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Citizenship, norms and infrastructure: Elements that contribute to strengthening the work of cooperatives of recyclable material collectors

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ABSTRACT
This article aims to carry out a bibliographic study to investigate how the actions of citizens, the existing norms and the public equipment made available by the State for the disposal of solid waste, contribute to the strengthening of the work of Cooperatives of Recyclable Material Collectors (CCMR), aiming to propose a new flowchart of the Selective Collection Program of Salvador to contribute to the improvement of the work of these enterprises in the city. This is a study with a qualitative, deductive, exploratory approach, carried out in the city of Salvador-BA. The results indicate the relationship of the aforementioned elements in the strengthening of the work developed by these cooperatives. In addition, they highlight the need for changes in the Selective Collection Program in the capital of Bahia. One can mention, as an example, the replacement of the type of Voluntary Delivery Points and the changes in the flow of the program's actions, seeking to achieve the benefits of selective collection and, consequently, the maximum valorization of waste with the socio-productive inclusion of recyclable material collectors for the environmentally appropriate disposal of Urban Solid Waste, as provided for in the legislation in force in the country.

Keywords: Selective Collection, Recyclable Material Collectors, Cooperatives, National Solid Waste Policy, Citizenship.

INTRODUCTION

The growing generation and inadequate disposal of Urban Solid Waste (MSW) – which includes those from domestic activities in homes, sweeping, cleaning of public places and roads, as well as other urban cleaning services – are factors that corroborate the scenario of pollution and destruction of nature (SANTIAGO; DIAS, 2012). The theme of USW is a constant point in several global debates, due to its environmental, economic and social impacts. In Europe, for example, the European Parliament has adopted Directive (EU) 2018/851, which extends the targets for preparing for reuse and recycling waste set out in Directive 2008/98/EC on packaging and waste there. In this way, the member states of the European Union (EU) influence the change in the way municipalities manage solid waste, establishing reuse and recycling targets (EU, 2018).

In Brazil, as a way to regulate and improve waste management, the National Solid Waste Policy (PNRS) was approved through Law No. 12,305, of August 2, 2010 (BRASIL, 2010a), regulated by Decree No. 7,404/2010 (BRASIL, 2010b). According to Cempre Review (2019), this law responds to one of the country's main environmental challenges; The management of materials

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generated after consumption is integrated with the search for sustainable development in the scenario of population growth and economic, environmental and social demands, with repercussions on the quality of life in cities. For Marchi and Almeida (2015), the PNRS brings in its scope important definitions such as integrated management and shared responsibility for the life cycle of products, leaving, in a way, defined the responsibilities of social agents – Government, private companies and civil society – for better waste management.

In this context, in 2014, Law No. 12,932/2014 was approved in the state of Bahia, which instituted the State Solid Waste Policy (PERS), which has not yet been regulated (BAHIA, 2021). However, it is worth mentioning that both the PNRS and the PERS provide for the incentive to selective collection with the participation of cooperatives or other forms of association of collectors of reusable and recyclable materials at the national and state levels, respectively. According to data from the Recycling Yearbook (2020), 1,829 waste picker organizations have been mapped in Brazil, 73 of which are located in the state of Bahia. In Salvador, there are approximately 14 Cooperatives of Recyclable Material Collectors (CCMR) with about 340 members in total, according to the register of the Urban Cleaning Company – Limpurb (LIMPURB, 2013).

However, ten years after the approval of the PNRS, the management of solid waste continues to be one of the challenges of the municipal government in Brazil, responsible for the management of this waste and for urban cleaning, since it is not only a matter of carrying out the environmentally appropriate final disposal of waste, but also carrying out selective collection, recycling, composting and other possible treatment possibilities for MSW (SILVA et al., 2018); Especially because the improper disposal of waste results in severe environmental impacts, harming the lives of the population, such as the pollution of beaches, floods, clogging of storm drains, degradation of the marine ecosystem and pollution of water supply sources, among other problems.

Thus, the complexity of the issue is understood, and that the search for solutions to reduce the aforementioned impacts involves the responsibility and participation of individuals, through the exercise of citizenship, the effectiveness of established norms – such as the PNRS – by governments and companies, as well as the availability of infrastructure aimed at the management and proper final disposal of waste.

In view of the above, this work aims to carry out a bibliographic study to investigate how the actions of citizens, the existing norms and the public equipment made available by the State for selective collection contribute to the strengthening of the CCMR work, aiming to propose a flowchart to contribute to the improvement of the work of these enterprises in the city of Salvador.

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METHODOLOGY

STUDY DESIGN

The present work can be classified as a descriptive research, through a narrative review of literature. The design used was bibliographic research, using secondary sources, articles on the Scientific Electronic Library Online (SciELO) portal, scientific texts and books related to the theme, research made available online in virtual libraries. The method proposed in this article is based on the assumption that, knowing the importance of CCMR activities in Brazilian cities, obtained from secondary data, it is possible to identify how the elements of citizenship, infrastructure and standards contribute to the strengthening of these enterprises.

