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Abstract- This work evaluated the main difficulties for the implementation and maintenance of selective collection in a large Brazilian city with more than 1 million inhabitants. For that, the qualitative method was used through interviews with 18 professionals who work in the area of selective collection and waste management. The interviews were recorded and the data submitted to content analysis. The results pointed to the following difficulties: lack of government management, low efficiency and limited coverage; poor separation of waste at source; distortions in the logistics chain of selective collection and in the distribution of waste by cooperatives; high informality, precarious work and low remuneration of collectors; the presence of intermediaries and corruption in the system; and idle capacity of cooperatives and public agencies.

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Diagnosis and Difficulties in Waste Management in a Large Brazilian City, Focusing on Selective Collection

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Abstract- This work evaluated the main difficulties for the implementation and maintenance of selective collection in a large Brazilian city with more than 1 million inhabitants. For that, the qualitative method was used through interviews with 18 professionals who work in the area of selective collection and waste management. The interviews were recorded and the data submitted to content analysis. The results pointed to the following difficulties: lack of government management, low efficiency and limited coverage; poor separation of waste at source; distortions in the logistics chain of selective collection and in the distribution of waste by cooperatives; high informality, precarious work and low remuneration of collectors; the presence of intermediaries and corruption in the system; and idle capacity of cooperatives and public agencies. It was possible to conclude that in order to evolve in the service rates of selective collection and for it to be more effective, there is a need to improve the management of the process by the public authorities with greater transparency and integration between the various actors involved, education of the population, better working conditions and remuneration for waste pickers.

Keywords: selective collection, difficulties in the selective collection process, waste management; qualitative method.

I. Introduction

Difficulties of waste management in developing countries include small coverage area, deficiencies in the collection, open dumps, and informal management, among others (Simatele et al., 2017; Shams et al., 2017).

In Brazil, the quality of waste management is poor, due to several aspects such as frequent unpreparedness of the personnel in charge of the matter in public agencies, failures in the collection and establishment of fees by the government, problems in the collection and in the transport, large-scale presence of informal waste collectors, frequent irregular disposal of waste, inadequate collection coverage and periodicity, low recycling rates (Marshall & Farahbakhsh, 2013; Chaves et al., 2014; Jabbour et al., 2014).

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On average, Brazil recovers approximately 2.2% of the total collection of household and public cleaning waste (except organic matter and residues). For a country where almost 40% of municipalities declare to have some initiative for selective collection, recovering only 2.2% and composting 1.8% of the collected waste is very little and these numbers haven't changed in years. (SNIS, 2018). Without efficient selective collection, it is not possible to obtain good waste recovery rates, considering that one of the causes of the low recovery rate in developing countries is the difficulties of efficient waste separation in households (Simatele et al., 2017; Almeida & Mol, 2020).

The selective collection is one of the phases of the recyclable material management process, having begun with the segregation of waste in households, public agencies, and private companies, in categories (metal/paper/glass/plastic, dry/wet, recyclable/non – recyclable, organic/inorganic) for subsequent disposal in public places, properties frontage, or voluntary delivery points - PEVs. In Brazil, more than 1000 municipalities have some type of selective collection (CEMPRE, 2016), and in almost all, there is the active participation of formal and informal waste collectors. Unfortunately, selective collection as it should be performed does not occur in Brazil.

Given the above, the question arises as to why waste recovery rates in Brazil are so low, despite having a PNRS since 2010, instituted through Law 12.305/ 2010? This study seeks to understand this failure, through the analysis of the perception of the actors involved in the cycle of solid waste selective collection. Because it is a phenomenon that involves not only technical aspects, but also social, economic, legal and cultural conditions. The selective collection must be understood in a broad way, through the analysis of the different aspects, therefore, the contribution of the present work is in the fact that it has obtained the information directly from the actors involved in the process, those who daily deal with the problems and thus, the phenomenon could be understood more clearly.

