

IPCP Webinar Series: POPs in plastic and monitoring approaches

Sampling plastic recyclates in selected GRULAC countries and information on recycling situation

Yago Guida, PhD

Research Associate

Material Cycles Division, National Institute for Environmental Studies, Tsukuba, Ibaraki, Japan

Biophysics Institute, Federal University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil

(guida.yago@nies.go.jp)

Scope of the presentation

An overview on plastic production and recycling in the GRULAC.

Selected countries.

Plastic production and recycling in each selected country.

Sampling experience in the three selected countries.

Pellet samples collected for the UNEP-GMP Project.

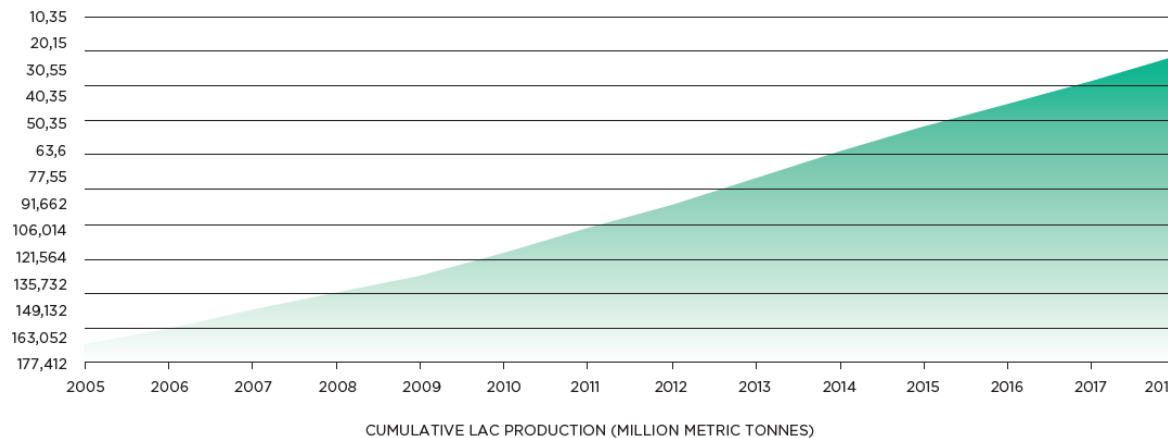


Plastic production and recycling

Latin America encompasses approximately 4% of global virgin plastics production, which in 2018 was equal to about 14.4 MMT of 359 MMT.

the largest global sector of plastic production is packaging at nearly 40%, followed by the building and construction sector (19.8%) and others (16.7%), which includes appliances, furniture, medical plastics, etc.

The overall average of plastic consumption in LA was estimated at 32 kg per person in 2017.



Cumulative Plastic Production in LAC Region (2005 - 2017)



