

## SOLID WASTE AND SOCIAL DISTANCING CAUSED BY THE COVID-19 PANDEMIC: A BRIEF SOCIAL AND ENVIRONMENTAL OVERVIEW AND A CASE STUDY OF THE MUNICIPALITY OF RIO DE JANEIRO

*Resíduos sólidos e o distanciamento social ocasionado pela pandemia da Covid-19: um breve panorama socioambiental e um estudo de caso do município do Rio de Janeiro*

*Los residuos sólidos y el distanciamiento social provocado por la pandemia del Covid-19: breve resumen socioambiental y un estudio de caso en Río de Janeiro*



**Melanie Lopes da SILVA** – Universidade do Estado do Rio de Janeiro (UERJ).

ORCID ID: <https://orcid.org/0000-0001-8443-5236>

URL: <http://lattes.cnpq.br/8141351762960401>

EMAIL: [melaniels\\_1@hotmail.com](mailto:melaniels_1@hotmail.com)

**Sara dos Santos Barreto COCCHIARELLI** – Universidade do Estado do Rio de Janeiro (UERJ).

ORCID ID: <https://orcid.org/0000-0002-9040-5938>.

URL: <http://lattes.cnpq.br/3789621391444450>

EMAIL: [sarabarreto97@gmail.com](mailto:sarabarreto97@gmail.com)

**Rebeca de Oliveira CASTRO** – Universidade do Estado do Rio de Janeiro (UERJ).

ORCID ID: <https://orcid.org/0000-0003-4800-8581>

URL: <http://lattes.cnpq.br/4338599970713150>

EMAIL: [oc.rebeca@gmail.com](mailto:oc.rebeca@gmail.com)

**Fábio Vieira de ARAÚJO** – Universidade do Estado do Rio de Janeiro (UERJ).

ORCID ID: <https://orcid.org/0000-0002-1931-7302>.

URL: <http://lattes.cnpq.br/5852019883599693>

EMAIL: [fvaraujo@uol.com.br](mailto:fvaraujo@uol.com.br)

### SUMMARY

The restrictive measures for the movement of people caused by the COVID-19 pandemic caused part of the population to remain at home, reducing the flow of people on the streets. In order to understand the influence of changes in the population's behavior in the generation of solid waste, this research aimed to gather information on production and disposal of solid waste during social distancing in order to verify if there have been changes in the habits of consumption of products and waste disposal. The research was designed from bibliographic review and a public survey on the behavior of the population in relation to solid waste on a digital platform. The data collected shows that the delivery service increased after the start of social distancing, as well as the demand for disposable packaging, especially plastic ones. On the other hand, increased competition between delivery workers and there was a worsening in working conditions. The volume of solid waste in urban areas and on beaches has decreased, while the volume of waste sent for selective collection has increased. In this period, new types of waste began to be seen on streets and

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beaches, disposable masks and gloves. It is concluded that this is an important moment for society and public entities deal with the consumption and disposal of solid waste in order not to further aggravate problems related to waste; the individual habits are important and everyone should seek to improve behavior in relation to the environment, however, a significant and lasting change must rely on public power, industry and commerce, which govern the behavior of the population. Politics must be an instrument of transformation and social improvement, and citizens must act as active subjects, capable of questioning and proposing changes.

**Keywords:** Social distancing; Pandemic; Plastic; Pollution; Disposable waste.

## RESUMO

As medidas restritivas de circulação de pessoas ocasionadas pela pandemia da COVID-19 fez com que parte da população permanecesse em casa, diminuindo o fluxo de pessoas nas ruas. Para compreender a influência das mudanças de comportamento da população na geração de resíduos sólidos, a presente pesquisa objetivou reunir informações sobre produção e descarte de resíduos sólidos durante o distanciamento social a fim de verificar se houveram mudanças nos hábitos de consumo de produtos e descarte de resíduos. A pesquisa foi elaborada a partir de revisão bibliográfica e uma sondagem de público sobre o comportamento da população em relação aos resíduos sólidos em plataforma digital. Os dados coletados mostram que o serviço de delivery aumentou após o início do distanciamento social, bem como a demanda por embalagens descartáveis, especialmente as de plástico. Por outro lado, aumentou a competitividade entre os trabalhadores do ramo de delivery e houve piora nas condições de trabalho. O volume de resíduos sólidos em áreas urbanas e nas praias diminuiu, enquanto o volume de resíduos enviados para a coleta seletiva aumentou. Neste período, novos tipos de resíduos passaram a ser vistos em ruas e praias, máscaras e luvas descartáveis. Conclui-se que este é um momento importante para a sociedade e os entes públicos tratem do consumo e descarte de resíduos sólidos a fim de não agravar ainda mais os problemas relacionados aos resíduos; os hábitos individuais são importantes e todos devem buscar melhorar o comportamento em relação ao meio ambiente, no entanto, uma mudança significativa e duradoura deve contar com o poder público, indústria e o comércio, que regem os comportamentos da população. A política deve ser um instrumento de transformação e melhoria social, devendo os cidadãos atuarem sujeitos ativos, capazes de questionar e propor mudanças.

