

IMPACTO DA COVID-19 EM FRÁGEIS ATORES DA CADEIA DE SUPRIMENTOS CIRCULAR E OS OBJETIVOS DO DESENVOLVIMENTO SUSTENTÁVEL

IMPACT OF COVID-19 ON FRAGILE ACTORS IN THE CIRCULAR SUPPLY CHAIN AND THE SUSTAINABLE DEVELOPMENT GOALS

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ABSTRACT

Purpose: This paper aims to analyse the human and work situation of waste pickers in the federal capital of Brazil (Distrito Federal) during the COVID-19 pandemic, connecting them to the Sustainable Development Goals.

Method/approach: We conducted a descriptive case study using a qualitative approach when interviewing ten leaders of their organisations. Following content analysis technique, we created nine thematic categories to understand the waste pickers' perception of stakeholder participation, besides the challenges and opportunities in the three dimensions of sustainability: social, environmental and economic.

Main findings: During the COVID-19 pandemic, waste pickers' organisations in the Distrito Federal had their operations wholly paralysed for six months. The government's participation was negative because of the delay in financial assistance and conflicting information, and some private companies provided support. Due to donations of food and hygiene products,

society was the stakeholder that most recognised the importance of work and the vulnerability of the waste picker. We discussed the results from the perspective of Sustainable Development Goals to list the risks and opportunities of this period.

Theoretical, practical/social contributions: Theoretically, this article contributes by demonstrating categories for analysing the perception of stakeholders. Public and private agents can use its results to adjust their practices in search of SDGs. Finally, the paper's social importance is providing information about these workers' vulnerability and their role in making the solid waste chain more circular.

Originality/relevance: This paper is distinguished from the others because, so far, there are no articles in the Brazilian literature that relate the themes of the COVID-19 pandemic and the work of waste pickers to achieve Sustainable Development Goals.

Keywords: Waste pickers. COVID-19. Circular Economy. SDG.

RESUMO

Objetivo: Este artigo tem como objetivo analisar a situação social e laboral dos catadores na capital federal do Brasil (Distrito Federal) durante a pandemia do COVID-19, conectando-os aos Objetivos de Desenvolvimento Sustentável.

Método/abordagem: Foi realizado um estudo de caso descritivo com abordagem qualitativa, entrevistando dez líderes de suas organizações. Seguindo a técnica de análise de conteúdo, criou-se nove categorias temáticas para entender a percepção dos catadores sobre a participação dos stakeholders, além dos desafios e oportunidades nas três dimensões da sustentabilidade: social, ambiental e econômica.

Principais achados: Durante a pandemia de COVID-19, as organizações de catadores do Distrito Federal tiveram suas operações totalmente paralisadas por seis meses. A participação do governo foi negativa devido ao atraso na ajuda financeira e informações conflitantes, e algumas empresas privadas forneceram apoio. Devido às doações de alimentos e produtos de higiene, a sociedade foi o público que mais reconheceu a importância do trabalho e a vulnerabilidade do catador. Discutimos os resultados sob a ótica dos Objetivos de Desenvolvimento Sustentável para elencar os riscos e oportunidades deste período.

Contribuições teóricas, práticas/sociais: Teoricamente, este artigo contribui ao demonstrar categorias para análise da percepção dos *stakeholders*. Agentes públicos e privados podem usar seus resultados para adequar suas práticas em busca dos ODS. Por fim, a importância social do trabalho é trazer informações sobre a vulnerabilidade desses trabalhadores e seu papel na circularidade da cadeia de resíduos sólidos.

Palavras-chave: Catadores de materiais recicláveis. COVID 19. Economia circular. ODS.

1 INTRODUCTION

In 2015, the deadline for the eight-millennium goals, signed in New York fifteen years earlier, expired (United Nations, 2000). Faced with the need to continue searching for a planet with more financial prosperity, less social inequality and more ecological balance, the United Nations reinforced the commitment in the same year. Thus, in 2015 more than 190 countries signed the pledge to pursue the seventeen Sustainable Development Goals (SDGs) (United Nations, 2015).

