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The Brazilian National Solid Waste Policy: perspectives of the waste pickers' cooperative networks

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Abstract: Despite the advances in the implementation of the National Solid Waste Policy (PNRS), waste pickers' organizations (WPOs) continue to face structural problems that challenge their viability. Facing the challenges, cooperative networks (CNs) emerged as an alternative to expand their role in the recycling chain. This research aims to identify the challenges and perspectives of the actions of waste pickers' networks in the recycling chain and discuss how this new organizational arrangement can contribute to the expected advances of the PNRS. The methodological procedures included the selection of 3 case studies on CNs, interviews, documental and content analysis. The results show the importance of public policies and the breadth of the partnerships to the consolidation of the CNs analyzed. Thus, an adaptation of the PNRS to the new dynamics of the recycling market, considering the multiple benefits of CN, can contribute to overcome the structural problems faced by WPOs.

Keywords: Waste Pickers; National Solid Waste Policy; Networks; Recycling; Solid Waste; Recyclable Materials.

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Introduction

The predominant linear model of production and consumption has potentialized the exploitation of natural resources and generated increasing the amount of waste. About 2.01 billion tons of urban solid waste are generated yearly in the world, of which only 19% are recycled or composted. Until 2050, the generation of these wastes can reach 3.40 billion tons/year, more than the double of the population growth expected for the same period (WORLD BANK, 2018).

The adequate management of municipal solid waste is fundamental for reducing the impacts on the marine and land ecosystems, besides positively contributing to the conditions of life, sanitation and public health (IPCC, 2014). In developing countries, solid waste management has to necessarily include the social dimension, in that a large part of the wastes returning to the reverse chain results from the individual and informal work of waste pickers in the city streets, exposed to health risks (GUTBERLET; BESEN; MORAIS, 2020) and to the exploitation by the other participants in the recycling chain (BERMUDEZ; MONTOYA; SALDARRIAGA, 2019). Chronic problems, such as high unemployment rates, concentration of wealth and failures in the education system, drag thousands of men and women workers to the waste picking, separation, and trading activities in the quest for survival. Moreover, the very formal sector supports the continuity of this informal activity, since this large number of workers is key to ensure the profitability of the recycling supply chain (SILVA; WEINS; POTINKARA, 2019). The World Bank estimates that approximately 15 million people in the world survive by picking and recovering recyclable material, of whom 4 million in Latin America (IRR, 2013).

Participating in the Brazilian reality since the late XIX century, waste pickers represent a considerable share of this group in Latin America. The estimates of the number of waste pickers are discrepant and hinder the formulation of public policies. The 2019 PNAD Contínua (Continuous National Household Sample Survey) shows the existence of 281,025 waste pickers in the country, 70% of men and 30% of women. IPEA (Institute of Applied Economic Research) (2013) reports from 400 to 800 thousand pickers acting in Brazil, of which 70% are women. Albeit fundamental in the Brazilian recycling chain structure, they are the ones that profit the least from the activity, since most of the value generated is concentrated at the top of the structure, mainly benefiting the paper/paperboard recyclers and recycling units (BERMUDEZ; MONTOYA; SALDARRIAGA, 2019).

Since the late 1980s, Brazil has stood out in the international scenario for the initiatives for stimulating and integrating recyclable material pickers in the recycling chain (BESEN; FRACALANZA, 2016; DUTRA; YAMANE; SIMAN, 2018). From the early programs of selective waste picking involving the municipal government and waste pickers' cooperatives in the 1990s (FUNASA, 2014), the country progressed to unprecedented federal and innovative legislation. Some landmarks of this process are the recognition of the waste picker profession with the integration of the category in the Brazilian Code of Occupation in 2002, and the enactment of the National Policy on Solid Waste (PNRS, in Portuguese), in 2010. PNRS stands out in the international context of the regulations providing on post-use waste management for integrating the social, environmental and

economic dimensions, and for expanding the protagonist of the waste pickers' organizations (WPOs) as service renderers to reverse logistics (LR) (BRASIL, 2010). However, the more than 1,829 WPOs in Brazil (ANCAT, PRAGMA, 2020) face structural problems that challenge their sustainability in an increasingly dynamic and competitive market (GUTBERLET; BESEN; MORAIS, 2020)

The cooperative networks (CNs) thus emerge as an alternative organizational arrangement aiming to respond to the challenges (TIRADO-SOTO; ZAMBERLAN, 2013; DUTRA; YAMANE; SIMAN, 2018). Their goal is to expand the competitivity and sustainability in relation to the individual action of the WPOs (IBÁNÑEZ-FÓRES et al., 2019), highlighting joint trading (GUTBERLET; BRAMRYD; JOHANSSON 2020), information exchange and the strengthening of the negotiation capacity with recyclers (SAVIO; TEIXEIRA, 2016).

