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RECYCLING INDUSTRIES IN THE STATE OF RIO DE JANEIRO: SPATIALITIES AND MARKETING NETWORKS OF METAL, OIL AND RESIDUAL FATS (OGR), PLASTIC AND PAPER

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ABSTRACT

Recycling and its socio-environmental impacts have been frequently addressed by the most recent geographical studies. Thus, this article intends, through studies of geographical science, to unveil the possible forms of theoretical interpretation of the phenomenon of recycling, dialoguing about the relationship between waste picking and the precariousness of work in the very transformation of the capitalist mode of production. It also discusses how capitalism needs unequal relations for its maintenance, also using strategies so that the professional collector does not recognize the importance of his work for society. In addition, it seeks to bring important data and figures, through graphs and cartograms, about the recycling industry operating in the State of Rio de Janeiro. Finally, this work demonstrated the importance of looking at certain marginalized individuals and functions in Brazilian society, understanding the current system of oppression, and seeking a more balanced relationship between the subjects that make up the recycling production network or the "garbage game".

Keywords: Uneven development scales. Recycling industries. Spatialities and commercializations.

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INTRODUCTION

Currently, we hear a lot about sustainability, and, therefore, it would not be possible for research in geography to stop being interested in the study of solid waste and everything that involves its management and treatment. In summary, the daily practices of recycling, its management, and socio-environmental impacts in the urban space have been the aspects most addressed by the recent geographical perspective.

In this sense, it is essential to remember the social subjects who are involved in the practice of waste picking and recycling since they are part of the processes of a geography of inequality and labor exploitation that interconnect and interact in an interdependent way at multiple geographic scales.

Therefore, this article seeks to dialogue with a specific literature of geographical science to reflect on the possible forms of theoretical interpretation of the phenomenon of scavenging. In addition, it brings important data and numbers related to the recycling industry that operates in the State of Rio de Janeiro.

This article is divided into two parts. The first part, "Waste picker and the scales of uneven geographic development", deals with aluminum scrap and its importance for the security of the national economy (due to the higher value it has in relation to other scraps), which suffered negative effects during the 2008/2009 crisis.

In addition, it dialogues about the direct relationship between waste pickers and the precariousness of work and the transformation of the current capitalist mode of accumulation, which promotes unemployment in the formal market and gives rise to alternative and informal forms of income, as is the case of recyclable material collectors, who are the main part of maintaining production. But they represent the weakest link at the bottom of the hierarchy, which is made up of waste pickers, scrap buyers, middlemen, and entrepreneurs in the processing industry. This chapter also deals with how capitalism needs these unequal relations to maintain its status, where one population languishes while the other expands.

The second part, "Recycling industries in Rio de Janeiro", presents cartograms that locate the recyclable materials industries in the state of Rio de Janeiro, being detailed by material and spatial distribution in the state, about the places of final disposal of the waste. It also discusses the strategies used so that the waste picker worker does not understand the importance of his work, believing that he depends on his hierarchical successors and

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that they are doing him a "favor", thus disguising a certain imbalance in the power relations between the individuals involved in the phenomenon of waste picking.

In addition, it brings graphs that demonstrate and explain the surrounding aspects of the spatial distribution of the metal recycling industry in the state of Rio de Janeiro, as well as the recycling of OGR - residual fat oil, aluminum, PET, and paper.

Thus, it is necessary to debate the role of recycling and waste pickers in the capitalist system of production and how the main actors involved experience this space, analyzing how their labor relations and exploitation contribute to a geographical and social development that perpetuates inequality.

SCAVENGING AND THE SCALES OF UNEVEN GEOGRAPHIC DEVELOPMENT

Social inequalities have been the subject of research in several areas of the social sciences. However, we will seek, in the theoretical contribution of Geography, the understanding of how inequalities are historically and geographically produced in capitalism, to then analyze the relationship between unequal geographic development and the recycling production network.

Regarding the national scale of the recycling industry in Brazil, Pereira *et al.* (2016) discuss the impact of recycling on the Brazilian economy in its interface with the national market and the export market. The authors demonstrate the importance of maintaining the recycling practice for the security of the national economy when referring to aluminum scrap, the main product of the sector in the country. The highlight of aluminum lies in the higher value paid for it compared to other recyclable materials, such as plastic and paper.

The authors show that the country was in an advanced situation in the world context of aluminum recycling, having, in mid-2000, exceeded 95% of aluminum material recycled in the domestic market. This represents a direct relationship between the purchase of scrap and the production of aluminum in Brazil, consolidating a network production system. However, when crossed by the value of transfer to the base of the recycling chain/network – collectors of recyclable materials- there is still a low remuneration, to the detriment of higher values earned by actors who occupy hierarchically superior positions in the production network, such as middlemen and entrepreneurs.

Pereira *et al.* (2016) highlight the direct (negative) effects of the 2008/2009 economic crisis on the Brazilian recycling production network. The same phenomenon of

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the effects of global economic processes on the national recycled market was noted by Costa, for whom:

> The economic crisis, which devastated the world in 2009, sharply affected the recyclables market; in particular, the metals market, lowering the amounts paid to scrap collectors, since the industry gave preference to the use of virgin raw materials in the production process, such as pig iron (COSTA, 2014, p. 52).

This consequence is defended by the authors as a result of the drop in Brazilian exports of metallurgical products and, of course, the excess of virgin raw materials in the domestic market, thus reducing the value of waste pickers' scrap. According to Costa and Chaves (2012), the work of a waste picker is directly linked to the characteristics of contemporary capitalism, more specifically to the changes in the configurations of this system and the phenomenon of work in recent decades.

> In the social and human sciences, there is a need to understand the phenomenon of work in garbage, based on the questioning of the role of waste pickers in the recycling industry, fruitful issues, such as the reinsertion of garbage in the capitalist logic of production, the class struggle through the expansion of poverty and denial of access to the world of work have been (re)thought in the context of the strategic dynamics of the expanded reproduction of capital (COSTA and CHAVES, 2012, p. 02).

The authors assume the need for approaches to social labor relations with regard to the capitalist system of recycling production. In this way, they define their analytical approach in understanding the position of waste pickers within the recycling production network. They also highlight the direct relationship between waste picking and the precariousness of work and the transformation of the current capitalist mode of accumulation, pointing to an increase of approximately 240% of workers in the recycling sector in Brazil between 1995 and 2005. According to Costa and Chaves (2012 p. 03), the growth in the number of waste pickers guarantees "the sustainability of the industrial processing of materials, ensuring greater gains through worker exploitation, reduction in the use of raw materials, energy savings and, consequently, maximization of profits".

However, the position of these professionals in the recycling production network represents the weakest link at the bottom of the hierarchy, which comprises, in ascending order, collectors, scrap buyers, middlemen, and entrepreneurs in the processing industry. It is interesting to note that, although the recycling production network is crossed by several actors, if we look at its functioning, we observe that the collectors of recyclable materials

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constitute the main part of the maintenance of production and the possibility of achieving high rates of profit by capitalist agents in peripheral countries.

Corroborating Montenegro (2011), Costa and Chaves (2012) also state that the social situation of waste pickers is materialized in precarious working conditions, resulting from the constant search for survival strategies. The same is argued by Bosi (2008), for whom waste pickers are socially excluded subjects who seek alternative ways to produce income. For the author, the massive increase in workers whose trade refers to informal waste picker work is directly associated with the increase in unemployment in the formal sector, which leads excluded workers to seek in waste picking a possibility of income.

Seeking to dialogue with Harvey's (2011) theoretical proposal, it is possible to understand the production network of garbage recycling as belonging to the cycle of constant capital accumulation. By discussing what he called the 'enigma of capital, Harvey produced a reflection on how capital is maintained and reproduced, according to a logic of constant accumulation, concentrated in the wealthier classes, to the detriment of the plundering of the less wealthy classes. The author states that throughout the history of capitalism, in order to maintain the economic growth of the system, new patterns and practices are established, changing the power relations between the actors that spatially compose such a system.