From a broader perspective, managing waste properly requires cities, regions or countries to increase the circularity of materials, which contributes to the achievement of the 2030 Agenda for Sustainable Development (United Nations, 2015). With the pandemic of COVID-19, significant adverse impacts are expected on the production of world wealth (Maliszewska et al., 2020) and the current economic system in general (Everingham & Chassagne, 2020). However, SDGs still need to continue to be pursued, for example, SDG number 8, “Promote inclusive and sustainable economic growth, employment and decent work for all” and SDG 12 “Ensure sustainable consumption and production patterns” (United Nations, 2015).

Currently, billions of tons are generated unexpectedly, and there is a global trend of growth globally, mainly in developing countries. The World Bank report with data from more than 200 countries points out that only about 30% of the waste generated globally is used through recycling, composting or energy recovery. Therefore, the vast majority go to landfills or open dumps (Kaza et al., 2018).

It is also known that improper solid waste management can negatively affect the environment, economy and society (OECD, 2020). Waste management provides some benefits, such as reducing pollution (soil, air and water), closing the flow of material, and reusing raw materials/energy (Bai et al., 2020). In developing countries, waste often flows through a chain of organisations that should generate income and social inclusion for a historically marginalised population (Gutberlet et al., 2017).

In the opinion of Sarkis (2021), the COVID-19 pandemic has changed the perception of managers and consumers regarding issues related to the sustainability of the supply chain. According to the author, scientists must collaborate to generate lessons to reduce supply risks in future crises (Sarkis, 2021). Zampier, Stefani e Dias (2022) emphasise the importance of cooperatives of waste pickers (which in Brazil operate in a solidarity economy system) for fulfilling the SDGs. Therefore, it also is crucial to study them in the pandemic context.

Given the gaps identified in the literature, the following research question was elaborated: Under what conditions did the waste pickers go through the COVID-19 pandemic, and how are human and work issues relate to the Sustainable Development Goals? Therefore, this article aims to analyse waste pickers' situation in the Federal District of Brazil during the COVID-19 crisis, connecting them to the Sustainable Development Goals.

Based on the results, it is possible to point out several risks to the health of these workers, the possibility of bankruptcy of their cooperatives, and environmental damage due to the increase in inappropriate waste disposal and accumulation. Despite the population showing solidarity, the government and the companies that produce and distribute packaging in general need more effective and proactive participation. This paper guides actions towards strengthening waste pickers cooperatives, given that their performance contributes to achieving the Sustainable Development Goals.

After the introduction, this paper is organised as follows: First, the theoretical section brings relevant documents to understand the role of the waste pickers in the recycling chain for the Circular Economy. Then, the research design is exposed detailing methodological classifications and the path taken by the researcher. Finally, the results are presented, discussed, and practical implications are suggested based on the reports collected with this category of professionals.

2 THEORETICAL BACKGROUND

2.1 SUSTAINABILITY AND CIRCULAR SUPPLY CHAIN

Among other forms of understanding, the Circular Economy can be understood as a new way of doing business (Batista et al., 2018). This innovative way would continually seek to carry out management practices with people, the planet and profit along the lines of the Triple Bottom Line (TBL) disseminated by Elkington (1998). Knowledge management, integration between supply chain agents, and design for green manufacturing are some of the areas that require development in organisations to make changes towards sustainability (Cerqueira-Streit, Guarnieri, & Farias, 2022). Although, the sustainability of current economic systems has been questioned by many scholars (Genovese et al., 2017).

Materials are exploited in an exaggerated way to produce excessive products, sometimes through labour exploitation (Farooque et al., 2019). These products are distributed and marketed in a polluting manner and consumed and disposed of degradingly (Farooque et al., 2019). The depletion of natural resources is already a prediction for the near future, because of this, a change in the managers' mindset needs to be initiated towards circularity (Kirchherr et al., 2017).

As much as the ideals of circularity in production and consumption have been realised since the 1960s, it has only recently being inserted in public policy agendas. Some actions in companies and society have been noticed (de Jesus & Mendonça, 2018). The Circular Economy (CE) principles emphasise that products can be produced, distributed, and consumed, balancing economic growth concerning ecological and social systems (Nasir et al., 2017). In this new business model, the 3R's known as "Reduce, Reuse and Recycle" are the basis for concrete eco-efficiency actions for the various stakeholders in a production chain, whose responsibility must be shared (Ghisellini et al., 2016).

