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Plastic Recycling in Uruguay: Between Reality And Utopia

Sonia Gau Angelo

Faculty of Humanities and Educational Sciences. Udelar. Uruguay

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Abstract

In recent decades, the role of plastic in the global economy has increased considerably and this is largely due to its own qualities. The main drawback of this material is the difficulty it presents for its disposal or recycling. From the anthropological discipline as a science committed to revealing all the cultural and social manifestations of society, the recycling of plastic waste is the subject of treatment of this anthropocene era, so this work on the recycling of plastics in Uruguay does not escape the vivid reality in its discards, processes and possible utopian futures.

Keywords: plastics, properties, recycling, process, recycling chain

INTRODUCTION

This work, based on a search for bibliographic information and interviews with actors in the plastic recycling chain in Uruguay, seeks to make visible the particularities and complexities of this process, as well as its challenges and opportunities, topics that interest anthropology as a science committed to reveal all the cultural and social manifestations of society.

To do this, observations in different contexts that are related to the plastic recycling chain were taken into account; where I position myself as an observer not only as a participant as a researcher-citizen, but from the observational perspective itself, within a cultural framework that is my own, given my place of residence and my role as a social actor in terms of generating plastics for recycling. Visits were also made to specific places (recyclable deposit sites), public spaces, shops, processing companies, NGOs, contextualizing each place according to its particularity.

Although the ethnographic approach methodology is the one that provides the data by investigating and collecting information, the open and non-directed interviews allowed us to weave a dialogue of confidential and spontaneous communication. In this way it was possible to access immersion in the world of others.

This work is based on the discourse of social actors who relate to the issue of plastic recycling from their different places, as a way of contributing to the understanding of sociocultural, economic and environmental dynamics of the issue in question, and which refer us to the Anthropocene. as it was made of plastic.

At the same time, the holistic nature of the anthropological discipline is what allows us to analyze these different dimensions of the recycling process. In this regard, Velasco and Díaz de Rada point out:

> Almost all field work is an exercise of observation and interview (...) in order to capture (...) behaviors and thoughts, actions and norms, deeds and words, reality and desire. Observation and interview are two basic ways of obtaining information, or rather of producing it. (Velasco and Díaz de Rada, 2006, p. 33)

It starts from the Anthropocene concept, but problematizes it from the Wasteocene concept. Well, in our consumer society, discourses about recycling and reducing waste generation are common on social networks, in schools and in advertisements for ecological products. Part of an ecological turn that dates back decades and that intensified in the 2000s with the emergence of the climate crisis and the massive dissemination of the issue in the press. In this way, the construction of a prerogative of "we" as humanity is recurring. One cannot fail to mention the transformations in production processes that really make a difference for the environment as rich experiences that should be encouraged. This production cannot be individualized or compared with identical parameters, since waste production is related

to the types of products consumed and, more than that, to the industries located in each territory. After all, many of the ecological prerogatives followed by European countries are not fulfilled by their companies in territories outside the euro zone, what we can call environmental colonialism.1In this sense, we consider the concept of Wasteocene to be important since it is the result of discussions about environmental justice and is not displaced from the particular contexts of different social groups.

Waste as part of society is not separated from it and all its disposal processes that include human and non-human places and animals. According to Armiero, the colonial practice inherent in our relationships is that of the "other" or theproduction of the other, which occurs in the clash between the "stranger" and the "we" (Armiero and De Angelis, 2017, p. 2)

> The Wasteocene is to coloniality what the Anthropocene is to the species discourse, now so cherished by Chakrabarty (2009). We might say that "othering", that is, the colonial production of the other, and "saming", that is, the rhetorical invention of the "us", are two sides of the same coin. The othering produced through wasting is more pervasive than the making of zones sacrifice. Otheringmeans to change the "nature" of the other while simultaneously using it to preserve a privilege. (Armiero and De Angelis, 2017, p. 2)

The Wasteocene is a radical and critical way of carrying out the debate about the Anthropocene, taking into account that the "Age of Man" has waste in all areas. According to Armieiro, waste is the essence of the Anthropocene, which is why he and Massimo De Angelis proposed this term. In addition to quantitative data, the Wasteocene point of view encompasses waste and not just the wasted object.

> The Wasteocene, then, is not the age where waste is everywhere; it is not a fancy academic label for lamenting the dirtiness of our cities. Neither is it another word for the familiar environmentalist nostalgia for some paradise, lost in the past. Actually, the Wasteocene is about cleanliness and aseptic environments as much as it is about griminess and contamination. Because at its very essence, wasting implies sorting out what has value and what does not. (Armiero and De Angelis, 2017, p. 11)

THEORETICAL APPROACHES TO RECYCLING

As Miller (2001) argues, the study of consumption and merchandise has been a transforming fact of the discipline from anthropology. For this author, from the anthropological vision, the consumption of material things plays in the maintenance of relationships and culture. Consumption is embedded in social relations. Douglas and Isherwood (1979) had already expressed: "Goods are necessary to make the categories of a culture visible and stable… at the same time, commodities have another important use: they serve to establish and maintain social relationships" (pp. 74-75) .

For Michael Thompson, garbage depends on who sees it and calls it, the decision of what is or is not garbage is mostly in the hands of those with the most power. In this definition there is the distinction between three categories of objects, the durable, the transitory and the worthless, the latter being the category of garbage. These worthless objects are those that do not fit into our vision of the world and, therefore, are rejected (Rial, 2016, p. 19).