INFORMATION BASE

The theoretical contribution of the present study was carried out with special attention to the searches carried out in the following indexed databases: Scientific Electronic Library Online (SciELO) and Google Scholar. In addition, relevant information published on the official websites of national and international institutions that deal with the subject was sought. The following descriptors were used for the research: Citizenship, Environmental Citizenship, Solid Waste Management, Infrastructure for Selective Collection, Regulatory Standards for MSW Management, Cooperatives of Recyclable Material Collectors. Searches were also carried out with junctions of descriptors, such as Environmental citizenship and Cooperatives of Recyclable Material Collectors, Regulatory Standards for MSW Management and Cooperatives of Recyclable Material Collectors, and Infrastructure for Selective Collection and Cooperatives of Recyclable Material Collectors, with the period between 2008 and 2021 as a time frame.

The research resulted in the finding of 43 publications, which, after reading their abstracts and keywords, 19 were excluded, leaving only 23 – among them, scientific articles, dissertations and theses that address the theme of Urban Solid Waste and its intersection with the work of cooperatives of recyclable material collectors. Virtual productions not freely available in full were excluded. To access the full text, the following resources were used: link available directly in the databases, search on the portal of the journal in which the article, dissertation or thesis was published, search on the Capes portal and Google search engine.

DATA ANALYSIS

The analysis of the information for the subsequent development of the text was carried out through exploratory and analytical reading of the material found, which made it possible to carry out a bibliographic study on how the actions of citizens, the existing norms and the public equipment

made available by the State for the disposal of solid waste contribute to the strengthening of the work of the CCMR. Based on the analysis of the identified contributions, a new flow of the Selective Collection Program (PCS) of Salvador was developed, aiming to contribute to the improvement of the work of the city's CCMR.

RESULTS AND DISCUSSION

In this section, elements such as citizenship, standards and infrastructure aimed at the management of USW will be presented and analyzed, in addition to the benefits of selective collection for the strengthening of cooperatives of recyclable material collectors in Salvador.

CITIZENSHIP, STANDARDS AND INFRASTRUCTURE OF PUBLIC EQUIPMENT AIMED AT THE MANAGEMENT OF MW

According to Pereira and Curi (2013), the increase in MSW generation was accentuated after the Industrial Revolution, when industries began to use a greater amount of natural resources to supply their factories and meet the demands of the market, which became increasingly consumerist, as a result of the current ideology of fostering consumption and, thus, increase the production and wealth of countries.

Godecke, Naime and Figueiredo (2013, p. 1702) report that "the perception of consumption and its environmental consequences in the economic sciences presented distinct moments", that is, it went from the understanding that a high demand represented economic and social progress to advocating the valorization and encouragement of activities that used the rationalization of natural resources. This perception of consumption and its environmental consequences, in the early days of neoclassical theory, lost "importance throughout the twentieth century, in the evolution of the mainstream, due to the predominance of the conception of natural resources as abundant and free, easily replaceable by technical progress" (GODECKE; NAIME and FIGUEIREDO, 2013, p. 1702).

The authors point out that:

> [...] From the debates on the limits of growth, which took place in the 1970s, natural capital was gradually rescued by neoclassical theory, through neoclassical branches such as "natural resource economics" and "environmental economics" (ENRÍQUEZ, 2010 and THOMAS; CALLAN, 2010). More recently, "ecological economics" works on the same themes, but with an ecosystem and interdisciplinary view (ROMEIRO, 2010). In neoclassical theory, the study of individuals' consumption choices is within the scope of "consumer theory". Another economic school, the "institutionalist" one, broadens the spectrum of analysis, seeking an explanation for the behavior of individuals and their evolution in the institutional environment in which they are inserted (FELDMANN, 2008). The assumptions of "consumer theory" were also expanded by "economic psychology", in the incorporation of subjective, emotional and cognitive aspects (AZEVEDO, 2009). (GODECKE; NAIME and FIGUEIREDO, 2013, p. 1702).

The result of this consumption, called garbage, came to be called solid waste by sanitarians in the middle of the twentieth century (PERREIRA; CURY, 2013). There is growing concern about the socio-environmental impacts resulting from the high generation and inadequate final disposal of urban solid waste in various parts of the world. According to Filho (2019, p. 2), "there is an increase in consumption and indiscriminate disposal. There is no separation of solid waste in the disposal at home, there is no process of sensitization of the population to consume more sustainable products".

In Brazil, between 2010 and 2019, the generation of MSW registered a considerable increase, from 67 million to 79 million tons per year, according to data from the Panorama of Solid Waste in Brazil 2020, produced by the Brazilian Association of Public Cleaning Companies (Abrelpe, 2020). Of the 79 million tons generated in 2019, 92% were collected, equivalent to 72.6 tons, but 59.5% were destined for landfills and 40% for dumps or controlled landfills (those that do not guarantee the integrity of the environment) – a reality present in 56% of the country's municipalities (Abrelpe, 2019). The MSW Management Panel of the National Sanitation Information System – SNIS (BRASIL, 2018) estimates that 62.8 million tons of Household Solid Waste (RDO) and Public Solid Waste (UPR) were collected, with 75.6% of them in the sanitary landfill, 11.4% in the controlled landfill and 13% in the dump – with the latter final waste disposal being inadequate. It is noteworthy that the growth and improper final disposal of the identified MSW go in the opposite direction to the PNRS, which has as some of its objectives the reduction of waste generation and its environmentally appropriate final destination.