The concept of Circular Economy is broader than that of Sustainable Supply Chain Management (SSCM), as the CE has ambitions beyond chain operations (Genovese et al., 2017). In this sense, the concept of Circular Supply Chain (CSC) is also broader than SSCM, as it seeks to coordinate the direct and reverse flow of the product (or service) integrating the entire business ecosystem to generate social, environmental, and economic value (Batista et al., 2018).

However, CSC can operationalise ecological innovations that contribute to 3R and, consequently, to EC. For example, repair and remanufacturing is only possible with the recirculation of resources. The reconstruction of inputs becomes viable through recycling and eliminating waste brings the renewal of systems (de Jesus & Mendonça, 2018). Organisations are beginning to implement circular practices, seeking ecologically more responsible suppliers, seeking cleaner delivery of their products or responding quickly to environmental accidents (Bai et al., 2020). Adopting these practices can generate long-term competitive advantage (Genovese et al., 2017).

Pursuing the balance between environmental protection and economic growth in the chain has advantages, even though perfect circularity is practically impossible (Ghisellini et al., 2016). Although social factors have often been overlooked in studies in this area (Chiappetta Jabbour et al., 2019). A whole concept of the circular economy should consider the social as crucial as the environmental and economic sides due to the constant interrelations of these three dimensions. Indeed, the circularity of materials can generate employment and income, which inevitably contribute to improving economic performance (Nascimento et al., 2019).

2.2 WASTE PICKERS AND SUSTAINABLE DEVELOPMENT GOALS

The linear model of development (take-make-dispose) already shows signs that it will not be sustained in the 21st century and needs to be replaced by a circular model in which “reduce, reuse, repair and recycle” are principles to be followed (Ghisellini et al., 2016). An industrial system that seeks to close loops must be restorative and regenerative from design. Therefore, emphasises Waste Management (WM) as something strategic (EMF, 2013; Guarnieri et al., 2020; Sehnem et al., 2019). Thus, the centrality that waste management must have in the path towards Circular Economy is evident. This is true, since actions to prevent the generation, such as reduction, reuse, and recycling, can be considered in all stages of a product's life cycle: extraction, transportation and manufacturing until consumption and final disposal (OECD, 2020).

In developing countries, waste management has peculiar characteristics, including different actors and therefore presents other opportunities and challenges than in developed countries. In the paper research by Gall et al. (2020), a case study carried out in Nairobi (Kenya) is presented to discuss waste pickers' participation in the post-consumer plastic chain. In this case, it was found that the quality of plastic from the informal collection activity is like that of a formal system, which encourages the formation of new partnerships and consequently distributes income to the most impoverished workers.

In this sense, the review organised by Jia et al. (2018) sheds light on the most common problems in developing countries: corruption and lack of enforcement of contracts, lack of infrastructure and low environmental awareness among citizens. Likewise, the authors list factors that can encourage the implementation of sustainable supply chain management, including national regulation, economic incentives as well as partnerships between recyclers' organisations and companies.

Since 2010, Brazil had a specific federal law for solid waste, which guides the appropriate disposal of waste through guidelines and instruments, aiming to close all dumps in the country and perform the productive inclusion of waste pickers (Guarnieri & Cerqueira-Streit, 2015). Ten years after the sanction of the Law, the Brazilian Association of Waste Pickers (ANCAT, in Portuguese) launches a publication in which 607 organisations respond. This document highlights the importance of this agent for the recycling chain by revealing that more than 1.5 million tons of solid waste were recovered by these cooperatives only in 2019 (ANCAT, 2020).

Figure 1
Waste pickers separating materials on the conveyor



Source: ANCAT (2020).

The database of this association of waste pickers was also used in the work (Rutkowski, 2020) when comparing the scheme of extended responsibility to the producer (EPR) used in Europe and Brazil. Although both systems need to be improved, the study finds that for the Brazilian system, there are beneficial aspects in including the waste picker to increase the recoverability rates of packaging and decrease the operating costs.

Many Brazilian municipalities still find it challenging to carry out waste management that respects the Law and is sustainable (economically viable, socially just and environmentally appropriate) (Nogueira Zon et al., 2020). Some actions have been taken in this direction. For instance, the work of Guarnieri et al. (2020) analysed the Brazilian sectorial agreement of packaging, signed in 2015 by the government, waste pickers association and the packaging industry. According to this research, from the perspective of waste pickers, reverse logistics is still in its initial state in Brazil (Guarnieri et al., 2020).