Still not frequently studied in the national or the international context, little is known about how this organizational arrangement has contributed to overcome the challenges faced by the WPOs. By means of three case studies on networks operating in the state of São Paulo, this research purposes to identify the challenges and perspectives of the waste pickers' networks actuation in the recycling chain, besides discussing how this organizational arrangement can contribute to the implementation of the PNRS.

The evolution of the Waste Pickers' Organization and of the PNRS

Since the late 1980s, the empowerment process of the recyclable material pickers has been supported by the government and private sectors and by the civil society. This has contributed for the WPOs to overcome a condition of invisibility and to occupy a relevant space in the debate of public policies on solid wastes. From a favorable political and institutional convergence, a "window of opportunity" was opened for the waste pickers in the 2000s (PEREIRA; TEIXEIRA, 2011). The visibility of the problem of waste pickers in garbage dumps, the support from national and international bodies and the establishment of the Movimento Nacional de Catadores (MNCR – National Waste Pickers' Movement) are highlighted. In 2006, it acted to insert in Law n° 11,445 the hiring of waste pickers' organizations for rendering selective municipal picking services exempt from public bidding.

Standing out among the advances for strengthening the WPOs are the increase in investments in infrastructure for the collection and processing of recyclable material, formalization of these organizations for rendering services to the government and to private organizations, besides the advance in working rights for the cooperative members (APARCANA, 2017). Yet a large share of these WPOs does not count on appropriate infrastructure or equipment, thus compromising the activities of storing and processing the materials and the direct sale to major recyclers, negatively impacting their income and working conditions (TACKLA; BALDAM; SIMAN, 2017; SIMAN, 2020). Furthermore, the deficiency in technical-administrative knowledge (DUTRA; YAMANE; SIMAN, 2018) hinders the obtainment of working capital and the search for new opportunities, affecting long-term planning and the consolidation of long-lasting practices (TIRADO-

SOTO; ZAMBERLAN, 2013). The scenario is aggravated by the emergence of new actors in the recycling production chain competing with WPOs for the recyclable waste (DEMAJOROVIC; BESEN, 2007; BERMUDEZ; MONTOYA; SALDARRIAGA, 2019).

PNRS emerged as an opportunity to materialize the advances for the WPOs. It integrates the more modern waste management principles and concepts, establishing a hierarchy, reducing the generation, reuse, recycling and disposal of wastes in environmentally adequate landfills. A pioneer in Latin America and the Caribbean (ALC) for promoting the integration of de recyclable material pickers in the selective waste picking and LR service rendering (BESEN; FRACALANZA, 2016), the Brazilian experience led eight countries to adopt the shared responsibility principle, inserting waste pickers in the recycling chain (CORREA; XAVIER, 2013).

In PNRS, LR emerges as an economic, environmental and social instrument, the sectorial agreement being the major instrument to make it operational (GUARNIERI; SILVA; VIEIRA., 2020). The sectorial agreements, celebrated by manufacturers, importers, distributors and traders, should foresee the procedures for acquiring products or the packing to be used, making available points for the voluntary delivery of recyclable material and investments in the WPOs infrastructure so as to improve the efficiency of the separation and trading processes in those organizations (DEMAJOROVIC; MASSOTE, 2017).

After over 11 years in force, the goal provided in the PNRS of sending only waste to environmentally adequate landfills until August 2014 has not materialized. The expansion of selective waste picking by the inclusion of WPOs as service renderers in municipal governments and companies in the ambit of the implementation of sectorial agreements for LR and a better qualification of these organizations has advanced less than expected. The discussion shows that the long Brazilian experience in strengthening and formalizing the waste pickers' cooperatives does not ensure a transition from a vulnerability situation to a context whereby decent work and the social-productive inclusion of the professional category prevail (GUTBERLET; BESEN; MORAIS, 2020).

The legislation, especially that regarding LR and the integration of waste pickers, is argued not to advance in structural issues of the Brazilian reverse chain. For Bouzon, Govindan and Rodriguez (2015), there are structural, operational, attitudinal, financial and technological barriers to the advance of LR in Brazil, harming the cooperatives' activities. The structural barriers regard the lack of information on packaging collection and LR. The operational ones refer to the implementation of collection points and the establishment of recycling industries and selection centers in underprivileged regions located far from the country's industrial poles. The attitudinal ones regard the challenges to sensitizing the population to correctly separate and discard wastes. As regards financial barriers, there has been little advance in the remuneration of WPOs for the selective waste picking services and LR by the municipal governments and by the organizations integrating the sectorial agreements. Lastly, the technological challenge concerns the packaging development standard, which privileges complex and multi-layer structures, transforming part of the packaging collected in the municipal selective waste picking

or in the PEVs into waste in the cooperatives (DEMAJOROVIC; MASSOTE, 2017).