It is important to draw attention to the fact that the difference of 9.8 million tons between the data from Abrelpe (2019) and SNIS (BRASIL, 2018) is due to their different methodologies used for data collection. The first uses information from companies providing urban cleaning services; the second, the references presented by the municipal administration.

To change this scenario, it is necessary to fulfill the responsibility and participation of individuals, through the exercise of citizenship; the effectiveness of instituted norms, such as the PNRS, by governments and companies; as well as the availability of infrastructure aimed at the management and proper final disposal of waste.

In this way, citizen actions, through the change of behavior and attitude in relation to consumption and the practice of separation and proper disposal of MSW, contribute to the reduction of the socio-environmental impacts mentioned above. According to Godecke, Naime and Figueiredo (2013, p. 1709), "the equation of problems related to waste is difficult to solve precisely because it has a direct cause-and-effect relationship with the unsustainable consumption practices rooted in contemporary society". That is why it is important to exercise environmental citizenship that enables individual and collective awareness of responsibilities, aimed at facing environmental imbalances

related to inappropriate human conduct (ALMEIDA et al., 2019).

With regard to the exercise of citizenship, it is worth emphasizing the concept of citizenship traditionally used. For Monteiro and Castro (2008), it is understood as a set of rights and duties that a subject has towards the society of which he or she is a part. For Cyrne et al. (2020, p. 415), "citizenship is understood as the quality of a citizen who exercises his rights and fulfills his duties in the face of a society of which he is a part". To this end, this task must be collective, as it is understood that the benefits are also collective. Also according to the aforementioned authors:

> [...] The exercise of citizenship must consider the impacts on other citizens, observing a sense of common destiny and solidarity, since the absence of this would be the source of all the ills of humanity. Selfish individualism and the entrenched defense of the individual must be abandoned and cooperative virtues should be prioritized as a way of being a citizen (CYRNE et al., 2020, p. 415).

Thus, it is important to involve citizens in the management of USW because the change in attitude and habits, with regard to consumption and the practice of selective collection, results in the reduction of the impacts alluded to. According to Bringhenti and Gunther (2011), the effectiveness of selective collection programs and initiatives necessarily requires the involvement of citizens, considered at the end of the production and consumption chain, the generators of solid waste. Thus, it is necessary to develop awareness and guidance actions aimed at these individuals (BRINGHENTI; GUNTHER, 2011).

The process of engagement and social participation regarding selective collection, for example, is still a huge challenge to ensure the proper disposal of USW, as highlighted by the aforementioned authors, since the voluntary participation of the population in the Selective Collection Programs (PCS) is low, although it may increase in the long term. The authors point out the existence of research in some countries, such as Australia (WANG; RICHARDSON; RODDICK, 1997 apud BRINGHENTI; GUNTHER, 2011) and England (TIMLETT; WILLIAMS, 2008 apud BRINGHENTI; GUNTHER, 2011), directed to the relationship between the behavior and attitudes of the population and the performance of recycling, based on selective collection (BRINGHENTI; GUNTHER, 2011).

In Brazil, according to data from the National Association of Waste Pickers (Ancat) through the 2017-2018 Recycling Yearbook, about 66% of the population knows little or nothing about selective collection, with 39% not separating organic "waste" from recyclable waste; even so, 98% of Brazilians see recycling as something important for the future of the country (ANCAT, 2018). The purpose of highlighting the importance of the role of citizens in the search for solutions to the proper management of USW is through the fact that they start to consume excessively and, therefore, increase the generation of waste, causing more and more pollution to the environment (PEREIRA;

CURY, 2013). Considering that according to Pereira and Cury (2013) the generation of solid waste is:

> [...] Directly proportional to consumption, it can be concluded that the greater the urban population and its purchasing power, since this layer of the population is the most influenced by the purchasing and consumption power that capitalism imposes, the greater will also be, therefore, the waste generated by this population, since it is known that, when consuming a product, part of it will be discarded in the form of waste (PERREIRA; CURY, 2013, p.154).

According to Vansetto and Ghisi (2019), for change in this scenario, the population's perception of this problem is essential, because when citizens recognize that they must collaborate with selective collection and recycling, they are not only contributing to the environment, but also to the various people who survive from this activity. In this sense, Rosado and Heidrich (2016) add that this type of collection brings the concrete possibility of greater participation of each citizen in the environmental management of the city, but requires political will from municipal governments. To this end, according to data from Cempre Review (2019), investments in educating consumers about new conscious consumption habits are important, including how to separate packaging in order to increase the amount collected and facilitate the process of materials in the recycling chain (CEMPRE REVIEW, 2019). However, it is essential for public authorities and private initiative to develop and enforce rules aimed at the responsibility and participation of citizens.

