEV with broken lid.

Source: the authors.

Figure 12 - PEV with broken lid.

Source: the authors.

Figure 13 - PEV with broken lid.



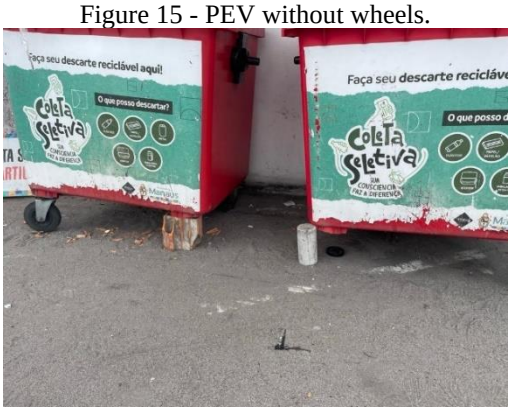
Source: the authors.

Figure 14 - PEV with broken lid.

Source: the authors.

In addition, another anomaly found in the containers was the loss of wheels, which are essential at the time of the collection service carried out by SEMULSP, as indicated by Figures 16 and 17.

Figure 15 - PEV without wheels.



Source: the authors.

Figure 16 - PEV without wheels.

Source: the authors.

There was also damage to the stickers identifying the selective collection in the PEV, with some of them without any identification, as illustrated in Figures 18 and 19.

Figure 17 - PEV with damaged identification.

Source: the authors.

Figure 18 - Unidentified PEV.

Source: the authors.

Some PEVs had peculiar information, such as some of them that accepted only some types of inorganic waste, such as "we are not receiving glass" or "only plastic", as can be seen in Figures 20 and 21.

Figure 19 - PEV does not accept vitreous waste.

Source: the authors.

Figure 20 - PEV accepts only plastic waste.

Source: the authors.

In addition, some PEVs were in need of surface cleaning, as they were covered with dust, especially in the cracks of the lids, as shown in Figure 22.

Figure 21 - Dust in PEV.

Source: the authors.

During the research, collectors were also found that had passages with obstacles, more specifically shopping carts. In one of them, there was also a sign on the PEV that read "carts are not allowed to leave", obstructing the passage for the population that wants to carry out the selective collection of their inorganic waste.

Figure 22 - PEV with obstructed passage.

Source: the authors.

Figure 23 - PEV with obstructed passage.

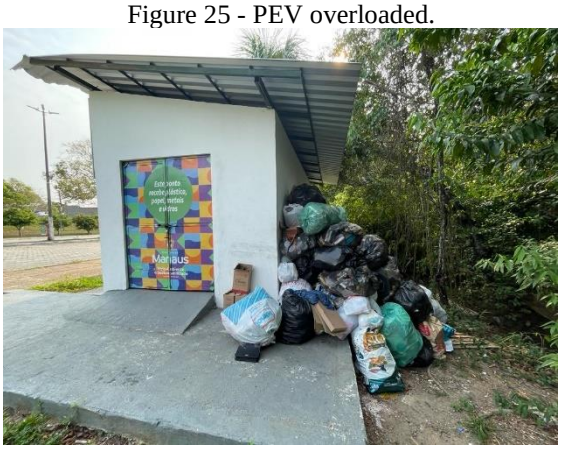
Source: the authors.

Some of the PEVs were overloaded, which may indicate that there is a need for more collectors in the region or that the collection is not being carried out efficiently, as shown in Figures 25 and 26.

Figure 24 - PEV overloaded.

Source: the authors.

Figure 25 - PEV overloaded.



Source: the authors.

4.8 CORRECTIVE MAINTENANCE IN ENPS

Finally, the need for maintenance of PEVs in the capital of Amazonas was quantified, where 72.7% of the collectors must have their physical integrity restored, either through the replacement of parts, restoration of identification stickers or others, as shown in Figure 27.

The 32 PEVs that need maintenance are as follows:

- Carrefour Supermarkets: Adrianópolis / Flores / Dom Pedro
- Assaí Supermarkets: Flores / Aleixo
- CIGS
- DB Atacadista
- Empório DB Supermarkets: Aleixo

- Hiper DB: Parque 10 / Cidade Nova / Dom Pedro / Ponta Negra / Japiim / Novo Aleixo
- EPI Mindu
- Adam and Eve Supermarket
- Atack Supermarket: Coroado II
- Yroyak Supermarket: Nossa Senhora das Graças / Ponta Negra
- Victoria Supermarket: Flores
- Supermarkets Venice: Park 10 / Blue Lake
- Pátio Gourmet Supermarkets: Adrianópolis / Aleixo / Chapada
- Nova Era Supermarkets: Flores / Santo Antônio / Novo Aleixo
- Cezar Supermarket
- DB Supermarkets: Planalto / Santo Antônio / Cachoeirinha

Figure 26 - Need for maintenance of PEV in the city of Manaus.