**Palavras-chave:** Distanciamento social; Pandemia; Plástico; Poluição; Resíduos descartáveis.

## RESUMEN

El distanciamiento social provocado por la pandemia de COVID-19 significó que parte de la población se quedara en casa, reduciendo el flujo de personas en las calles. Con el fin de comprender la influencia de los cambios de comportamiento en la generación de residuos sólidos, la presente investigación tuvo como objetivo recabar información sobre la producción y disposición de residuos sólidos durante el distanciamiento social con el fin de verificar si hubo cambios en los hábitos de consumo de productos y disposición de residuos. La investigación se basó en una revisión de la literatura y una encuesta pública sobre el comportamiento de la población en relación a los residuos sólidos en una plataforma digital. Los datos recopilados muestran que el servicio de entrega aumentó después del inicio del distanciamiento, así como la demanda de envases desechables, especialmente de plástico. Por otro lado, la competitividad entre los trabajadores del sector repartidor aumentó y las condiciones laborales han empeorado. Disminuyó el volumen de residuos sólidos en zonas urbanas y playas, mientras que aumentó el volumen de residuos enviados a recogida selectiva. Durante este período, se empezaron a ver nuevos tipos de residuos en calles



y playas, máscaras y guantes desechables. Se concluye que este es un momento importante para que la sociedad y las entidades públicas aborden el consumo y disposición de los residuos sólidos para no agravar más la problemática relacionada con los residuos; individuales son importantes y todos deben buscar mejorar el comportamiento en relación con el medio ambiente, sin embargo, un cambio significativo y duradero debe contar con el gobierno, la industria y el comercio, que gobiernan el comportamiento de la población. La política debe ser un instrumento de transformación y mejora social, los ciudadanos deben actuar como sujetos activos, capaces de cuestionar y proponer cambios.

**Palabras-clave:** Distanciamiento social; Pandemia; El plástico; Contaminación; Residuos desechables.

## 1 INTRODUCTION

The pandemic of the infectious disease COVID-19, caused by the Sars-cov2 virus, popularly known as Coronavirus, began in December 2019 in Wuhan, Hubei province in China and, due to its high degree of contagion, through displacement of people infected, the virus spread to all continents in a few months. To control the disease, it was necessary to install social distancing for all individuals, whether infected or not, to prevent the spread of the virus (FARIAS, 2020; FERREIRA NETTO E CORRÊA, 2020). In Brazil, social distancing began in March 2020, however, it happened unevenly in the different regions and states of the country, some cities had very restrictive measures and others did not show any adherence to social distancing,

Social withdrawal made part of the population remain in their homes and reduced the flow of people on the streets, possibly also modifying the pattern of consumption, the type and volume of waste generated. Essential services such as hospitals, pharmacies, markets, transport, among countless others, were maintained (CASA CIVIL, 2020) and distancing measures and the use of masks, alcohol gel and keeping a safe distance were widely publicized, so that workers and customers to minimize the risk of contamination. The recommendations of the World Health Organization (WHO) and the imminent risk inside and outside the hospital environment, changed the habits of the population and led to an increase in the use and disposal of personal protective equipment, and new types of waste such as masks and gloves appeared on the streets and beaches (FADARE and OKOFFO, 2020; PRATA et al., 2020; WHO, 2020a) . On the other hand, people who were already in social vulnerabilities were even more exposed. In Brazil there are about 100,000 homeless people (INSTITUTO DE PESQUISA ECONÔMICA APPLIADA - IPEA, 2015).

The population's adherence to social distancing was influenced by the lack of a single standardized social distancing policy by the federal government. Different degrees of

rigor were observed in the states and municipalities, which adopted policies autonomously, influencing the effectiveness of controlling the spread of the virus (MORAES, 2020). The company “In loco” developed, through monitoring the location of cell phones, a social isolation index (term adopted in the research to name the permanence of people in their homes), the map shows the percentage of people who were in their homes from on 02/01/2020, 31.7% of the population; the highest isolation rate was verified on 03/22/2020, 62.2%, coinciding with the moment when social distancing measures were being initiated in several states and being reported by the media; on 07/22/2020, the value was 38.5%, when measures to ease social distancing had already been implemented (INLOCO, 2020). This research excludes people who do not have access to cell phones and the internet, however, it is possible to have a general idea of the number of people who stayed in their homes and thus understand the influence of staying at home on the waste produced by the population.

The social distance caused by the COVID-19 pandemic has changed the routine of several people across the country, unemployment rates have increased, especially among informal workers; part of the staff of some companies was removed; in others there were mass dismissals; the work provided by workers from public and private sector companies who kept their jobs, when possible, started to take place from their homes, a practice known as home office (MELLO, 2020; PORTO and MEIRINHO, 2020). These facts made more people spend more time in their homes, causing changes in their waste disposal patterns. Changes occurred in industrial production, sales of products and services, and consumption.

compared to the same period last year (CARMARGO, 2020). In February, the increase was 15.8%, in April the increase was 15.9% and in May, 11.93%, compared to the same month of 2019. The increase in consumption in this sector can be explained due to changes in the population's habits, such as eating more meals at home and also due to the increase in the prices of basic foodstuffs. This whole picture also caused changes in the disposal of solid waste (ALBUQUERQUE, 2020; BENITES, 2020).