The main regulatory standard in force in the country with this focus is the National Solid Waste Policy (PNRS), which provides for principles, objectives and instruments, as well as guidelines related to the integrated management and management of solid waste, including hazardous waste (BRASIL, 2010a). It is worth mentioning that this law defines solid waste as:

> [...] material, substance, object or discarded good resulting from human activities in society, whose final destination is carried out, is proposed to be carried out or is obliged to be carried out, in solid or semi-solid states, as well as gases contained in containers and liquids whose particularities make it unfeasible to dispose of them into the public sewerage system or into bodies of water, or require solutions that are technically or economically unfeasible in the face of the best available technology (BRASIL, 2010a).

Rodrigues and Menti (2018), on the other hand, consider waste to be all solid or semi-solid leftovers from human activities (or not). Still in reference to PNRS, Schueler, Kzure and Racca (2018) highlight some important principles such as: eco-efficiency, which establishes a hierarchy for the management and management of solid waste, in order to provide for the non-generation, reduction, reuse, recycling, treatment and environmentally appropriate final disposal of waste; shared responsibility for the life cycle of products, with a focus on reducing the quantity and hazardousness of hazardous waste; society's right to information and social control, with the purpose of stimulating the recycling industry, with the purpose of using raw materials and inputs derived from recyclable

and recycled materials from selective collection; and cooperation between the different spheres of public power, the business sector and other segments of society, seeking to achieve the integrated management of USW and the articulation between the different spheres of public power and the business sector.

It is worth mentioning the various instruments present in this law, such as plans, sectoral agreements, inventories and the annual solid waste declaration system, reverse logistics systems and the incentive for the creation and development of cooperatives of collectors of reusable and recyclable materials, in addition to fiscal, financial and credit incentives, as well as the National Information System on Solid Waste Management – SINIR (BRASIL, 2010a).

Maiello, Britto and Valle (2018) point out other principles of this law, such as the protection of human health and sustainability, which are guiding all government actions in this area, identifying goals for the eradication of dumps and promoting environmentally appropriate solutions for the final disposal of MSW.

Causing a change in people's relationship with waste and sharing responsibilities and obligations, involving generators, individuals and legal entities, are elements present in this legislation, as purposes that result in environmental protection and the health of the population (RODRIGUES; MENTI, 2017) . Marchi (2015) corroborates this understanding, pointing out that this law recommends that the responsibility for the collection, treatment and final disposal of solid waste be shared between the government, companies and consumers. Also according to the aforementioned author, there are other federal norms that, since the end of the 1970s, have been acting as a support tool in the interrelationship between solid waste, society and the environment.

Finally, the need for public infrastructure for selective collection is presented through the installation and disposal of equipment in order to provide the population with the sending of reusable materials for recycling, since the segregation of solid waste through selective collection is fundamental for the process of its management and management. Conke and Nascimento (2018) highlight the importance of this activity, both for its contribution to urban sustainability and for the generation of income and citizenship and the economy of natural resources it provides. Sousa (2018) reinforces the importance of selective collection, as it is a service specialized in collecting segregated material at the generating source, which will be directed to the recycling chain, through industries.

However, it is necessary for citizens to have access to infrastructure and public services, to properly dispose of MSW, such as selective collection programs and projects, such as: Door-to-Door Collection (PAP); Voluntary Delivery Points (PEVs) and/or exchange stations; Associations and Cooperatives of Recyclable Material Collectors; in addition to composting units. To this end, in order to encourage the participation of society, what Kuhn, Botelho and Alves (2018) propose in a

study on selective collection in the light of the PNRS in Brazilian states is indispensable: an integrative systematic review, "the realization of campaigns that are aimed at raising awareness, conscious consumption, reduction, reuse and recycling" (KUHN, BOTELHO and ALVES, 2018, p. 662). Chart 1 is composed of identified scientific contributions that discuss and present how the aforementioned elements strengthen the work of the CCMR.

Chart 1 – List of articles that discuss elements related to the proper management of USW and the strengthening of the work of recyclable material collectors' cooperatives (2011 to 2020).

Year	Elements that contribute to strengthening the work of the CCMR	Article Title	Author(s)
2011	Citizenship	Social participation in selective collection programs for solid waste	BRINGHENTI, J.R; GÜNTHER, W.M.R.
2019	Citizenship	Environmental education: awareness about the destination of solid waste, water waste and food waste in the municipality of Cametá/PA	ALMEIDA, N. C. C. et al.
2020	Citizenship	Waste management, citizenship and environmental education: the subversion of the concept of function	CYRNE, C.C.S. et al.
2013	Standards	Integrated management models of urban solid waste: the importance of recyclable material collectors in the environmental management process	PEREIRA, SS.; CURI, RC.
2015	Standards	New perspectives in sanitation management: presentation of a model for the final disposal of urban solid waste	MARCHI, C.M. Dacach F.
2018	Standards	Review of public policies for the management of urban solid waste in the city of Porto Alegre	RODRIGUES, C. R.; MENTI, M.de M.
2018	Standards	Implementation of the National Solid Waste Policy	MAIELLO, A.; BRITTO, A. L. N. P.; VALLE, T. F.
2018	Standards	How is urban waste in Rio's favelas?	SCHUELER, A.S.; KZURE, H.; RACCA, G. B.
2018	Infrastructure	Selective collection in Brazilian research: a methodological evaluation	CONKE, L. Silveira; NASCIMENTO, E. P.
2018	Infrastructure	Selective collection in the light of the PNRS in Brazilian states: an integrative systematic review	KUHN, N.; BOTELHO, L. L. R.; ALVES, A. A. A.
2018	Infrastructure	Analysis of the management of urban solid waste in the city of Salvador and the challenges to compliance with Federal Law No. 12.305/2010	SOUSA, E. R.