Thus, one of the ways pointed out by Harvey (2011) for the increase in profit rates for the accumulation of constant capital is the change in jobs and working conditions and, of course, the reduction of job offers and the expansion of an industrial reserve army. Workers, in addition to being adrift, under conditions of poverty, are driven to compete with each other for the occupation of scarce job vacancies or even underemployment, with lower and more precarious wages. When it is not possible to have a formal professional allocation, excluded workers, in search of survival, start to create new work practices and income generation, as is the case of urban solid waste collection.

The dialogue proposed by Harvey (2011) contributes to the notion of excluded workers presented by Bosi (2008). The paradoxical informal practice of work, despite not being part of the upper circuit of capital accumulation, contributes, albeit in parallel and indirectly, to the logic of capitalist reproduction. If, on the one hand, the excluded subjects are part of the industrial reserve army in the fight for employment in the formal sector and force the wage base down; on the other hand, they collaborated for the reproduction of capital, returning, as waste pickers, raw material from solid waste to the recycling industry,

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as well as acting as consumers of necessities, such as food and hygiene products (albeit in a very precarious way).

Thus, it is necessary to debate the capitalist system of production and its socio-spatial differences since they are of great value to Smith's theory of uneven development (1993). For the author, in order for the expansion of capitalism to be constantly imprinted and to correspond to the eagerness for capital accumulation, it is inevitable and strategic that a logic of uneven development be established. Now, what the author states is that, while there is economic growth of a certain population group, another population group languishes to the detriment of this one.

Likewise, Harvey (2011) points to the intensification of an unemployment process linked to the need to increase profit. Thus, Smith (1993) states that, for the development of capital, the production of inequalities is a condition. By proposing spatially uneven development, Smith explains that the development of one place is associated with the impoverishment of another. In this way, we can conceive the excluded workers who compose, as waste pickers, the recycling production network in the state of Rio de Janeiro as a reflection of unequal capitalist development.

On the way to understanding the phenomenon of inequality, the result of the production of recycling, Ross, Carvalhal, and Ribeiro (2010) state that:

> (...) We note the strategic forms of capital in the exploitation of the work of recyclable material collectors, noting the perversity engendered by the reproductive processes of capital. The condition of precariousness is structural to the economic support of the recycling circuit, as a corollary of the lack of alternatives for workers, who "must" submit to such a condition (ROSS; CARVALHAL; RIBEIRO, 2010, p. 118).

As discussed by the highlighted authors, analyzing the labor relations and exploitation of selective collection workers contributes to the understanding of the unequal organization of space because, based on labor relations, a logic of exclusion of these workers in space is perpetuated. It is worth noting that, according to Corrêa (2000), space is the result of social relations (also intrinsic to labor relations), as well as being a fundamental element for the maintenance of these same relations.

The meaning, then attributed to space, is directly related to the social relations that constitute it. However, the simultaneous conditions for the maintenance of these relations are related to the existence of this spatial configuration itself in a dialectical way.

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Thus, understanding how the main actors who experience the recycling space animate the production network means understanding how social and work relations are established between actors within the scope of a networked spatial ordering. In other words, as a starting point, it is necessary to reflect directly on the practice of scavenging and the workers who carry out such labor practice. Ross, Carvalhal, and Ribeiro (2010) point out:

> These workers carry out this activity of scavenging informally, that is, without the legal attributes of a formally registered worker, which is an important dimension of precariousness since they are unprotected from the insecurities that affect the activity (without guaranteed minimum income and protection against accidents or health problems). Moreover, they are intrinsically subordinate since they sell their labor power to the recycling industries (middlemen) that exploit them. These waste pickers perform this work function without receiving the social benefits of the world of work, as previously mentioned, in addition to being an exhausting job, with long daily hours of work in waste picking (ROSS; CARVALHAL; RIBEIRO, 2010, p. 119).

In the same way that a worker in the formal sector composes labor relations, as subordinate about the owners of the means of production, the informal worker (street collector) who, in this case, relates to the recycling industry through middlemen, given the absence of the protection of labor legislation, establishes himself in a relationship of even greater exploitation. Ross, Carvalhal, and Ribeiro (2010) conclude their reflection by stating that:

> (...) The organization of waste picker workers does not mean freedom from the metabolism of capital because, for the capitalist system, it is useful in its reproduction and expansion in which there is informal and precarious work. In this environment, public policies are necessary, ensuring the social insertion of waste picker workers and aiming at better living conditions. These attitudes are identified through cooperatives that are configured in organizational structures that can obtain the fair inclusion of workers and in a not so perverse way (ROSS; CARVALHAL; RIBEIRO, 2010, p. 130).

In the aforementioned excerpt, the tension of labor relations involving the actors in the recycling production network does not guarantee the full inclusion of these subjects who work in the collection of recyclable solid waste, also requiring a broad legal framework of social rights, as well as targeted public policies.

In this sense, Dagnino and Dagnino (2010) discuss real initiatives that could be adopted by public managers (and, in turn, in the promotion of public policies). In order to establish public policies and define arrangements in favor of the rights of workers involved in the recycling production network, it is necessary to take into account the interests of

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current and future society. By returning to the contributions of Dagnino and Dagnino (2010), it can be understood that such public policies must correspond to the interests of the actors that make up the garbage game. Nevertheless, the social position in which they are inserted is directly related to the scope or non-scope of the public policies sought.

In contrast to the precariousness of work and the generation of a broad mass of unemployed, Harvey (2011) highlights that capitalism needs to constitute a consumer market for the goods produced. Thus, the working class, at the same time that it is exploited through labor, whether by extracting absolute or relative surplus value, acts as consumers, feeding back the circulation of the market, favoring the capitalist in two ways: through the purchase of produced goods and, therefore, the generation of direct profit for the capitalist; and through its exploited labor force. Thus, the author points out that the worker is essential for the maintenance of profit and the capitalist system itself.

If, for Corrêa (2000), space is the result of social relations, it is also a fundamental element for the maintenance of these relations and all practices intrinsic to social relations and, as it is a capitalist production system, it corresponds to a spatial logic that positions the subjects spatially, according to the power conditioned to the accumulation of capital. The practice of selective collection and its entire unequal network is, in this way, fed back by the logic of capitalism and the favoring of only a portion of society.

Thus, it can be understood that, at the same time that the collectors of recyclable material make up the weakest link in the recycling production network or the 'garbage game', the non-existence of these workers would correspond to the non-existence of the network as it is, particularly when referring to the existence of this network under an aspect of the Brazilian peripheral reality and, more precisely, from the state of Rio de Janeiro.

MATERIALS AND METHODS

The methodological path for the realization of this article on the organization of recycling circuits in the state of Rio de Janeiro, aiming to understand the performance of the actors involved; and, also, the conflicts and barriers that exist in the production of recycling, whether in the implementation of public policies or the limits of collective actions. In addition, we intend to analyze the socioeconomic situation of waste pickers based on data collected by PANGEA (2018). The proposed approach encompasses a broad spectrum of processes, actions, and social and spatial relations, which will require different methodological, qualitative, and quantitative procedures.

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By understanding that the research must contemplate the economic, political, historical and social links that build social relations, considering the complexity of the spatial reality established in this work, we used both quantitative data, from the PANGEA databases, to analyze the capital-labor relationship and the socioeconomic condition of the collectors, as well as qualitative data, from the analysis of documents and, mainly, from the experience lived by the researcher in the field of recycling.

Therefore, the commitment assumed by the research, by proposing to problematize and understand the relationships established in the recycling scenario, is to contribute to a more qualified look at the actors (governments, industries, merchants, cooperatives, etc.) involved in the recycling production network, in the formulation and implementation of actions aimed at the entire network and the subjects who practice it in their daily lives.

Among the documents that were analyzed, we highlight the report developed by the State Secretariat for the Environment – CRS/ Fundação Getúlio Vargas – FGV and by the NGO PANGEA – Center for Socio-Environmental Studies, which identified and registered, in 2014, 3,084 (three thousand and eighty-four) waste pickers and recyclable material collectors and carried out a socioeconomic diagnosis of solidarity economic enterprises of the productive network of waste pickers in 41 municipalities in the state of Rio de Janeiro3element. From this survey, a report was carried out in 2015 for accountability, having been delivered to the Management System of Agreements and Transfer Contracts of the Federal Government – SICONV.