Therefore, one of the challenges to implementing the PNRS is to find ways to operationalize the commitment of making the WPOs the protagonists in the recycling chain. A proposal for advancing in this path is strengthening the networks.

Waste picker network organizations: perspectives and challenges of a new paradigm

CNs are configured as a relevant organizational arrangement to face the challenges posed by the recycling market (TIRADO-SOTO; ZAMBERLAN, 2013; GUTBERLET; BESEN; MORAIS, 2020). Considering the complexity and competitivity of the Brazilian recycling market, the transformation of the WPOs into CNs is an alternative for better positioning them in the ambit of selective waste picking and of LR (PISANO, 2018; GUTBERLET; BRAMRYD; JOHANSSON, 2020). The exchange of experiences favors knowledge that would hardly ever be available in an individual way (SIMAN et al., 2020).

CNs favor economies of scale and access to recyclable material at volumes and periodicity compatible with the dynamics of the production lines and volumes required by the recycling industry. Part of the materials processed in cooperatives turn into refuse due to the lack of the minimum volume required by large recyclers at the top of the recycling chain (ANDRADE et al., 2020). Seeing that recyclable material present low unitary value, its economic viability for large recyclers depends on the transportation of large, consolidated volumes in a few collection points (AQUINO; CASTILHO JR.; PIRES, 2009; GUTBERLET; BRAMRYD; JOHANSSON 2020); moreover, most companies require that the materials are supplied with some degree of predictability for production planning effects (CORREA; XAVIER, 2013).

Hence, CNs represent an innovative process in the country and a groundbreaking one in the international scenario. They act in a regional and local context and articulate different cooperatives and/or waste pickers' associations in the same city or in neighboring municipalities. They keep the legal independence of the members and presuppose their active participation, preserving their horizontal and self-management character (TIRADO-SOTO; ZAMBERLAN, 2013).

Formalized as from 2006 in Brazil (PISANO; DEMAJOROVIC; BESEN, 2018), the number of CNs has increased. A survey conducted in 2018 by the Federal Government program Cataforte III identified 35 CNs, while Campos and Teixeira (2021) identified 50 CNs in 2021.

The literature values the operational aspects of the CNs, highlighting joint trading, production and processing, increase in the added value of the recyclable materials and the CNs direct access to large recyclers as an income propeller for the cooperatives (AQUINO; CASTILHO JR.; PIRES, 2009; FARIAS FILHO; PIRES, 2013; TIRADO-SOTO; ZAMBERLAN, 2013; SAVIO; TEIXEIRA, 2016). Other benefits deserve detachment, such as the information exchange among the WPOs and the technical capacity-

building (AQUINO; CASTILHO; PIRES, 2009; SIMAN et al., 2020). The information exchange on the prices charged and possible boycott to buyers prevent exploitation by intermediary actors in the recycling chain (ALVES; MEIRELES, 2013; SIMAN et al., 2020; GUBERLET; BRAMRYD; JOHANSSON, 2020).

CNs can also offer financial aid and logistic support, providing risk and cost reduction, besides the increase in access to complementary resources by means of public notices and projects (CIRNE et al., 2021). These resources allow for improvements in the physical and equipment infrastructure of the WPOs, contributing to better working conditions for the waste pickers (VIANA, 2012; TACKLA; BALDAM; SIMAN, 2017). The support to legal regulation facilitates negotiations and rendering services to municipal governments, large generators and events (CRUZ; QUANDT; MARTINS, 2008; CARDOSO, 2021).

Another benefit identified is the viability or consolidation of WPOs in regions far from the large urban centers. Massive volumes of material allow creating logistic paths that financially justify the transportation of recyclable material for longer distances (SIMAN et al., 2020). Lastly, the organization into CNs has served to improve the remuneration of the WPOs rendering municipal services of selective waste picking (CAMPOS; TEIXEIRA, 2021).

Even their being a recent arrangement, some challenges faced by the CNs are identified. The voluntary adherence of members and the protagonism of waste pickers are essential for promoting self-management for the CNs consolidation (TIRADO-SOTO; ZAMBERLAN, 2013) and sustainability (PISANO; DEMAJOROVIC; BESEN, 2018). In this sense, the relationships among members must be anchored in trust and occur in an organic fashion. Another relevant aspect is that their good operation presupposes well-structured members in their composition, since WPOs with management problems may negatively influence the performance of their members (TIRADO-SOTO, 2011; DUTRA; YAMANE; SIMAN, 2018). To go further into the CNs perspectives and challenges, and their contribution to advances in the PNRS, the methodological procedures employed in the field research are presented as follows.