Source: Prepared by the author, 2020.

After reading and analyzing the aforementioned studies, it was possible to observe that the exercise of citizenship is related to the issue of the proper management and destination of solid waste through selective collection, as evidenced by Bringhenti and Günther (2011) in the study on social participation in selective collection programs for urban solid waste, pointing out that "the

effectiveness of selective collection programs necessarily requires the involvement of citizens" (BRINGHENTI; GUNTHER, 2011, p. 421). Cyrne et al. (2020, p. 419) report that:

> [...] as a citizen, fulfilling his duties, the exercise of citizenship and waste management can be related to the need to comply with article 1, paragraph 1 of the PNRS, which says that all individuals or legal entities directly or indirectly responsible for the generation of waste are subject to the application of the law.

Pereira and Curi (2013, p. 156) highlight the guidelines related to the integrated management and management of solid waste included in the law called PNRS, adding "the social dimension, through the participation of the citizen in the waste management process and the social inclusion of the excluded who live from the collection of domestic waste", that is, the collectors of recyclable materials. Marchi (2015) points out that this policy establishes that the responsibility for the collection, treatment and final disposal of solid waste is shared between the government, companies and consumers, thus reinforcing the essential nature of the involvement of private organizations and people in the management of USW.

Rodrigues and Menti (2017) corroborate the issue of sharing the responsibilities and obligations of individuals and legal entities in waste management, highlighting the effects on environmental protection and the health of the population, in reference to compliance with this standard. Schueler, Kzure and Racca (2018) expose some principles and instruments of this law, including the incentive to create and develop cooperatives of collectors of reusable and recyclable materials.

Another aspect in the analysis of these studies is the importance of public infrastructure aimed at selective collection, that is, installation of equipment that provides people with the proper disposal of solid waste for recycling. To this end, Conke and Nascimento (2018), Kahn, Botelho and Alves (2018) and Sousa (2018) point out that in this process there is the inclusion of cooperatives and associations of recyclable material collectors.

It is considered that the elements of citizenship, norms and infrastructure, as presented by the studies included in Chart 1, are directly associated with the process of strengthening the work of cooperatives of recyclable material collectors, when the importance of citizen participation for segregation and adequate final disposal of waste is highlighted, as well as the legal fulfillment of responsibilities of the public authorities and the private sector, as well as the provision of equipment aimed at promoting selective collection.

PROPOSAL OF A NEW FLOWCHART OF THE PCS OF SALVADOR, WITH A VIEW TO CONTRIBUTING TO THE IMPROVEMENT OF THE CITY'S CCMR WORK

The segregation of USW through selective collection is essential for the process of its

management and management. The PNRS, in its Chapter II, Article 3, V, defines selective collection as the "[...] collection of solid waste previously segregated according to its constitution or composition [...]" (BRAZIL, 2010a). The legislation itself also encourages that this collection be developed with the participation of cooperatives or other forms of association of collectors of reusable and recyclable materials (BRASIL, 2010a). The provision of this service, which is part of the urban solid waste management system, is the responsibility of the municipal government, according to the Brazilian Constitution of 1988 (BRASIL, 2020).

Carrying out this activity in Brazilian cities is fundamental, because, in addition to integrating the solid waste management system, it contributes to environmental, economic and social sustainability, as well as promotes the economy of natural resources and inputs, the reuse of materials, the expansion of the recycling market, education for more conscious consumption and the socio-productive inclusion of recyclable material collectors (BESEN et al., 2017).

It is worth mentioning that, when this service is carried out through contracting or partnership with cooperatives that collect recyclable materials, it directly benefits the workers who are part of these enterprises, their families and the community, through the generation of work and income; thus reducing social ills and socioeconomic inequality linked to the activities performed by workers who collect solid waste in Brazilian cities. As discussed by Marchi and Santana (2018), the activities of recyclable material collectors are permeated by prejudice and discrimination, especially because society considers the activity and its executors to be fearsome, condemning those who manage the garbage.

However, selective collection is still a challenge for municipal administrations. According to surveys carried out by the Business Commitment to Recycling – Cempre (2018) and the National Sanitation Information System – SNIS (BRASIL, 2018), respectively, only 22% and 38.1% of Brazilian municipalities have some action aimed at the activity of selective collection. Also according to Cempre (2018) and SNIS (BRASIL, 2018), the actions are carried out in different ways, and many cities reconcile more than one model. According to the Cempre survey (2018), only 17% of the Brazilian population has access to municipal selective collection programs. Even with an increase of 11.4% compared to the survey carried out in 2016, the offer of this service still needs to be expanded in the country.