Solid waste generated by the world's population has been changing in type and volume, especially in large urban centers. Modern societies produce more waste composed of synthetic elements that generally do not have natural decomposers, in addition to taking longer than waste of natural origin to be decomposed. Inadequate management of solid waste and disposal in an inappropriate place by the population generate impacts on the environment, such as pollution of the soil and groundwater by manure, air pollution through gases generated during the decomposition of waste, attraction of animal vectors of



diseases, negative impact on the quality of life of the population residing around improper waste disposal sites, ingestion of waste by fauna, among others (GOUVEIA, 2012). In the last years, pollution by solid waste and its environmental implications were in evidence and there were advances related to laws, standards and reporting in the media. The pandemic caused by the Coronavirus has changed the focus, leaving the environment as a less important subject, which can lead to greater and different problems in the future.

In view of the above, it was necessary to collect data on solid waste generated during the social distancing caused by the COVID-19 pandemic so that we can better understand the current scenario; reflect on practices that may be harmful in the socio-environmental and economic context; and develop possible solutions to the identified problems. The present research aimed to gather information on the production and disposal of solid waste in Brazil during the social distancing caused by the COVID-19 pandemic in order to understand the changes in behavior that occurred in this period.

## 2 METHODOLOGY

For the preparation of this research, information was sought in scientific articles, books and reports published on websites of associations, news websites and websites of public cleaning companies in Rio de Janeiro. As this is a recent subject with few scientific publications, we carried out a public online survey, with 21 questions on the digital platform Google forms, in order to obtain information about the

habits adopted during social distancing by the population regarding product consumption and waste disposal. The public poll contained closed multiple-choice responses and an option for respondents to enter additional responses if they wished; it was available between July 7, 2020 and August 11, 2020. The questions were related to: the place of residence (city, state and country), the number of residents in the houses; to the habits adopted during social distancing in terms of: the frequency of leaving home, the possible change in the amount of waste generated in households, the types of waste most generated in households and those that most integrated food delivered by delivery, the number of purchases carried out online, the number of garbage bags discarded per week,

The focus of the present work was to gather data; observe changes in product consumption and waste generation; stimulate reflections on the COVID-19 pandemic and solid waste. The public survey was a complementary tool for analysis and reflection,

therefore, its results will be exposed and discussed in the topic “A brief overview of the city of Rio de Janeiro”.

### 3 DEVELOPMENT

#### 3.1 Waste, Tailings and Pandemics

Initially, it is important to understand the difference between the terms waste and reject, as it is possible to find different definitions according to the research source. According to Law 12,305, which instituted the National Solid Waste Policy, solid waste is that which has not had its possibilities exhausted, and can be reused, recycled and even reinserted into the production chain, thus reducing the volume of waste that reaches sanitary landfills and dumps, saving the extraction of new raw materials and reducing the various types of pollution involved in this process. Tailings are solid residues that have had all possibilities of treatment and recovery by available and economically viable technological processes exhausted, because they present excessive contamination or physical-chemical losses; being the only solution for waste, forwarding to landfill or incineration. It is then pointed out that most of what is discarded by the population is waste, but is treated as waste (BRASIL, 2010; VGRESIDUOS, 2020). That said, follow the historical context for a better understanding of the theme.

The first problems related to household waste emerged with the sedentarization of human beings, when they began to aggregate in communities and the amount of waste produced increased as a result of domestic and agricultural activities (EIGENHEER, 2009). During the Middle Ages, most of the remains resulting from the activities of human beings were related to their excrements, such as feces, urine and decomposing corpses; and remains related to food such as animal carcasses, fruits, vegetables and vegetables. These remains began to be associated with the physical and psychological suffering of human beings, thus generating a strong feeling of fear, which became even more evident as a result of the outbreak generated by epidemics and pandemics of diseases in the Middle Ages, such as the Plague. black,

In the Contemporary Age, more specifically in the 19th century, there were considerable changes in urban cleanliness. This change occurred in part due to the emergence of the Industrial Revolution, which generated accelerated urban growth with

serious housing and hygienic-sanitary consequences. It was necessary to elaborate and put into practice measures to improve the sanitary condition of the peripheral neighborhoods of industries, as well as the most privileged areas of Brazilian cities. The emergence of the microbial theory of diseases was a decisive milestone for advances in urban cleaning, bringing a more radical change in the view of public health and care in relation to waste (MIZIARA, 2008).

