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PROFILE SURVEY OF WASTE PICKERS IN BRAZIL: REQUIREMENTS FOR THE DEVELOPMENT OF A COLLECTION VEHICLE AND OPTIMIZED ROUTING

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Abstract:

This study presents information collected from waste pickers in the southern, south-eastern and north-eastern regions of Brazil to guide the development of a collection vehicle and a support system for the definition of collecting routes. The study had three objectives: to specify the profile of waste pickers of recyclable materials in the three surveyed regions; to diagnose the working conditions of individuals linked to associations and cooperatives of waste pickers and to identify the physical and operational structure of the waste picker organizations. To reach these objectives questionnaires were issued to waste pickers linked to associations and cooperatives that collect recyclables using human- or animal-powered vehicles and to the waste picker organizations themselves. Based on the results of this study, we are able to provide the requirements for the development of the collection vehicle, to draw a profile of the waste pickers in the three study regions and have better understanding of the working and physical conditions and the organizational structure of waste picker entities. It can be concluded that waste pickers suffer several forms of deprivation, resulting in the marginalization, prejudice and exclusion of individuals who conduct this work, making it essential to promote actions that contribute to the social inclusion of waste pickers in their productive segment.

Keywords:

Waste pickers; collection vehicle; definition of routes; waste collection routes, optimized routing

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INTRODUCTION

This study originated in a call for projects by the National Council for Scientific and Technological Development (CNPq), a funding agency for academic research, for the development of technologies to improve the working conditions of recyclable materials collectors. In Brazil, workers in this field are fundamental components in the management of municipal solid wastes (MSW).

The generation of MSW has grown rapidly worldwide. In Brazil alone, MSW generation increased 1.3% from 2011 to 2012, reaching 62 730 096 ton, according to Abrelpe (2013). This leads to many problems related to the proper disposal of this waste, involving environmental, economic and social factors. According to Calderoni (1999), the recycling of solid waste is cheaper than the production of goods from raw materials because it lowers consumption of energy, raw materials, and water resources, reduces the costs of environmental control and of the final disposal of solid wastes. Moreover, the recycling industry brings social benefits by creating jobs.

According to the Institute of Applied Economic Research (IPEA, 2010), the benefits of recycling for Brazilian society, if all recyclable waste (steel, aluminium, pulp, plastic and glass) would be recycled, are estimated at R\$ 8 billion annually. These calculations include economic and environmental benefits related to the production processes for materials (in R\$/t); benefits (costs of collection and disposal) associated with MSW management (R\$/t); benefit per tonne (R\$/t) and quantity available in collected waste (t/year). IPEA calculates that at Brazil's current recycling rates, the activity generates annual benefits of R\$ 1.4 to R\$ 3.3 billion.

IPEA (2010) also analysed information from several Brazilian agencies about the production of various products (steel, aluminium, pulp, plastic and glass) from virgin raw material or from recycling and demonstrated the financial viability of the latter. The value of the net benefit from recycling was obtained by comparing the cost of generating the primary products mentioned above with the costs of recycling, considering in this case, the cost of secondary materials, water and energy. The analysis understood that a ton of secondary material could be converted into a ton of final product. To IPEA (2012), the marketing chain of recycling begins in the recovery of recyclable materials present in the waste that can be generated as excess production processes or through the obsolescence of machinery and tools, being classified as post-industrial waste, or such as disposal of the material left over from a good or service, making the post-consumer waste.

In the words of Wilson (2006), the degree of recycling of a material depends on the income level, the existence of local and national markets, the need for

raw materials, level of government intervention and financial regulation, prices of virgin materials, international trade of materials and relevant treaties.

According to IBGE (2010), the number of selective waste collection programs has increased in Brazil, rising from 58 in 1989 to 994 in 2008. Following this trend, depending on the economic conditions, and especially on the social conditions of Brazilians, there are a growing number of individuals, known as waste pickers who earn income from the collection of recyclable materials and contribute to strengthening the recycling chain. Wilson (2006) says that specific economic conditions prevailing in many developing countries and include: rapid population growth, migration to urban areas, lack of funds and economic services and skilled workforce. Even to the author, it is common to communities of waste pickers are in poor living conditions, limited access to facilities and infrastructure, the lack of services for water supply and sewage treatment and absence of social security.

Nevertheless, there are no public policies that contribute to the real social and economic inclusion of these workers. The number of waste pickers in Brazil varies greatly ranging from 70,000 (IBGE, 2010) to 800 000 (Lopes, 2010). According to IPEA (2012), the data provided by IBGE should be read with caution, since the level of informality and social stigma of waste picker hinder your knowledge by public administration bodies in the same way that, in the higher degrees of vulnerability social activity of scavenging shows more seasonality due variations in prices of recyclable waste and offers of these, beyond increase the presence of children and teenagers in school holiday periods whose work reduces the volume of waste reaching sanitary landfills, decreases energy consumption and lowers the use of natural resources, while bringing economic meaning to their life.

The survival of these individuals is associated to the removal of materials from landfills and dumps and almost always provokes strong and negative reactions to their lifestyle. They are mostly very poor, with low education levels and work experience limited to the informal sector. In 2002, this occupation was recognized by Brazil's Ministry of Labor and Employment in a category defined as those who "collect, select and sell recyclable materials such as paper, cardboard and glass as well as ferrous and non ferrous metals and other reusable materials" (MTE, 2011).

According to WIEGO (s.d), waste pickers can vary from poor people who go through the trash to meet needs such as food, individuals who informally collect recyclable materials and sell them to intermediaries or companies, as well as organized waste pickers affiliated to unions, cooperatives or associations, who in many countries are the only ones responsible for selective collection.

However, Vieira (2011) states that waste pickers often tend to see their work only as a means of subsistence, and few consider working in the organization as a real means of social and political participation. Romansini (2005) sees the waste picker directly involved in two social problems that must be confronted: social inequality and exacerbated production of urban solid wastes. The author also comments that waste pickers are associated with prejudice, exclusion and marginalization, and constantly seen as part of the problem of social inequality and excessive production of MSW. In this context, they unfortunately are not associated with possible solutions to these problems.

According to Medina (2010) and IPEA (2010), a more detailed analysis shows that the work of waste pickers makes positive contributions to society and with support, these contributions can be even greater. Romansini (2005) points out that the proper management of waste and the high costs for collection, transportation and proper disposal of these wastes shows that waste pickers, by exercising their role contribute to reducing these costs, even if this work is invisible to society. Francisco (2009) states that the work of these individuals around the world helps to supply industries by reducing raw material imports.

Dumps are common in family activities organized, involving individuals rather vulnerable, such as women, children and elderly, and that end up being exposed to health risks and depriving children of formal education. Organize and train informal collectors is a very effective way to improve your ability to add value to the collected material (Wilson, 2006).

To IPEA (2012), the waste pickers occupy different positions in the chain of recyclables, acting primarily on scavenging and resale of recyclable materials from the waste coming from post-consumer, it can also provide or will provide service private collection postindustrial. According Tirado-Soto & Zamberlan (2013), the pickers are at the base of the economic pyramid recycling, which grows in relation to economic gain, but decreases in the number of benefited. This is mainly due to not adding value to recyclables due to the lack of investment in infrastructure and information technology and the lack of public policies to support the of selective collection with the inclusion of the waste pickers, which makes them subject of concern to many intermediaries. The authors also say that The waste pickers organizations weak in terms of infrastructure and equipment, face difficulties in collecting, mainly due to lack of transportation and receipt of materials in quantity and quality required by industry. The biggest challenge facing organizations refers to these self-management. Another challenge is related to lack of working capital can allow members of organizations deliver materials in sufficient quantities and on a regular basis.