II. Materials and Methods

Waste management issues, including selective collection, involve political, economic, social, cultural, regulatory, and environmental aspects. (Warrior *et al*. 2013). As this is a broad problem, the use of qualitative

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research methods that have not been applied so far is growing in importance. Qualitative methods also called comprehensive by some, as they aim at a deeper understanding of the phenomena, have proven to be effective tools for the investigation of complex phenomena, whose objective is to understand it and not just measure it, as in the case of waste selective collection. Used for over a century in research in the human and social sciences, qualitative methods have been used in areas such as health sciences, education, administration, and even engineering (Pessoa *et al*., 2017; Poupart *et al.* 2018; Taquette & Borges, 2020)

a) Characterization of the Study Site

The city where we focused our study has more than 1 million inhabitants, has high cultural, ethnic, regional, and mainly social diversity. These characteristics turn the phenomenon of selective collection even more complex. Selective collection in the studied city began in the 1990s with a one-off initiative in a predominantly residential neighborhood by the local waste collectors cooperative. However, the official selective collection program in the respective city was launched in 2002 through a pilot project in one of the noblest and traditional neighborhoods of the city. Currently, the city's selective collection system works with the participation of the Municipal Public cleaning company and the formal and informal recyclers. The Municipal Public cleaning company theoretically carries out the selective collection of recyclable materials, either in the door-to-door mode or at the voluntary delivery points – PEVs (Baptista, 2015) and makes the material available to the waste collectors cooperatives, which are 23 currently registered. According to official information from the city, the cooperatives carry out sorting, separation by type and preparation of the material for sale (bundling, weighing, tying, identification) (Baptista, 2015).

b) Data and Collection Instruments

We used individual interviews as the main data collection tool. An interview is a privileged tool for the researcher to know, from the perspective of the actors involved, the meaning that themselves confer on their actions (Poupart et al., 2018; Taquette & Borges, 2020). A semi-structured interview was carried out with a two-part script: the first with direct questions to trace the sociographic profile of the interviewed and the role of each one in the selective collection. The second part contained open questions to know the interviewed perception about the selective collection, as it should be and is indeed done, its barriers and challenges.

c) Sample Criteria

Although the number of interviewees is not a consensus among researchers, the vast majority understands that when using the qualitative method, the sample significance criteria do not follow the standards of quantitative methods. In the present work, there was a need to interview a greater number of members of the group of recyclable material collectors, since they work in different areas of the municipality with peculiarities, so it was felt the need to interview a greater number of people. participants in this group, so that the saturation criterion (Minayo, 2017) was met. For the other groups, there was greater homogeneity in the information.

Table 1: Interviewed by interest groups

Interest group	Interviewed Number	Profile of Respondents
Collectors of recyclable materials that are members of cooperatives	7	Leaders (presidents) of cooperatives, all with more than ten years of experience as a collector and/or cooperative manager
Liberal Professionals and Consulting Companies that work in Selective Collection	5	Professionals with at least a college degree and at least ten years of experience with selective collection consulting services
Representatives of Public and Private Institutions that have selective collection programs	3	Members of public authorities or companies, with a management/leadership role and at least ten years of experience in waste management and selective collection
Members of the Government (City Hall/Public Cleaning Company)	3	

d) Ethical Aspects

The research was approved by the Research Ethics Committee – CEP of the institution whose responsible investigator is linked, through Opinion number 4.434.856/2020, and all participants signed the free and informed consent form.

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III. Results and Discussions

After applying the content analysis, it was found that the main information, for the purposes of analysis, could be distributed into seven categories, to facilitate the presentation of results: *Obstacles and difficulties of selective collection in the studied city; Obstacles related to the action of Government/Governance; Obstacles related to the engagement and education of the population; Financial Logistical Obstacles.* All research participants, regardless of the group they belonged to, contributed to all seven categories of analysis, since the information obtained was very similar in terms of message content, regardless of the interviewee's sector.

a) Obstacles and difficulties of selective collection in the studied city

Several difficulties and obstacles of selective collection in the studied city were possible to observe. For better analysis and presentation, these were divided into four subcategories or subgroups in order to synthesize them and draw attention to the most important aspects.