Source: the authors.

4.9 UPDATED LIST OF PEVS IN THE CITY OF MANAUS/AM

In addition, the result is the updated list of SEMULSP with the points visited that are in operation, facilitating, based on the coordinates, the population to find the PEV for the disposal of their inorganic waste and participate in the selective collection process in the city of Manaus.

Frame 4 - Updated list of ENPs in the city of Manaus.

Identification	Name of the ENP	Address	Neighborhood	Coordinates
1	Emporium DB	Av. Mário Ypiranga, 799, 69057-001	Adrianópolis	-3.1079035, -60.0132311
2	Supermercado Carrefour	Av. Umberto Calderaro, 203, 69057-015	Adrianópolis	-3.1054414, -60.0113122
3	Supermercado Pátio Gourmet	Rua Terezina, 351, 69057-070	Adrianópolis	-3.112028742544345, -60.015040466874446
4	Empório DB	Av. Efigênio Salles, 200, 69057-050	Aleixo	-3.088451665591656, -60.005773947279
5	Supermercado Assaí	Av. Ephigênio Salles, 2045, 69060-020	Aleixo	-3.09075944546514, -59.99101361042497
6	Supermercado Pátio Gourmet	Av. Via Láctea, 825, 69060-085	Aleixo	-3.091887508966588, -59.99856863767587
7	Supermercado DB	Av. Carvalho Leal, 1017, 69065-000	Cachoeirinha	-3.126298242423635, -60.00657391844291
8	Supermercado DB	Av. Eduardo Ribeiro, 453, 69010-001	Centro	-3.1334066422806686, -60.024432329810125
9	Supermercado DB	Av. Constantino Nery, 114, 69010-160	Centro	-3.1247814425267255, -60.02640868969813
10	Supermercado Pátio Gourmet	Av. Djalma Batista, 1375, 69053-000	Chapada	-3.103368019881413, -60.02490892259819
11	Hiper DB	Av. Max Teixeira, 3676, 69090-002	Cidade Nova	-3.0359936,-59.9948181
12	Sede da Prefeitura de Manaus	Av. Brasil, 2971, 69036-110	Compensa	-3.1079765732437585, -60.054650674250134
13	Sede da Semulsp	Av. Compensa, 1335, 69036-115	Compensa	-3.108914314527715, -60.0510781655814
14	DB Atacadista	Av. Cosme Ferreira, 2540, 69082-230	Coroado	-3.0776304684678095, -59.97322779986388
15	Supermercado Atack	Av. Cosme Ferreira, 3700, 69083-000	Coroado III	-3.075127217211268, -59.96494567766975
16	Supermercado DB	Av. Silves, 1835, 69073-175	Crespo	-3.129697438646956, -59.992436496934545
17	Hiper DB	Av. Pedro Teixeira, 79, 69040-000	Dom Pedro	-3.0876425, -60.0365185
18	PEV Dom Pedro	Av. Pedro Teixeira, 52, 69040-000	Dom Pedro	-3.0920894, -60.0474244
19	Supermercado Carrefour	Av. Pedro Teixeira, 52 - Lote B, 69040-000	Dom Pedro	-3.0923429,-60.0498645
20	Supermercado Assaí	Av. Torquato Tapajós, 2.200, 69058-830	Flores	-3.0545145,-60.0238647
21	Supermercado Carrefour	Av. Djalma Batista, 276, 69058-807	Flores	-3.0785716,-60.0241864
22	Supermercado Nova Era	Av. Torquato Tapajós, 2871, 69048-010	Flores	-3.0523567,-60.0256756
23	Supermercado Vitória	Av. Torquato Tapajós, 5200, 69093-000	Flores	-3.0626197,-60.0248182
24	Hiper DB	Av. Rodrigo Otávio, 3810, 69010-160	Japiim	-3.120463839065065, -59.98085103840626
25	Supermercado Veneza	Av. Torquato Tapajós, 13118, 69018-406	Lago Azul	-2.9694017,-60.0151496
26	Supermercado Yroyak	Av. Rio Madeira, 664 A, 69053-030	Nossa Senhora das Graças	-3.1073422367212773, -60.020731601117184
27	Hiper DB	Av. Margarita, 1359, 69097-305	Nova Cidade	-3.0030118,-59.9807872