In Oliveira's opinion (2007), the main reason waste pickers say they collect recyclable materials is unemployment, followed by the low educational level required, physical limitations to exercising other activities and their already advanced age. Romansini (2005) points to rural exodus, unemployment and the fact that these workers are not qualified for other jobs as factors that contribute to their involvement in the collection of recyclable materials. Medina (2011) attributed the causes of informal collection to underdevelopment, poverty, unemployment and lack of support for the poor, coupled with industrial demand for raw material.

Oliveira (2007) points out that the waste pickers, as a labour force, are presented in contemporary society as a type of commodity, far from being seen as individuals with rights and political and social powers. Thus, these individuals face various difficulties: rising unemployment, precarious working conditions, and exclusion from the formal work market and from social life, which leads them to seek their survival and integration into the world market. However, this insertion is questioned by the author, because besides the lack of decent conditions for exercising their occupation, the waste pickers are self-employed and have no access to social and labour security, or the means to improve their situation, with the work becoming a way to occupy their mind, forget their problems and take care of their body. To Wilson (2006), The inability of scavengers enter into more formal professions and lack real choices need to be recognized by interventions that try to change the role and practices social work related to informal recycling.

IPEA (2010) points out some difficulties the waste pickers face when performing the service they provide society, such as a lack of recognition for their work and the absence of any formal compensation system. Another difficulty is the fact that the income is unstable, subject to fluctuations in the prices of materials they sell. Meanwhile, the volume of recyclable materials they collect is lower than the potential available among MSW, since most still winds up in landfills and dumps. The institute also indicates some situations that give rise to many other problems such as the low administrative capacity of most waste picker organizations, which limits these groups' access to contracts for collecting recyclable materials. The sector is also largely informal.

Wilson (2006) states that may not be productive to establish new formal systems recycling disregarding existing informal systems. Therefore, the integration of the informal sector for the planning of waste management is the preferred option, taking into account the practices and experience in this sector and working to improve the efficiency and the conditions of life and work of those involved. The informal sector, in the context of municipal solid waste, refers to the work of

scavengers, in which there is intense work, low-tech, low pay, job unregistered and unregulated, often run by individuals or family groups.

For Vieira (2011), the only limitation that the waste pickers mention is a need to sell their work product to intermediaries, which may be private owners of small dumps or a waste-picker association. Thus, owning their own collection vehicle would allow them to overcome this limitation, though, the end result, translated into economic gains, depends on the prices charged by the intermediaries or by the recycling companies.

The collection activity also presents hazards to waste pickers. The entity *Cidades Inclusivas* (s.d.) points out that because of their poor living conditions and the nature of their work, waste pickers run serious risks including exposure to extreme temperatures, wind, rain and sun, exposure to hazardous waste, including toxic substances such as lead and asbestos, as well as blood, fecal matter, animal carcasses, broken glass, needles and sharp metal objects, exposure to diseases spread by worms, flies and mosquitoes, as well as pain in their limbs and backs, skin irritations and rashes, and a particularly high risk of contracting tuberculosis, bronchitis, asthma, pneumonia, dysentery and parasitic infections.

According to a report prepared by The National Solid Waste Management Commission (NSWMC, 2009) the most common diseases that affect people involved with collection are respiratory and skin problems, eye infections and physical injuries. Oliveira (2011) states that occupational diseases among waste pickers are increasingly common due to the environments and unhealthy work conditions. However, it may be noted that the individual's exposure to situations that can cause accidents and injuries suffer interference context, behavior and preventive measures taken, and that the perception of risk, and feel safe, self-management and knowledge can also influence the control actions taken by workers.

To Wilson (2006) manual sorting of mixed waste can create unhealthy situations, attracting disease vectors and increasing the exposure of vulnerable groups. In addition, open burning, proximity of points of accumulation of waste, combined with low sanitation, poor personal hygiene and poor or nonexistent urban infrastructure are other health risks.

As stated by Conceição (2005), the waste pickers undergo a daily work routine that often exceeds twelve hours nonstop, carrying in their carts, with their own strength, more than 200 kg on each trip, travelling over 20 km per day, and in the end, often exploited by the owners of the dumps (middlemen) who trade collected material for alcohol or a token payment, insufficient for their survival.

The waste pickers suffer considerable exploitation along various links in the recycling chain. IPEA (2012) states that these workers are often victims of a market in

which there is only one buyer for the materials, for which reason the waste pickers earn very little compared to the total profit for the buyer. A solution that waste pickers often find to survive in the face of these situations is to organize themselves into associations or cooperatives, which may lead to an increase in their income, social status and self-esteem (*CIDADES INCLUSIVAS*, s.d). According to Conceição (2005), most of the cooperatives sell the materials they collect to scrap dealers, intensifying the exploitation of waste pickers and of the cooperatives. The scrap dealer, which has stronger bargaining power considering the lack of other buyers, buys the materials from these groups for very low prices, remaining with a much bigger profit. When selling to recycling companies in large quantities, the scrap dealers win again. The scrap dealers and recycling companies profit in the relationship, while the waste pickers and their cooperatives lose.

According Wilson (2006), the materials collected by the informal sector are usually marketed locally, involving industries, various intermediaries, collectors, among others. However, the collectors are involved most vulnerable, because they lack a support network organized, having a limited, low processing power or storage of materials and therefore are very overworked and renumbered.

Romani (2004) points out that in Brazil, junkyards have a profit of around 100% of the price offered to waste pickers and intermediary companies (that process the material), have profits of 80% over the junkyards. The author states that two actions are needed to ensure that the material sold does not pass through intermediaries before reaching recycling company and that the waste pickers are better compensated for their efforts: organizing labour and adding value to the collected material by increasing the volume and quality of the recyclable material.

Romani affirms that waste-pickers should be offered more than an opportunity to work in a cooperative. Other problems must be attended such as the low self-esteem that prevents them from seeing themselves as economic and environmental agents recognized by the government and society and the social inclusion of their family, which also bears the marks of social inequalities, education not only for the children of waste pickers, but also for the waste pickers themselves, who generally have a low educational level.

The majority of the groups are informal, although there is the need for these groups to be competitive on the market for recycling. Therefore, it is required economies of scale to negotiate directly with the industries and get the best prices for materials collected, excluding intermediaries in this process. Thus, the organization of collectors in the network can be very attractive to scavengers, since it allows the joint marketing of materials and obtaining higher prices,

providing better working conditions, as well as benefiting the general population with reduced the need for disposal of the waste (Tirado-Soto & Zamberlan, 2013).

Still, according to the authors, the organization of these networks scavengers requires the participation of all stakeholders: citizens, mainly in the proper separation of waste and the government, to promote the selective collection; recycling industries to provide an better access for waste collectors and institutions, such as universities and financial institutions, to promote research and funding of these, respectively.

According to Gonçalves & Abegão (2004), government must be involved with the waste pickers, because if there is no partnership between the two, there tend to be constant conflicts between the parties and consequently large losses, especially for the waste pickers. Romani (2004) also emphasizes the importance of this relation by affirming: "The diversity of deficiencies and the possibilities for support reinforce the need for policies that are articulated among various segments of the public administration." This scenario could make, waste pickers sufficiently organized to be able to manage the triage centers at which they work.

When waste pickers are asked about the main needs of their organizations, they mention the lack of adequate warehouses, equipment and social security benefits (ICom, 2009).

IPEA (2012) points out that most waste pickers organizations have low or very low physical efficiency and these efficiencies will only be changed by executing investment aimed at increasing productivity, which is substantially expensive due to the amount of capitalization required and needs a some years to their full and proper implementation. Thus, only the medium and long term can be expected efficiency gains physical for most waste pickers units, assuming there public policies that encourage financial contributions in this direction.