In recent years, infrastructure improvements have been noticed in some waste pickers' organisations (Kain et al., 2022). However, government and industry still do little than they could to sign more advantageous contracts for this fragile agent in the chain (Guarnieri et al., 2020). Recent data indicate that, on average, after one month of work, a Brazilian waste picker receives around US\$ 175.00, so, there is still a long way to these professionals receive the equivalent of the important environmental work they carry out (ANCAT, 2020).

The signatory countries of the 2030 Agenda must act in health, education, and the environment, among others (Khajuria et al., 2022). The investigation conducted by Ferrari, Cabral & Salhani (2022) identified trends in Brazilian organisations committed to the 2030 Agenda. Most are large organisations (with over a thousand employees) and for-profit. In this way, the authors recognise the efforts of large companies to improve their performance. After all, favouring sustainable development tends to attract new investments, expand access to new markets and strengthen stakeholder relationships (Ferrari, Cabral & Salhani, 2022). The SDGs are interdisciplinary, but solid waste management is more linked to some of them (United Nations, 2015).

It is important to highlight recent published studies related to the themes of the COVID-19 pandemic, cooperatives and SDGs. Although none of them has been applied in cooperatives of recyclable material collectors, their results deserve to be highlighted. The study conducted by Galleli et al. (2020) used the Institutional Theory to assess the influence of institutional pressures on Brazilian organisations to change behaviour in favour of the SDGs in the pandemic context. After analysing 72 valid questionnaires, the results point out a tendency for coercive isomorphism to present a greater possibility of changing the behaviour of organisations. That is, it is the fear of the force of the law. Movements due to normative pressures (that are carried out by partners in the chain or even society) were also observed but to a lesser extent. The tendency of organisations to follow market leaders (mimetic isomorphism) was also identified with the lowest degree of pressure for changes in attitude towards the SDGs during the COVID-19 pandemic.

Zampier, Stefani, & Dias (2022) applied a questionnaire with 16 cooperatives from different branches (transport, health, and services, among others) to investigate the Cooperatives' actions concerning the SDGs during the COVID-19 pandemic. According to the participants, most of the SDGs were negatively affected by the pandemic, the main ones being SDG No. 11 (Sustainable Cities and Communities), SDG No. 10 (reducing inequalities) and SDG 4 (Quality education). The research participants reported few actions in search of the SDGs. These few actions would be mainly linked to SDG 8 (Decent Work and Economic Growth).

In this way, the importance of the work of organised collectors for closing the production cycle is highlighted since they make it possible to return materials to the chain. In addition to implying its activity also drives a reduction in recycling costs, social and environmental factors. Therefore, it worked directly towards achieving some of the sustainable development goals.

3 RESEARCH METHODS

To investigate waste pickers' perception in Brazil's federal capital in combating the pandemic of COVID-19, we conducted a case study. According to Yin (2003), this empirical investigation method is advantageous when trying to understand a current phenomenon in its natural context. In this research approach, the researcher does not control the variables but interacts with them. Moreover, various data are usually obtained, not always converging and belonging to specific contexts, so it is qualitative research (Hoon, 2013).

Case studies can be single or multiple and usually combine several instruments for data collection, such as interviews, questionnaires and analysis of archived documents (Eisenhardt, 1989). They also are descriptive by nature. The author also emphasises the importance of carefully selecting the case, since only from a well-adjusted population decreases the external variation and allow the definition of limits to generalise the results (Eisenhardt, 1989).

This research fits as a single case study, since it analysed a stakeholder's opinion (waste pickers) from a single chain (recyclable materials). For data collection instruments, we applied the semi-structured interview, previously a script was elaborated to guide the interviews. Ten waste pickers, who also hold leadership positions in their organisations (cooperatives) participated. It should be noted that the ten leaders represented ten different organisations (waste pickers' cooperatives). The interviews were previously scheduled, each lasting approximately 38 minutes; they were recorded and transcribed to enable the analysis of the results. The intentional sample included people in management positions in addition to operational activities because they would probably be better able to answer questions due to their broader view of problems and processes.