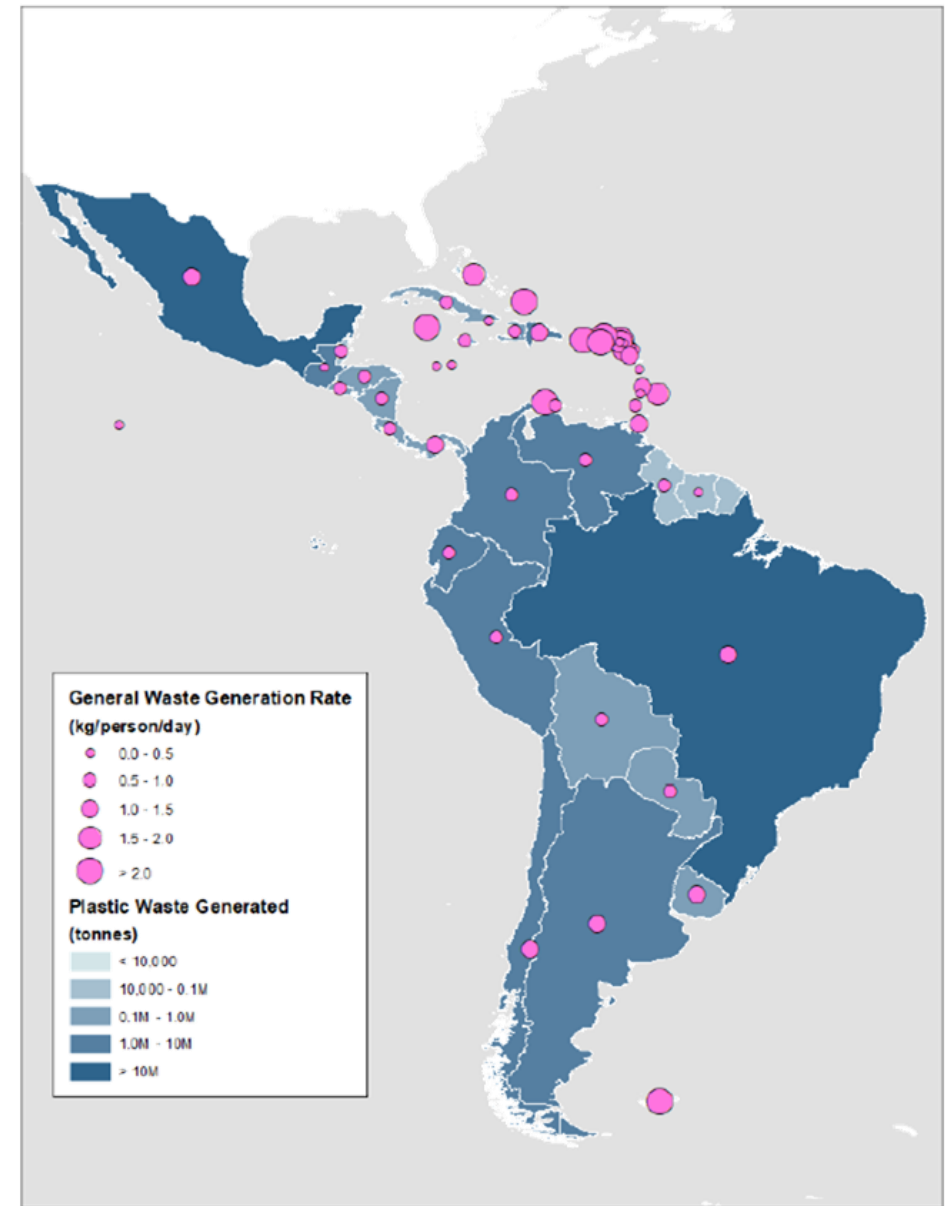
According to the World Bank, the LAC region generates 11% of the world's municipal waste.

The LAC region has the third highest per person waste generation rate at 0.99 kg/person/day, only less than North America, and Europe and Central Asia. This general generation rate is also higher than the global average of 0.74 kg/person/day.

Based upon data from the World Bank, 81% of waste generated in the LAC region is collected, and 84% of the population has waste collection coverage.

LAC as a region manages waste by 26.8% open dumping, 69% landfilling (approximately 52.4% sanitary landfill, 14.6% controlled landfill and 1.5% landfill unspecified), 4.5% recycling and 1% or less of composting and incineration.

The practice of open dumping in the LAC region ranges from 4% reported in Colombia to 84% reported in Trinidad and Tobago.



The LAC region was the fourth highest plastic scrap exporting region out of eight with 5.9% of exports between 1988 and 2016.

The region was the third lowest plastic scrap importing region out of eight at 0.8% of imports in the same time period (1988 – 2016).

Cumulatively over the 28 years, the region has exported 12.6 MMT and imported 2 MMT.

Mexico is the most relevant country in terms of plastic scrap trade (both export and import).

Most of the imported plastic are classified as “other plastics” in the COMTRADE Database.

PET and PP are reported to compose most of the “other plastics” category.

PE, PVC, and PS are respectively the most traded plastic scraps after “other plastics”.