There are many other challenges faced by waste picker associations and cooperatives including: the economy of scale in marketing; specialization and qualification of the product; the flow of the supply, often because organizations are forced to trade with a particular intermediary because of machinery and equipment loaned to them, physical space that is often rented, loaned or given but not large enough for the volume of materials collected; and the difficulty in establishing a network of buyers, allowing price negotiation (Romani, 2004).

It is important to highlight the role of Law 12.305/2010, known as the National Policy on Solid Waste, in relation to strengthening the work of scavengers. In several articles, this law uses several instruments in order to value the work of waste pickers and to promote the achievement of the recycling chain in Brazil. IPEA (2012) points out that the city hall's

commitment to social inclusion of waste pickers, effective integration of these agents in selective collection programs, in addition to the recognition of social and environmental externalities of scavenging activity are essential for the success of the shared management of solid waste. Furthermore, the basic work and social mobilization and institutional encourages cooperative or associative behavior of scavengers, which, however, assumes technical and financial support in the case of organizations in formation or poorly structured. In this sense, the partnership of the government must ensure the flow of recyclable materials for scavengers and ensure stability agreements signed.

Overall, the look of the formal waste management for the informal recycling is very negative, although incompatible with the modern system of waste management, which tends to reduce dependence on disposal of waste, increasing recycling, and for this, the existing recycling systems can be very effective. The organizational form of informal activities influence the generation of income, working conditions and status, so that the smallest organization in this sector leads to the inability to add value to the materials collected by the waste pickers, intensifying their exploitation (Wilson, 2006).

This reality is slowly changing in some parts of Brazil, as in the case presented by Francisco (2009) in the municipality of Diadema (SP), which was the first in Brazil to establish the remuneration of waste pickers for collection services and street cleaning in a program that covers more than 200 partners, divided among public and private entities, and about 70 waste pickers. According to Oliveira (2011), the demystification and appreciation of the role of the waste picker have been stimulated by the preservation of the environment, creating new ways of working and cooperative actions and movements of waste pickers around the country that promote environmental education, professional qualification, training in safety and campaigns that publicize and inform the importance of the task performed by the waste pickers, favor the value and dignity of work, recognizing it as work. Nevertheless, there is still much to do to achieve better working conditions for this class of professionals.

To Wilson (2006) the support and integration of the informal sector waste management is a major challenge and requires convincing the municipal authorities and politicians to change their policies of repression and neglect the informal sector. To do so, one must first be recognition of the social, economic and environmental consequences of recycling, and recognizing the limited effectiveness of copying policies for waste management in more developed countries. Interventions need to be designed and built so that they can have maximum effect.

Thus, considering the generation and disposal of municipal solid waste, the role of recyclable material pickers as part of the solution to this issue and the need to promote improvements in the working conditions to ensure greater financial benefit to these individuals, this study focuses on the recyclable materials pickers, because of the need to better understand the daily work of these individuals and the peculiarities of this activity in southern, south-eastern and north-eastern Brazil.

The objective of this study is to report the information gathered from the waste pickers in these regions to assist in the development of a collection vehicle and support system for the definition of collection routes. The specific objectives were to (a) specify the profile of waste pickers in the three surveyed regions, (b) Diagnose the working conditions of individuals linked to associations and cooperatives of waste pickers; and (c) Analyze the physical and operational structure of the waste picker organizations.

MATERIAL AND METHODS

The target of this study consisted pickers of recyclable materials from various associations and cooperatives in south, southeastern and northeastern Brazil who collect recyclable materials in the streets with human- or animal-powered vehicles.

Due to the lack of consensus regarding the number of waste pickers in the country and to their profile, no previous choice was made about the number of people to be interviewed or their profile. The aim was simply to include individuals associated to waste picker organizations that collect recyclable materials with human or animal powered vehicles, and who were willing to participate in the data survey. The sample used was not random (non-probabilistic) because of the difficulty of determining the size of the population.

The methodology applied to the work was a Survey study that is described as “the acquirement of data or information about the characteristics, actions or opinions of certain groups of people, appointed as a representative of the target population through a survey instrument, usually a questionnaire” (Pinsonneault & Kraemer, 1993 apud Freitas *et al.*, 2000). The method that supported the research included a search for information about the working conditions of waste pickers and the physical and operational structure of their organizations in three Brazilian regions. The research also sought information that could aid the development of a motorized collection vehicle, apart from developing a tool for optimization of the routes taken by scavengers.

The data collection and construction techniques used included a **semi-structured questionnaire given to the waste pickers** with objective questions, and a filmed interview, and observation apart from the questionnaire

of organizations using a checklist and subjective questions. For the analysis and interpretation of these data, content analysis was used and graphics were constructed with the MS Excel Program and Statistica software.

The semi-structured questionnaire was applied in interviews with waste pickers and included 30 questions and was based on the works of the PREFEITURA MUNICIPAL DE FLORIANÓPOLIS [Florianopolis municipal government] (2004) and Oliveira *et al.* (2007), as well as questions developed by the team working on the identification of waste pickers, related to education, income, the collection work itself, the collection vehicle, definition of the routes taken and occupational safety issues and diseases related to the physical effort of collection.

The questionnaire for the organizations was designed to understand their physical and organizational structure and was composed of a checklist about the properties held by the entity (collection site, collection vehicles to be loaned to scavengers, computer, internet, shirts or jackets, gloves, boots, earplugs and caps for use of the associated waste pickers) and questions about the amount, destination and frequency of the marketing of the collected materials by the waste pickers and their associations, the existence of organized definition of collection routes, and a space for comments and suggestions. The data collection for this survey occurred through visits to the organizations, sending the instrument by mail or a web form and through telephone contacts.

The results were obtained by applying the data collection tools to 236 waste pickers linked to 29 organizations represented by associations or cooperatives in eight Brazilian states.

RESULTS AND DISCUSSIONS

The results obtained can be divided into results of the questionnaire issued to individual waste pickers and the results of the questionnaire issued to waste picker organizations.

Results of the application of the questionnaire to individual waste pickers

The data analysis found that 32% or 75 of the people interviewed in the three regions were between 31 and 40 years old. This confirms surveys conducted by Alencar, Antunes & Cardoso (2009) in which the average age of interviewees was 39. It also confirms the work of Silva & Costa (2010) that found that most collectors were between 20 and 39 years (53%). FMP (2004) found that 24.8% of interviewees were between 21 and 30.

A similar situation was found in the South and Northeast regions, where the majority of interviewees

were from 31-40. In the Southeast, the largest group was between 51 and 60.

The survey found that 56% of the sampled waste pickers are female, which differs from the results of previous studies. According to the PMF (2004), 77.1% of interviewees were male. Alencar *et al.* Cardoso (2009) found that males accounted for 72.7%. Silva & Costa (2010) identified a majority formed by male waste pickers or 67% of the sample.

These results indicate that the collection of recyclable materials is carried out by mostly female individuals who are not so young. For these individuals, it is more important to have a lighter and more agile collection vehicle and develop a shorter route to reduce the physical effort.

Regarding education, the responses showed that low educational level of the waste pickers is fairly frequent, although waste pickers were found who had completed high school or even higher education (one had a degree in philosophy). The number of collectors interviewed that completed a maximum of eight years of elementary education was 220, corresponding to 93% of all the waste pickers who responded to the questionnaire, confirming the findings of Medina (2000), Romansini (2005) and the municipality of Florianopolis (2004) among others, about the low educational level of pickers. For PMF (2004), 60.5% of the waste pickers had completed primary school. For Alencar, Antunes & Cardoso (2009) the majority completed elementary school (68.2%). Silva & Costa (2010) identified a majority of illiterates (64.5%).