In the final decades of the 20th century, consumption, which was an issue dependent on industrial society, began to play a more relevant role; associated with production, allowed a new cycle of accumulation caused and intensified by the search for social demand and its diversification (COSTA LIMA, 2015). This symbolic change, according to Harvey (2012), occurred as a strategy to overcome the economic crisis that hit the Capitalist world in the mid-1970s. This acceleration, which began in production, was successful in the spheres of exchange and consumption, due to new information technologies and mechanization; administrative organization; flexibility of work and its markets (HARVEY, 2012).

### **3.2 Capitalism, Crisis and Socio-Environmental Vulnerability**

The new era of Capitalism is known as the society of mass consumption, marked by increased production of consumer goods, ease of transactions or forms of payment and programmed obsolescence. All this ease in the production, consumption and, consequently, disposal of waste, brings impacts in the social, political, environmental and economic spheres. Greater visibility of environmental and socioeconomic issues, due to the growing generation of waste, began to occur in economically developed countries in the late 1970s, and in other countries in the mid-1980s (ALIÓ, 1999). Three main causes of the increased generation of waste in global society are identified: planned obsolescence, excessive consumption and flexible industrial production,

From 1980, profound transformations occurred in the Capitalist system, consumers began to be called a hyperconsumption society (LIPOVETSKY, 2007). Consumption is often motivated by emotions, feelings and desires, so that several products end up being purchased without reason or functionality by the consumer (CONCEIÇÃO et al., 2014). If in past periods, what went to the trash were rejects, all the human remains that were no longer useful, with the rise of Capitalism, society starts to consume much more than it needs and



discards residues that could still be reused, reused or recycled; generating impacts to the environment from the moment of extraction of raw material to the final disposal of material that is no longer useful in its view.

According to Harvey (2020), capitalist economies have up to 80% of their stimulus caused by consumerism. This economic model, which is based on the exploitation of the workforce and values material goods more than all forms of life, including human life, has increasingly produced inequalities of class, color and gender. The crisis in capitalism is part of its essence, since in the midst of so many inequalities, there will always be crises like a cry, a denunciation of a bad scenario for most people. (COSTA and BRAZ, 2020). The economic context before the pandemic was already one of crisis, with capital profitability showing a downward trend. The social and economic crisis related to the Coronavirus is not something completely unexpected, since the capital's search for profit in agriculture and in the exploitation of nature occurs in an increasing and unlimited way. Added to this is the fact that the economy is weakened worldwide, having not fully recovered from the 2007-2008 crisis. This crisis therefore has three dimensions: environmental, social and capital appreciation (ROBERTS, 2020; COSTA E BRAZ, 2020).

Costa and Braz (2020), state that the ocean may be the same for the entire population, but the vessels are very different. Although the Coronavirus is highly contagious and has reached people from all social classes, the impacts have unevenly affected different classes. The fact of staying in a house with good hygienic-sanitary quality is a privilege, since more than 37% of the Brazilian population lives in households where at least one basic sanitation service is lacking, and among people with the lowest income, it reaches 60%; Brazilian households that do not have access to garbage collection are 9.7%; water does not arrive through the network and sewage is not collected in 15.1% and 35.7%, respectively.

The choice to remain at home during social distancing is also a privilege for those who can work from home and do not risk losing their job if they do not show up for work. The number of unemployed in Brazil reached 12.8 million Brazilian men and women between March and May 2020; in July, 12.2 million Brazilians were unemployed. Social inequalities are once again shown when formal and informal jobs are compared. Compared to the first quarter of 2020, in the second quarter there was a 16.4% drop in informal jobs, while formal jobs fell by 5.1%. The difference draws even more attention when compared to



2019, less than 5% of formal jobs were lost in a year, against 20% of informal ones. During social distancing,

As can be seen, this is a question of environmental injustice, since low socioeconomic status is related to high exposure to environmental risk; there is an unequal distribution of environmental risks among social groups. Environmental inequality is related to other forms of inequality, such as gender, skin color and income. Layrargues (2009) states that “individuals are environmentally unequal because they are unequal in other ways”; inequalities overlap since individuals and social groups have different access to environmental goods and services such as clean water, fresh air and arable soil (LAYRARGUES, 2009). This situation reflects directly on society and the environment, since groups in socio-environmental vulnerability will hardly have the choice to adopt positive and sustainable habits and attitudes for themselves and for the environment. Furthermore, it is important to point out that being employed does not mean having good working conditions and a salary that can meet basic needs, as we will see below in what happened in the delivery service.

### **3.3 The home delivery service during social distancing**

In the context of social distancing, some branches had room for growth, such as deliveries, in a survey carried out by Mobills, a personal finance management company, it was found that delivery sales grew by almost 100% between January and May 2020 compared to the same range as in 2019 (BÜLL, 2020). With the increase in this type of service, there was also a greater demand for disposable plastic, paper and aluminum packaging and, consequently, an increase in the disposal of these items.

According to data from the Associação Brasileira de Bares e Restaurantes (ABRASEL, 2020), 55% of establishments were only working with deliveries between April and June and some establishments began to invest in delivery due to the pandemic. Consequently, sales in the packaging sector have grown. The Brazilian Plastic Industry Association (Abiplast) states that the demand for utensils

as plates, cutlery and disposable cups doubled in the months of April, May and June 2020, compared to the year 2019 (ABRASEL, 2020).