According to Luiz Marques, nature does not produce garbage, but it does produce metamorphosis and nutrients. In the industrial age, the secretions of human animals have an intense scale and rhythm, as well as being chemically stable. This produced a change in ecosystem cycles. The chemical and petrochemical industry and new technologies enhance waste production, with their form of expansion and appropriation of ecosystems, producing an amount of waste never seen before, that is, as the author points out, a toxic and active interaction (Marques , 2015).

An interesting exercise is to analyze the entire process of an object as a biography, thus realizing that most of the time

1. "The exploitation of natural resources and the extraction of wealth (mineral, human, energy and biological), the destruction of the environment and related epistemologies, have traditionally been considered primary manifestations of colonialism. This fundamental dimension of colonialism, called by Mattei and Nader (2008) as Plunder or plunder, can be evidenced through the different historical processes of colonization and domination undertaken by the Global North around the world. A historical journey through the different waves of colonialism will show us that, despite the possible transformations of colonization strategies, one of its primary purposes lies in the plundering and exploitation of the wealth of the colonized countries/territories. (Atiles-Osoria, 2013).

objects are predominantly identified as garbage. The time of use of the object as a product is not compared to the time until its total degradation. The importance of a biographical approach to objects lies in the possibility of questioning their usefulness, duration and cultural markers.

A very important fact to understand how waste is an important part of municipal administration is the size of the budget spent on waste collection and disposal. In low-income countries, municipalities spend between 20 and 50% of their budget on waste management (Marques, 2015). When this information is combined with the fact that the service is offered to less than half of the world's population, the contradiction and questions increase.

In fact, waste demand is, in a way, a city issue, although it is not focused on the urban environment. It is in this space where one of the largest volumes is produced. It is clear that the consequences of improper disposal, as well as increased production, affect the entire planet. Generally, the focus of the discussion of this global dilemma is in the urban environment, but it is worth pointing out the problematic processes found in rural areas, in the oceans and even in conservation units. Shocking examples of the progress of waste accumulation on the planet are recurrent in the media, for example, the situation in Antarctica and Mount Everest, places considered far from any dirt, which annually receive expeditions to collect tons of waste (Rial, 2016, p. 15).

Another example is the so-called "garbage continents" that are found in all oceans, they are formed by marine currents and condense all types of waste. There are numerous awareness campaigns regarding garbage, especially those that promote recycling and correct packaging and disposal, which are undoubtedly important. However, we are often given the false impression that we can continue consuming at the same level. Thus, in addition to understanding what leads us to throw away objects, it is necessary to rethink the consumer attitude.

Consumption can be better understood if put into perspective, as there are differences between the waste produced in post-industrial, industrial and agrarian countries. (Rial, 2016, p. 14). There are also societies in which modernity is selectively present, that is, only some aspects of modernity are experienced, whether they are more or less tangible. These differences in consumption influence the types and volume of waste generated (Rial, 2016, p. 14). In addition to the discrepancies between countries, we can verify that the amount of waste generation per capita depends greatly on the differences between the spaces of the urban environment and their peculiarities.

Postmodernism and postindustrialism are related. In the transition from "traditional society" to Modernity, individuals lost the fixed anchors that positioned their place in society. These anchors could consist, for example, of kinship relations, of territorial units (such as a village), or of social classes. In modernity, when traditional anchors have lost their strength, the social position of people has become uncertain. Therefore, the breaking of these chains resulted in both uncertainty and freedom. (Rial, 2016, p. 15).

From that moment on, freedom also required individual decision-making, and consumer choices are one of the ways to establish oneself in a place in modern society. In the urban environment there are differences between domestic waste produced in neighborhoods considered to have high purchasing power and those with low purchasing power. The "poor garbage and the rich garbage" are disputed by the collectors and the sorting units. They are memories of inequalities.

Marques lists three factors of a possible environmental collapse of capitalism and the issue of waste. The first is planned obsolescence. The second is neophilia, compulsive consumerism stimulated by desires that, when they come true, appear and require new shopping "experiences." These desires, stimulated and realized immediately, are accompanied by the third factor, which is the appearance of consumer credit. Much of the waste produced comes from pre-consumer waste, that is, packaging waste, from the ornamentation associated with the display of the brand in a kind of fetish. In this way, the fetish of commodities is no longer in the sphere of production, but in the sphere of consumption. Currently, exercising citizenship is synonymous with being part of the consumer market and having access to consumer goods, which presupposes having access to credit (Marques, 2015).

Waste is also a trace of the rates and characteristics of global consumption, its circulation is not only in the production, consumption and disposal chain, but in waste export and import initiatives. There is an illegal market worldwide in which recyclable or non-recyclable waste, generally very dangerous, is deposited in developing countries. There is

a network of financial incentives for developed countries to transfer their most polluting companies to developing countries (Marques, 2015).

Therefore, studying garbage, waste recycling, elements that are part of the consumption of goods, from anthropological science in an interdisciplinary manner, is an effective means of investigating fundamental questions of what the human being is within the diversity of culture, and contributes to giving new potential to the discipline.