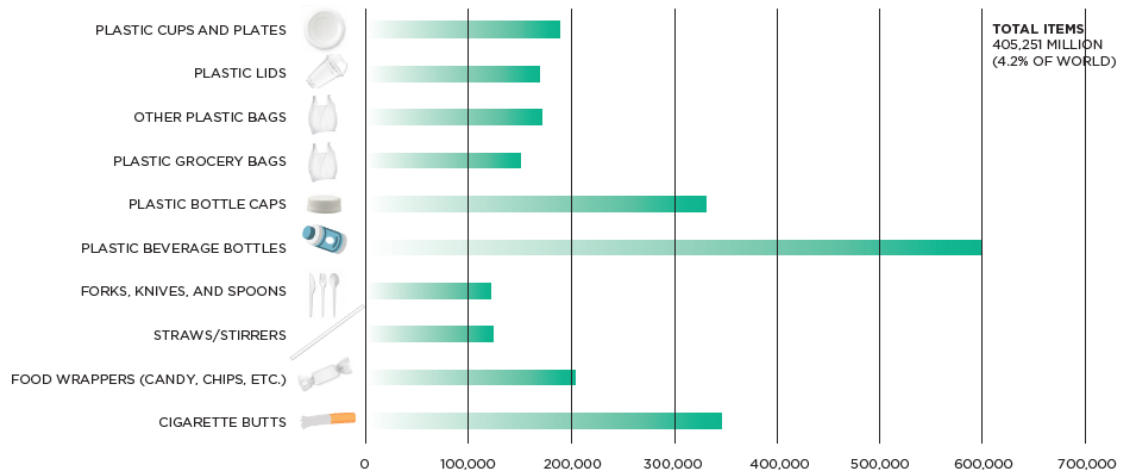
Top 10 Plastic Scrap Exporters in LAC Region (cumulative 1988 – 2018) [30]

COUNTRY	CUMULATIVE EXPORTS (METRIC TONS)	% OF REGION	% OF WORLD
Mexico	11,212,367	83%	5.0%
Argentina	423,065	3.1%	0.2%
Ecuador	228,122	1.7%	0.1%
Dominican Republic	224,347	1.7%	0.1%
El Salvador	196,967	1.5%	0.1%
Brazil	167,870	1.2%	0.1%
Chile	164,966	1.2%	0.1%
Costa Rica	118,058	0.9%	0.1%
Guatemala	114,848	0.9%	0.1%
Nicaragua	104,682	0.8%	<0.1%