A fact that deserves attention is the working condition of delivery application providers, since without social justice it is impossible to achieve environmental balance

(LAYRARGUES, 2009). In a survey carried out in the period prior to the pandemic, the profile of couriers was: male, black, aged between 18 and 22 years old, with a daily workday, without days off, and remained connected to the app for up to 12 hours straight, with lower monthly earnings a minimum wage (MACHADO, 2019; ALIANÇA BIKE, 2019). In a survey carried out by BBC NEWS BRASIL, based on data from the Brazilian Institute of Geography and Statistics (IBGE), it was found that after the start of the COVID-19 pandemic, delivery app workers began to receive lower remuneration and have longer working hours;

With the advancement in the creation and demand for delivery by companies in the food sector, the number of packages used in this type of service has also grown (REVOLUÇÃO DELIVERY, 2017). Most packages used to store food for delivery have petroleum raw materials in their composition (BERGHANN, 2019; STARTUPI, 2020). One way to mitigate the effects generated by the production and disposal of these materials is to replace the raw material, from petroleum to biodegradable or that are at least recyclable (BERGHANN, 2019) and, allied to this, the creation of public policies that enable and encourage the use of these less harmful packages by industry, commerce and consumers.

The company A. Poli Júnior is one of the pioneers in Brazil and is developing a project that seeks alternatives for the creation of ecologically sustainable packaging for food delivery, through the production of pots that contain recycled polypropylene in their composition (STARTUPI, 2020). It is also worth highlighting the research by Berghann (2019) in which he proposed a project to change habits coordinated by a strategic design and ecodesign, based on the development of a returnable and biodegradable packaging capable of generating less waste and that meets the needs of delivery (BERGHANN, 2019). However, isolated initiatives do not generate a significant change, it is fundamental that there is participation of the public power and the awareness of all people involved in the production chain in consumption.

The daily decision to consume and discard materials that have less impact on the environment can and should be made by all citizens. However, it is urgent to apply public policies on solid waste that already exist, such as reverse logistics, for example, and inspection; for industries to replace non-renewable raw material products that are long-lasting in the environment, such as plastic, with other more sustainable materials, less harmful to the environment and human health.

According to the Ministry of the Environment (2020), one third of Brazilian domestic waste is made up of plastic packaging and approximately 80% of packaging is discarded



after just one use. These data are important for reflection on the role of government, industry and the adoption of practices that are less harmful to the environment by the population; it is important to deepen knowledge about solid waste management in order to sensitize the population until this agenda is seen as fundamental for society as a whole.

### **3.4 The production and management of solid waste during social distancing**

Solid waste management in Brazil occurs unevenly across different states and municipalities. In addition, 17.3 million people live in regions without any type of collection, especially in rural areas and small municipalities. A survey carried out by the Brazilian Association of Public Cleaning and Special Waste Companies (ABRELPE), in 2017, showed that of the 64 million tons of waste produced by the population, 24 million, that is, 37.5%, were sent to inappropriate destinations such as dumps or sanitary landfills with poor operating conditions (LIMA, 2016). The absence of this public service is yet another factor that aggravates socioeconomic and environmental inequalities, such as unequal access to land

and good quality water, pollution-free air, etc. The permanence at home of part of the Brazilian population caused a smaller flow of people on the streets, causing changes in the generation of waste. In a survey carried out by (Abrelpe) and by the International Association of Solid Waste in Brazil (ISWA), together with companies that represent 60% of the private urban cleaning market operating in all regions of Brazil, it was concluded that the generation of waste households in Brazil decreased by 7.25% in April 2020, compared to April 2019. Carlos Silva Filho, CEO of ABRELPE, says that waste generation is directly related to society's income and consumption habits, therefore, instability and economic downturn are decisive factors for the consumption of goods and services by citizens.

The study also addressed selective collection, the collection of recyclable materials increased between 25% and 30% in April 2020 compared to the same month in 2019, which does not mean that there was an increase in recycling in this proportion. According to the data analyzed, it was observed that part of the volume collected was being sent to landfills due to the total or partial closure of the sorting sites. The greater number of recyclable items composing household waste indicates a change in the waste profile, with less organic waste and more packaging, which may have occurred due to the increase in online shopping. Despite this increase in selective collection, it is important to note that this service covers

only 1,322 of the 5,561 municipalities in the country, just over 20% of the total (ALBUQUERQUE, 2020).

Waste from health services showed a reduction of 15.6% in the country during social distancing compared to the pre-pandemic period, according to Silva Filho, this data indicates that Brazil is in the opposite direction to the world trend, which is growth, currently. What may be happening is an inadequate separation and disposal of these items, since the management of infectious waste is more expensive and laborious; which exposes workers, the population and the environment to numerous risks (ALBUQUERQUE, 2020).