Garbage is a concept that acquires multi-dimensions, presentsa complex network of relationships that connects heterogeneous consumer detritus with the inputs demanded by the large companies that recycle them. Let us add, as Drackner (2005) indicates, that from the anthropological discipline what constitutes waste (garbage/waste) is a purely subjective notion, since it can be seen as a health risk, be unsightly, as a social contagion, or be of economic benefit as a source of income. These perceptions can affect waste management systems. As an issue that is the center of all cities in the world, waste management, if previously the responsibility of administrations and companies, has now become everyone's issue because its responsibility has been transferred to the citizenship: classify, recover, recycle. This attention given to waste and its destination has highlighted less visible actors who play an important role in its recovery, the sorters, who with their recovery activity free the city of its waste.

Between marginalization and recognition, between exclusion and integration, recyclers are the first links in the changing environmental management systems of cities. These wastes become resources, becoming lucrative, affecting their valuation, intervening in laws that settle recovery activities. And this is related to the consumption of so-called modern societies, the volumes and types of waste that are produced.

Bauman (2005) conceptualized the term liquid modernity to give the definition of a society based on the mode of production and consumption, where values and perceptions constantly mutate. A society that worships consumption for the sake of consumption and the elimination of waste. This is how the economy stays running. The waste disposal industry, says Bauman, is perhaps the only one in which there will never be a lack of work, and the work of the collector, who takes away the modern waste of each day, becomes simply invisible without looking at it and unthinkable without thinking. On it. Waste is, at the same time, the most distressing problem and the best kept secret of our times.

The vast majority of the products we now consume and own were designed outside of the circular economy. Therefore, it is proposed that our attitude is twofold: recycle what is already on the market and redesign the future. Recycling fulfills two important social and environmental functions, since it reduces the volume of waste that goes to landfills and generates monetary value through the sale of what is recovered (recyclable) to industries. transformers. Recycling allows materials that were used primarily to be returned to the circle of consumption. It avoids extracting resources from nature that are finite and makes the new products generated in the process cheaper.

THE MANY FACETS OF PLASTIC

In recent decades, the role of plastic in the global economy has increased considerably and this is largely due to its own qualities. We find them in packaging, clothing, buildings, cars, airplanes, mobile phones, agriculture or medical devices, among many other applications. Plastics are materials obtained artificially through a large chemical transformation of substances of organic origin, that is, they are synthetic materials that are not found naturally. To facilitate the identification of each polymer, and also to assist in their classification (for example, for mechanical recycling), the International SPI Code has been instituted, which makes it easy to identify what specific material a plastic object is made of. The main polymers have been classified as follows:

Figure 1. Polymer symbols

Ecoplast (2011) Sourcehttps://ctplas.com.uy/

But, despite their benefits in use, the difficulty they present is their elimination or recycling. The way plastics are produced, used and disposed of does not allow for the sustainability benefit of a circular economy and harms the environment. The final disposal of plastic accumulated for more than a century and the global inability to manage it correctly has generated a dramatic environmental and social problem. Although plastics provide many benefits, their value chains, which are still linear, entail significant economic and environmental drawbacks (Pittaluga and Pirroco, 2021).

As Boucher and Billard (2019) mention, plastic is a single word for a multifaceted reality, as it encompasses a variety of polymers and additives with different chemical and physical properties. The final products range from single-use plastic bags, food wrappers, plastic bottles, footwear, various containers to synthetic fibers used in the clothing and fishing industries. But, just as the use of plastic is widespread, so is plastic pollution. An estimated ten million tonnes of plastic leak into the ocean each year, causing an unprecedented environmental crisis. And there we have both macroplastics and macroplastics in our seas, rivers and oceans.

Plastic pollution is globally distributed throughout the oceans due to its buoyancy and durability properties and the absorption of toxic substances into plastic as it travels through the environment (Eriksen et al., 2014). While, in cities, the fact that this material is not biodegradable means that its disposal through burial generates a very important environmental liability, since the time required for its degradation is very long.It is estimated that plastic takes between one hundred and one thousand years to decompose, which is why it is considered a very slow and long-term decomposing material. A plastic bottle takes up to five hundred years to disintegrate, although if it is buried this time is even longer (Cempre, 1998).

RECYCLE PLASTIC, WHY?

Plastics are materials obtained artificially through a large chemical transformation of substances of organic origin, that is, they are synthetic materials that are not found naturally. Obtained from petroleum, they are made up of giant molecules or macromolecules, called polymers.

What properties does plastic have that make it such a useful element to use? Their main characteristic is plasticity, that is, they are easy to manufacture and shape. As they have poor electrical conductivity, they can be used as electrical insulators. They achieve acceptable mechanical resistance, that is, they withstand stretching, blows, twisting and pressure very well. They also resist very well atmospheric and corrosive agents. Most plastics are lightweight. They have good resistance to acids, solvents and corrosive products (Espinosa, 2014).

But, at the same time, what is its main drawback? It is the difficulty they present for their elimination or recycling. The way plastics are produced, used and disposed of does not allow for the sustainability benefit of a circular economy, and ends up harming the environment. The final disposal of plastic accumulated for more than a century and the inability – on a global scale – to manage it correctly have generated a dramatic socio-environmental problem. Plastic is a 100% recyclable material. The fact that this material is not biodegradable means that its deposition through burial generates a very important environmental liability, since the time required for its degradation is very long. It is estimated that plastic takes between one hundred and one thousand years to decompose, which is why it is considered a very slow and long-term decomposing material.