Concomitantly, it was pertinent to promote a survey of secondary data from the recycling sector, as well as IBGE, IPEA, Laws, articles, theses, reports, dissertations, in which it is intended to draw a general overview of the functioning of recycling in the state: the types of materials collected (i.e., the networks of paper, plastic, aluminum, OGR4, cardboard). For Silva & Mendes, "documentary research represents a resource capable of bringing important contributions to research, because it can help in the understanding of the facts. Thus, documents deserve special attention in qualitative studies" (2013, p. 210).

[3] For the development of the report, I was able to participate both as an employee in its execution and in the creation of the system aimed at compiling the information collected in the research, generating maps and data files. We also had the collaboration of 40 (forty) enumerators, who were in charge of visiting the collectors of recyclable materials, carrying out the appropriate face-to-face interviews with a closed structure. In this work, which lasted 6 (six) months, Global Positioning System - GPS devices were used as a methodological resource, in order to obtain precision as to the location of each of the collectors.
[4] Residual Oils and Fats – OGR.

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We mapped the organization of all recycling production networks in the state of Rio de Janeiro, identifying cooperatives, private companies, public agencies, and other actors active in these networks. From the interviews, we sought to verify the conflicts, tensions, and institutional barriers in the context of the organization and functioning of the recycling production network.

We chose to carry out the semi-open interview model with a pre-established script because we recognize the importance of qualitative research as a way of understanding the actors involved and their actions. In this sense, "field research is a means and not an end in itself. It is the research that is indispensable to the analysis of the social situation. It is a social situation and not a spatial situation" (KAISER, 2006, p. 97). For the author, the social situation, from the Marxist point of view, is fundamentally a product of history. Or again, it is the product of the class struggle, as it is expressed on the ground. Finally, he contributes to us: "the analysis of the situation must take everything into account: in essence, it is what is called today a system analysis. The local situation is, in reality, a subsystem, a metasystem, representing social formation" (KAISER, 2006, p. 97). In addition, the author emphasizes the attention that the researcher must have to what is produced in the daily lives of those who are inserted in the field research:

> For him, the familiar, the everyday, is the important, the significant. And social analysis must be done from what is at the core of people's lives, from what conditions their current and future existence, from what the past has made of them. Hence the importance of the cultural and political levels. The researcher must be prepared not to be distracted by the anecdotal, the strange, and the singular. It is one thing to observe to try to understand, to record the phenomena to interpret them, with the support of general explanation; another is to go "to research" like someone who goes to the zoo or safari! (KAISER, 2006, p. 100).

We understand the relevance of fieldwork, which must be done directly, as Borges points out, in which "... the researcher must integrate himself into the group, analyzing it from the inside out, through daily experiences and coexistence" (p. 186). According to the author, participant observation is the technique that some authors call method:

> For those who venture into the search, in the field, for the understanding of the various human manifestations in space, especially when directly related to culture, participant observation has been able to provide good instruments to identify and establish relationships with theoretical studies (BORGES, 2009, p. 185).

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With this in mind, we launched ourselves into the search for understanding the daily processes of recycling in Rio de Janeiro, "through people's memories and the reconstitution they make of the history they have learned, the great determining features of the current situation appear clearly" (KAISER, 2006, p. 99). We seek, based on the narratives of the actors and subjects of the recycling production network, to learn from them.

As Santos (1995) contributes, who thinks about inequalities from the sociology of absences, an investigative procedure intends to unveil what supposedly does not exist, due to its invisibility vehemently produced in the modes of unjust and predatory social relations. Therefore, the intention is to convert non-legitimate subjects and processes into legitimate ones, and also to transform absences into presences. Apprehending with these narratives allows us to highlight "(...) that fieldwork should not be reduced to the world of the empirical, but be a moment of theory-practice articulation" (ALENTEJANO; ROCHA-LEÃO, 2006, p. 56).

In order to present the waste picker and his living conditions, we will turn to Santos (1995), who tells us that if inequality is a socioeconomic phenomenon, exclusion is mainly a cultural and social phenomenon, a phenomenon of civilization. And so, culture is strengthened and legitimized, by a historical discourse that is supposedly true and that aims not only to dictate what needs to be followed, but also to reject everything that does not fit. It refers to a historical process by which a culture, through a discourse of truth, generates the interdict and rejects it.

Waste pickers, then, are pushed to the condition of marginality in society, in which their place is seen as subordinate and invisible, even though they occupy a role of paramount importance in the recycling production network. We will then seek to survey the socioeconomic conditions of waste pickers, in which their character of exclusion and social invisibility prevails.

We also aim, with the analysis of the data, combined with field research, to understand the social processes, through documentary sources and interviews, to better examine it, then regroup and reconstruct it.

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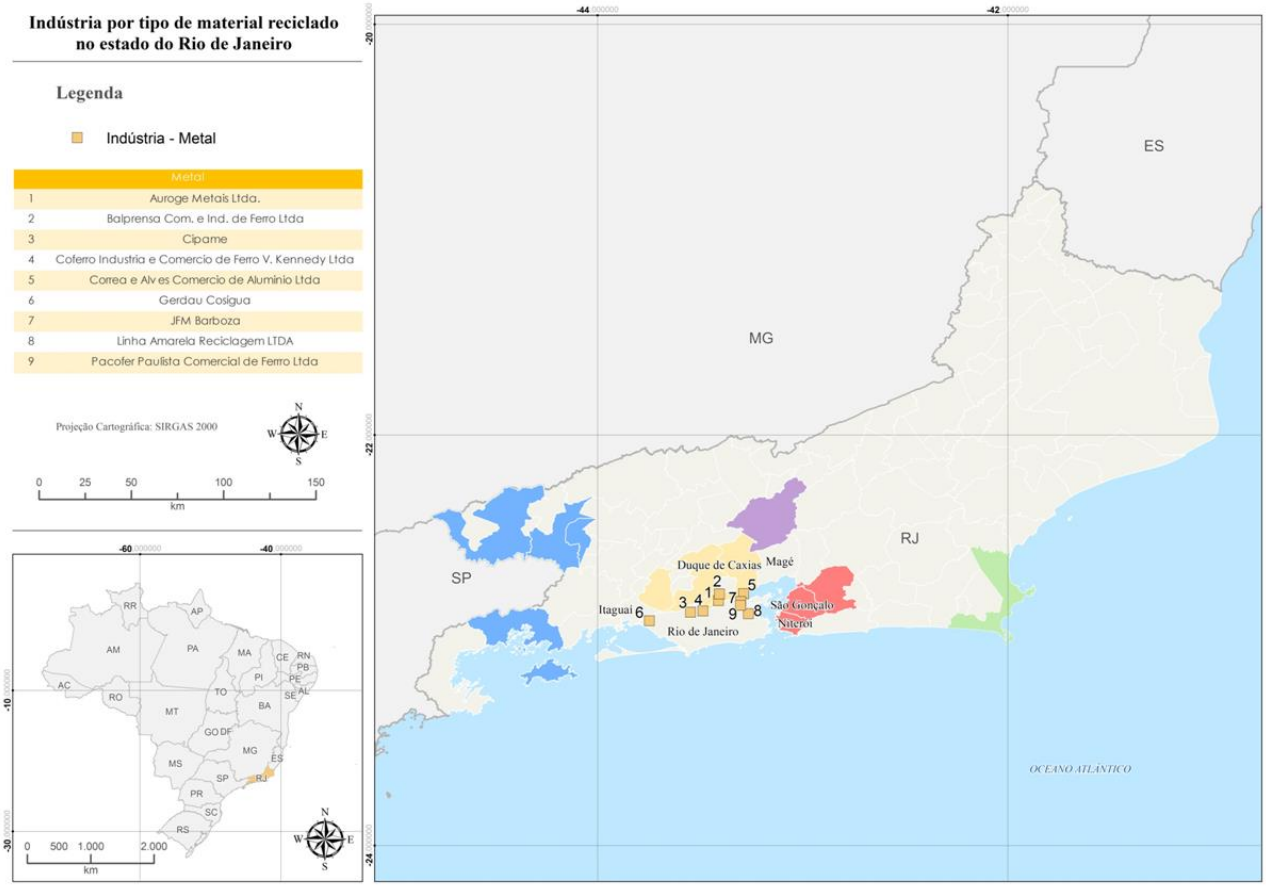
RECYCLING INDUSTRIES IN THE STATE OF RIO DE JANEIRO

In the following cartograms, which deal with the location of the recycled materials industries in the state of Rio de Janeiro5, we detail each one by material and its spatial distribution in the state, in relation to the places of final disposal of the waste.