The Municipal Urban Cleaning Company (COMLURB), responsible for waste management in the city of Rio de Janeiro, reported in an interview with Band news fm Rio, that the amount of waste decreased dramatically after the beginning of social distancing. The daily amount of waste removed in the city in recent years was 10,000 tons on average, including household and urban waste, large generators and construction waste. According to the company, there was a reduction in household waste of 11% in the week of May 10 to 16 compared to the average of the two weeks prior to social distancing; in the week of May 17th to 23rd, compared to March 1st to 14th, the decrease was 5%. On the other hand, selective collection marked an increase of 24%, during social distancing, compared to the same month last year (SANTOS, 2020).

This type of collection takes place in a few neighborhoods, especially in the South Zone, the area with the highest purchasing power in the city; the increase in the number of recyclables can be attributed to some factors, among them the longer time at home, which allowed people to dedicate more time to separating waste and forwarding it to the selective collection service; Another factor was purchases made over the internet, which increased during social distancing, where items tend to arrive packaged in recyclable materials such as plastic, cardboard and styrofoam. Public garbage, that which is collected in the streets, also decreased, showing a more significant reduction on weekends. On April 19 (Sunday), a 24% drop was recorded compared to March 8 (Sunday), the date before the social distancing measures were taken (ALVES, 2020).

On the beaches of Rio de Janeiro, the drop on weekdays reached 91%. According to Comlurb, street sweepers used to collect 120 tons of waste from the sands from Monday to Friday during the summer and 341 tons on weekends, 146 on Saturdays and 195 on Sundays. During social distancing these numbers were reduced to 10 tons on the waterfront on weekdays and 15 tons on weekends. The residues found on the beaches during the



period of social distancing were mainly those brought by the tide and gigogas. The reduction of residues caused the cleaning company to relocate the employees who worked in the collection of debris from the sands, transferring them to other activities; of functions (SANTOS, 2020; ALVES, 2020). The data obtained show, in general, a decrease in the amount of waste collected in Brazil and in the city of Rio de Janeiro. scientific publications regarding consumption habits and waste disposal by the population. Then follow the results obtained in the public survey carried out by the researchers.

### **3.5 A brief overview of the municipality of Rio de Janeiro**

The survey made available online and posted on social media received 545 responses, of which 415 corresponded to the state of Rio de Janeiro. The municipality with the most participants was Rio de Janeiro with 165 responses, 40% of the total. Therefore, only responses from the municipality of Rio de Janeiro were taken into account; when analyzing the data together and separately, it is concluded that the state and municipality responses followed the same trends.

The state of Rio de Janeiro is home to Guanabara Bay, a national symbol internationally recognized by the UN since 2012 as a World Heritage Site. This ecosystem currently comprises a water surface of 337 km<sup>2</sup>, has 81.1 km<sup>2</sup> of mangroves and great biodiversity (245 species of fish; 76 species of birds; green turtles; gray dolphins; rays; seahorses; among other species) despite all the pollution and neglect by the government. In the Guanabara Bay watershed area, 11.3 million people live, distributed in 16 municipalities, among them, Rio de Janeiro; 143 rivers and streams flow into the Bay and its communication with the sea takes place between the municipalities of Rio de Janeiro and Niterói. Despite the notorious importance of this environment, Guanabara Bay has suffered for many years from various impacts, such as: overfishing; deforestation of coastal vegetation; landfills; release of untreated sewage; highly toxic chemical pollutants from industries; oil leaks; and solid waste that is thrown directly into the water surface or arrives through rivers (ALENCAR, 2016).

Around 90 tons of waste are thrown into the Bay daily. The seven surrounding municipalities (Rio de Janeiro, Duque de Caxias, Magé, Guapimirim, Itaboraí, São Gonçalo and Niterói) add up to 296 tons of waste per day that are not collected, being deposited in inappropriate places such as the banks of rivers and existing dumps around the Bay. These

data are alarming, since an ecosystem of this size and importance is threatened and endangering not only the living beings that inhabit the waters of the Bay, but all those who live in its surroundings (ALENCAR, 2016). The decrease in the volume of waste after the beginning of social distancing brings hope and the need to develop public policies that make this decrease a fixed reality and not just a temporary one.

The analysis of the responses to the public survey showed that in most of the households of the survey participants, 93%, live from 1 to 4 people. The increase in the total volume of discarded waste was observed by 70% of respondents, of which 65% reported that they realized this because they are sending more waste to selective collection and 35% noticed the increase in the number of garbage bags generated. The number of bags discarded per week was between 1 and 5 for 65% of respondents, and between 6 and 10 bags for 20% of respondents. This note is contrary to the data provided by Comlurb, which showed a decrease in the amount of waste collected. The fact that people spend more time at home makes them concentrate on the waste generation site, which may be due to the impression of generating more waste. The type of waste that produced the most was recyclable, 50% of the responses; 25% indicated that they produced more organic products and 25% produced recyclable and organic products in the same proportion; these data are in line with those released by Comlurb, which pointed out the purchase of items over the internet, which arrive at homes with recyclable packaging, the reason for this difference (ALBUQUERQUE, 2020).