28	Hiper DB	Av. Autaz Mirim, 8431, 69085-000	Novo Aleixo	-3.044067968001221, -59.94292003583894
29	Supermercado Assaí	Av. Autaz Mirim, 8755, 69099-045	Novo Aleixo	-3.0403935120365477, -59.944089744453755
30	Supermercado Nova Era	Av. Gov. José Lindoso, 230, 69098-129	Novo Aleixo	-3.063086397790042, -59.987971553158026
31	Hiper DB	R. Lindon Johnson, 100, 69054-712	Parque 10	-3.0736024,-60.0077705
32	PEV Mindu	R. Domingos José Martins, S/n, 69098-257	Parque 10	-3.078085101306096, -60.00830255993454
33	Supermercado Adão e Eva	R. Alexandre Magno, 869, 69054-264	Parque 10	-3.074966586689333, -59.999939343031194
34	Supermercado Veneza	Av. Tancredo Neves, 915, 69054-700	Parque 10	-3.0697401,-60.0061491
35	Supermercado DB	Rua Roma, 120 - Conjunto Campo Elíseos, 69045-540	Planalto	-3.0708860,-60.0489567
36	Hiper DB	Av. Coronel Teixeira, 7687, 69037-700	Ponta Negra	-3.0899662,-60.0571395
37	Supermercado Yroyak	Av. Coronel Teixeira, 5006, 69037-473	Ponta Negra	-3.0783741,-60.0774355
38	Emporium DB	Av. Coronel Teixeira, 5850, 69037-000	Ponta Negra	-3.0762991,-60.0825947
39	Supermercado DB	Av. Visc. de Porto Alegre, 606, 69020-130	Praça 14	-3.1311405875315894, -60.013244782818354
40	Supermercado DB (Alegro)	Av. Torquato Tapajós, 7070, 69093-415	Santa Etelvina	-3.0181480, -60.0273610
41	Supermercado DB	Av. Francisco Queiroz, 1025, 69093-000	Santo Antônio	-3.0265959,-60.0015708
42	Supermercado DB	Av. Padre Agostinho Caballero Martin, 2462, 69029-120	Santo Antônio	-3.1114166,-60.0512318
43	Supermercado Nova Era	Av. Brasil, 15, 69029-040	Santo Antônio	-3.1107051,-60.0504341
44	Supermercado Cezar	R. Penetração II, 239, 69086-011	São José Operário	-3.060059178914106, -59.95374911938438

Source: the authors.

5 CONCLUSION

The situation of municipal solid waste management in relation to recycling in Brazil is worrying, where only 4% of MSW is recycled, diverging from goal 12.5 of the UN 2030 Agenda, which aims to substantially reduce waste generation through prevention, reduction, recycling, and reuse. That said, one way to increase the rate of use of waste in recycling is through selective collection.

To assist, therefore, the selective collection process in Manaus, this work developed an overview of the physical conditions of the PEV in the capital, based on the updating of the list of stations, made available by SEMULSP, as well as the photographic record of the stations present in the city and the creation of a form with indicators of the physical conditions of the collectors.

Based on the results obtained, it is suggested the implementation of more collectors in the north and east zones of the city of Manaus, considering that most of the population of the capital is found in these two

regions (53.01% of the population of Manaus) and, today, there is little incidence of PEV (20.83% of the collectors in the capital).

In addition, due to the high rate of presence of organic material in the PEV (36.4%), it is of great importance to continuously educate the city about the separation of organic from inorganic waste. Therefore, in order to mitigate this indicator, it is suggested that SEMULSP, through CEDOLP (Special Commission for the Dissemination of Public Cleaning Policy), expand the awareness service for students and teachers of schools and universities in Manaus, as well as install collectors in these institutions, so that learning is carried out in a theoretical and practical way.

The high rate of collectors with "bad" (40.9%) and "regular" (38.6%) indicators in relation to physical condition, whether due to vandalism and/or lack of maintenance and cleaning, suggests that there should be immediate corrective maintenance, through the Municipal Department of Public Cleaning, in the 32 PEVs indicated in the previous item.

Finally, it is suggested that SEMULSP update the list of collectors on its electronic portal, according to the provisions of Chart 4 of this work, in order to facilitate the population to find the PEV in operation for the disposal of their inorganic waste and participate in the selective collection process, in an effective and practical way, and that less waste is redirected to the only sanitary landfill in Manaus, which has a capacity close to the maximum.

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