Due to the sanitary restrictions imposed by the pandemic moment, direct non-participant observation was only carried out on three occasions, which provided knowledge of part of the physical infrastructure, equipment, and organisational processes. The other seven interviews were conducted by telephone, following the social distancing protocols. Document analysis was also a source of data collection, since reports were shared, and the Recycling Yearbook was recently launched by the waste pickers association (ANCAT, 2020).

For data analysis, the interview's main points were placed in a matrix of responses and a content analysis was carried out, as evidenced in Bardin (2001). According to Mozzato & Grzybovski (2011) researchers seek this method of analysing qualitative data in organisational studies to compare respondents' responses. Bardin (2001) proposes that the interpretation be carried out by searching for nuclei of meaning in the interviewees' speech, decoding them to properly understand what is being communicated.

According to what this research aims, we created nine thematic categories to understand the perception of waste pickers during the management of COVID-19, they were: 1) Government actions; 2) Company actions; 3) Citizens actions; 4) Social challenges; 5) Environmental challenges; 6) Economic challenges; 7) Social opportunities; 8) Environmental opportunities; 9) Economic opportunities.

4 FINDINGS AND DISCUSSION

4.1 THE IMPACT OF COVID-19 ON WASTE PICKERS CONNECTING THEM TO THE SDGS

To contextualise the challenges that this category of workers went through during the COVID-19 pandemic in the capital of Brazil, it should be noted that as of March 2020, the selective collection was suspended and only returned in September. This suspension resulted in the disposal of all waste produced in this period for the sanitary landfill. Therefore, waste pickers' organisations could not work on collecting and sorting recyclable material for at least six months.

Without proper sorting, the direct deposit of materials of all types (including organic and recyclable) compromises at least the Sustainable Development Goals numbers 6, 8 and 11. The supply of quality drinking water (SDG 6) in the studied region (Federal District of Brazil) tends to be reduced because the waste when disposed of improperly, pollutes the aquifers and groundwater (United Nations, 2015).

Waste pickers cannot work for at least six months in 2020, hampering economic growth and decent work (SDG 8) since they are a category of workers with few financial resources and little ability to make reservations/savings. Therefore, they tend to make working conditions more precarious to seek better incomes.

Sending waste to landfills without triage in the face of the COVID-19 pandemic compromises the fulfilment of the goals linked to SDG number 11. After all, this SDG aims to build more sustainable cities and communities. However, this practice reduces the service life of the region's landfill, which will soon become more expensive, more distant and with more polluting gas emissions with each route taken by the garbage truck.

A table was created with the main results from the analysis of ten interviews conducted with these underpowered players in the recycling chain. The columns indicate the perception of most respondents and the authors who supported the proposed discussion. The lines demonstrate the thematic categories created from the core of meaning extracted from the content obtained. Then, each will be briefly commented on, including excerpts from the statements.

Table 1
The perception of the players according to the thematic category

Thematic categories	Perception of waste pickers during the pandemic	Authors
Government actions	Low participation: Aid poorly distributed	(Jia et al., 2018; Rutkowski, 2020)
Companies actions	Few partnerships, with existing projects and food card	(Rutkowski, 2020)
Citizens actions	Active participation. Donation of food and protective equipment	(Gutberlet et al., 2017)
Social challenges	Poor housing and work conditions. Lack of information.	(Chiappetta Jabbour et al., 2019)
Environmental challenges	Recyclable materials sent directly to the landfill.	(Jabbour & Jabbour, 2020)
Economic challenges	Decrease in income. High risk of bankruptcy for organisations.	(Kahlert & Bening, 2020)
Social opportunities	Greater awareness of the waste picker: hygiene and safety at work.	(Wuyts et al., 2020)
Environmental opportunities	Greater awareness of the population about the disposal of waste	(Wuyts et al., 2020)
Economic opportunities	New partnerships and business diversification.	(Guarnieri et al., 2020)

According to Jia et al. (2018) the results usually contribute more to the theory and present a greater capacity for generalisation when contrasted with the existing literature. In the present investigation, waste pickers are dissatisfied with governmental actions, both at the local and federal levels. Disaster relief was distributed. However, only part of the members of their organisations had access even though they all met the low-income criterion. As Rutkowski (2020) pointed out, governments should implement mechanisms that help organisations that work with sustainable practices, whether buying products directly, with tax subsidies or emergency aid. Usually, in developing countries, the state is the driver of change and should use regulation to encourage sustainable behaviour.