The lack of professional qualification and the consequent informality, as was identified by Romansini (2005), was confirmed in this study that found a low educational level among the interviewees and that they had previously exercised other professions. Most of these jobs were poorly paid and informal. Conceição (2005) stated that the collectors are usually unemployed, have had no vocational training and no better employment options.

The analysis of the monthly income of interviewees showed that 31% earn between R\$ 401.00 and R\$ 600.00 per month. This result is different than that found by PMF (2004) where 34% of interviewees had an income ranging from R\$ 201.00 to R\$ 400.00 (Fig. 1). Alencar *et al.* (2009) found a mean monthly income of R\$ 335.22. Silva & Costa (2010) identified that most had an income of less than one minimum monthly wage (95.6%).

A regional comparison of the monthly incomes indicates that waste pickers in the South earn more than those in the other surveyed regions. Those in the northeast earn the least. The causes of this variation in income between regions have not been investigated.

The low pay of collectors is directly related to the fact that most collectors interviewed do not have their own collection vehicle. Those collectors that have their

own vehicle have been using it for a long time and/or built it themselves. This reinforces the need to develop a vehicle with low cost acquisition and maintenance.

The income variation observed among the collectors in the same organization can be explained by differences in the number of hours worked, the pace of their work and the quantity and quality of waste found. This is because some do not work every day and others have physical limitations caused by accidents or old age. On the other hand, most of the waste pickers work more than eight hours per day and earn more. Another important factor in the remuneration of the waste pickers is the market price of the materials.

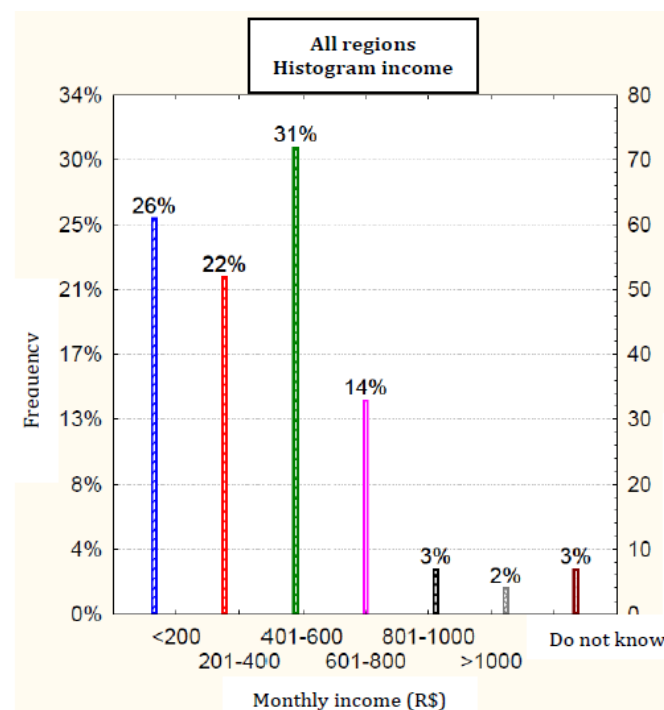


Fig. 1 Histogram income.

The time worked as a waste picker varies from 6 to 10 years for 27% of interviewees. This amount is different from that found by Silva & Costa (2010) who identified a predominance (35.55%) of those who had worked for more than 10 years. In the southern region, 24% of interviewees said they had been working as collectors for 3-5 years. This is similar to that found in the Southeast where 29% of the waste pickers said they had been working as collectors for 3-5 years. However, in the Northeast, 36% of interviewees had been working as waste pickers for 6 to 10 years.

Of all those interviewed, 81% have held another job and 57% of these said the profession of scavenger is better than what they had done before. This confirms the study by the city of Florianopolis (2004) in which 91.6% of interviewees said they had exercised another profession, but that they preferred waste picking. In the South, 82% of the waste pickers said they had engaged in another profession, while in the Southeast this figure was 85% and in the Northeast 78%.

The low education level of the people interviewed, coupled with the fact they have already exercised other professions, nearly all dependent primarily on physical force, demonstrates the lack of vocational skills needed for available jobs, contributing to the growth of informal work, as affirmed by Romansini (in 2005). Thus, the job opportunities available to this group are more restricted, less profitable and informal. Conceição (2005) found that the waste pickers are usually unemployed, have no training and no options for a better job. Most of the waste pickers were unable to study, and were illiterate or functionally illiterate.

Sixty-five per cent of those interviewed said they are better off as waste pickers, confirming the diagnosis of PMF (2004) in which 50.6% said they are better off as waste pickers. In the South, this rate was 76%, in the Southeast 51%, and in the Northeast 63%.

The reasons given for why the profession of waste picker is better than that they previously performed vary, considering that among those interviewed (purple in **Fig. 1**), the most cited reasons were that “there is more freedom because there is no boss or time sheet” (54.4%) and “there is always work in collection, they do not run the risk of being unemployed” (41.6%). The most frequent responses are shown in **Fig. 2**.

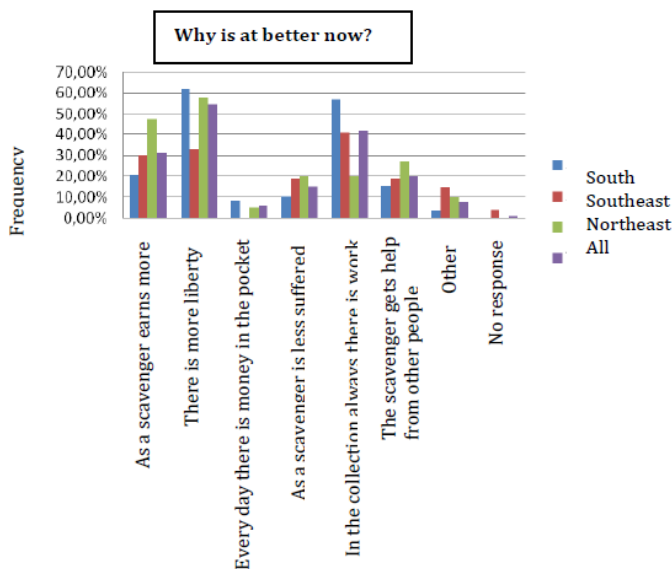


Fig. 2 Reasons why the scavenger profession is better.

For those who said collecting was better than their previous work, the most identified reason was that “the income was higher than in another profession” (56%). This was also the reason most often mentioned in each of the regions: 50% in the South, 64.3% in the Southeast and 50% in the Northeast.

The high rate of waste pickers in the informal sector was found during the research, confirming many other studies. Icom (2011) found that only 31% of the waste pickers in Santa Catarina State contribute to Social Security, highlighting the lack of social security for most individuals linked to waste picker associations.

Oliveira (2007) pointed out the concern and the plight of waste pickers in the absence of labour rights, in addition to their feeling of helplessness and lack of prospects for the future, which is thus completely uncertain. The PMF (2004) also found informality to be high in this category of professionals. In the South, 34% of surveyed waste pickers said that they had never worked formally, compared to 39% in the Southeast and 59% in the Northeast.

The high informality found among the collectors, coupled with their low education and low income are factors that highlight the need to establish policies and partnerships that can meet the various needs of this social group, as quoted by Medina (2000), Gonçalves & Abegão (2004), and Romani (2004).

The main reason given for working with collection, was that they like this activity. Of all those interviewed, 39% said they like to be waste pickers since they like the profession and gave several reasons, though the most cited were the flexible schedule and the absence of a boss. Some reported the satisfaction of being able to help the environment and the legacy for future generations. Many also seek to learn more about environmental issues and participate in courses and workshops. It is common to hear declarations that work as a collector provides freedom, a flexible schedule and the possibility of always having a job, because there is always material to collect. In addition, several waste pickers reported receiving help from people who donate clothes, food and shoes. For Vieira (2011) the waste pickers affirmation that they work “on their own,” and celebrate the fact they can choose the days, time and place to go and what to collect is a form of justification.