b) Obstacles related to the action of Government/ Governance

The difficulties that the municipal government has in inadequately managing selective collection were evident in the present study. For the interviewed, as for the scope of selective collection, formal selective collection in the studied city does not yet cover a considerable number of neighborhoods, which makes it difficult to improve the efficiency and gain in service scale. "*Just for you to get an idea, this cooperative collects more than the whole public cleaning company"* (Interviewed 18, working for 30 years in the public cleaning Company). In addition to the low spatial coverage of selective collection, it was found that little waste with recycling potential is collected. *"Unfortunately, based on the data I have, the city collects less than 10% of the material that could be collected"* (Interviewed 2, representative of a Public Institution that carries out selective collection).

c) Obstacles related to the engagement and education of the population

It was possible to observe that in the interviewed perception there are problems in the segregation of waste at the generating source, which are an obstacle to the selective collection. "*I think the organic matter is the big villain when it comes to separation at the source"* (Interviewed 18, working for 30 years in the public cleaning Company). It was also found that an important factor for improving the segregation of waste at the source is the awareness of the population and environmental education. "*Only with a lot of environmental education by the Government coming to people's door"* (Interviewed 8, consultant in the area of waste). "*Engagement… People love to do social action, pick up garbage on the beach, take pictures, but the hard part is to do selective collection every day".* (Interviewed 4, collector)

d) Financial Logistical Obstacles

A recurring claim is as to the cost of selective collection. However, it was possible to see that the high cost of selective collection is the result of distortions and inconsistencies in the process. "*Trucks are expensive and collect very little, you take a truck that is supposed to carry 10 tons and it carries, sometimes, 500kg"* (Interviewed 18, working for 30 years in the public cleaning Company). "*The material collected in neighborhood X goes to a faraway transfer station to be weighed because there is no road balance in neighborhood X. The cooperative in neighborhood X receives material collected from neighborhood Y... that's why we see in this "logistic nightmare" that costs a lot"* (Interviewed 12, selective collection consultant). "*Most cooperatives today are idle and no longer process because they receive little material.*" (Interviewed 4, 31 years old, collector)

e) Suggestions for process improvements

Through the present study, it was realized the need for training and awareness of all actors involved in the selective collection process, so that really effective improvements occur. With regard to waste pickers, a constant training program is suggested, led by the government and with the financial support of the productive sector. It is also suggested a constant work of interaction and training with the participation of representatives of the public power, the generating companies and the collectors, so that there is a greater integration between the actors involved, where each one has the exact notion of the role of each actor. involved in the selective collection process and not just individualized training. It is also suggested a constant program of environmental education for the general population, making everyone aware of the importance of separation at source for an efficient selective collection and training the population on the correct form of separation and thus, the population would feel part of the process. A possible solution for training the population and the other actors involved would be the creation of "reference centers in selective collection", places for the dissemination of the selective collection culture, available to everyone.

IV. Conclusion

Through this work, it was possible to know the main difficulties and obstacles of selective waste collection in the city focus of this study. Although limited to the perception of actors in the selective collection chain in a large city, the study provides information about details of the selective collection process, which could not be obtained without a comprehensive

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approach to the problem and which serve as subsidies for policies for the sector.

In general, the interviews showed that poor management, the lack of planning and monitoring of the various stages by the government to which this responsibility is attributed, together with corruption, are the main causes of the problems of selective collection in the studied municipality and probably in other large cities with the same characteristics. Differences were found in the perception of different actors in the selective collection process: for waste collectors and consultants, the role of cooperatives would be a possible solution to improve the efficiency, while for civil servants in the sector, the waste collectors are one of the problems in the process.

The present work is expected to contribute to the improvement of selective collection in Brazilian cities, especially the large ones. The need for public policies for greater awareness, engagement and education of the population, training and social protection to waste collectors aiming improvements in working conditions, support to cooperatives, as well as an efficient logistics of the transport of recyclables to sorting stations, separation and recycling plants, were hereinabove demonstrated.

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