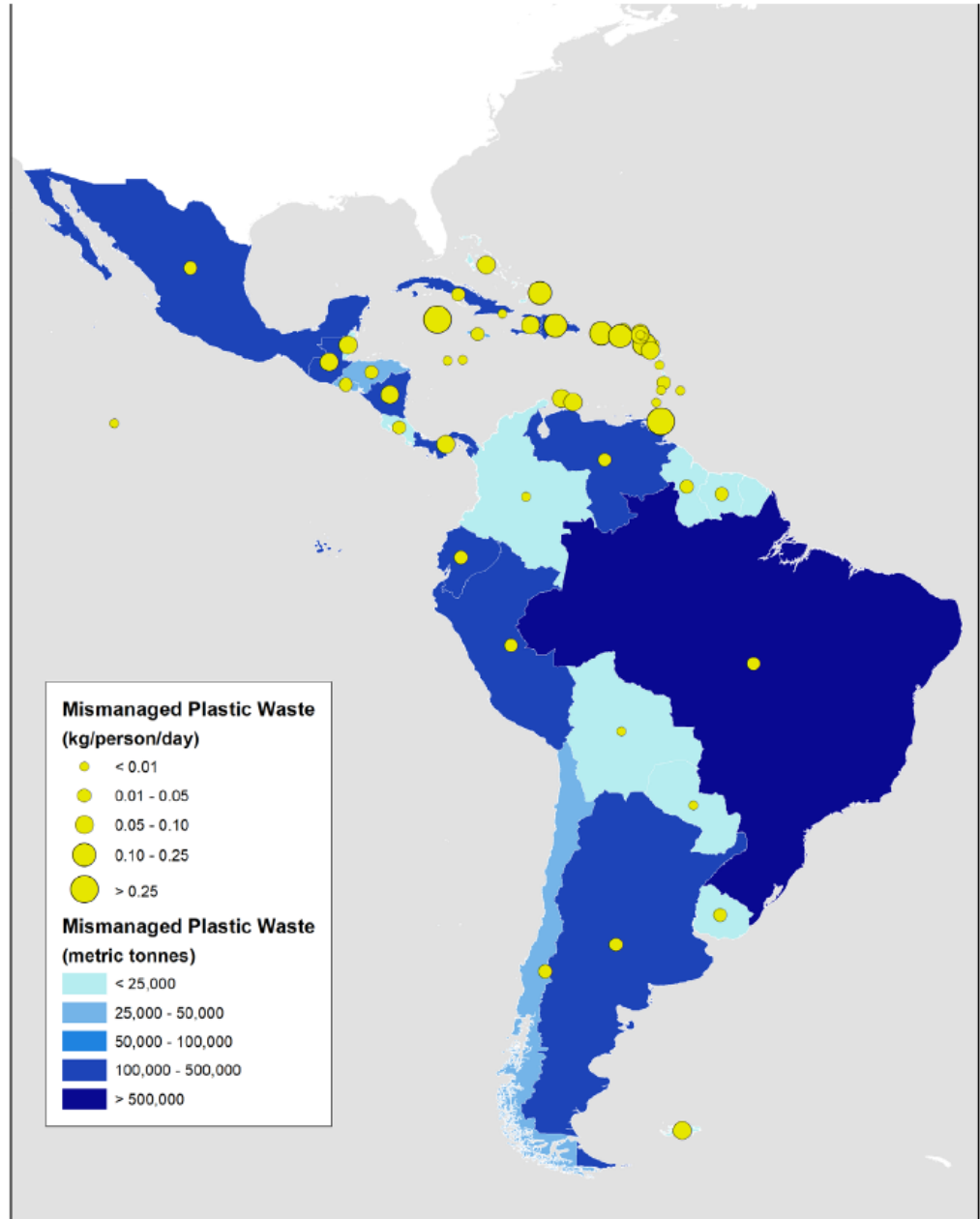
Top 10 Plastic Scrap Importers in LAC Region (cumulative 1988 – 2018) [30]

COUNTRY	CUMULATIVE IMPORTS (TONNES)	% OF REGION	% OF WORLD
Mexico	1,312,267	58%	0.5%
Brazil	133,467	5.9%	0.1%
Colombia	122,278	5.4%	<0.1%
Chile	112,089	5.0%	<0.1%
Costa Rica	104,654	4.6%	<0.1%
El Salvador	100,297	4.4%	<0.1%
Bahamas	70,690	3.1%	<0.1%
Peru	55,101	2.4%	<0.1%
Ecuador	47,752	2.1%	<0.1%
Dominican Republic	46,027	2.0%	<0.1%

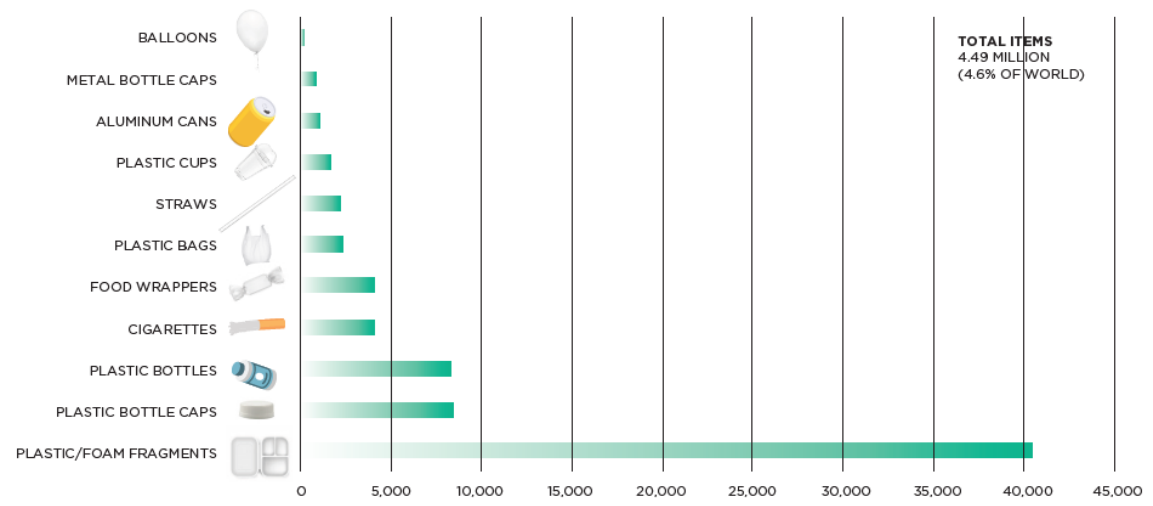
Poor plastic waste management and environmental contamination