For this reason, recycling plastic materials produces social and economic benefits for society. For example, it reduces the volume of collected solid waste sent to landfills; generates jobs (sorters, workers, warehouses, among others); reduces the consumer price of items made from recycled plastic (on average, items made from recycled plastic are 30% cheaper than the same products made from virgin raw materials); produces improvements in the decomposition process of organic matter in landfills, since plastic waterproofs the layers of decomposing material, and this discourages the circulation of gases and liquids (Cempre, 1998).

HOW DO PLASTICS ENTER THE URUGUAYAN MARKET?

These materials enter as imported plastic raw materials (polymers) (they are converted into plastic products and packaging for the domestic market and export). As imported intermediate plastic products (they are converted into plastic products and packaging for the domestic market and export). As imported products in plastic containers. Such as imported products with plastics incorporated in different proportions in clothing, footwear, electronics, construction materials, furniture, automobiles, auto parts, among others). As secondary and tertiary packaging that is part of imported

products (low-density polyethylene, polystyrene, high-density polyethylene packaging, etc.). Then those plastic products entered into the market are directed to industry, businesses and services, for consumption in the domestic market and for export. And their final destinations will be landfills, landfills, garbage dumps, ecosystems, recovery and recycling (Baráibar and Andrada, 2017).

> To find out about the entry of plastics, I interviewed Jorge, a member of the Centro Uruguay Independiente (CUI). The CUI is a civil association that has been working with environmental projects since 1995. In 2007 he began work to dignify and formalize waste classifiers.

Jorge is one of the founders, and he expresses in this regard: "Plastics enter the country from imported products where they are converted into plastic products and packaging for the domestic market and export." Also, he continues, through imported products with plastics incorporated in different proportions: in clothing, footwear, electronics, construction materials, furniture, automobiles, auto parts. Furthermore, forming part of packaging and packaging that comes from imported products, "and there you have different types of packaging with different resins, low-density polyethylene, polystyrene, polyethylene" (Jorge). Those plastic products that enter in this way go to industry, to businesses, either for domestic consumption or for export. As Baráibar and Andrada (2017) express, the final destinations of all that plastic entered will be landfills, landfills, garbage dumps, ecosystems, and a small part will be for recovery and recycling.

According to Pittaluga and Pirrocco (2021), taking recent calculations, 79% of the plastic waste that has been produced until 2015 currently lies in landfills, garbage dumps or in the environment, mainly in the oceans, while approximately 12% has been incinerated and only 9% has been recycled.

Jorge says that "plastic as waste is a whole issue in itself, because there are different types and that complicates recycling." The fact that there is a great diversity of plastic resins makes plastic recycling more complicated, since a correct classification is needed for subsequent recycling. Therefore, the previous stage of identification and classification becomes essential, but it is not always easy to recognize the different types if they are not correctly identified with their symbology. Recycling plastics when they are mixed leads to obtaining materials of lower quality and resistance.

At this point, upon visiting ATMA, a plastics processing company located in the city of La Paz, Leticia (quality manager) says the following:

> "Not everything is simple, the recycling process faces certain challenges which is related to the molecular difference of the different types of plastics, since they cannot be mixed with each other. The reason for this is that they tend to separate. It is then necessary to recycle each type of plastic separately so that they can be mixed successfully. To obtain good products you have to recover and recycle resins."
>
> Continuing with the recycling of plastics in the country, Jorge explains that the most complicated issue is the economic one, due to the existing oligopolies.
>
> "There is a monopoly for PET, almost an oligopoly. And then there are small companies that operate in the local market, several of them operate with irregularities of all kinds, informal work, theft of electricity, etc.. Nobody has cared much about recycling, it is not business, but for those at the top, in the oligopolies."

In the case of the recovery of containers for recycling, there is a majority of them that have no market value (noodle packet containers, cookie containers, and other plastic containers), these possibly end up in landfills and landfills. In the case of soft drink bottles, they have a low value, they cannot be recovered from the base because they do not have a return value and since there is no return price (for example, the consumer takes the container to be recycled). the consumer does not carry it. "Only the returnable returns. He always comes back there," says Jorge. The issue is that we do not want to accept that all packaging is returnable.

And in this Jorge emphasizes: "In the case of recycling, the economic always takes precedence over the social and environmental. For PET, there is a company that has been in business for more than two decades, who needs the raw material because the China market was closed (they exported dirty plastic flakes). Now they need washed raw materials to use as cheap local raw materials." The issue is that you have to collect the containers, Jorge continues explaining, and in itself "they are not interested in collecting in quantity, the business is that they want cheap raw materials to be able to produce what they need, and that's it."

In plastics, the monopoly is held by the company that intervenes with PET resin, which ends up buying everything from intermediaries. For the rest of plastics, there are many buyers and recycling companies. In terms of economy, circular with respect to plastic, Jorge gives his explanation: "In terms of packaging, of course they do not align, they know that it is impossible to collect millions of containers that go to the market daily, their big business is single-use packaging. ". And he reaffirms that, if we are serious about the circular economy, the packaging, at least the larger ones, should be returnable.

A factor to take into account is the price paid for the plastics to be recycled, which varies according to the price of oil, therefore, it is a highly variable market, which can affect the sustainability of the business.