The 2020 Recycling Yearbook, produced by Ancat (2020), indicates that the evolution of the percentage of municipalities with selective collection was timid between 2012 and 2018, from 37% to 38%, respectively. Also according to the survey, in the same period, the increase in the share of selective collection in the total volume of solid waste collected in the country was not significant, standing at about 3%. Among the materials collected through the system, the main one is

paper/cardboard, followed by plastics, metals, glass, and others, with the following percentages, respectively, 42%, 23%, 13%, 12%, and 10% (ANCAT, 2020).

According to Nascimento et al. (2015), there is a need for city halls to make an effort to seek incentives and to increase the number of the population served with the selective collection service, taking into account the participation of waste pickers in the waste collection and treatment processes.

In Salvador, for example, the municipal administration offers this service through Voluntary Delivery Points (PEVs), as shown in Figure 1. According to the Ministry of the Environment, PEVs consist of places strategically located close to a set of residences or institutions for the delivery of segregated waste and subsequent collection by the government (BRASIL, 2021). The City of Salvador, through Limpurb, also installed two Ecopoints located in the neighborhoods of Itaigara and Itapuã for the disposal of volumes and waste such as sofas, stoves and refrigerators, as well as debris and tree branches, with the objective of enabling the correct disposal of these materials (LIMPURB, 2021). According to Marchi and Almeida (2015), an Ecopoint is a public facility that must be installed in easily accessible places for voluntary delivery of Urban Solid Waste (MSW).

Figure 1 – Type of Voluntary Delivery Point – PEVs in Salvador.

Source: ABRAMPA, 2018.

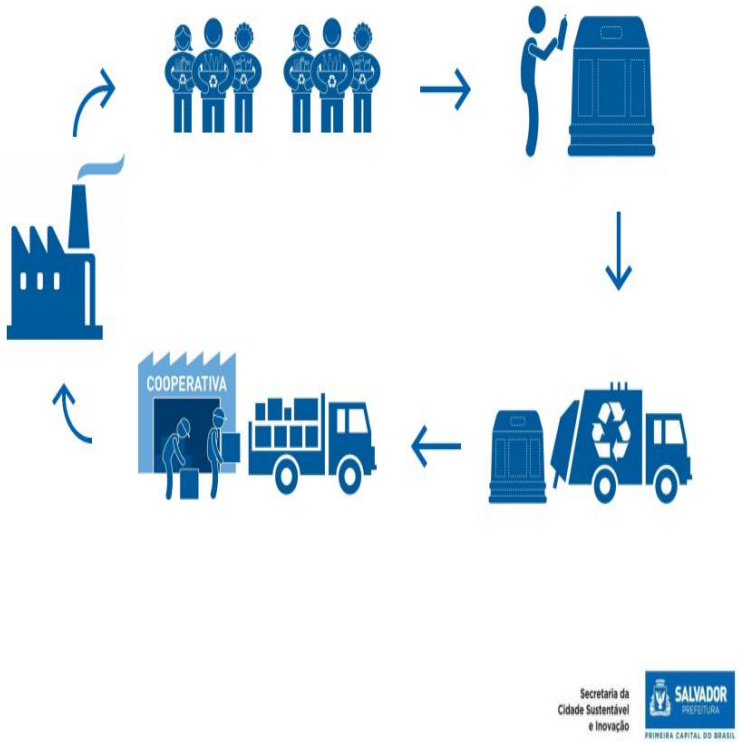
In addition to the PEVs installed by the city hall, the population of Salvador has other actions and infrastructure aimed at selective collection, among them, the collection developed by the CCMR and recyclable material exchange points installed by the private sector, such as the Vale Luz Project, of the Electricity Company of the State of Bahia – Coelba, which allows the exchange of solid waste

for discounts on the energy bill through the installation of tents, containers, fixed points, itinerant trucks and partnerships with condominiums and companies (COELBA, 2020). Another selective collection action in Salvador is the So+ma Vantagens Program, which makes it possible to exchange recyclable materials for different types of rewards made available by the project; currently, this action is developed in two neighborhoods of the capital, through the installation of a container, called Casa So+ma, by the startup So+ma in partnership with private companies and the municipal government (SOMAADVANTAGES, 2019). It is important to note that both projects have a partnership with the city's CCMR.

It is worth mentioning that the capital of Bahia has an estimated population of 2,886,698 million inhabitants, according to the Brazilian Institute of Geography and Statistics – IBGE (2020). And that according to LIMPURB, an average of three thousand tons of household waste are currently collected per day. Also according to the company, from the beginning of the new Coronavirus pandemic, there was a 7% increase in household garbage collection, considering the comparison of the period between the months of March and July 2020 and 2019 (SALVADOR, 2020a). Since 2015, the municipal administration has been developing a Selective Collection Program (PCS) coordinated by the Municipal Secretariat for Sustainability, Innovation and Resilience – Secis, whose objective is to receive recyclable material, initially through the installation of 150 PEVs in some neighborhoods of the city. These PEVs are made of plastic material with a single compartment to temporarily store dry waste such as paper/cardboard, plastic, glass and metal, with a capacity of 2,500 liters and support loads of up to 1,000 kilograms (SALVADOR, 2017).