In addition to the People, Planet, Prosperity and Peace axes, the Sustainable Development Goals have the Partnership Axis. The intention is evidence of the need to strengthen partnerships for cooperation toward fulfilling the SDGs. The government has been a critical player in executing projects stimulating actions in this direction. According to the 2019 reports, more than US\$ 12 million were invested in fostering partnerships. The government performed 86% of this financial execution (ONU, 2020).

There was low participation of large packaging generators and recycling industries in assisting waste pickers during the suspension of their activities. According to Gutberlet et al. (2017), packaging-generating industries, importers, distributors and recycling industries are influenced by waste pickers' work. After all, the post-consumer products need to be collected and transported for possible reintegration into the production cycle, through reuse or recycling, for example.

There are reports that buyers of recyclable material, besides not helping, may be taking advantage of the crisis to pay even less to waste pickers. As reported by interviewee D, who is already at the head of an organisation for four years: *"The industry says it has no money and the values continue to fall. The cooperatives that are selling at prices even lower than before the pandemic"*. Interviewee B complements the idea by summarising, *"It looks like they (the recycling industry) take the opportunity to exploit us"*.

Positive initiatives have also been observed. Through the National Association of Waste Pickers (ANCAT), through a project called "Recycle for Brazil", companies like Coca-Cola and Nestlé helped partner organisations for two months (Reciclar pelo Brasil, 2022). A multinational credit card company, also for two months, distributed the Food Card for waste pickers to go shopping. This project raised the esteem of some workers, according to interviewee G: *"The collectors felt valued because the collector himself goes to the market and that gives a lot of dignity"*.

SDG number 9 concerns Industry, Innovation and Infrastructure. Goals were set for inclusive economic growth and productive diversification. Therefore, the importance of carrying out actions to increase the participation of key players in the recycling chain (such as waste pickers) is highlighted, even though they do not represent an economic force. Furthermore, SDG 9 aims to build resilient chains with social participation. According to the UN Brazil report, around US\$75 million were invested in combating the socio-economic effects of the COVID-19 pandemic (ONU, 2021). In the case studied, good practices from large industries were observed, albeit on a symbolic scale.

In the interviewees' opinion, citizens support waste pickers' work. During this period, several people gathered their families and friends to donate food and personal protective equipment. Interviewee C's account shows: *"If it weren't for the people to help, people were already starving. Imagine who has 4 children at home and has not been working for months?"*.

According to Gutberlet et al. (2017), organisations formed based on the solidarity economy, as well as those of waste pickers, are usually formed by people historically marginalised from the traditional labour market and economically excluded.

Using the lens of institutional theory and strategic management models as the public sector's response to unexpected problems, Reyes et al. (2021) analysed the impact of the conflict between economy and health during the COVID-19 pandemic. The authors performed a content analysis of several reports published about the pandemic in 2020 in the largest circulation newspaper in Brazil: Folha de São Paulo. The results are surprising insofar as they suggest that the apparent conflict between economy and health originated and strengthened in the existing political conflict between the federal government and state governments. Therefore, the authors of the present research believe that the alignment of discourse and actions between the different spheres of public power could have avoided deaths and social problems potentiated by the pandemic, such as hunger.

Hunger is still a problem in Brazil. A study with more than 12,000 families in 577 Brazilian municipalities and all federation units confirmed this. 58.7% of respondents experience some level of food insecurity, with 15.5% experiencing severe food insecurity. This last category concerns families that do not eat due to a lack of money to buy food, eat only one meal a day or stay all day without food (Rede Penssan, 2022).

SDG 2 aims to end hunger, improve nutrition, and promote sustainable agriculture. In addition to the nine goals stipulated in the 2030 Agenda, Brazil created one more goal, including the poor, people in vulnerable situations, children and the elderly, in ensuring safe food by 2030 (IPEA, 2018). Therefore, waste pickers during the COVID-19 pandemic need to be included in policies to combat hunger.

Organisations are fundamental to pave the way towards sustainable development, and adopting circular practices contributes to this. However, authors like Chiappetta Jabbour et al. (2019) raise the concern that studies in the area place too much emphasis on sustainability and the environmental dimension. They often neglect the social side of the circular economy. By integrating green human resource management (GHRM) with Circular Economy, they find that improving social conditions, respect for cultural factors, empowerment and teamwork can positively influence the CE's inclusion in business models.