Figure 1 - Spatial distribution of metal recycling industries, in the state of Rio de Janeiro - (2019)



Caption: Prepared by the authors, through a survey carried out in field research - 2019.
Source: The authors, 2018.

The previous map shows that the spatial distribution of the metal recycling industry in the state of Rio de Janeiro is concentrated in the metropolitan region, which implies for this type of recyclable a specific logistics plan. The metal industries in the state of Rio de Janeiro are: Gerdau Cosigua, Auroge Metais Ltda, Balprensa Com. Ind. de Ferro Ltda, Cipame, Coferro Com & Ind de Ferro V Kenedy Ltda, Correa e Alves Com de Alumínio

[5] TIRE - Recycled Rubber - Estrada União e Indústria, 620 - Bairro Monte Castelo - Municipality of Três Rios - R. The only tire recycling industry in the state of Rio de Janeiro.

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Ltda, JFM Barboza, Linha Amarela Reciclagem Ltda, Pacofer Paulista Comercial de Ferro Ltda, MW Reciclagem.

This need is met and, if negotiated with the entrepreneurs of the industry, it is differently negotiated in relation to the payment of this material – and also the sorting of it -, in addition to what has been previously demonstrated about the 'non-rationality' of the subject who, through mechanisms and strategies, absents the worker linked to the collection of material, from the knowledge about the importance of his work, as well as regarding the logic of commercial operation of this material, thus excluding the possibility of direct negotiation. In other words, Gonçalves highlights:

> Thus, in order to participate profitably in this trade network, the scrap dealer must have, in addition to knowledge about the functioning of the recyclable waste market in its various scales, a basic infrastructure, which presupposes the existence of a place for storage, machines and people who will do the separation and pressing and vehicle(s) for transporting the goods from the dumps to the warehouses (GONÇALVES, 2006, p. 80).

The author also advances the notion that the maintenance of the direct exploitation of the scrap dealers towards the waste pickers, maintained through the logic of an affirmed and accepted discourse, is placed as a pseudo-discourse of improvement in the relationship between scrap dealer and waste picker, disguising the inequality of power imprinted in this relationship, based on an understanding that the scrap dealer collaborates with the income of the waste picker, because he establishes himself as a buyer (client) of the collector.

Thus, in the same way as the other authors, Gonçalves also understands the recycling of urban solid waste in its labor relations, according to a network that corresponds directly to the logic of the capitalist system of production, since it is based on uneven development and, of course, on the unequal relationship between the actors that compose it. It is a direct way in which profit is produced intrinsically to the exploitation of the worker, who constitutes the fundamental basis of the recycling chain, as well as establishing himself as the main exploited in this network.

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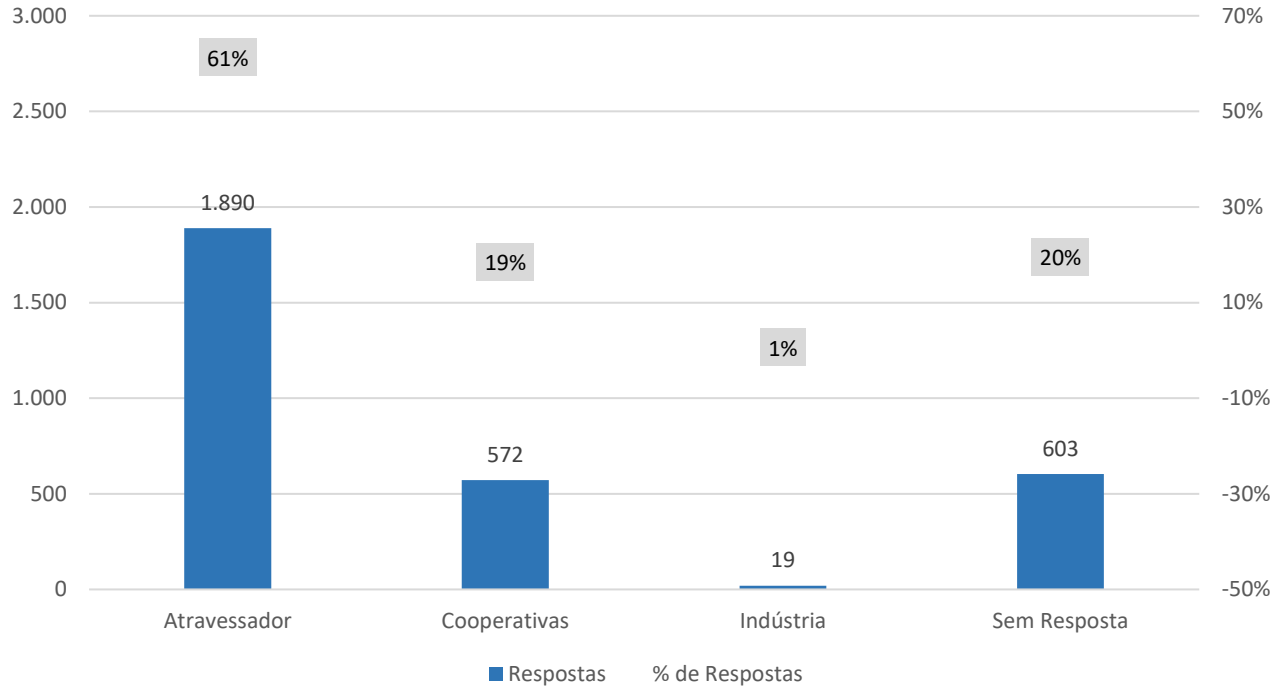
Graph 1 - Aluminum: Who do you sell it to? - (2014).



Legend: Elaborated from questionnaires applied in the research carried out by PANGEA/FGV.
Source: The authors, 2018.

From the point of view of the aluminum commercialization process, 61% of the interviewees informed that they sell this material to middlemen, that is, to intermediation structures, and 19% to cooperatives that, in this case, also function as intermediaries, even though there are within these organizations, among their members, supposedly, production relations based on solidarity economy. Evidently, the fact that an individual collector sells his product to a cooperative is still a contradiction in itself, because if within the organization relations of solidarity economy prevail, in the cooperative relationship – unorganized collector, a relationship of intermediation prevails.

Only 1% of respondents reported that they sell their materials directly to the recycling industry. In fact, this material, due to the nature of its recycling process, whose nature is characterized by the use of intensive capital, has an oligopsony structure. Probably the 19 respondents who say they sell to the industry must be referring to intermediaries, as there is no information in the market of aluminum recycling industries that buy this material from individual collectors.

The largest scale of sale is for middlemen, with a much higher number of sales, even if the collector has a financial disadvantage at the time of commercialization with the middleman. This is what collector C tells us when he tells us that the product has a high

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added value, but that there is suspicion that the middleman's scale is not properly calibrated. Another recurring complaint made explicit by the collector was related to the consideration of the discount of the possible liquid that may exist in the content of the aluminum can, which is around 10% to 20% of the value of the total product weighed on the scale.

We noticed, through the graph in the survey, that 1,890 respondents (61%) have a direct economic relationship with the middleman, as he has immediate working capital to buy such goods and meets the immediate survival needs of the collector, even selling his goods weekly to the middleman. In numbers, direct sales to the middleman also represent more profit for the collector, since, while the cooperative pays R$ 1.85 and the industry for R$ 3.00 per kilogram of aluminum, the middleman for R$ 3.20. Thus, only 572 people (19%) seek to sell their goods to cooperatives. And, when interviewing collector 01, he contributes with the information that these cooperatives are medium or large or façade cooperatives, popularly known as "coopergatos".