Methodology

This research has a qualitative descriptive character and the strategy was conducting multiple case studies. The selection of the three cases regarded their singularity and consequent representativity in the context in which the investigation was carried out (GIL, 2010). The cases integrated the Federal Government Program - Cataforte III: Sustainable Businesses in Solidary Networks (from 2015 to 2018), which aimed to technically structure and strengthen 33 CNs (CATAFORTE, 2015).

The cases were selected in a non-random way (EISENHARDT, 1989). The CNs researched are located in the state of São Paulo and present different formation histories, degrees of maturity, formalization and size, seeking to represent the field in their diversity,

providing the possibility of new insights into the theory. Network 1, still at an initial stage and not formalized as a 2nd-degree cooperative allowed to go further into issues regarding the consolidation process of a network in its early stage. Network 2 is in an intermediary situation, has developed political and economic articulation for 9 years, and was formalized as a 2nd-degree cooperative in 2016, already indicating important advances and challenges in the CN management. Network 3 stands out for being one of the first and largest formed in the state of São Paulo and is the only one to have its own warehouse, allowing to think of new ways to the future of the organizational arrangement. The anonymity of the interviewees was decided upon and the cases are denominated Network 1, Network 2 and Network 3. Table 1 presents the main characteristics of the CNs analyzed.

Table 1 – Networks and their characteristics

CN	Formalized year	Members	Pickers	Region
1	No	3	63	São José do Rio Preto - SP
2	Yes (2016)	13	468	Ribeirão Preto; Araraquara; Piracicaba; Campinas; Franca and Rio Claro - SP
3	Yes (2006)	22	524	Alto Tietê, in the city of São Paulo and on the coast of the state -SP

Source: The authors, 2022.

Data collection and analysis

The data collection was based on the analysis of documents and on semi-structured interviews. The analysis included institutional documents; bylaws; meeting minutes; administrative controls and internal reports, totaling 18 documents analyzed. The authors sought data on the history of the CNs establishment, management practices and evidences relating the categories surveyed in the literature about the reality of the CNs studied.

The semi-structured interviews were conducted with waste pickers who were members of the Board or of the Management Board of the CNs and with the technical personnel in charge of articulating the actions of the Program Cataforte III with the waste pickers' CN, totaling 07 interviews. Table 2 systematizes the positions and the profile of the interviewees. The analysis of the results refers to the codification of the interviewee.

Table 2 – Profile and codification of the interviewees

Interviewee	Position/profile	Code
Technician Network 1	Project manager in charge of Cataforte III in Network 1	T1
Waste Picker Network 1	Waste picker member of the Management Board of Network 1	C1
Technician Network 2	Technical-administrative aid of Network 2	T2
Waste Picker Network 2	Waste picker member of the Board of Network 2	C2
Technician Network 3	Technical-administrative aid of Network 3	T3
Networks Analyst	Analyst, Federal Government representative in charge of following up the Networks in the state of São Paulo in the ambit of Project Cataforte III	A1

Source: The authors, 2022.

The semi-structured interview script approached the positive impacts of joint trading, improvements in the management processes of members as well as their political representation, access to better infrastructure and expansion of partnerships. As to weaknesses, the authors sought to understand the dependence on external actors, the challenges in the management process, including cultural and logistic aspects, and the vulnerability of the members.

For analyzing the results, the choice was to analyze the contents of documents and the interviews carried out. Following that proposed in Bardin (2011), a set of pre-analytical categories were identified in the review of the literature for conducting the information systematization process. 7 categories and 21 subcategories were identified, 15 of which regarding advantages and 8 categories regarding weaknesses of the CNs (Table 3). The weaknesses refer both to difficulties for their establishment and to the challenges faced for managing the CNs.

Table 3 – Categories of Advantages and Weaknesses of the Waste Pickers' Networks

Advantage Categories	Advantage Subcategories	Authors
Joint trading	Direct trading with the industry	Aquino et al., (2009); Soto and Zamberlan (2012); Farias Filho and Pires (2013); Savio and Teixeira (2016); Correa and Xavier (2013)
	Value-adding to the material	Savio and Teixeira (2016); Alves and Meireles (2013)
	Greater bargain power in the recycling market	Cruz et al., (2008); Fuzzi and Leal (2018); Correa and Xavier (2013)
	Improvement in the logistic condition for outflowing the material	Campos and Teixeira (2021); Cirne et al., (2021)
Strengthening	Improvement in waste picker's income	Cirne et al., (2021)
	Improvement in the formation of human resources	Soto and Zamberlan (2012); Cardoso (2021); Cruz et al., (2008)
	Strengthening of Individual WPOs	Alves and Meireles (2013); Cirne et al., (2021)
	Improvement in political representation	Savio and Teixeira (2016)
	Better management practices for Individual WPOs	Cruz et al., (2008)
Infrastructure	Improvement in working conditions	Viana (2012); Cirne et al., (2021)
	Improvement in infrastructure	Viana (2012); Cirne et al., (2021); Soto and Zamberlan (2012); Cruz et al., (2008);
	Possibility of processing the material	Cruz et al., (2008)