Top Litter Items in the LAC region from the Ocean Conservancy International Coastal Cleanup 2018



Estimated Mismanaged Plastic Waste in LAC 6



Top Litter Items Compiled from Marine Debris Tracker Database 2011 - Present

Selected countries: *Brazil, Argentina, and Chile*

Three of largest and most industrialized countries in South America.

Total population of 280 million people, with the largest part living in urban areas.

Selection based on sampling viability.

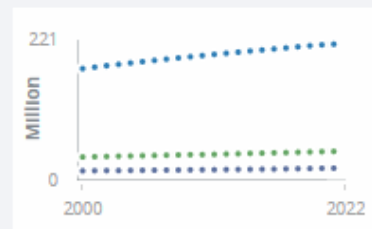
Other countries were individually consulted without success, but some might have joined through the focal centers for the Stockholm Convention.



Population, total ⓘ

Brazil	214,326,223
Argentina	45,808,747
Chile	19,493,184

(2021)



Brazil

Brazil has one of the highest waste collection rates, although a minor parte is recovered.

Plastics represent 13.5% of the collected waste in Brazil.

From the 79 MT of urban solid waste generated in the country in 2018, it was estimated that 38.3% had inappropriate final destinations, 59.5% were landfilled, and only 2.2.% were recovered in sorting facilities for further recycling/transformation.

The Brazilian government intends to eradicate all open dumping sites in the next three years. However, there are over two thousand open dumping sites operating in the country.

Summary of Data on Waste Management in Brazil

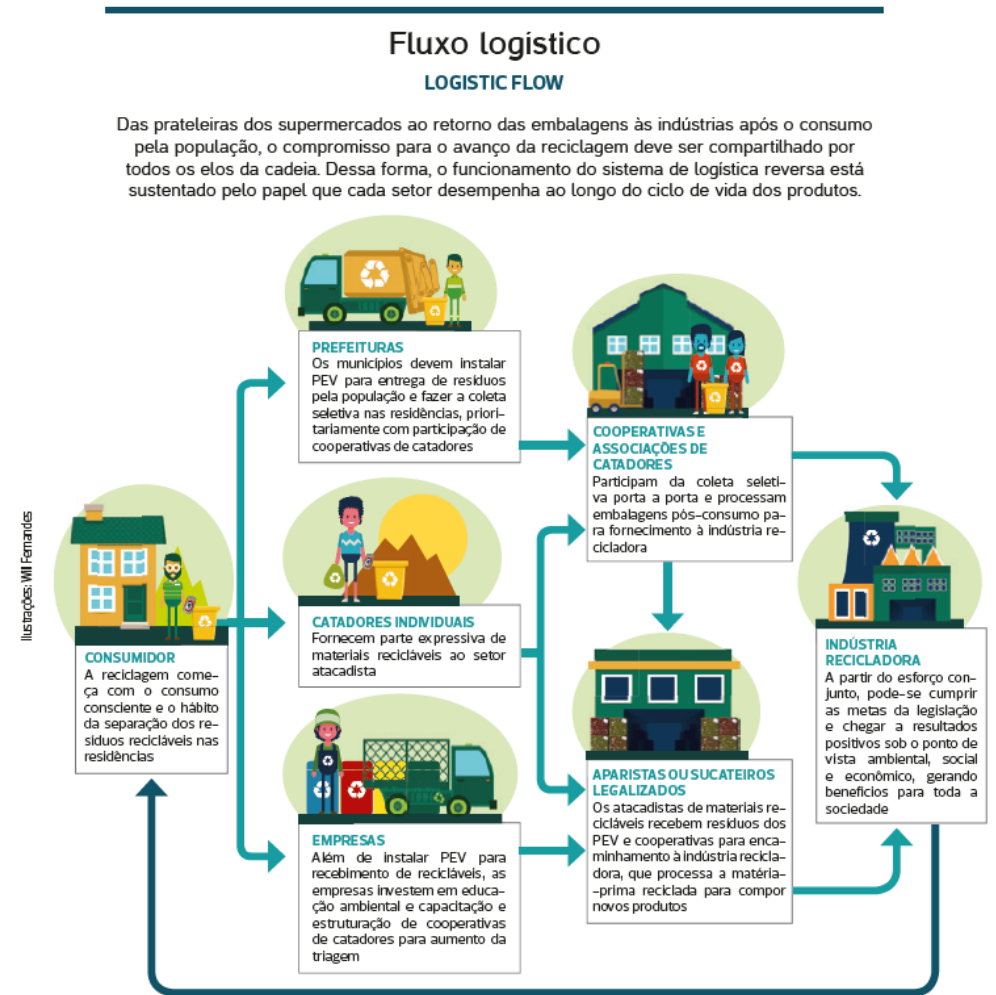
	DESCRIPTION (UNITS)	QUANTITY (UNITS)
Generation and Collection MSW 2018	Per person waste generation (kg/d)	0.96 (kg/d)
	% Collection	92.1%
	% Collection with recovery option	38.1%
Most Recent MSW Composition Estimates	% Plastic	13.5%
	% organic (food and green waste)	51.4%
	% paper, paperboard, cardboard	13.1%
	% Metal	2.9%
	% Glass	2.4%
	% Other	16.7%
MSW Final Disposal Sites (Recovery Non-Included)	% Open Dump	13.0%
	% Sub-regulated Landfill	11.4%
	% Landfill	75.6%
MSW Final Disposal for Diverted Materials	% Recycling (includes informal recycling)	1.7%
	%Composting	0.2%