Although legislation assigns companies responsibility for the plastics they put on the market, according to CTplas, in 2017 14,000 tons of beverage containers were placed and almost 1 million beverage containers ended up in landfills or the environment. . When the new General Law on Comprehensive Waste Management was approved in 2019, it sought to minimize the generation of both plastic and other waste, promoting reuse and recovery through recycling. At the same time, an environmental tax was introduced to finance special waste management programs. But the business lobby of the plastic industries influenced several articles by allowing companies to continue using single-use plastics and exempting them from any liability. The AUIP (Association of Plastic Industries) blames the consumer and diverts its responsibility as a producer of plastic packaging. An industry tactic that shifts its responsibility to others, while continuing to produce packaging and bottles that will not be recycled at the end of their life cycle. "The lobby is increasing," says Jorge, "they say they have solutions for plastic, they talk about the potential of recycling, but the issue is the cost, the big problem is collecting it and making it clean, and they don't want to risk losing, "They lie with the figures they recover."

RECYCLING AND MARKETING OF PLASTIC

It must be taken into account that we find pre-consumer and post-consumer recycling in this process. What does it mean? In pre-consumer recycling, waste is recovered from the same industry that generates that waste or from others. For example, they are items that came out with defects, mold cuts, they are industrial scraps and are used to manufacture other products. Post-consumer waste consists of the transformation of discarded plastic waste into urban waste. They come from sorting plants, warehouses, and informal collection. As they are different resins, a good separation is necessary for them to be recycled. The commercialization of this plastic that comes from urban waste will depend on various factors that will affect the added value, depending on its collection and separation system. And the price will also depend on the improvement that is given to the collection. (CEMPRE,1998)

PLASTIC RECYCLING AND THE CIRCULAR ECONOMY

It is known that from the so-called circular economy, the economic, social and environmental benefits in the design of plastic products create value for the different actors in the chain. And to improve the environmental performance of companies, which has to do with their performances, objectives and goals being in favor of the environment, the focus is placed on the search for sustainable development as an indicator of reducing environmental damage. In this way, Circular economy builds a bridge between economy and ecology, relying on nature in this way, to reduce environmental impacts. As we know to date, production as we know it has been based on a linear economy scheme, extracting natural resources, transforming them into production, then using the product and discarding the garbage or waste for final disposal in landfills or landfills.

Jorge from the Centro Uruguay Independiente (CUI) regarding whether companies in our country align with the circular economy in relation to plastic says "in terms of packaging, of course they do not align, they know that it is impossible to put together millions of containers that go daily to the market, single-use packaging is its big business. If we are serious about the circular economy, the packaging, at least the larger ones, should be returnable!"

ACTORS IN THE PLASTIC RECYCLING CHAIN

The ethnographic research was carried out mainly from observation in the streets and neighborhoods, and was later expanded to the city of Las Piedras (Uruguay) with the topic of plastic. From the moment you leave your house with the plastic bag and find an overflowing garbage container, with waste scattered on the street, you may wonder how the entire system works. This stage of the paths that garbage travels is the closest to us and therefore the most questioned.

We start from that point until we find the actors who mainly work and recycle plastic waste.

The record was carried out using a notebook on site, and a field diary afterwards. Informal conversations were held with the classifiers while they carried out their work, recording them on the spot or afterwards. A gymnastics of the gaze in the delimited space of the neighborhood allowed me, in that ethnographic time, to observe the circulation of these human beings and link with other dimensions of their lives. While the interviews took place in a specific space and time and were recorded by tape recorder, in accordance with research protocols, some of the names of the participating subjects were changed to preserve their identity.

The inhabitants take over the corners to place waste next to the container, modifying the space, while contaminating it, generating practices in the poor management of waste and determining the formation of micro-garbage dumps around them.

Figure 2. Corner with garbage.

Figure 3. Container with waste around

Source: Personal collection of Sonia Gau Angelo

In figure 2 we see a paved street with the sidewalks absent and grass grows in their place, we can see posts near the walls of the buildings in the background, it seems that the street is tree-lined. Right next to a tree is a faded blue

garbage container, black and white bags overflowing from the container and some larger waste on the ground awaiting collection. In figure 3, also on a corner, or in front of it, we see paved streets, without sidewalks, but with grass, a water greenhouse with low walls and other buildings in the background. Centered in the image is the blue container, also faded. It is observed that it is in poor condition, without a lid, crooked and almost in the middle of the street. This is not overflowing, but apparently all the waste is on the ground, abandoned waiting for the next step in its trajectories. We see a red sofa turned upside down, under what appears to be the frame of a television, white bags with large materials and remains of tree pruning.

These photos are examples of what you find when walking through the streets of the city, and point out the problem of waste. They are, in a way, a crossing point between the different actors, from production to the final destination of the waste.

This waste is not in those spaces by magic and it does not disappear by magic; there are a series of public policies that over time modify the ways of collecting said waste. If we refer specifically to plastics, there are several actors involved in this work. Next, we will analyze the roles of some of them.