Partnerships	Better partnership conditions with the government and the with the private sector	Carvalho and Ladeia (2011); Cirne et al., (2021); Cruz et al., (2008); Alves and Soares (2020)
	Better conditions for rendering services	Cardoso (2021)
	Providing evidence to the government	Soto and Zamberlan (2012); Carvalho and Ladeia (2011); Cardoso (2021); Cirne et al., (2021); Cruz et al., (2008)
Weakness Categories	**Weakness Subcategories**	**Authors**
Dependence	Dependence on external support	Aquino et al., (2009; Soto and Zamberlan (2012)
	Little incentive from public policies	Farias Filho (2012)
Management	Susceptibility to power conflicts	Carrion (2009); Alves and Soares (2020)
	Lack of transparency	Alves and Soares (2020)
	Logistic difficulties	Alves and Soares (2020)
Vulnerability	Social vulnerability of waste pickers	Farias Filho (2012)
	Structure not well understood by waste pickers	Farias Filho and Pires (2013); Rutkowski (2013); Alves and Soares (2020)
	Structural unevenness of Individual WPOs	Alves and Meireles (2013); Alves and Soares (2020)

Source: The authors, 2022.

Results and Discussion

Advantages of Networks

The first category analyzed was the joint trading of recyclable material. Still at a very early stage, Network 1 does not conduct joint trading, yet the interview with a female waste picker of Network 1 (C1) revealed that this was the major motivation for the articulation in a CN, seeking to raise the monthly income of the WPOs. The Network 2 interviewees (C2; T2) confirmed the trading potential of low-added-value wastes when in larger quantities, as is the case of glass. Glass is a difficult-to-trade material; only substantial quantities make its recycling viable for covering the logistic costs and for ensuring the profitability of the process (DEMAJOROVIC et al., 2014). In this case,

joint trading allowed outflowing the production of the cooperatives that did not count on glass buyers to reach higher values and increase their negotiation power when faced with recyclers. Joint trading as one of the main benefits of cooperation is also found in Network 3. For the technical aid (T3), this result was potentialized because this CN has its own warehouse, equipment, and its exclusive cooperators. In the warehouse, the cooperators are in charge of receiving, fine-screening and baling paperboard, ferrous scraps and, periodically, other materials jointly traded by the CN directly with the industry. For member of the Network 3 (C3) Board, the articulation also allowed access to new buyers and to trade materials considered tailings, overcoming the market challenges faced by individual cooperatives pointed out by Aquino and Castilho (2009) and Demajorovic and Massote (2017). Different interviewees, including waste pickers (C2; C3), technical aids (T3) and the analyst representing the Federal Government (A1), stress the benefits that were extended to the WPOs not directly participating in the joint trading. Due to the geographic distance, it is financially unfeasible for those WPOs to transport the material. The information exchange on the market prices and on the commercial practices of different buyers allowed better trading conditions.

The second category analyzed was strengthening, understood as the characteristics that favor income, human resources, and political actuation. Network 1 identified these advantages even not conducting joint trading (C1; T1). The WPOs experienced strengthening processes related to Cataforte III, which provided technical aid and capacity-building to the waste pickers for better management practices, improvements in the layout of the warehouse and of collection techniques (T1; A1).

The political strengthening pointed out by Savio and Teixeira (2016) also stood out in this research. The articulation in CNs stimulated the members to join the MNCR, expanding the capacity-building activities and the political mobilization of its members (T1; A1). There was also an increase in the members' income since, even in the absence of joint trading, each individual cooperative benefited from the previous commercial relationships developed by their associates before the network was established. Network 2 showed the importance of the historical process of its formation and its unfolding in strengthening the network members (C2). The articulation of the WPOs currently composing Network 2 started even before the formation of the CN. According to the history provided by the waste picker member of the Board (C2), in the mid-2007, two cooperatives started parallel processes aiming to articulate a CN with the WPOs in their respective regions. Despite the willingness and the initial actions, they did not succeed in going forward due to the little knowledge about cooperatives for an articulate action. These processes eventually met in the ambit of Program Cataforte III and, following the MNCR suggestion, they joined to participate as a single CN in the public notice. Once accepted in Cataforte III, they managed to evolve in their organization, turning into a CN formalized as a 2nd-degree cooperative in 2016. The articulation as a single and large CN provided greater political representation, an important benefit as indicated by Alves and Soares (2020). Since CNs demand a certain degree of standardization in the WPOs controls and management to allow for joint actions, the political strengthening leveraged the capacity-building processes and better management practices for all of the members