Waste pickers face several humanitarian challenges in this pandemic, including that reported by interviewee B: *"My fear is that someone will catch this disease and return home. Here we live twelve families on the same land, with the children we add up to forty-seven people living in the same space"*. In other words, sanitary or social distance measures become utopias in the face of such precarious housing realities. In this sense, interviewee H also reports: *"Many waste pickers live on rent, many returned to live on the streets or returned to live with relatives in this pandemic. We get food donations, but we also have bills to pay"*.

In the context of the COVID-19 pandemic, the activity of collecting and sorting recyclable materials has been affected worldwide. Due to the high risk of contagion and spread of the disease, many countries have decided to send their materials directly to landfills or incinerator industries (Nzediegwu & Chang, 2020). Jabbour & Jabbour (2020) cites France as an example of a country that drastically reduced the labour force in this period, in addition to Italy and Spain as countries that abruptly interrupted the material sorting system.

In the capital of Brazil, the months of paralysis (6 months throughout 2020) generated anxiety; after all, the risk of bankruptcy was reported by most waste pickers. Interviewee A's speech illustrates this feeling: *"Customers and the government pay only for what we produce..."*

So, if the material does not arrive, the money will not enter, and we are afraid of needing to close the cooperative".

In addition to the notorious financial and social impacts that supply chains are suffering, there are also negative environmental consequences (Nzediegwu & Chang, 2020). According to the data collected from the waste pickers, the Brasilia landfill durability tends to decrease due to the time in which recyclable materials were sent directly to be buried. The sorting of materials contributes to the environment insofar as it separates what still has value and could represent pollution of soil, air and groundwater.

In the environmental area, one of the interviewed waste pickers shared her hope: *"Today I think the population is more aware of the waste picker's work. At the beginning, we found a lot of medical waste and a mask in the common waste. Currently, they put the glass in a PET bottle or milk carton to avoid harming the collector"*. Finally, it is evident that some interviewees keep hoping for better days when they understand that management lessons have been taken.

Professional F demonstrated that he values management by saying: *"We must not postpone planning. We need to be prepared, in every way: financially and even emotionally"*. Interviewee G predicts that the increase in consumption at home will increase the demand for packaging, which consequently, will bring more significant financial gains for her: *"With the increase in delivery, the production of packaging has increased a lot and therefore recyclables will be more and more valued"*. As investigated by Guarnieri et al. (2020), waste pickers' cooperatives need to be strengthened (in equipment and management attributes) and adequately included in the chain for Brazilian Law and the packaging sector agreement to be done appropriately.

Even in the face of the challenges that COVID-19 brought, Wuyts et al. (2020) can see opportunities to narrow and slow down loops to reduce the generation of waste, including in the health area. We identified opportunities in this research's social, environmental, and economic areas. In the social area, interviewees C and D talk about increasing solidarity when reporting: *"People are realising that work and money is not everything. Health and family must come first"* and *"It was a year of more unity and less arrogance. It was a year of learning"*.

The period of stoppage of activities of organisations due to the COVID-19 pandemic brought numerous management challenges. These difficulties resulted in economic, social and environmental losses, and consequently, the fulfilment of sustainable development objectives became even more distant.

Several actors were summoned to provide support to organisations that play an important social and environmental role in the urban environment. However, according to the interviewees, the government, companies and society participated at different levels during this period.

5 FINAL REMARKS

The literature shows that in developing countries (such as Africans and Latin Americans), waste pickers act as an essential agent for collecting, sorting and disposing of materials for the recycling industry. In addition to millions of lives lost, the COVID-19 pandemic has negatively affected the economy and several supply chains worldwide. This paper aimed to analyse the situation of waste pickers in the Federal District of Brazil during the COVID-19 crisis.

To achieve this objective, ten semi-structured interviews were conducted with leaders of ten organisations (mostly by telephone, respecting health issues). This qualitative case

study used the technique proposed by Bardin (2001) and therefore created thematic categories to analyse the subjects' statements' content.