The sorters, also called urban reclaimers, make up a group of informal workers who collect plastic waste from the urban or commercial circuit on their own using a horse cart, bicycle cart, moped or hand-drawn cart. After collecting the waste, they classify it by type of material in their homes. They frequently dispose of leftover or discarded material on the banks of water courses. Finally, the product of their work is sold to warehouses in the neighborhood. There are also groups of classifiers formalized in complementary projects for the classification of post-consumer and commercial primary packaging (with clean circuits, door to door and voluntary delivery points), who carry out their task in a recovery plant to complement the commercial circuit. It is estimated that there are around five thousand classifiers in Uruguay (Baráibar and Andrada, 2017).

In this regard, Jorge says:

"The organization of the classifiers was based on the packaging law (2004) and in 2007 they became cooperatives. We continue accompanying three groups of classifiers, two in Las Piedras and one in Barros Blancos, all three in Canelones. First we trained them, but it was quite a problem because they began to refuse, and some actors who were going to be in the coordination, for example, the Mides [Ministry of Development] and the Ministry of Housing, left, only we were left, the Municipality of Canelones and the Chamber of Industries, which is the one that provides, as established by law, the money, and is the strongest actor along with the Municipality and now the Ministry of Environment has been added. There are interests in this, that they are not trained, that they do not grow, that they dedicate themselves to classifying, this is a great issue."

Julio sometimes passes by my house. He used to collect paper, cardboard and plastics to sell them at the neighborhood warehouse, he collected them from the public containers in the area. Now, by changing the waste collection system to household containers, his collection has been reduced to some neighbors who join him and when he passes they reach out to him. Before he pulled his cart manually, now he added a bicycle "and it's better," he says,

"Luckily I got a pension, because before I worked in farms, picking fruit, and I was also in a barracks when I was young, in Lavalleja. What I get from what I sell also helps me, although they pay little. For paper and cardboard they pay very little, and I have to collect a lot to make a profit, for plastic, a little more. Everything is sacrificed for us who gather, but I am proud to be what I am, for something people gather and give to me, and I sell it."

He was never able to agree to be formalized, even though he says that they registered him in the census of classifiers, perhaps "because he was already old" and they needed younger people, he makes a deduction "but now with this and what I get from retirement we We mess with the boss, she works in the family home," and he has two young granddaughters that he and his wife are raising.

The sorters constitute the fundamental link for plastic recycling in Uruguay, since they are the ones dedicated to collecting the waste discarded by neighbors. In fact, the amount of packaging discarded daily by the population is high, especially when disposable packaging appears. They sell the plastics to warehouses that then export them (in the case of PET) or sell them to recycling industries. Like Julio, they express pride in dedicating their time to collecting and classifying

recyclable materials because,If they don't, those materials will end up in the earth, and in this way they can return them to the market. It is a decent job and they try to do it not only for its economic value, but also for the environmental value they provide.

In the case of classifiers organized in a cooperative, accompanied by CUI, the NGO of which Jorge is a part, they are already formalized, although it is worth clarifying that the mechanism to achieve this situation is bureaucratic and slow. The issue is that "the sorters do not own anything at all" the companies do not want to buy directly from the employees, "they outsource everything, especially because there is no national authority on the issue of waste" (Jorge, CUI).

The data provided by the press in Uruguay on plastics are worth taking into account, considering the issue of recycling and the view that the country gives to this issue. According to the weekly Busqueda (2022), more than 200,000 tons of plastic waste currently reach final disposal sites each year. Of these, 80,000 are containers of which the plants recycle 4%. This influences the precariousness and instability of the classifiers who work in collection centers.

Regarding the formalization of the classifiers, years go by and many have not achieved it, while others are not interested; The panorama around this issue is complex. Of a population of between 5,000 and 10,000 classifiers, the formalized ones only reach approximately three hundred (between 3% and 6%).

Continuing with the plastic recycling actors, we find the neighborhood deposits. They are generally classifiers who manage to scale their activity, have a means of transporting cargo, possibly a press, and buy materials in the neighborhood and its surroundings. They are an intermediary between classifiers and large warehouses. They are frequently informal organizations that may have some specialization by type of materials.

Near my house there is a warehouse for the purchase of recyclable materials that buys, among others, plastic. Antonio is the manager. He says that he does not give a purchase receipt, because no one who comes to sell to him asks for it. He pays and everyone agrees. He sells in Montevideo to a warehouse that comes to pick up the merchandise and is the one that pays the best. "I sell to the one who pays the best." Each material has a price that corresponds to 1 kg of material. The classifier brings the material, it is weighed on the scale that the business has and "they pay what is fair," he says. Since the purpose of the business is the collection of materials, he, together with an employee, is in charge of classifying them and packaging them into bales to better sell them.

Companies that are dedicated to receiving, sorting, baling and conditioning various types of post-consumer or post-industrial materials are the large warehouses. The suppliers of the tanks are large generators, businesses, industries, and neighborhood tanks. They are in many cases the main suppliers to the recycling industry. These large depositsThey offer buying and selling services,They treat recyclable materials in their plants, and then send them to national and international companies.. When the country does not offer the necessary solution to manage these materials, these warehouses are responsible for exporting them.In general,They try to include the greatest amount of their waste in the recycling circuit.Such is the case of plastic scraps,waste or raw material rejected from the industrial process, which has an economic value and which these companies in turn manage.Somanages to supply industries that use them as raw materials, anywhere in the world.Rotondaro (paper and cardboard) and Pedernal (various waste) are the large deposits, located in Montevideo. In the case of Pedernal, cbuys and sells various plastic scraps to supply industries, whether national or foreign, that use them as raw materials.