(T2; A1). The income increased seeing that the network allowed for the joint trading of certain materials, as is the case of glass. The cooperation permitted the direct sale to a major recycler located at the top of the chain, generating higher financial gains to all the associates. In a broader way, these benefits were identified in Network 3, highlighting the establishment of a space for exchanging experiences, fostering exchanges among the WPOs, political and administrative strengthening and actions to ensure better working conditions. These benefits were enjoyed even by the WPOs located further away from the warehouse and that, due to the logistic costs, could not benefit from joint trading (T3; C3). In this case, the exchange of experiences fostered the strengthening in their local markets by the access to new partners and by reducing administrative and legal weaknesses (C3), corroborating the research by Soto and Zamberlan (2012). Its income was positively impacted by the operation of the warehouse exclusive to the network, which contributed to its signing a service-rendering contract for municipal selective waste picking. As the analyst of the Federal Government (A1) stated, this characteristic was fundamental to improve the income of the weaker associates, ensuring greater competitivity and sustainability for the members, corroborating the findings in Ibánñez-Fóres et al., (2019).

In the infrastructure category, Network 1, even without counting on specific investments to acquire equipment, has benefited from the technical aid to ameliorate the work practices of the WPOs and favor a more efficient use of the equipment available (T1; A1). According to the technician representing Network 1 (T1), one of the cooperatives composing the CN counts on machinery to process PET bottles. However, the CN does not produce the necessary amount of PET to make its operation viable. The CN has investigated ways to gather individual productions so that the PET processing equipment can be used, adding greater value to the material. Network 2 does not have its own warehouse, yet with the articulation in CN and its formalization in 2016, by means of Cataforte III, it managed to achieve resources to acquire equipment and to structure the warehouse of one of its associates. This cooperative works as the CN headquarter, favoring the better process efficiency for the participating WPOs (C2). At a more advanced stage, Network 3 own warehouse has equipment and vehicles applied both to the processes regarding joint trading and the operation of the selective waste picking contract with the municipality (C3). The CN projects have also allowed for ameliorating the WPOs infrastructure, including warehouse improvements and the acquisition of new equipment. According to the technical aid report (T3), Network 3 also counts on two administrative centers that support the activities developed. One is located in the CN warehouse and is in charge of managing the selective waste picking contract and the activities related to joint trading. The other center, located in the capital of the state, purposes to obtain and to manage the CN projects, besides providing technical aid to the WPOs, thus contributing to strengthen and to improve the working conditions of its members.

The category partnerships encompasses the CNs collaborations with the government and with the private sector. In Network 1, the partnerships were significantly expanded; different interviewees (C1; T1; A12) indicated that the WPOs started to get articulated with the MNCR and OSCIPs which provided the CN with technical aid besides fostering the cooperation with Network 2. Geographically close, Network

2 has reached a more advanced stage of organization and has invited Network 1 for capacity-building and political events, besides having studied possible partnerships for trading and material processing (T1; C2). These partnerships have brought greater visibility to the CN, serving as a new gateway to interact with the local government (A1). In the case of Network 2, the focus are partnerships with municipal governments aiming to allow its WPOs to render services of municipal selective waste picking to municipal governments. Noticing the logistic difficulties in the joint trading of all of its members, the CN sought alternatives for activities to ensure benefits to its members. The fact that the CN has greater administrative, accounting and legal infrastructure permitted it to start competing for service rendering contracts not accessible to the WPOs. Thus, the CN is legally responsible for the contract, yet the operation is conducted by the PO located in the city where the contract has been celebrated, individually strengthening the CN (C2; T2) members. Network 3, by means of its administrative centers, managed to accelerate and to expand the construction of its partners, including government bodies, private organizations, universities, civil society organizations and class movements (C3; T3). The center contributed to the prospection of new projects and to manage the selective waste picking service-rendering contract (T3). The members benefit for being in an already well structured and known CN, contributing to the legitimization process of the WPOs with the government and with possible partners (T3; A1), as identified by Cardoso (2021). Note that the diversification of partnerships in Networks 2 and 3 is also benefited by their legal regulation, which opens new possibilities of acting as service renderers in selective waste picking also for the private sector, as advocated by the PNRS (BESEN; FRACALANZA, 2016).