The program also has a mobile application with detailed information to citizens about the collection points of the material (SALVADOR, 2015b). Figure 2 shows the logistical flow and equipment used in the program. According to Secis, the recyclable material delivered at these points is transported by the city through Limpurb to four cooperatives of recyclable material collectors currently partners of the PCS (SALVADOR, 2020).

Figure 2 – Flow of the Selective Collection Program of Salvador.



Source: ABRAMPA, 2018.

It is important to highlight according to Silva et al. (2017), that the Selective Collection Programs in the municipalities are promoted so that there is scope, quality in the collection and a greater volume of potentially recyclable and reusable materials to be collected, so that they are reinserted into the production system, enabling the logistical system and the economic, social and environmental support of these programs.

According to Secis, of the 150 PEVs installed since the beginning of the PCS, only 50 remained available to the population, due to the need to maintain them in the face of vandalism. However, at the beginning of the Covid-19 pandemic, caused by the new coronavirus (SARS-CoV-2) (GEISS, 2020), in April 2020 the secretariat suspended the PCS by removing all PEVs from the city, claiming to prioritize and preserve the lives of cooperative waste pickers and their families, considering that waste is a real vector of coronavirus transmission (FERNANDES, 2020). It is worth mentioning that, also during this period, the Brazilian Association of Sanitary and Environmental Engineering – Abes, through its National Thematic Chambers of Solid Waste, Environmental Health and Communication and with the collaboration of members of the Commission for Special Studies on Waste from Health Services of the Brazilian Association of Technical Standards (CEE 129 ABNT), issued recommendations for waste management in a Covid-19 pandemic situation, signaling, among other measures, the stoppage of selective collection.

However, even with a set of procedures and devices prepared – among them, the operational manual that guides the work of recyclable material collectors safely during the pandemic, prepared

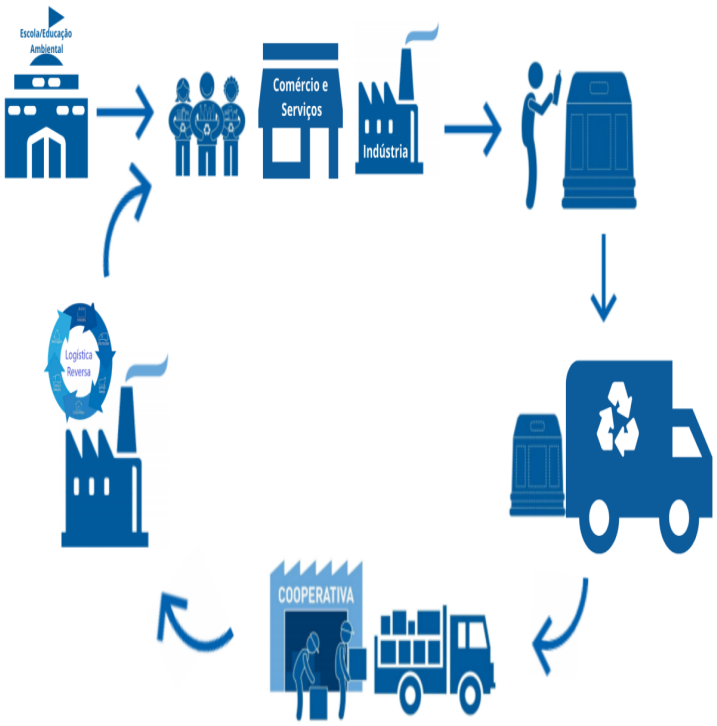
by a working group organized within the scope of the Municipal Forum on Waste and Citizenship of Belo Horizonte (FMLC-BH), made up of representatives of civil society, associations and cooperatives of waste pickers, technicians from the Superintendence of Urban Cleaning of Belo Horizonte (SLU), NGOs and universities, as well as members of the Observatory of Inclusive and Solidary Recycling (ORIS) – to date, the PCS of Salvador has not been resumed.

After observing and analyzing the logistical flow of the Selective Collection Program carried out in Salvador, through the elements that strengthen the work of cooperatives of recyclable material collectors and the benefits of this collection, it is pointed out the lack of indications of actions to guide the population through environmental education, through campaigns and other actions of mobilization and socio-environmental communication. Other aspects identified are the non-integration of CCMR in all stages of the PCS, such as the collection (transportation) of recyclable materials from PEVs, in addition to the need to incorporate other solid waste generators in the city as a way to reinforce the importance of shared responsibility.

Thus, it is proposed, as shown in figure 3, a new selective collection program for the city, since it is possible to improve the PCS currently developed by the municipal administration with the availability of PEVs, based on some actions and changes, such as:

- Change the type of PEVs to another that allows the receipt of recyclable materials such as plastics, metal and paper/cardboard separated from glass; because the packaging of these materials next to the glass results in possible safety problems for the work of recyclable material collectors and losses in the sorting process in the cooperatives;
- Increase the number of PEVs, given the number of neighborhoods not served by the Selective Collection Program;
- Include the CCMR in all stages of the program, preferably in awareness-raising and guidance actions for citizens and in the collection (transport of materials), as provided for in the PNRS, as well as in taking advantage of the experience of these enterprises in this activity.

Figure 3 – Proposal for the Flow of the Selective Collection Program for the strengthening of cooperatives in the city of Salvador.