Figures 4 and 5. Plastic scraps

Fountain:https://depositopedernal.com.uy/gestion-scraps-de-plastico/

The actors in the plastic recycling chain that operate formally are the recycling companies.

Plastic recycling companies process different amounts of material, depending on the volume and market they handle, as well as the origin of these plastics. It can also affect recycling, the resin used, for example, polyethylene and PVC, which are difficult to recycle. Sometimes entrepreneurs and designers intervene to develop products with added value, thus promoting the sale and placement of the products. recycled. It may happen that there are companies that are dedicated to a certain type of packaging, obtaining resin flakes for example PET through the process and after transforming it into pellets, they must be exported to neighboring countries because they do not have the technology to complete the process and obtain the product. There are not only processing companies but also small industries that recycle plastics, and let's not forget, the large warehouses that function as intermediaries, which process scraps, or bales of plastic material, which market them in the domestic market or export them. Jorge (CUI) adds "the rest of the plastics are placed in the local market, in small industries, several of them operate with irregularities of all kinds: informal work, theft of electrical energy, etc."

But it is nevertheless convenient to highlight that the industrial sector is a key link in the production chain, since it affects the activities related to suppliers, whether other industries, intermediaries or classifiers of raw materials, their obtaining, the manufacturing of products, the distribution of them, as well as their final stage. The decisions made in the product design stage will determine the environmental impact in all stages of their life cycle, as well as facilitate the comprehensive management of waste in industrial plants.

Therefore, the decision that this link in the chain must make is to close technical and biological cycles, and this is achieved with recycling strategies, for example using recycled and recyclable materials, facilitating classification processes and adaptation to the recycling system. and the return of post-consumer products to industrial processes. As I have been indicating, transforming/recycling companies are the large processors of different polymers. The use of specialized technology is what allows them to produce plastic items, through injection, extrusion, blowing processes, among others. They are the major participants in the economy of a society, since they are the ones that supply the consumer goods demanded by the population. Their management is important to implement a sustainable, circular economy model, since they are the ones who can finally close it by having a global vision (recover, design, recycle) of the products they put on the market. One of the premises of the plastic recycling industries is to address the functionality, usefulness and materials of the products, as well as their recovery after the end of their useful life, reincorporating recycled or recyclable material.

In Uruguay there are around 23 companies that process a variety of plastic materials, mainly LDPE, HDPE and PET. To learn more about plastic recycling in generating companies, I go to ATMA, a company that is close to my house, approximately two kilometers away.

This company has operated in Uruguay since 1948, and since 1982 its industrial plant has been located in the city of La Paz, near Las Piedras.

There I contacted Leticia (quality manager), who agreed to give me information about how ATMA has approached the issue of recycling. In the beginning, a company advertising phrase summarized the role of plastic: "Plastic is not only matter, it is also spirit." In its beginnings, the factory was especially focused on drawers and household products; Currently there is a hybridization focused on products and design development.

Figure 6. Old ATMA advertising

Fountain:www.atma.com.uy

Leticia says that the company has been betting heavily on the issue of recycling. So much so that, in 2020, together with Fábricas Nacionales de Cerveza (FNC), they developed a new line of work.

Leticia says

"This project with Fábricas Nacionales de Cerveza arose as part of providing a solution to the client, what to do with the broken or disused drawers; This is how he brings them and incorporates them into the process and they are recycled again and reincorporated into the market."

Both companies have been working together for years and this project helped give a boost to the plastics industry in the recycling area.

Leticia says that the company's technicians worked on the development of the mold and the design of the parts, which had to be compatible with the structure of the FNC locker and also had to be sustainable.

"So much so that, in order for it to become one hundred percent recycled, the mold and the machine that makes the locker had to be revised." The design process took time, almost a year, between developing the matrix and testing if it worked, "in addition, different material tests were carried out to see what percentage of recycled material could be reached." After several tests, a 100% recycled product was validated by reusing broken lockers that were going to be destroyed. Plus, when those lockers break again, they go back into the recycling cycle again. Thus, this project avoids using virgin plastic by replacing it with recycled plastic. Nearly 50,000 recycled lockers were made, using about 52,500 originals.

Figure 7. Lockers used for recycling
Fountain:www.atma.com.uy

Figure 8. Recycled locker
Fountain:www.atma.com.uy

In order to know what other products are made through recycling, Leticia explains:

> "Today most of the drawers are being recycled and there is also a line of paint buckets with recycled material incorporated, but they are trying to increase the products with this process."

But he makes a clarification, food packaging cannot be incorporated into the process with recycled material, because the cleanliness of the product cannot be ensured. There are regulations that prevent the incorporation of post-consumer recycled material in packaging that will be in contact with food. "What ATMA does is recycle products for various industries that do not have direct contact with food."

Regarding the polymers that the factory uses to produce, "everything that has to do with drawers and lockers is high-density polyethylene and the paint buckets are made of polypropylene. The company does not manufacture anything in PET."