Only approximately 22% of the Brazilian municipalities have a waste selective collection, which attends around 17% of the population.

Due to the high rates of poverty in the country, Brazil has an impressive number of waste pickers (~600 000), who are responsible for most of the waste collected from the streets, irregular dumping sites and landfills, destined to reuse, transformation and recycling.

Brazil was the fourth-largest producer of plastic waste in the world in 2016, with 11.3 million tons, surpassed only by the US, China and India. Only 1.28% of the waste generated in the country were sent for recycling. This is one of the lowest rates in the world and well below the global average of 9%.

Besides PET and other specific polymers that can be collected in large amounts and have well known composition, the plastic recycling flow is limited to industrial scraps and waste.



Plastics related to POPs in Brazil

Brazil stands out in South America as an e-waste generator.

It has been estimated that 2143 million ton of e-waste was generated in Brazil in 2019, primarily in the Southeast region.

Although Brazil announced an e-waste Federal regulation in 2010 a formal e-waste Reverse Logistics System (RLS) with the structure for collecting and recycling is absent in most regions, and, hence, a large share of the e-waste generated is still disposed mixed with household waste in landfills and is destined for informal chains.

Besides the imports, in 2018 Brazil produced 8.3 million t of thermoplastic resins and 7.2 million t of transformed plastics.

Although PVC recycling has increased at a rate of 11% per year since 2005, only 17% of the PVC generated post-consumption were recycled in 2014. Thus, from the 134 thousand t of post-consumption PVC generated in that year, nearly 23 thousand t were recycled.



BASEL CONVENTION
*the world environmental
agreement on wastes*



**ROTTERDAM
CONVENTION**



**STOCKHOLM
CONVENTION**

Plastics related to POPs in Brazil

In Brazil, 70% of industrial rubber is used in tires. In 2016, manufacturers and importers destined around 493 thousand t of tire rubber. Around 70% of unserviceable tires collected in the country are removed from the environment and transformed into alternative fuel for 24 cement production units.

Energy recycling is completed by the use of rubber in flooring, carpets and rubber asphalt, which together absorb the other 30% of the volume collected at 834 points.