Regarding the spatial distribution of the recycling network of OGR - residual fat oil, in the state of Rio de Janeiro, the same behavior of the metal is observed, with high industries located in the metropolitan region, however, with few existing options for this type of recyclable, which requires its own and specific logistical arrangement. Companies that have a plant for processing OGR oil invest a high amount in machinery and a specific license from the SEA - PROVE Program, which is obtained from the Department of the Environment.

In Rio de Janeiro, only JRM Reciclagem and Lwart Lubrificantes ltda have this license and cooperatives do not even have a technical staff to carry out the maintenance of the machines. For this reason, there is no record of the oil being sold by the collectors.

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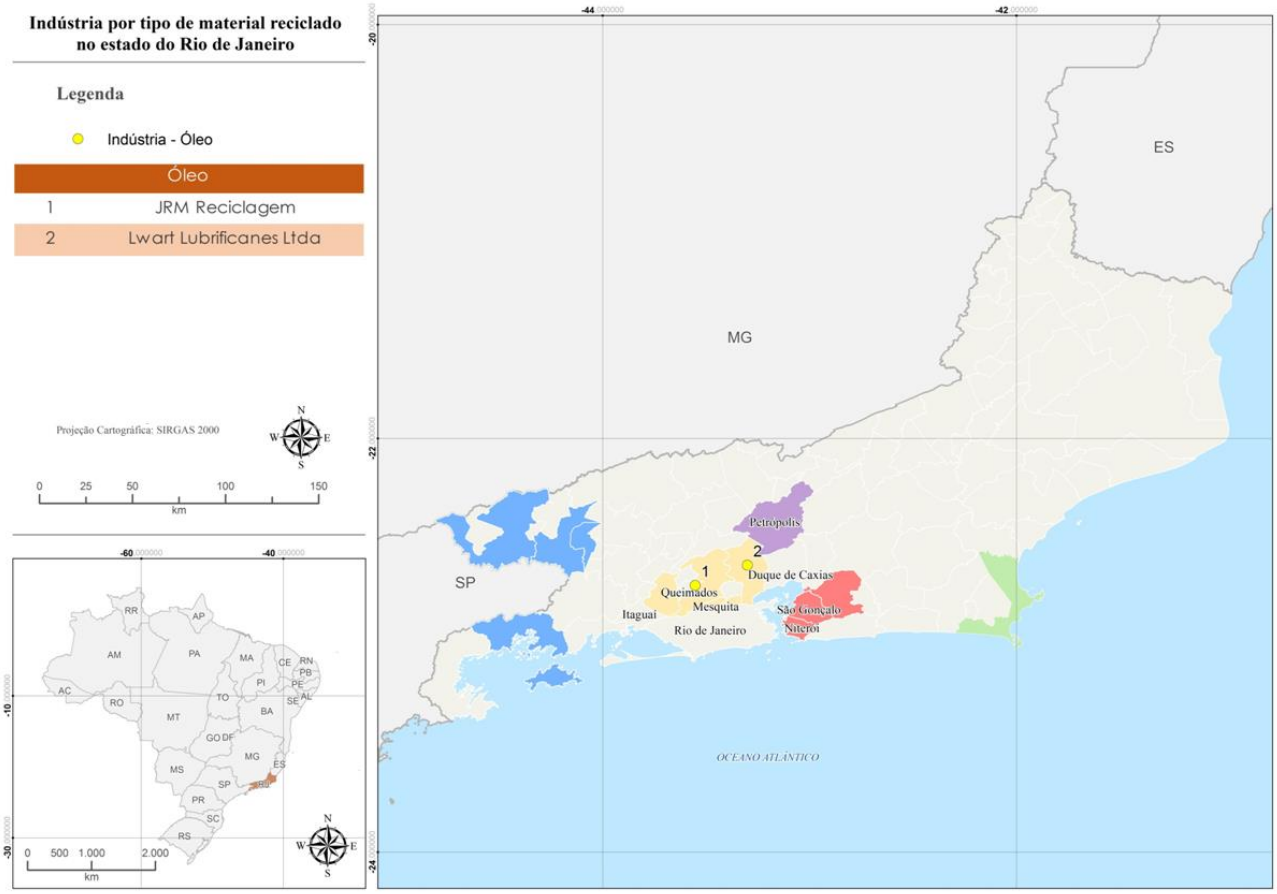
Figure 2 - OGR recycling industries in the state of Rio de Janeiro - (2019)



Legend: Prepared through a survey carried out in field research - 2019.
Source: The authors, 2018.

Regarding the spatial distribution of the plastic recycling industry in the state of Rio de Janeiro, there is a greater spatial deconcentration, with the presence of several industrial units distributed in other regions. This implies that the Logistics Plans for this type of recyclable will enable regional inter-network agreements, not so dependent on the metropolitan network of waste pickers.

As the price of aluminum is higher, the collector prefers to collect aluminum. This demonstrates one of the reasons why Brazil has such a low percentage of plastic recycling. In plastic, the collector prefers to negotiate with the cooperatives, and the middleman is not discarded, although in a smaller proportion. The value of the machinery needed to work with plastic is low-cost, because even the machine that separates the plastic by color is low-cost, which makes it possible for cooperatives to acquire transformation machines.

Among the plastic transformation industries in the state of Rio de Janeiro are: Belizário Plásticos, Bell Pet Reciclagem Indústria e Comércio de Plásticos Ltda, Charroma Plásticos Suc. Indústria e Comércio Ltda, Chico Comercial e Indústria de Plásticos Ltda

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(Salix), Daher e Gama Comércio de Plástico Ltda (Plasbil), Hermatek Indústria e Comércio Metalúrgico Ltda, IBP Indústria Brasileira de Plásticos Ltda, IMP - Indústria de Material Plásticos Ltda, Indústria de Plásticos Zarzur Ltda, IRF - Indústria e Reciclagem Fluminense, JRM 21 Indústria e Comércio de Plásticos e Reciclagem Ltda, L.M.G - Indústria e Comércio de Plásticos Ltda, Lupe - Comércio e Indústria de Plásticos Ltda, Metalplac Indústria e Comércio Ltda, NobrePlast Reciclagem e Indústria de Plásticos Ltda, PeterLub Indústria e Comércio Plástico Ltda, Plascor Line Indústria e Comércio de Plástico Ltda, Plastemax Indústria e Comércio, Plásticos Indústria e Comércio Risan Ltda, Plastimaq Indústria e Comércio Ltda, Plastin Indústria e Comércio de Plástico Tec Equipamentos Resíduos Ltda, PlastQuimica Indústria e Comércio Ltda, Pluriplast Indústria e Comércio de Plásticos Ltda, Poli Injet Indústria e Comércio de Material Plástico Ltda, Politubos Indústria e Comércio de Plásticos Ltda, RDM 2000 Indústria e Comércio Representação Ltda, Reale Plásticos Indústria e Comércio de Recicláveis Ltda, Faizão Indústria e Comércio de Reciclados Ltda, Faria Plásticos Comércio de Recicláveis Ltda, Pacofer Paulista Indústria e Comércio de Ferro e Máquinas Ltda, RecPlast Indústria e Comércio Material Plástico Ltda, Roma Plásticos Indústria e Comércio Ltda, Guanapel Embalagens Ltda, Frilca Indústria e Comércio de Sacos Plásticos Ltda, Bauen Indústrias de Plásticos Ltda, Prensa Brasil Ltda, Dutoplast Indústria e Comércio Ltda, Âncora Indústria e Comércio de Estopas, Polyrio, Granplast Indústria e Comércio de Plásticos Ltda.

Such companies mentioned above are the main buyers of plastic in Rio de Janeiro. These companies are small and medium-sized, in which their transformation plants require low informational capital and reduced investment cost, which corresponds to the lower circuit, as Santos (2008) demonstrates. In addition, due to the low volume of plastic recycling, the recovery and production of this material are encouraged by public policies.