Networks Weaknesses

As regards the CNs weaknesses, the first category analyzed was the relation of external dependence of the CNs and of their developments on their organization capacity. The results indicate that the support of public policies is fundamental to make networks viable, and also how this support can, in certain cases, undermine this organizational arrangement. In the case da Network 1, its onset was only possible due to the initiative of the municipal government, by making the application of N1 for Cataforte III (T1). Despite the different benefits deriving from the articulation in CN, this dependence is observed as a weakness, as raised by Aquino and Castilho (2009). The process started by the municipal government and by the cooperatives was observed to hinder the availability of cooperation among its members and compromised the CN autonomy, since the waste pickers understand the CN as being directly bound to the municipal government. They also recognize that, without the Program Cataforte III of the Federal Government, it would not have been possible to advance with the CN organization (C1; T1). In turn, Network 2 started its articulation autonomously by congregating its cooperatives. This process began to take shape with the participation of these cooperatives in a BNDES project aiming at the social inclusion of workers of the recycling production chain in Brazil and at increasing the productive capacity in the sector. The Program Cataforte III was

also essential to ensure the necessary capacity-building for its formalization as a CN (C2). In the case of Network 3, the National Program for the Environment II, coordinated by the Ministry of the Environment (MMA) and directed to forming several cooperatives and waste pickers' associations in the Great São Paulo, accounted for joining the WPOs and stimulating the discussion on the importance of the articulation in CNs. The WPOs came closer and started to hold meetings to discuss their common difficulties and possible solutions. Therefore, Network 3 originally emerged to help with the WPOs administrative, infrastructure and production difficulties (T3).

The results of the 3 CNs evidence the importance of support by external organizations and of public policies for strengthening this organizational arrangement, as pointed out by Aquino and Castilho (2009), expressed by assigning the warehouse and other infrastructure equipment. Still, Network 3 succeeded in ensuring some independence by the diversity of partners both in the public and private spheres. This shows the importance of the very WPOs protagonism in the process of constructing the CNs as a way of minimizing the possible negative effects of the relationship with the government.

Carrion (2009) and Alves and Soares (2020) stated that other weaknesses are the issues regarding power conflicts, lack of transparency or logistic difficulties. In the cases studied, these challenges follow the CNs growth in size. Since Network 1 still does not participate in joint trading, these problems were not identified, although the interviewees believe that problems related to these issues can start to exist when the CN begins the joint trading (C1). In Network 2, the power conflicts were not identified either, even though the interviewees recognize that some WPOs have greater influence in the CN decision-making for the role had in the consolidation of the network (C2). In Network 3, challenges related to transparency and to power conflicts were more clearly identified. The interviews revealed that the accounting does not occur as often as established and the Audit Committee is not very active, which impairs the management transparency (C3; T3). There were also reports on there being power asymmetry among the WPOs (T3). The most influent are those with active actuation with the external members, such as those with MNCR members, which allows access to information on the negotiations with private companies and public bodies, directing the decision-making process (C3).

The vulnerability category regards the very social vulnerability of waste pickers, the structural unevenness of the WPOs composing the CNs and the fact that CNs structure is still not very well understood by waste pickers, as pointed out by Rutkowski, (2013) and Alves and Soares (2020). At different levels, these problems emerged in the 3 CNs. In the case of Network 1, for being a PO that had never participated in political capacity-building or broader discussions on the recycling market, a lack of understanding regarding the CN structure was verified, as well as of its functions and administrative and legal obligations (T1; A1). In Network 2, the need for immediate results in the WPOs clashes with the necessary span of time for the CN to generate benefits to its set of members (C2). The strengthening process involves the participation in capacity-building, administrative, accounting and legal tuning. Despite the importance for the WPOs operation, they demand time and compete with the daily picking, selecting and commercializing activities (C2;

A1). A similar problem occurs with Network 3, due to the gap between the CN interests and the immediate needs of the WPOs. Although it had been agreed that certain materials would be jointly commercialized, a number of WPOs opt for commercializing individually. This is because the trading by means of the CNs often means longer times for receiving the payment. The impossibility of waiting for this necessary time for the direct trading with the industry reduces the amount of material sold, negatively influencing the CN sustainability and the remuneration of the WPOs (C3; T3).

Table 4 systematizes the major results of the field work, highlighting the potential of this organizational arrangement to go beyond the joint trading category and offers insights for advances in the PNRS. The green color indicates elements of the categories and subcategories identified; the red one indicates those not identified and the yellow one, those partially identified in the CNs studied.

Table 4 – Presence and lack in the Networks subcategories

Advantage Categories	Advantage Subcategories	Net. 1	Net. 2	Net. 3
Joint trading	Direct trading with the industry			
	Adding value to the material			
	Greater bargain power in the recycling market			
	Improvement in logistic condition for outflowing the material			
Strengthening	Improvement in the waste pickers' income			
	Improvement in the preparation of human resources			
	Strengthening individual WPOs			
	Improvement in political representation			
	Better practices for managing individual WPOs			
Infrastructure	Improvement in working conditions			
	Improvement in infrastructure			
	Possibility for processing the material			
Partnerships	Better conditions for partnerships with the government and with the private sector			
	Better conditions for rendering services			
	Visibility to the government			

Weakness Categories	Weakness Subcategories	Net. 1	Net. 2	Net. 3
Dependence	Dependence on external support			
	Little incentive by public policies			
Management	Susceptibility to power conflicts			
	Lack of transparency			
	Logistic difficulties			
Vulnerability	Social vulnerability of waste pickers			
	Structure little understood by waste pickers			
	Structural unevenness of individual WPOs			

Source: The author, 2022.