Source: Prepared by the author, 2020.

In the new proposition of the Selective Collection Program Flow (Figure 3), the first and permanent action to be developed is environmental education in schools, with the general population, in commerce and services, and in industry, as the process of generating MSW begins through the production and consumption that involves these segments. In this way, it contributes to the construction of an exercise of citizenship through citizens who are aware of and engaged with separation at source and with the proper disposal of USW.

It is also worth mentioning the need to expand the infrastructure for selective collection made available by the municipal management by increasing the number of PEVs installed in the city.

The cooperatives of recyclable material collectors, in turn, must be incorporated into the process of collecting (transporting) materials, sorting, packaging, storing, and selling waste to recycling companies and industries. Then, a new stage takes place, with the arrival of recyclable material to industries interested in participating in the reverse logistics system.

Finally, it is highlighted, in this flow, that environmental education has to be processed continuously, reaching generators and the public authorities, as well as manufacturers, distributors and importers of products that generate waste.

CONCLUSION

The socio-environmental damage caused by the growing generation and irregular disposal of

MSW has been a cause for concern in several parts of the world, including Brazil. In this context, the collaboration of the work of cooperatives of recyclable material collectors stands out in the country.

This article thus sought to carry out a bibliographic study to investigate how the actions of citizens, the existing norms and the public equipment made available by the State for the disposal of solid waste contribute to the strengthening of the work of the CCMR, aiming to propose a flowchart to contribute to the improvement of the work of these enterprises in the city of Salvador. Thus, it is possible to highlight that the following contribute to the strengthening of the CCMR of Salvador: the effectiveness of the responsibility of citizens in the process of participation in selective collection; the fulfillment of the actions and the use of the instruments provided for in the laws signaled at the national, state and municipal levels by those responsible for the management and management of solid waste, including the participation of the CCMR in these processes; as well as the availability of public infrastructure for selective collection aimed at providing the population with the opportunity to direct waste for recycling.

Thus, it is considered that the proposed objective was achieved, in view of the exposure of the relationship of the aforementioned elements in strengthening the work developed by these cooperatives. Finally, it was evidenced the need for changes in the Selective Collection Program of the capital of Bahia, such as, for example, the replacement of the type of PEVs and a new flow for the actions of the program, seeking to achieve the benefits alluded to of selective collection to achieve the maximum valorization of waste with the socio-productive inclusion of recyclable material collectors and with the achievement of the goal of environmentally appropriate final disposal of waste, as provided for in the legislation in force in the country.

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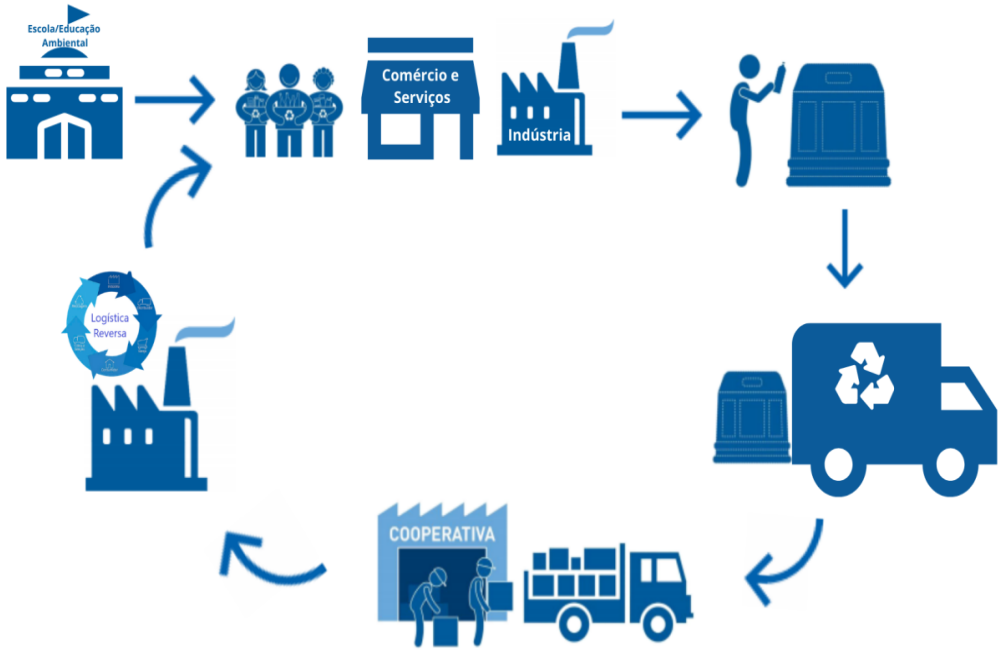
REVISTA CIENTÍFICA SISTEMÁTICA

APPENDIX C – PRODUCT

PROPOSITION OF A SELECTIVE COLLECTION PROGRAM (PCS) FLOW FOR THE STRENGTHENING OF COOPERATIVES IN THE CITY OF SALVADOR



APPENDIX D – PRODUCT

PEV VIVO – PROPOSAL FOR A NEW MODEL OF PEVs FOR THE PCS OF SALVADOR