Plastic, unlike the materials mentioned above, has a greater spatial deconcentration, with the presence of several industrial units distributed in other regions of Rio de Janeiro, which implies that the logistical plans for this type of recyclable will enable regional inter-network agreements, not so dependent on the metropolitan network of collectors.

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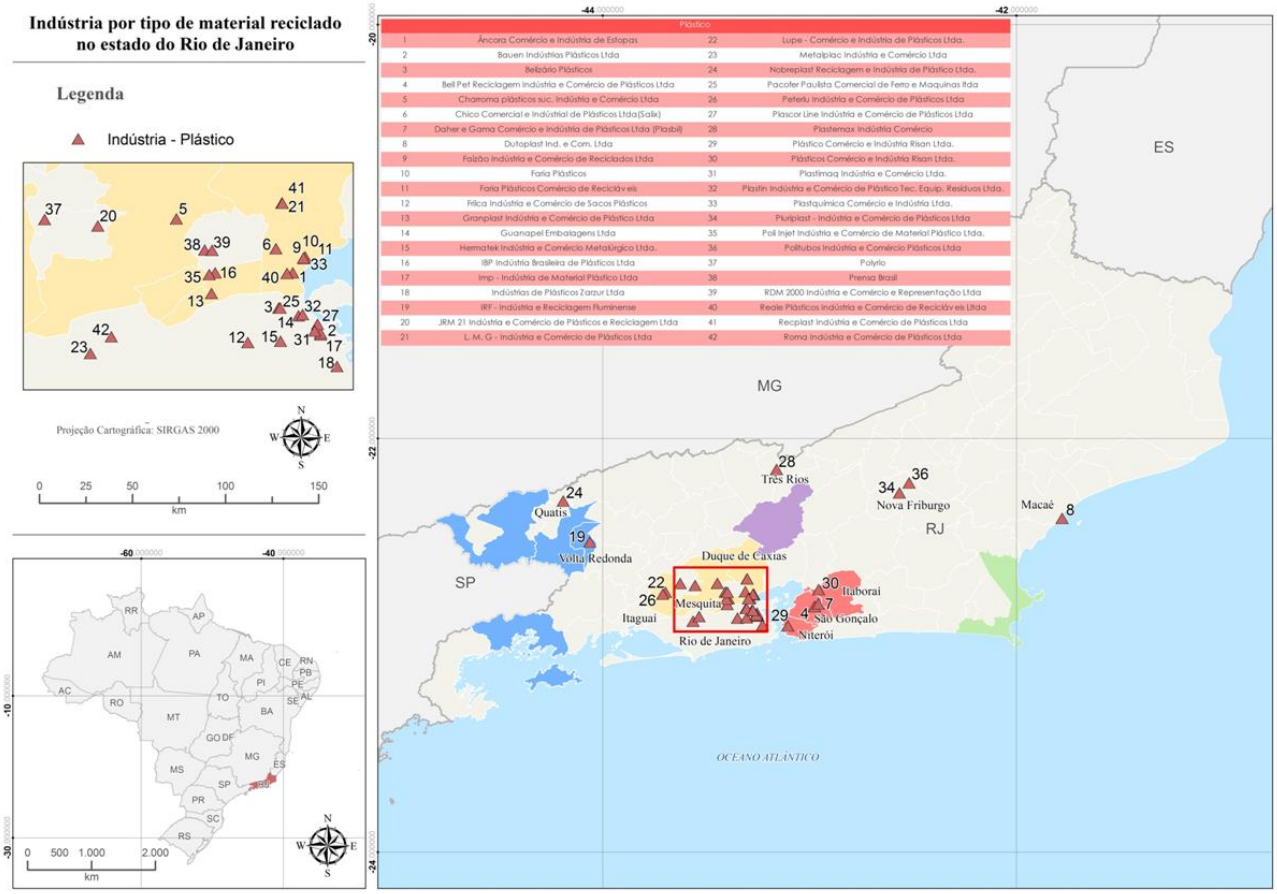
Figure 3 - Plastic recycling industries in the state of Rio de Janeiro - (2019)



Legend: Prepared through a survey carried out in field research - 2019.
Source: The authors, 2018.

With regard to the commercialization of PET, there is a trend close to the operation of aluminum, with a small variation, which points to a higher percentage of sales to cooperatives than to middlemen (57% in the case of PET against (61%) in the case of commercialization of aluminum and (23%) in the case of PET against (19%) in the case of aluminum. This slightly different percentage happens, considering that the PET industry has more actors in the manufacturing process of pre-products of the industrial process, until it reaches its final stage, which is the production of the final recycled good, allowing more actors in the transformation chain that use less intensive capital, which generates a larger market for the participation of cooperatives of this product.

Even so, the rates of waste pickers who trade with the industry remain irrelevant, considering that what differentiates this actor, even if less capital-intensive, in the case of PET, will always be the need for a minimum scale of purchase and regularity of supply, impossible to be generated by the individual waste picker.

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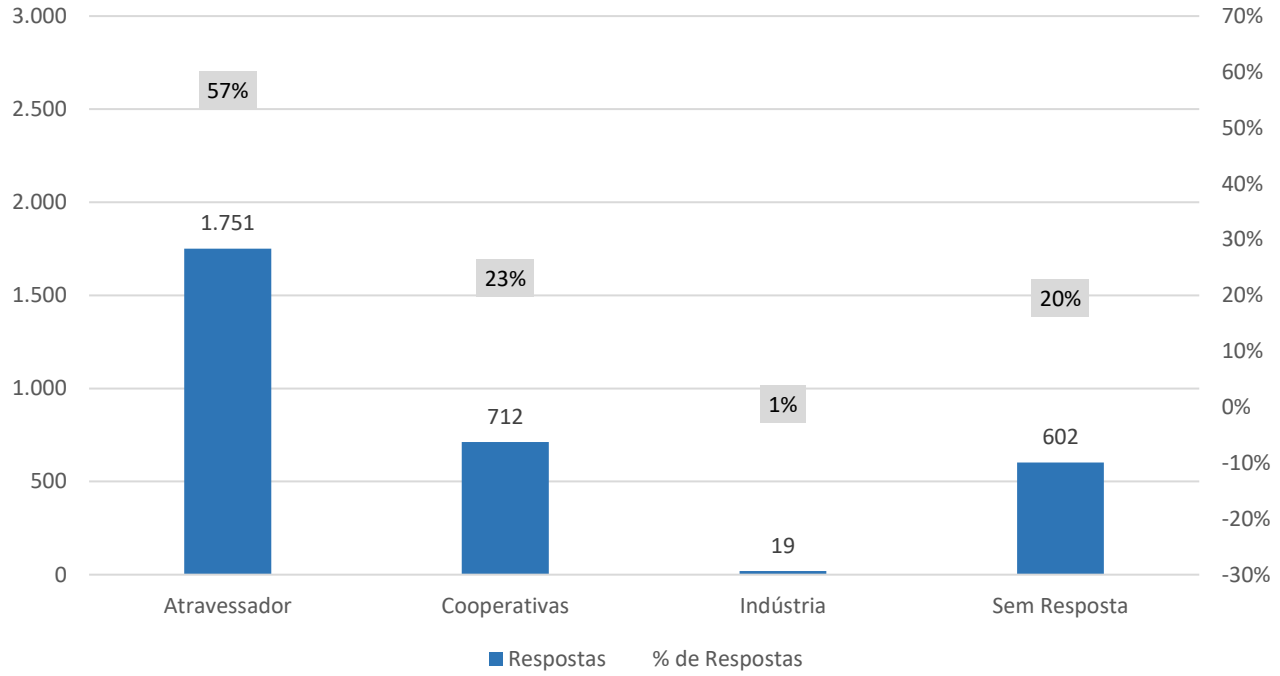
It is worth mentioning that the cooperatives in which they sell may be linked to front cooperatives, in which their marketing matrices are mostly plastic. Finally, we have 1% of waste pickers who can reach the processing industry. Perhaps, through specific agreements, in which a collector can represent a façade cooperative and, therefore, aggregate large volumes of materials.