Conclusions

The Brazilian experience in integrating waste pickers stands out in the international literature, especially in the Latin-American context. The PNRS represented a landmark of this process by also instituting the compulsoriness of LRs and by stimulating the protagonism of WPOs by integrating the cooperatives as partners of the LR program. However, their implementation did not result in a significant advance in solid waste management in Brazil and the strengthening of waste pickers' organizations did not occur as expected.

The lack of universalization of selective waste picking and of reverse logistics, the low rates of recovery of recyclable waste by selective waste picking, the perpetuation of the structural problems concerning the WPOs management and sustainability require a critical look into the hindrances to reaching some of the PNRS goals, as well as debating proposals for improvement.

The recycling market has attracted new and strong private actors. In this increasingly dynamic and competitive market, the existing policies do not show to be able to ensure the protagonism of waste pickers. Sectorial agreements contemplating waste pickers by increasing the number of Voluntary Delivery Points, of technical capacity building and of equipment allocated individually in cooperatives are not enough to alter the vulnerability scenario of the WPOs due to the lack or discontinuity of effective public policies.

It can be argued that the proposal for strengthening the CNs, not recognized or valorized by the PNRS or by any other legislation regarding waste pickers or solid wastes, opens new possibilities for recovering the commitment of Law in its social dimension. The results show that CNs evolve from the initial focus on the commercial aspect to the generation of benefits to their members. To be highlighted are the increase in competitivity, their greater visibility, their political strengthening and capacity-building, besides expand-

ing the possibilities of rendering services to public and private organizations. Challenges remain, however, such as power conflicts, challenges to transparency and the structural unevenness of WPOs. The results show the importance of the public policies supported by government resources and of the magnitude of partnerships for consolidating the CNs. Therefore, updating the PNRS to the new dynamics of the recycling market, considering the multiple benefits of CNs, may contribute to the effectivity of their implementation.

The analytical categories proposed in this research indicate future research paths and redirection of the reverse logistics regulation and of sectorial agreements, considering the inclusion of this organizational arrangement for designing strategies directed to valorizing the waste pickers' organizations.

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Política Nacional de Resíduos Sólidos do Brasil: perspectivas das redes de cooperativas de catadores

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Resumo: Apesar dos avanços na implementação da Política Nacional de Resíduos Sólidos (PNRS), as organizações de catadores (OC) continuam a enfrentar problemas estruturais que desafiam sua viabilidade. Frente aos desafios, as redes de cooperativas (RC) emergem como alternativa para ampliar seu espaço na cadeia de reciclagem. O objetivo desta pesquisa é identificar os desafios e perspectivas da atuação das redes de catadores na cadeia de reciclagem e discutir como este novo arranjo organizacional pode contribuir para os avanços esperados da PNRS. Os procedimentos metodológicos incluíram a seleção de 3 estudos de caso de RC, entrevistas, análise documental e de conteúdo. Os resultados mostram a importância das políticas públicas e da amplitude das parcerias na consolidação das RC analisadas. Assim, uma atualização da PNRS à nova dinâmica do mercado de reciclagem, considerando os múltiplos benefícios das RC, pode contribuir para superação dos desafios estruturais enfrentados pelas OC.

Palavras-chave: Catadores; Política Nacional de Resíduos Sólidos; Redes; Reciclagem; Resíduos Sólidos; Materiais Recicláveis.

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La Política Nacional de Residuos Sólidos de Brasil: perspectivas desde las redes cooperativas de recicladores

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Tema destacado

Resumen: A pesar de los avances en la implementación de la Política Nacional de Residuos Sólidos (PNRS), las organizaciones de recicladores (OC) siguen enfrentando problemas estructurales que desafían su viabilidad. Ante los desafíos, las redes de cooperativas (RC) surgen como una alternativa para ampliar su espacio en la cadena de reciclaje. El objetivo de esa investigación es identificar los desafíos y perspectivas de la actuación de las RC en la cadena de reciclaje y discutir cómo esta nueva configuración organizacional puede contribuir a los avances esperados de la PNRS. Los procedimientos metodológicos incluyeron la selección de 3 estudios de caso de RC, entrevistas, análisis documental y de contenido. Los resultados muestran la importancia de las políticas y la amplitud de las alianzas en la consolidación de la RC. Así, una actualización de la PNRS a la nueva dinámica del mercado del reciclaje, considerando los múltiples beneficios de la RC, puede contribuir para la superación de los problemas estructurales enfrentados por las OC.

Palabras-clave: Recicladores; Política Nacional de Residuos Sólidos; Redes; Reciclaje; Residuos Sólidos; Materiales Reciclables.