During the six months of selective collection stoppage in which waste pickers' cooperatives were inactive, the government's participation was assessed as negative since the aid did not always reach the needy. The involvement of the companies was assessed as reasonable since the purchasing industries did not improve payment conditions or help, however, large corporations carried out projects that occasionally helped part of the interviewees. Most organisations received support from people in the community. Due to donations of food, hygiene products and personal protective equipment, society was assessed with a stakeholder who recognised the importance and vulnerability of the waste picker.

Several challenges were identified as obstacles to be overcome by this class of workers. The risk of contamination is due to the activity's nature, the agglomeration, and the poor sanitary conditions of their homes and work infrastructure. The environmental damage to soil, air and water due to the lack of selective collection was listed, as well as the real risk of bankruptcy for these organisations to spend so many months without financial income.

We also identified social, environment and economic opportunities. It was noticed that the waste pickers are more aware of the need for hygiene and the use of protective equipment, as well as a gain in the environmental education of the population, who are more aware of their responsibility in the consumption and disposal of post-consumer products. The pandemic also provoked reflections on the importance of planning and management and stimulated changes in the current way of selling recyclable materials.

The results of this research were discussed with the Sustainable Development Goals. The work of the waste picker in the recycling chain mainly involves SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry and infrastructure) and SDG 12 (Responsible consumption and production). Issues related to their social vulnerability were discussed based on some SDGs, such as the SDG 1 (End poverty), SDG 2 (End hunger) and SDG No. 10 (reducing inequalities). Negative consequences of the COVID-19 pandemic were also discussed from the perspective of the SDG 3 (Good health and well-being), SDG 6 (water and sanitation) and SDG 11 (Sustainable Cities and Communities).

In addition to properly disposing of the dry fraction of urban solid waste (recycling), solidarity economy cooperatives have a strong social potential impact. These organisations contribute to reducing poverty, increasing social inclusion, and increasing gender equality, among other factors related to sustainable development.

This work contains some limitations. It collected data with only one participant in the solid waste management chain, which was the waste picker, without considering the government's opinion, the recyclers' and the main generators of waste. It also considered a specific region of the country, the Distrito Federal, and on-site observation to assess processes was limited due to the social distance required by COVID-19 pandemic. Thus, future studies may incorporate other essential stakeholders, such as members of the government or companies, as well as include other methods of data collection, such as questionnaires, direct observation and/or focus groups. This study's results can also be compared with similar studies in different regions and countries, especially the developing ones, which have the waste pickers.

Despite the research limitations, this paper provides helpful information for scholars and public policymakers about the critical role that waste pickers have in circular supply chains and their vulnerability. This awareness contributes to socio-productive inclusion, as advocated by Brazilian Law. This paper can also be helpful to other countries, particularly emerging ones

since they have underpowered actors that carry out key operational activities for the transition to a circular economy.

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Appendix A

Interview Guide – Waste pickers and COVID-19

General information

Organization/Cooperative Name:

What types of waste do you receive:

Position held:

Cooperative time / Time in function:

1. What was the daily or monthly volume of waste received before COVID?
2. Do you work in a suitable waste handling and sorting facility (e.g. sorting centre)? If not, how would you describe the facilities?
3. When were your organisation's activities suspended?
4. What are the losses caused by the stoppage of activities?
5. What measures is your city hall/GDF taking so that waste pickers do not contract the virus?
6. Did you receive any training or instructions?
7. Are there collectors who receive a "recycling grant"? How many %? How much is the aid? Are they keep paid?
8. Are you receiving any other type of scholarship or assistance? If yes, from whom? What kind of help? (Including food)
9. Do independent (non-cooperative) collectors receive any support from the government or only cooperative ones?
10. What measures is your organisation taking so that waste pickers do not contract the virus?
11. Is there distribution of PPE, alcohol gel and gloves? Who is donating?
12. Do private companies that buy from you (intermediaries) continue to request recyclable materials? Moreover, for the industries, is the material still being sent?
13. How do you rate government participation? Moreover, the companies? What about society?
14. Is there a forecast for the return of your organisation's activities?
15. Do you think anything will change (for better or worse) when will the crisis end?
16. What is the lesson that remains for people and waste pickers after this crisis?
17. How is your current state of health?
18. Do you feel more anxious than usual? Do you feel that this crisis affected your emotional state?
19. Do you feel supported by the government and/or society?
20. What are your main fears and insecurities with this crisis?