Online purchases were made by 82% of respondents, of whom 18% made purchases only at stores selling essential items, such as markets and pharmacies, and 82% at various types of online stores. Of the 136 people who purchased online, 47% made between 1 and 5 purchases, 34% made 6 to 10, 10% from 11 to 15 and 11% made more than 15 purchases between March and August 2020. The delivery service of food at home, delivery, was used by 66% of respondents at least once a week. These foods tend to arrive at homes with lots of packaging, 29% of people reported paper as the material in greater quantity in packaging, 25% reported that plastic and paper made up in equal proportions and 14% reported styrofoam as the most abundant material in packaging. As already discussed, this service increased by 100% in Brazil between January and May 2020 compared to the same period in 2019; 55% of the establishments were only working with deliveries between the months of April and June (BÜLL, 2020), contributing to greater consumption and disposal of disposable packaging.



The separation of recyclable items at home was reported by 72% of respondents, however, selective collection occurred in a smaller number, in 49% of households; 33% reported not having access to this service and 18% were unable to answer. It is urgent to expand selective collection in the city of Rio de Janeiro and in Brazil, because in addition to reducing the amount of waste sent to landfills and dumps, recyclable waste generates profit. According to Abrelpe (Brazilian Association of Public Cleaning and Special Waste Companies) Brazil fails to earn R\$ 14 billion per year due to the lack of proper recycling of waste. Of the 81 affirmative responses to selective collection, 67% reported that the service was maintained during social distancing, 28% reported that the service was discontinued during social distancing, and the rest did not know how to respond. The work in collecting and sorting recyclable materials, in which the virus can remain for up to 9 days, makes the collectors even more susceptible to contamination than the rest of the population. The resumption or continuation of activities must be done carefully, adopting measures that reduce the risk of contamination of these workers, such as spatial distancing, the use of personal protective equipment and the adoption of personal hygiene practices (MAURÍCIO and FORSTER, 2020; ORIS, 2020).

The risk of contamination for professionals who collect and come into contact with solid waste is evident and should be avoided as soon as waste is separated inside homes. Of the respondents, 27% reported having had a case of COVID-19 in their family. workers. According to the Operational Manual released by the Inclusive and Solidarity Recycling Observatory (ORIS), which presents a set of procedures for the work of recyclable material pickers to be carried out safely during the COVID-19 pandemic, household waste suspected of contamination or contaminated by the Coronavirus must be packed in double bags, filling only 2/3 of the volume to facilitate the closure and prevent it from tearing. The recommendation is to put the waste in a bag, remove the air, tie a knot, insert it into another bag, remove the air and tie two knots, after this sealing, the waste can be discarded in the common garbage collection. Waste generated by the medical treatment of sick people at home should be included in the hazardous waste category referring to waste from health facilities, with health professionals being responsible for managing it (ORIS, 2020).

Another problem related to the health area is the inappropriate disposal of medicines; 35% of participants reported having discarded medications during social distancing, of these, only 19% took the medication to be disposed of to a pharmacy, the rest disposed of it in the sink, toilet and common garbage. Drug waste is classified as hazardous

waste in CONAMA Resolution No. 452 of 2012 and must be treated with due care. When these residues reach the sewer system and consequently a body of water, they cause several impacts. Antibiotics can help resistant bacteria develop; estrogens can affect the reproductive system of aquatic organisms, as has been observed in the feminization of male fish in rivers contaminated by sewage; antineoplastics and immunosuppressants used in chemotherapy are known as potent mutagenic agents (CONAMA, 2012; JOÃO, 2011; FALQUETO et al., 2010). It is important that this information is passed on to the general population so that they adopt appropriate habits in the disposal of medicines. The industry and the government must also be charged and held accountable, since incineration is a widely used treatment for medicines, this process reduces the weight, volume and hazardous characteristics of waste. However, medicines packed with plastic containing PVC polymer (polyvinyl chloride), when incinerated, can produce dioxide, furans and other types of toxic air pollutants (JOÃO, 2011; WORLD HEALTH ORGANIZATION, 1999).

People who could choose to remain in social distancing and enjoy a good quality of life in their homes, had more time to pay attention to everyday habits related to consumption, food and waste separation (TEÓFILO, 2020). The adoption of positive habits during social distancing was reported by 68% of respondents, among the attitudes taken were better use of food, reviewing consumption habits and building vegetable gardens at home. If, on the one hand, the total amount of waste collected decreased and positive habits were adopted by part of the population, on the other hand, new habits brought new waste into the environment.

### **3.6 New types of waste: disposable masks and gloves**

Since Covid-19 was declared a pandemic disease by the WHO, several measures have been adopted as a way to contain the spread of the virus: quarantine (restriction of movement of people who presumably have been exposed to a contagious disease, but are not sick, because has not become infected or because it is still in the incubation period); social distancing (reducing interactions between people, which includes avoiding public spaces or spaces with crowds of people); isolation (separation of people with contagious diseases from uninfected people to protect uninfected people); reinforcement in hand hygiene; care with clothes, shoes and food that arrive at the houses; in addition to the use



of masks covering the mouth and nose (MURRAY et al., 2020; WILDER-SMITH AND FREEDMAN, 2020; WHO, 2020b).