Some drawbacks were reported in the profession, such as informality, that there is no retirement plan or support in case of accident or illness. It was also reported that the profession is “heavy,” “causes considerable suffering,” they carry much weight in the cart and sometimes the vehicle does not have space for all the materials that need to be collected, forcing them to leave some behind, or for things to “fall” off. There are also frequent reports of prejudice and humiliation from society that ignores the social, environmental and economic role of the waste pickers’ work. Many suffer verbal abuse from passersby and residents of homes and neighbourhoods, where they collect their materials.

The reason most cited for choosing to work as a scavenger, apart from the love of the profession, was the low level of education that made it the best option at the moment. It was also observed that many have health problems, being unable to work in another function due to the informality of the work done previously; and that serious financial problems forced them to collect recyclables.

Unemployment was also cited as a major factor in the research of Alencar, Antunes and Cardoso (2009) to whom 86.4% said they chose this work for this reason.

For Silva & Costa (2010), this rate was 42.22%. Conceição (2005) found that for the most part, the waste pickers are unemployed, without educational background and outside the labour market. In her research, Oliveira (2007) states that the waste pickers give unemployment as the main reason for their collection of recyclable materials, followed by poor education, physical limitations to exercise another activity and advanced age. Romansini (2005) also mentioned the rural exodus, unemployment and a lack of preparation (qualification) of workers for new jobs. Medina (2011) states that the causes of the collection are under development, poverty, unemployment, lack of support for the poor and the industrial demand for cheap raw materials.

Generally the waste pickers work from Monday to Friday or from Monday to Saturday, however, when opportunities arise or when financial difficulties are very great, they also work on Sundays. Some waste pickers work only 2 or 3 days a week to supplement income from another profession.

The amount of work trips per day and the number of hours worked is quite variable and depends on the amount of material available on the streets for collection, which is usually performed alone, without help from other individuals. While exercising their professional activity, 35% of those interviewed reported making two trips per day. This routine was predominant in each of the surveyed areas, mentioned by 30% of the waste pickers in the Southern region, 31% in the Southeast and 43% in the Northeast (**Fig. 3**). Meanwhile, 48% of all interviewees said they work 8 hours a day.

This alternative was the most common response in each region surveyed, representing 53% of those interviewed in the South, 44% in the Southeast and 46% in the Northeast. According to the IPEA (2010) waste pickers have their own dynamic, and the reality of cooperatives and associations varies greatly, so, just as there are waste pickers who follow a daily routine of work, there are others who have less regular routines, working a widely variable amount of time each day, or who even do not work some days. That is why waste picker organizations adopt payment policies proportional to production, avoiding uniform payments.

Silva & Costa (2010) identified a majority who work more than 8 hours a day (51%), and that 55.4% work every day of the week. Conceição (2005), found that collectors have a daily work routine that may exceed twelve consecutive hours. PMF (2004) found that the waste pickers worked about 9 hours per day, 5-7

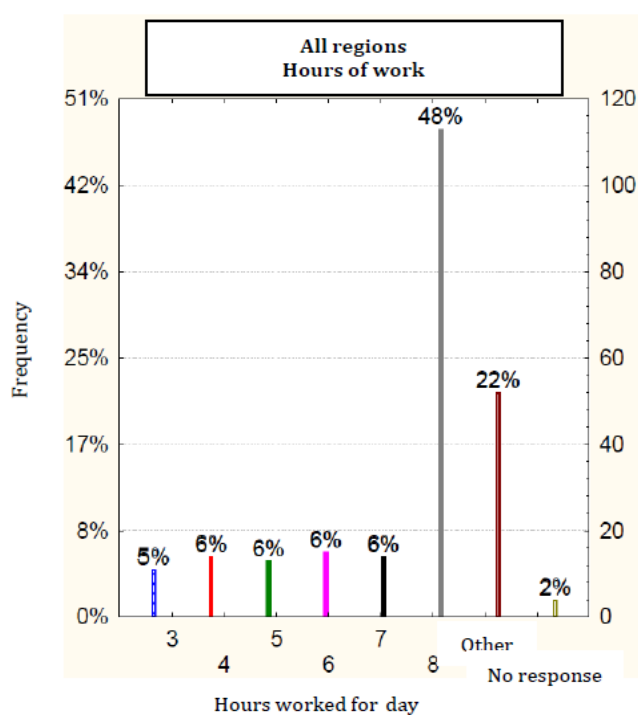


Fig. 3 Hours of work per day.

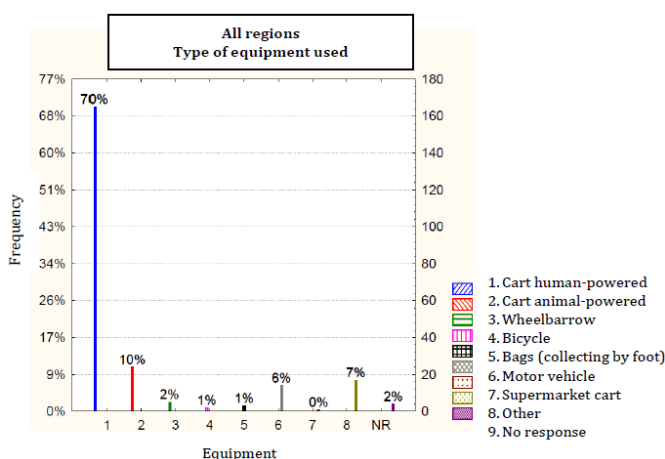


Fig. 4 Percentage of type of equipment used by collectors.

days a week. For Alencar *et al.* (2009) 68.2% of individuals worked more than 8 hours a day from Monday to Saturday.

Collection equipment was used by most interviewees, with 70% using a human-powered vehicle (**Fig. 4**). The use of this equipment was prevalent in all regions (by 78% in the South; 60% in the Southeast, and 69% in the Northeast).

A human-powered vehicle has an advantage over a motorized vehicle, because it is cheaper, though it has the inconvenience of being more physically demanding of the collector. Compared with animal drawn vehicles, it has the advantage of not requiring the use of animals, which generally do not receive proper care. However, animal traction allows transporting a larger amount of material, increasing the collector's income.

In the Southeast, the percentage of waste pickers who said they use a type of equipment different than those listed was 27%, most of whom were from

organizations in the city of Rio de Janeiro that collect with a motorized vehicle, but who have a human-powered vehicle for their own use or for collection close to the collection centre known as “donkey without a tail.” This equipment is shared by the waste pickers. In the Northeast, the percentage of collectors who said they use animal drawn carriages was the highest in all regions (25%).

Fifty per cent of those interviewed used collection vehicles that they own. In the South this figure drops to 42% and rises to 55% in the Southeast, while in the Northeast it is 56%. While it is clear that many of the vehicles used by the waste pickers belong to them, a high percentage of individuals who do not own a collection vehicle (**Fig. 5**).

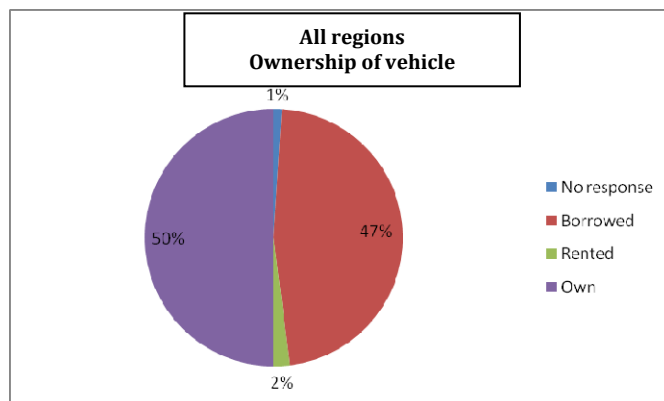


Fig. 5 Vehicle ownership.