Regarding how they obtain the raw materials for recycling, Leticia explains that the majority is brought by clients. Regarding cost, the recycled item is cheaper. The raw material is purchased from the client, which is ground, washed and then dried to later incorporate it into the process. Leticia states that "customers are demanding, and it is the line that must be followed, the recycling of plastic, we must begin to become aware that plastic can be reused, recycled." And she ends by adding that "in reality it is not the plastic that is bad, but the bad practices of human beings, in reality the material can be recycled many times."

The company has strongly focused on plastic sustainability through recycling. Among the strategies it implements, it not only aims at the circular economy, but also participates in recycling campaigns with clients and strategic partners with whom it works.

Other actors involved in plastic recycling are businesses. Through product packaging, the plastic they generate ends up in collectors, warehouses, formalized or informal sorters, and processing industries. To find out about it, I went to the supermarket where I shop. There Silvana, the owner's daughter, tells me:

> "Yes, a lot of nylon is taken from the covers, from boxes, from merchandise, so of course, an important package is put together and you have to have a physical space for it, dedicated to it, throughout the day it is put together. A man comes to lift it, a neighbor, if he didn't come, we would have to have..., I don't know, several containers for everything we take out during the day."

One day when I was leaving the supermarket, I saw the neighbor arranging the cardboard and nylon that were in the container and another pile scattered on the floor in a truck. I asked him where he sold them and he answered "where they pay me more," and he continued with his task of storing them.

COLLECTION PROGRAMS FOR PLASTIC RECYCLING

Although there are collection programs for plastic recovery, there are not enough awareness and communication instruments. There are departmental initiatives, but sometimes the programs do not work because there is not enough support from the municipalities. In general, this is because the low price compromises the sale of materials. "Your packaging serves" (TENS) is a packaging management system that seeks recovery and recycling as established in the Packaging Law and the regulatory decree. It currently involves the participation of the private sector through the Chamber of Industries of Uruguay (CIU) and the state sector through the Ministry of the Environment and the departmental municipalities. Additionally, an NGO, the CUI, participates in Montevideo and Canelones. The program has classification plants, coexisting strategies of clean circuits, door to door or in containers and a system of voluntary delivery points.

Figure 9. Voluntary delivery container in a supermarket
Source: Sonia Gau Angelo personal collection

These voluntary drop-off points or recycling islands were installed in some supermarkets so that residents could bring their packaging for recycling, for example, plastic bottles of all types, clean plastic bags, as well as other materials. This

waste recovery program was implemented within the framework of the Law on the Use of Non-Returnable Containers. This law established that any company that uses non-returnable containers to market its products in the national territory must contribute with plans to recover containers for recycling, together with the municipalities, promoting clean collection circuits and incorporating waste classifiers into the task.

Figure 10. Delivery point
Fountain:www.imcanelones.gub.uy

In Montevideo, the Greenest Montevideo program and the projectItinerant Ecocentro consists of a network of waste reception centers, through a module for receiving recyclable materials, which is installed for a week in each neighborhood of Montevideo. Plastics can be depositedPET, soft drink bottles, water, yogurt, cleaners, and HDPE plastics, shampoo containers, hypochlorite, drums.

Figure 11. Itinerant Ecocenter

Source: Sonia Gau Angelo personal collection

Regarding packaging of agricultural products (agrochemicals and fertilizers), the Campo Limpio program involves the actors of the agricultural, horticultural and forestry production chain (importers, manufacturers, distributors, applicators and farmers). It is related to a voluntary initiative for the collection, conditioning and recovery of containers of phytosanitary products. To this end, warehouses were implemented to receive empty perforated and triple-washed containers, implemented in collection centers in thirteen departments of the country.

Figure 12. Collection center in Salto
Fountain:https://campolimpio.og.uy

When I visited the ATMA company, Leticia had told me about this program. In the past, containers were taken to be recycled, requiring that they be well washed (triple washing).

At a time when we were participating in the recycling circle for drums for agrochemical products, triple washing agrochemical containers, making sure that no traces of toxic products remained, we delivered containers to sell. But what was wrong with us, that triple washing didn't work well. For us it meant a risk for the operator who was working there. If they assure us that they are well washed, yes, we receive them. The program is called Clean Field, the rural producer himself carried out the washing, the company collected it and brought it to the plant. That program still exists. They told us that with that triple washing, if they did it correctly, it was fine.

CONCLUSION

It is necessary to rethink and improve the operation of a value chain as complex as that of plastics. To implement it on a national scale, efforts and greater cooperation are needed from all groups, from plastic producers, recycling companies, consumers and other links in the chain. The continuous effort to increase the percentage of recycled and reusable plastics is essential, as well as the reduction of plastic content per packaging unit, to promote care for the environment.

In Uruguay there is still a long way to go in that direction. Some of it has to do with a lack of incentives and effective regulations that promote the use of recycled raw materials for the production of products. There is also no clear regulation for extended producer responsibility. On the other hand, there is a lack of awareness campaigns aimed at the consumer. The trend towards a circular economy for plastics must be promoted, which implies a closed system model that promotes the reuse of plastic products, generates value from waste and avoids sending recoverable plastics to landfills.

Since a world without plastics is not possible, the key is responsible consumption and awareness that we must correctly manage plastic waste so that it does not have an impact on the environment, as happens in the oceans and even on the continent. Antarctic, where plastic pellets have been found.

Furthermore, we must put the environmental and the social before the economic, because we cannot leave everything free to that sphere where profit is to the detriment of the other.

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