Regarding the use of face masks, it became a requirement through Law 14,019/2020 until there is complete control of the disease in Brazil (Brasil, 2020). As a consequence, there has been an increase in the global production of face masks with polymeric materials. According to the World Health Organization, to meet the demands generated by Covid-19, approximately 89 million masks were needed per month, in the hospital environment alone (WHO, 2020). Before the Covid-19 pandemic, China, which has half of the global production of surgical masks, produced 20 million surgical masks per day, in March 2020, after the start of the pandemic, this daily number increased to more than 120 million (FERNANDES, 2020). The increased production of masks, consumption and, consequently, disposal, led to a new reality. When walking along beaches,

The onset of the Covid-19 pandemic led to a shortage of face masks in various parts of the world. Faced with this situation, billions of masks were produced using petrochemical products as raw material, which are not biodegradable and, after disposal, generate pollution and environmental damage. One way to achieve sustainability is to use raw materials that come from biodegradable products and that can provide equal or greater protection efficiency (DAS et al., 2020).

In view of the above, it is urgent that environmental problems are treated in a serious and transparent manner, with the active participation of the population. The adoption of individual measures that are more beneficial to the environment and human health is important, however, these alone will never be enough to solve the problem that occurs in Brazil (and in other countries) of social injustice and inequality at a social, economic and environmental level. The public power has a fundamental role in the induction of educational content as a way to combat social and environmental degradation.

#### **4 CONCLUSION**

The debate about environmental problems should not be left aside due to the pandemic, since the preservation of ecosystems contributes to the improvement of health and human development, helps to control diseases and preserves biological diversity; a balanced environment, hinders the spread and harm caused by infectious agents. The responsibility for maintaining a good environmental quality belongs to everyone, however,

the decisions of public entities and representatives of commerce and industry govern the life of the population, therefore, citizens must be aware of the impacts suffered, the consequences and their rights to demand a serious and committed position from decision makers. The problem of solid waste management in Brazil is structural and must be approached in an organized and integrated manner by the government, industry, trade and population. The government must encourage industries to produce in a more sustainable way and with less impact on the environment; industries must rethink the way they produce and design their products, since products with poor quality design turn to waste more quickly.

Capitalism has a production model incompatible with a good quality of human life and the environment. It is urgent to combat social inequalities, since socio-environmental vulnerability leads to environmental degradation, it is impossible to have a balanced environment in the midst of so many social injustices. Consumerism is a reality in our society, we buy much more than we need, spending not only money but also depleting raw materials, the environment and exploiting cheap labor that is capable of meeting market demands. With the impossibility of leaving the house, due to the recommendation of social distance, many purchases began to be made over the internet and over the phone and the delivery service, delivery, grew throughout the country, which

it also represented an increase in the consumption and disposal of packaging. Discussions on the agenda in the pre-pandemic period related to the decrease in the use of disposable materials lost space and the focus turned to a production of the plastic industry that is not even able to meet the needs of the market such is the demand.

A decrease in the total volume of waste generated during social distancing was observed in Brazil and this improvement will be temporary when industry and commerce activities are re-established, if not: a review of the form of industrial production, the current pattern is unsustainable in the spheres social and environmental; enforcement of existing laws for waste management; creation of new laws and norms that guide the best practices of the industry and the population; adoption of positive habits for themselves and the environment by the population.

The research carried out by the researchers allowed the elaboration of a brief overview of the city of Rio de Janeiro. The participants reported producing more waste than usual, composed mainly of recyclables; the majority stated separating the waste and sending it to selective collection. Internet shopping and consumption of delivery food was reported by most of the interviewees, which draws attention to the packaging used in this



service, mainly composed of plastic, paper and styrofoam, as they reported. Health-related waste such as medication and waste from homes that had people diagnosed with the Coronavirus were discarded by many without the necessary care, exposing workers who handle this waste to greater risks.

The adoption of positive attitudes in homes and the decrease in the total volume of solid waste generated by the population during social distancing deserve attention. It is important to identify ways to maintain long-term actions capable of improving the population's life and the quality of the environment, such as separating waste for selective collection and making better use of food. However, the new habits adopted worldwide can have an impact and require reflection on the part of the government and the population. The use and disposal of masks is already a problem in urban and coastal regions, it is important to use less impactful raw materials in the manufacture of masks, as well as replacing disposable masks with reusable when possible.

Therefore, it is noted that it is essential to raise awareness of the population regarding the impacts caused by solid waste through access to information and environmental education in an integrative way, which allows: deep reflections; improvements in your daily habits; participation in politics so that their aspirations become reality through action. It is no longer possible to be passive and wait for governors to take the initiative, society must seek to break the political hierarchy and assume the role of an active subject, capable of questioning and proposing changes.

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