This indicates the need for subsidies and credit lines to facilitate the acquisition of vehicles (and other equipment) by waste pickers and organizations to which they are linked.

The 78% of those interviewed who said that they do not own a vehicle, indicated that they borrowed one from the waste pickers' organization to which they are associated. For Vieira, (2011) in these situations, the waste picker is obliged to sell the material to the organization that owns the collection vehicle, making this a labour instrument controlled by a contract, thus binding the scavenger to one of the organizations and restricting the freedom to seek better prices for the materials collected.

The portion of collectors associated to the organization that provides the collection vehicle can reach 80% in the South and 82% in the Southeast. The Northeast region had a slightly lower rate, of 69%. The collection vehicle currently used is the same as that used at the beginning of their activity as scavenger for 65% of the interviewees. These values are close to those found in each of the regions (South, 61%, Southeast, 65% and Northeast, 68%). Among the interviewees, 56.6% reported that they previously used a human-powered vehicle to collect materials.

The current working tool has been used from 1 to 3 years for 32% of the interviewees. Some of the waste

pickers said they had built their own collection vehicle using materials such as wood, metal and wire. The direct consequence of this is an inadequate vehicle that lacks durability. This reduces financial performance and leads to health problems such as bad posture, reaffirming the need for funding, grants and partnerships for the acquisition of better quality, longer-lasting vehicles. The PMF (2004) found that the equipment used for collection in 55.4% of the cases was a human-powered cart, which for 71.3% of the interviewees was their own property and for 80.7% of the waste pickers has always been the one they used for collection.

The lack of planning of collection routes was quite prominent and verified during the data collection, demonstrating the real need for a tool capable of optimizing the routes used by the scavengers. Only 39% of the waste pickers interviewed said they take the same route every day. In the South the figure was 30%, in the Southeast, 43%, and in the Northeast 47%. The lack of planning was perceived by both the association and by the scavengers. There were reports of several waste pickers meeting in the same street, which can decrease the amount of materials collected and increase the number of unproductive routes and unnecessary physical efforts.

The planning of routes becomes more critical when considering the rugged terrain of some cities visited, which highlights the importance of products to be developed as a follow-up to this study. For PMF (2004) 76.6% of the interviewees had a fixed route. For Alencar *et al.* (2009), the search for materials usually occurred on the same streets at different times. A route is usually established by familiarizing themselves with the schedules of trash removal from condominiums or residences.

Collected materials are generally separated at the site of the organization to which the waste pickers are associated, although in some cases the separation occurs in the scavenger's own home or at other sites.

The scavengers' organization was indicated as the predominant place of separation of materials in each of the regions studied. Thus, in the South, this item was selected by 54.8% of the collectors, by 79% in the Southeast and 86.4% in the Northeast. The responses are important for the operation of the system for defining the collection routes that will determine the organization as the end point of the route and for the development of a vehicle that will have equipment connected to it that facilitates unloading.

The materials most commonly collected by the waste pickers are: plastic, aluminium, cardboard, iron, white paper and mixed paper. Only 70.8% collect glass, claiming there is no market to sell this material, that is, in the vicinity of this organization there are no companies that buy glass. Thus, the types of materials collected by each group of pickers reflect the regional

market. The values found did not differ widely by region.

Another factor that influences the types of materials collected is the sales price to recycling companies or intermediaries. When the purchase price is low, the associations do not collect some types of material. The value of the material is directly related to its final destination and the amount of companies seeking the product. The more purchasing companies, the higher the price, while the more material in the market, the lower the price. IPEA (2010) states that the recyclables market is highly segmented and has several actors with different roles. The materials collected and their features also vary widely in factors such as cleanliness and compaction, which influence the purchase price.

Although some of the interviewees did not consider the following as workplace accidents, most of the items mentioned in the interview are common in the routine work of collectors and indicate that they do not use Personal Protective Equipment (PPE). The general data collected indicate a high level of cuts and abrasions (41.5%), backache (38.5%) and falls at work (14.8%) and are presented in **Fig. 6**. Meanwhile, 28.8% said they had never suffered accidents at work. Alencar *et al.* (2009) found signs that the waste pickers suffer from over exertion, indicated by physical and mental symptoms: musculoskeletal pain in 90.9% of interviewees (usually in the lumbar region), physical fatigue, in 95.5%; headaches, in 81.8%, rashes, 27.3%; indigestion in 45.5%, gastritis in 36.4%, insomnia 27.3% difficulty concentrating, 45.5% and mood swings in 63.6%.

In the three surveyed regions, the results indicate that the most common accidents are cuts, scrapes and backaches. The Southeast had a higher percentage of waste pickers who said they have suffered falls while collecting materials (22.5%).

The above problems are associated with unsanitary conditions inherent to the occupation of waste picking and predispose these individuals to a group of diseases that includes frequent body aches and osteo-articular problems as reported by most interviewees. In general, the responses to the semi-structured interview indicate that the pickers do not consider cuts, scrapes and falls to be work accidents. The respondents indicate that they only consider an event an accident when the consequences are more serious. The need was thus identified to invest in training and assistance to increase the use of PPEs, thus reducing health problems related to collection.

According to Alencar *et al.* (2009) the required physical effort requires repetitive flexion and extension of the trunk to push a cart, and leaning and rotating the trunk to watch for passing cars, with the physical stress aggravated when the cart is full. There are also differences in the muscular strength levels required for men and women, as a function of height,

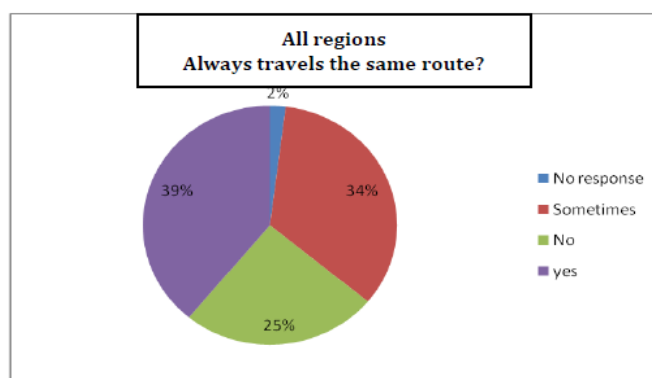


Fig. 6 Work accidents.

age, body weight and others factors. The pickers also risk cuts from sharp materials, since they usually do not use Personal Protective Equipment (PPE).

The use of PPE is not common among the waste pickers interviewed for various reasons. Some reported not using them due to the heat or because the PPE leave them less agile. Some entities have uniforms that identify those who collect recyclable materials. The PPE cited as being used are hats, gloves and boots (**Fig. 7**). A failure to use this equipment was also observed by Silva & Costa (2010). PMF (2004) found that only 25.8% of pickers stated that they had suffered an accident at work, while the use of protective equipment was common to 53% of the scavengers.

The lack of a driver's license is common among the individuals interviewed, hindering the development of a drivable motorized vehicle, since 85% of those interviewed said they do not have a license. This was true in each of the surveyed regions. Therefore, the vehicle to be developed may be more economically accessible, considering the low compensation of the surveyed scavengers.

Regarding the appropriateness of the collection vehicle to the working conditions, some think their cart suitable, while 62% of the waste pickers say it could be improved. In the Southeast, a relatively high percentage of individuals reported not using vehicles for work (19%), however, this may indicate a misunderstanding of the question, (believing it referred to a means of transport to get to the association).