Graph 2 - Pet: Sell to whom? - (2014)



Legend: Elaborated from questionnaires applied in the research carried out by PANGEA/FGV.
Source: The authors, 2018.

As for the spatial distribution of the paper recycling industry, we can say that it is a more balanced distribution between the metropolitan region and the eastern region of the state, enabling better logistical alternatives, considering that the cost of paper processing is extremely high, requiring high investment.

According to the graph, we can observe that the sale is made more frequently between the collector and the cooperative, because it is a product with greater volume and weight, with low added value, causing the collector to look directly for the cooperative. Now, we can analyze that the middleman has a low rate of paper purchase, with 5%, because there is no financial interest. In Rio de Janeiro, the paper industries are: Cibrapel S/A Indústrias de Papel e Embalagens, Klabin S/A, A Arca das Caixas, Sociedade de Papeis Santiago Ltda, Zirbac do Brasil Com and Rec de Papeis Ltda, Solimar Ltda, Aspergilus.

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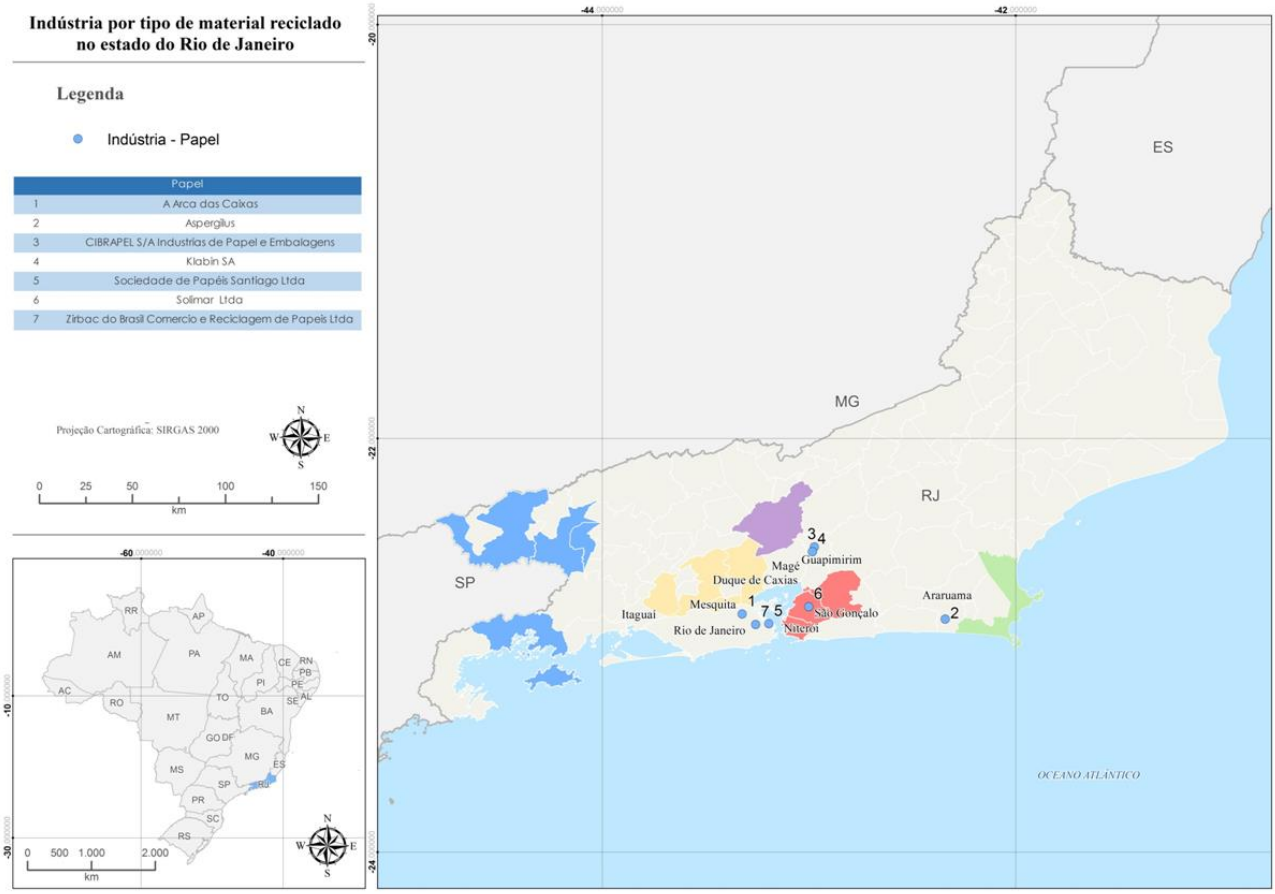
Figure 4 - Paper recycling industries, in the state of Rio de Janeiro - (2019)



Legend: Prepared through a survey carried out in field research - 2019.
Source: The authors, 2018.

As the maps mentioned above have shown, other spatial analyses of other recycling industries are possible, creating layers to spatially select industries by type. This is due to the diversity of typologies within a recyclable itself. There are, for example, several types of plastic industries, each with its maximum capacity to acquire a certain recyclable material (tons per month), distribution of the existing road network, among other variables.

The collection sites where each of the recyclable materials are collected by the subjects that make up the recycling production network can be justified based on the availability of material linked to the degree of consumption and production of waste; related to the per capita income of the municipalities and the population contingent; the presence of processing industries that consume recycled material; and, of course, the presence of cooperatives, middlemen and waste pickers.

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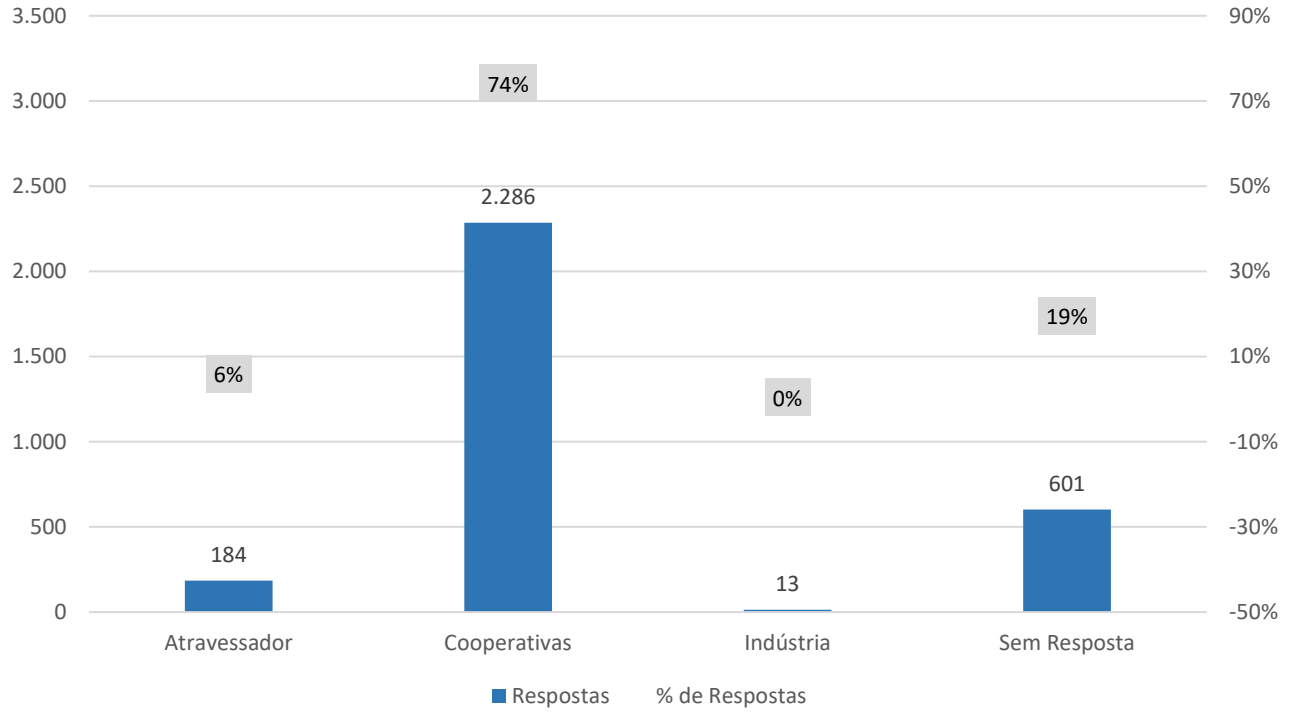
Graph 3 - Paper: Sell to whom? - (2014)



Legend: Elaborated from questionnaires applied in the research carried out by PANGEA/FGV.
Source: The authors, 2018.