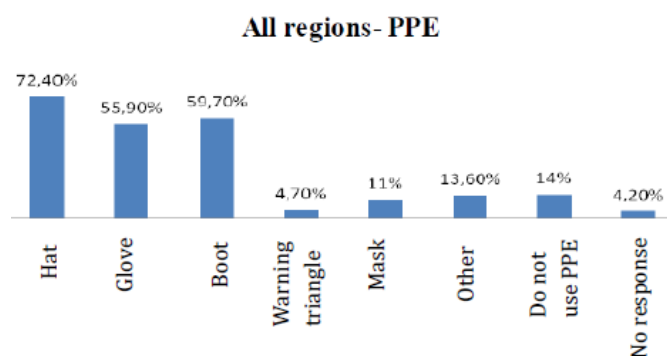


Fig. 7 Use of PPE.

Even those who reported that their vehicles were suitable for the collection activity reported some problems with their equipment. The main complaints about the vehicle referred to excess weight and a lack of shelter in bad weather, both for the waste picker and for the materials transported, apart from the frequent and often expensive maintenance that the vehicle requires, and a capacity below that required to carry all the material that they would like (**Fig. 8**).

The problems indicated among those interviewed, did not differ by region. It is interesting to note that the option “greeable”, referring to the perception of the appearance that the waste pickers have in relation to the vehicle they use is not considered a problem for these individuals, since for them the vehicle is what ensures their and their family’s survival and hence is not ugly or disagreeable.

The main work-related complaints of the waste pickers refer to body pain (back and limbs) and fatigue (**Fig. 9**). These problems are the result of a combination of factors including the failure to use PPE’s, lack of ergonomic suitability of vehicles, excess weight in the vehicle, among others.

Regional differences in terms of problems among waste pickers relate to the fact that in the Northeast, unlike the other regions, the biggest problems mentioned relate to pain in the arms, legs and feet.

Problems with the vehicle

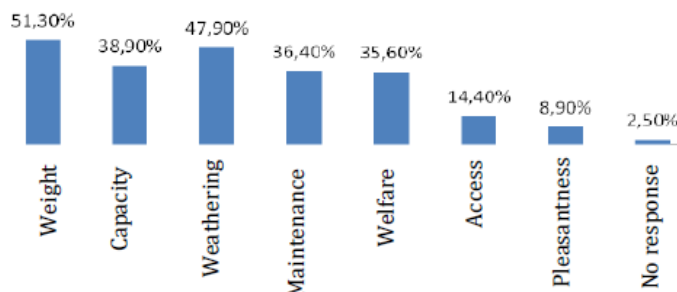


Fig. 8 Problems verified in the collection vehicle.

All regions- Problems in the profession

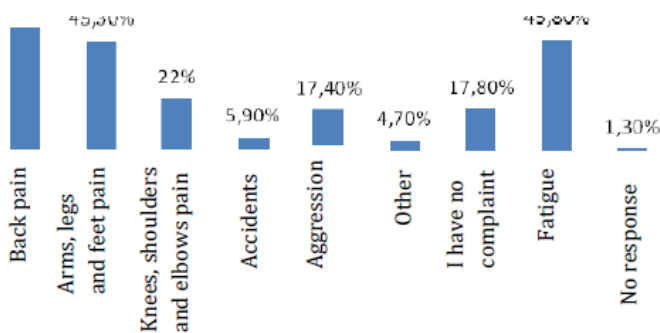


Fig. 9 Problems found in the profession.

During the semi-structured interviews, there were several outbursts by waste pickers who had several complaints about the work they do and the way that society and others involved in the recycling chain relate to them.

One of the complaints is that the companies that buy the recycled materials they collect, usually do not encourage (or do to a minimum) the work of waste picker organizations. This is revealed by the fact that they will only buy in volume greater than most of the associations and cooperatives visited can attain because they do not have sufficient space to store materials. Additionally, recycling companies generally take a few days to pay for materials acquired by waste pickers and usually do so with post-dated checks. On the other hand, the middlemen pay the scavengers at the time of purchase and in cash. It was also reported that recycling companies will not pick up the materials from the organizations, meaning that, in addition to receiving a very low payment, the organizations have to rent a means of transportation for the materials collected. So even though they are exploited by low prices, waste picker organizations prefer to negotiate with middlemen.

The low price paid for recyclable materials affects the waste pickers since they cannot negotiate directly with the recycling companies (with few exceptions) even if they are organized into associations and cooperatives.

It was also reported that the work of waste pickers is not well seen by society, and in part this is due to municipal recycling programs that do not recognize and include the waste pickers as essential components in this process, even if these individuals are responsible for collecting most of the material that reaches the recycling companies. Although they perform work similar to the sanitation companies, which often have expensive contracts with municipal governments, to do so, the waste pickers are not remunerated for their services.

Generally, the aid that waste picker organizations receive from government is restricted to the provision of spaces for sorting materials or the assignment of trucks to collect from more distant locations with greater volumes of waste. These spaces are often small or have poor storage conditions, endangering the lives of workers as observed during a few visits.

Humiliations and embarrassments are quite frequent in the everyday activities of waste pickers and come from different sources: municipal administrators, public sanitation companies that have partnerships with waste picker organizations, the companies that buy recyclable materials, the middlemen and the population in general.

It is common for the pickers to say that society should better recognize their work because it is essential, especially considering its environmental benefits. The waste pickers would also like the population attended by selective collection to show

greater support for their work by properly cleaning and separating recyclable materials. However, they say that as waste pickers they are treated with prejudice, exclusion and marginalization, being constantly seen as part of the problem of social inequality and excessive production of MSW and are not associated with possible solutions to these issues (Romansini, 2005).

The professional achievements that waste pickers have recently obtained in Brazil are the result of efforts by an entity that represents them at a national level that has been struggling to gain improved conditions for the waste pickers as an occupational class. Nevertheless, the actions of this group do not seem to fully meet its stated proposal, in that it has a distant relationship with the waste picker organizations that do not have representatives within the entity. It was found to be a fairly closed group that provides assistance through benefits.

Programs for the social inclusion of waste pickers are intended to reduce the invisibility that surrounds them and promote their work, but often do not achieve their goals, and do not always consider the needs and opinions of the collectors, not providing them autonomy.

The study also found that the courses and training offered to waste pickers do not always improve their work, and almost always repeat what they already know about their craft.

The dangers faced by waste pickers in their daily activities include traffic accidents, cuts and scrapes during the collections and falls and other accidents that may occur even within the sorting sheds. However, the waste pickers do not receive any help in these cases, because they do not have employment contracts or social security. Some of the forms of assistance reported include medicine or food for the sustenance of the family in case of an inability to work, with this aid coming from the organization itself (even though it also has scarce resources), from the middlemen who buy the materials, or from another entity.

The presidents of the waste picker organizations are people who stand out among the other peers, and usually individuals that exercise or exercised social activities in the community where they live, have more education, greater proactivity as well as a great love and dedication for waste picking.

The lack of government subsidies for the purchase of collection vehicles and improvements in working conditions of waste pickers was quite evident in the interviews, which proves Gonçalves and Abegão's (2004) affirmation that the lack of partnerships between pickers and government compromises the ability to conduct joint actions, which could only benefit the local community, the government and the waste pickers. In addition, the lack of partnerships with local government can increase the cost of selective collection because

waste pickers separate recyclable materials with much greater care, removing the undesirable impurities.

On the other hand, several associations reported receiving help from their municipalities through loans for motor vehicles for collecting, the donation of human or animal powered carts and other essential materials for conducting the activity.

Results of the questionnaire at the organizations

The questionnaire was given to 23 associations and cooperatives in the three surveyed regions, 9 of them in the South, 8 in the Southeast and 6 in the Northeast. The organizations whose pickers responded to the questionnaires are not necessarily the same ones that participated in this step. What was perceived is that as a group improves its organization, it makes a greater effort to establish partnerships, including those relating to the loan or donation of trucks for collecting materials, which facilitates the transport of recyclable materials and provides an increase in average income of the waste pickers.

On the other hand, collection by truck has disadvantages considering the higher cost and the fact that this is a less comprehensive form of collection, since it fails to serve the entire population, especially those residing in areas of difficult access, such as narrow or dead-end streets. The collection conducted by waste pickers, therefore, is more advantageous considering the closer contact the waste pickers have with the general population, which creates greater incentives and motivations for the collection to occur, and greater participation by society.

The questionnaire presented to the organizations had a checklist whose purpose was to know whether the entity has its own operations base and work equipment to provide its associates and five questions about its organizational structure. The analysis of the checklist detailed in **Fig. 10** indicates that most of the 23 organizations that responded to the questionnaire do not have their own operations base. The cart-type vehicles are available to 20 entities and the PPEs most used are boots (at 21 groups), gloves (20 groups) and T-shirts (17 groups). In **Fig. 10** the scavengers' organizations from the South are represented in blue, from the Southeast, in red, the Northeast, in green and all 23 in purple.

Dialogs established for this data collection tool also allow us to affirm that entities that do not have their own operational base may rent a space (paid for by the entity itself or the municipality) or use spaces provided by the government or another agency. An urgent need was identified for various forms of support such as the acquisition of land, sheds and equipment such as presses and conveyor belts, that assist the work of waste pickers.

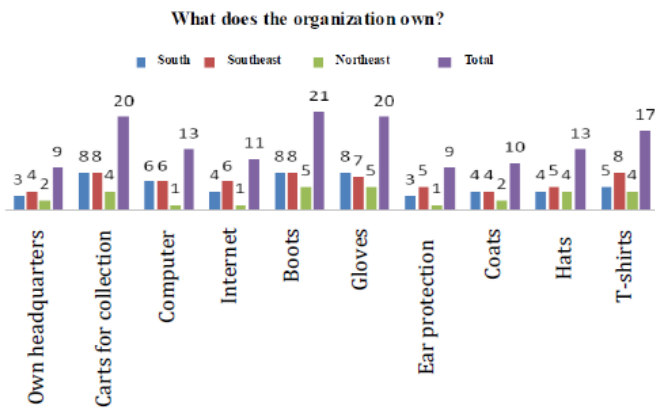


Fig. 10 Possessions of waste pickers organizations.

In addition to the PPE that were included in the checklist, others were also mentioned as being available: full uniforms (pants and shirt), masks, goggles, sunscreen and aprons. However, when organizations provided various types of PPEs, many said that their associated pickers do not use the materials.

In addition to the checklist, the questionnaire for the organizations had five questions. The first was about the destination of recyclable materials that came to the entity. The second about the periodicity of the sale of the materials. The third concerned the amount of materials collected each month. The fourth question sought to know if the organization indicates collection routes for pickers to use. At the end was a space for comments and suggestions. A content analysis of these five questions allowed affirming that:

- The intermediary dealers are the main purchasers of the collected materials for several reasons: the waste picker cooperatives and associations do not have enough material for direct sale to recycling companies due to lack of space to store what is collected or an urgent need for income; a lack of recycling companies that purchase materials in the vicinity of the picker organizations, the lack of organizational structure that would allow waste picker entities to increase the volume of materials collected and thus increase their bargaining power with the companies, payment at time of purchase and the amount paid by middlemen - unlike the middlemen, the recycling industries often pay with post-dated checks, the intermediaries provide trucks to pick up materials at the organizations at no cost, unlike the recycling companies that only buy materials that are brought to them. In the latter case, the shipping costs are left with the association or cooperative.
- In Rio de Janeiro a network of waste picker organizations was found that negotiates and sells all the materials it collects. This increases the volume of material, allowing the middlemen to be eliminated from the supply stream.

- The periodicity of sale varies according to the volume of materials collected, storage space and the need to give money to the waste pickers. The shortest time to market found was 1 week and the maximum time to market 3 months.
- The amount of material collected depends on the number of waste pickers that the entity has and the form of collection (by truck or human- or animal-powered carts). The organization that collected the smallest amount of material sold one ton per month, while the organization that collected the most sold nearly 90 tons per month.
- Although there are some organizations that indicate the collection routes to the waste pickers, most of them do not. For those entities that have a truck and waste pickers who use hand carts, the routes were only indicated for the trucks. The explanation for the lack of definition of routes is that this leaves the waste pickers free to take the route they choose. However, the result of this, especially in smaller cities, is that several waste pickers can cover the same region and a reduction in the amount of material found.
- The space for comments and suggestions was completed with information that had been identified at other moments of the research. Some of them indicated strengths related to scavengers, like the comment that mentioned that the work of the waste picker is being increasingly valued by society, both for aesthetic, and environmental reasons and for the cleanliness of the city.
- However, most of the comments and suggestions are about the needs and aspirations of the waste pickers. For example, they discussed the waste pickers need for assistance, both from the community in the separation of recyclable materials, and from the municipalities in the promotion of the collection conducted by the waste pickers. The comments also mentioned the need to encourage better cooperation among pickers and better preparation, especially for those who are marginalized.
- Some organizations mentioned material needs, such as an operational base, new uniforms and new collection carts.
- Finally, one organization emphasized the lack of harmony of the actions aimed at waste pickers and the real needs of the organizations to which they belong. In this sense, the desire of the group is for the waste pickers to participate in the discussions and development of the actions from the initial stages, not just after the decisions are already taken.

CONCLUSIONS

The purpose of this study was to gather information about waste pickers of recyclable materials to guide the

development of a collection vehicle for recyclable materials and a support system for the definition of collection routes. The main conclusions of the research are related to the specific goals outlined earlier in the study:

Specific Objective 1: Specify the profile of waste pickers of recyclable materials in the three surveyed regions. The collection of information from the waste pickers associated to organizations in the three regions surveyed, allowed composing a profile of the waste pickers in each of the regions. The information gathered was generally similar to that found in a bibliographic review and identified a low educational level among the waste pickers and low monthly income.

Specific Objective 2: To diagnose the working conditions of individuals associated to waste picker associations and cooperatives. The working conditions of waste pickers in the surveyed organizations are precarious, requiring recognition of the social, environmental, and economic importance and the public health service provided by the activity performed by the waste pickers. A lack of support was found from many different sectors of society that could strengthen the role of the waste pickers. The activity of collecting recyclable materials was characterized as being exhausting and of an informal character, and as being poorly paid, requiring plans, policies, subsidies and financing to promote significant improvements in the working conditions of waste pickers, that could allow more adequate remuneration for the service they provide society.

Specific Objective 3: To understand the physical and operational structure of the waste picker organizations. The waste picker organizations that composed the research sample have precarious physical and operational infrastructure, indicated by the lack of various items including: offices, machinery, equipment and collection vehicles; and space suitable for sorting and storage of the collected materials, which would allow the accumulation of enough materials for the establishment of negotiations with recycling companies, eliminating the middlemen; technical support for better management of the organization; financial support for acquisition and maintenance of needed equipment and physical structure.

The low administrative capacity of waste picker organizations leaves these groups unable to maintain themselves without outside support, and aggravates the problems that underlie the activity of collecting recyclable materials. It is hoped that this study provides an overview of the activity performed by the recyclable materials collectors and indicates, the importance that these workers have in the Brazilian economic,

environmental and social scenarios. Moreover, it is hoped that this work can guide decisions that can improve the working conditions of waste pickers.

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