In the case of paper, the participation is quite different. More than paper, here we are referring to cardboard, which makes up the paper/cardboard segment. Cardboard is the main product sold by cooperatives, and middlemen, in general, acquire these products from cooperatives, to then sell them to industries.

For this very reason, the role of cooperatives gains prominence in relation to middlemen, also because because they have a lot of volume and weight, individual collectors tend to sell the material to those intermediation structures that buy a small quantity, represented more by cooperatives than by industries.

The next chart highlights the main recyclable materials: paper, plastic, and metal (but in different orders). It is an important point to highlight, justified by the availability of these materials, resulting from waste produced by the industry that make up the upper circuit of the economy, as well as the superior valorization of these materials in the production of packaging or even components of objects.

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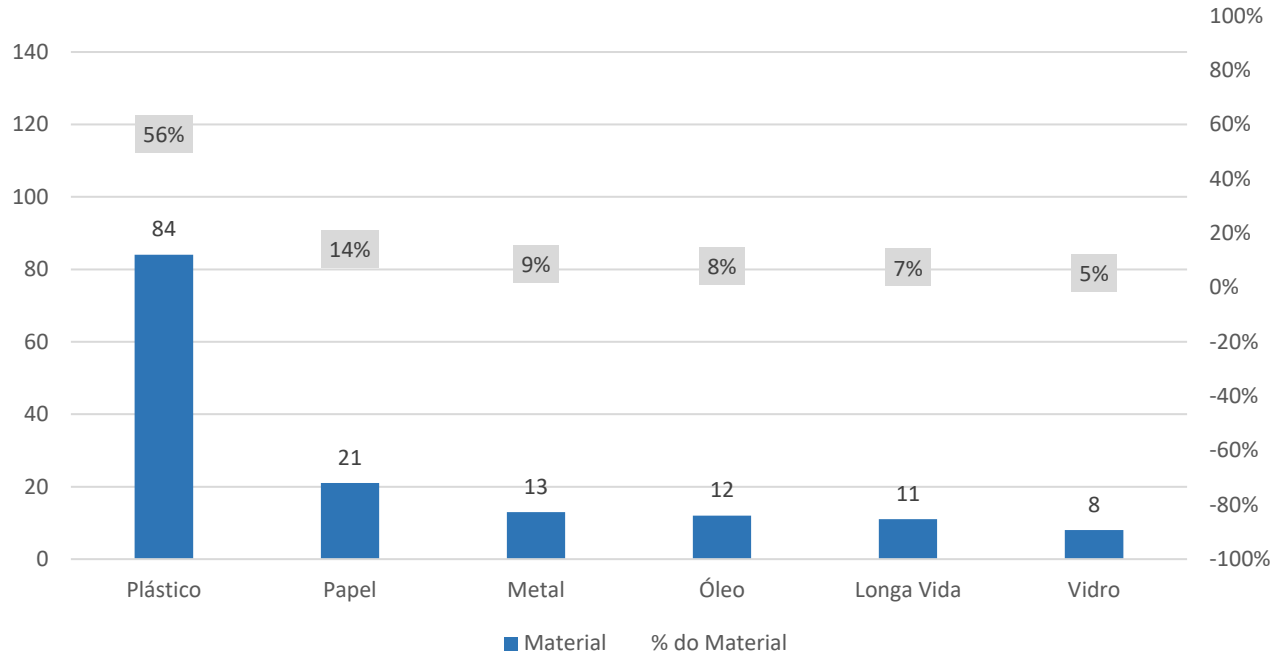
Graph 4 - List of recyclable materials and industries in the state of Rio de Janeiro - (2019)



Legend: Elaborated from questionnaires applied in the research carried out by PANGEA/FGV.
Source: The authors, 2018.

The industries in the state of Rio de Janeiro are strong in the plastic marketing network, containing 84 industries (56%), due to the great availability of this material through the space. Paper represents 14%, that is, 21 industries and the other companies concentrate unification of the following materials: metal, oil6, long life and glass, oscillating between 9% and 5%.

Having evidenced the cartograms above about the collection sites, based on the georeferencing of the six types of materials most collected and that make up the recycling network in question, as well as, as shown in the previous graphs, the materials distributed according to the 'intermediate' and 'industry' subjects, it is possible to affirm that there is a demonstration that the spatial distribution of the metal recycling industry, in the state of Rio de Janeiro it is concentrated in the metropolitan region.

The other material that appears, from the cartograms of collection distribution and the graphs of material distribution by actors (industry and middlemen), plastic, it is observed that, unlike the materials mentioned above, it has a greater spatial deconcentration, with the presence of several industrial units, distributed in other regions, which implies that the logistical plans for this type of recyclable will enable inter-regional

[6] Although there are other companies of Residual Oil and Fats - OGR, in this research we give light to 2, as they are the largest industries in the network.

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inter-network agreements that are not so concentrated in the network Metropolitan of waste pickers.

The recyclable material with the highest number of industries is plastic, containing 84 industries (56%), followed by paper, with 21 industries (14%) and 13 metal trading industries (9%). The others, oil, long-life and glass represent 17% of the existing industries.

FINAL CONSIDERATIONS

Today, not only sociology is dedicated to researching social inequalities. Several areas, in the case of this article, geography, seek to understand how inequalities are produced in capitalism.

Thus, this work sought to understand how the uneven geographic development is related to the recycling production network, analyzing the social relations that are formed in this niche, such as the power relations that exist in a recycling production chain and the position of waste pickers in this system composed of multiple agents, performing several functions. The perspective of the unfair circulation of capital, information and power among the subjects involved in this hierarchy was also considered.

In addition, this work revealed that there is a direct relationship between the phenomenon of waste picker and the precariousness of work in the transformation of the way of producing capitalism, which promotes the exploitation and precariousness of the work of waste pickers. These workers are the main part of the maintenance of the recycling system, although they themselves do not recognize this importance, which is the result of a deliberate manipulation that seeks to maintain their marginalized status and the privileges of their hierarchical successors, these relations being especially necessary for the functioning of capitalism.

Another interesting point of this research was the study on the spatial distribution of the recycling network in the state of Rio de Janeiro, which is mostly concentrated in the metropolitan region. Thus, it was concluded that the preference of the collectors is for aluminum, since its sale value is higher. Which explains why Brazil recycles so little plastic.

It was also observed that the behavior of the collectors in relation to OGR - residual fat oil - is the same as that of metal, however, it requires its own and specific logistical arrangement. The commercialization of PET has a trend close to that of aluminum, with a small variation. Finally, paper recycling is concentrated between the metropolitan region

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and the eastern region of the state, which provides better arrangements in terms of logistics, noting that the cost of paper recycling requires a higher investment.

Therefore, the authors brought in this literature review help to show that the recycling production network corresponds to an important component in the capitalist logic of peripheral space, in the paradoxical relationship between the economic development of a certain class and the invisibility of the other. As Santos (2006) translates, the maintenance of the upper circuit of the economy depends on the exploration of the lower circuit. Thus, strategies are produced to maintain this pattern of accumulation, expressed in the unequal relationship between the nodes that make up the recycling production network.

Obviously, this review does not demonstrate that the specific thematic focus of waste picking is saturated. On the contrary, as previously demonstrated, it represents a contribution to a theme that is still emerging in Geography, which can contribute to the compression of the social and labor relations that make up the Brazilian reality, especially urban scavenging.

In addition, the proposal seeks to highlight, through academia, the need to look at certain excluded and invisible subjects in Brazilian society, in order to unveil the system of oppression and move towards a more balanced relationship between actors that make up the recycling production network.

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