Regarding construction and demolition waste, municipal cleaning services collected about 122 t of this kind of residue per day in Brazil. Only 8% of all construction and demolition waste collected was destined for recycling. However, the real production of this kind of waste is unknown in Brazil, and most of it is probably used for embankment.

94% of agrochemical packages are properly managed in Brazil.



BASEL CONVENTION
*the world environmental
agreement on wastes*



**ROTTERDAM
CONVENTION**



**STOCKHOLM
CONVENTION**

Argentina

There is no complete official statistical data on plastic recycling in Argentina available on the web.

The plastic recycling industry was born in the 90s and has been growing in the last 15 years.

Most recycling industries are concentrated in the metropolitan area of Buenos Aires.

Mechanical recycling is the most popular.

The identification of plastic types in plastics produced in Argentina is voluntary. There is no legislation that requires their use, which makes household separation and recycling difficult.



Argentina is one of the countries with the highest plastic consumption per capita in Latin America (42.00 kg/habitant).

Of the 1,766,600 tons of plastic consumed, only 13% were recycled, which amounts to 232,900 tons.

- o PE: 24% of 640,100 tons (55,000 tons) were recycled.*
- o PET: 21% of 176,500 tons (37,000 tons) were recycled.*
- o PP: 10% of 272,500 tons (28,000 tons) were recycled.*
- o GPPS and HIPS: 8% of 63,200 tons (5,100 tons) were recycled.*
- o PVC: 2% of 114,300 tons (2,500 tons) were recycled.*
- o OTHERS: 1% of 500,000 tons (5,300 tons) were recycled.*

In general, companies specialize in different steps or aspects of recycling.

There are many small and medium-sized companies or cooperatives throughout the country that are dedicated to collecting and separating different types of waste, including plastics.

Typically, plastic is collected and then sent to specialized companies in large cities recycling.



**RESIDUOS PLASTICOS EN ARGENTINA.
SU IMPACTO AMBIENTAL Y EN EL
DESAFIO DE LA ECONOMIA CIRCULAR**

Final products made with recycled plastic in Argentina:

Recycled PET: Beverage containers (super-cleaning processes), cleaning product containers, textile fibers, tarps, nautical sails, carpets, straps, cords, monofilaments, etc.

Recycled HDPE: Domestic and condominium waste bags, various bottles for cleaning products, pipes, plastic wood, etc.

Recycled PVC: Pipes for construction, irrigation, and cable protection, garden furniture, railings, shoe soles, etc.

Recycled LDPE: Waste bags, pipes, plastic wood, films for agricultural use, insulating membranes, pots, etc.

Recycled PP: Containers, crates, buckets, automotive parts, plastic wood, monofilaments, luminous signals, battery boxes, etc.

Recycled PS: Office items, trays, cornices and skirtings, hangers, seedling pots, garbage containers, etc.



Plastics related to POPs in Argentina

Only 5% of e-waste is recovered or recycled.

Most of recycled e-waste plastics are not checked for POP contents, although Argentina is a country-Party of the BRS Conventions.

PVC is recycled within the country, albeit predominantly from industrial scrap.

Post-consumer PVC material carries little market value and is challenging to sort.

Approximately 130 thousand t of tires are disposed of in Argentina and most of it is informally recycled into rubber granulates for sport courts and rubber tiles.

Like in Brazil, most construction and demolition waste is used for embankments and not recycled.

20 million of agrochemical packages are disposed of in Argentina every years without proper environmentally sound management.



BASEL CONVENTION
*the world environmental
agreement on wastes*



**ROTTERDAM
CONVENTION**



**STOCKHOLM
CONVENTION**

Chile

In Chile, only 8.5% of plastic is recycled per year, which is equivalent to 83,679 tons of 990,000 t that are consumed, which is distributed in 17% (14,281 tons) at the household level and 83% (69,398 tons) not domiciliary.

The most recycled type of plastic is polyethylene terephthalate (PET) with 7,889 t, which translates into 55% of the recycling industry, the rest belongs to polyethylene (PE) and polypropylene (PP) with 6,392 t.

Only 48% of the installed capacity corresponds to grinding and 57% to pelletizing plastic waste.

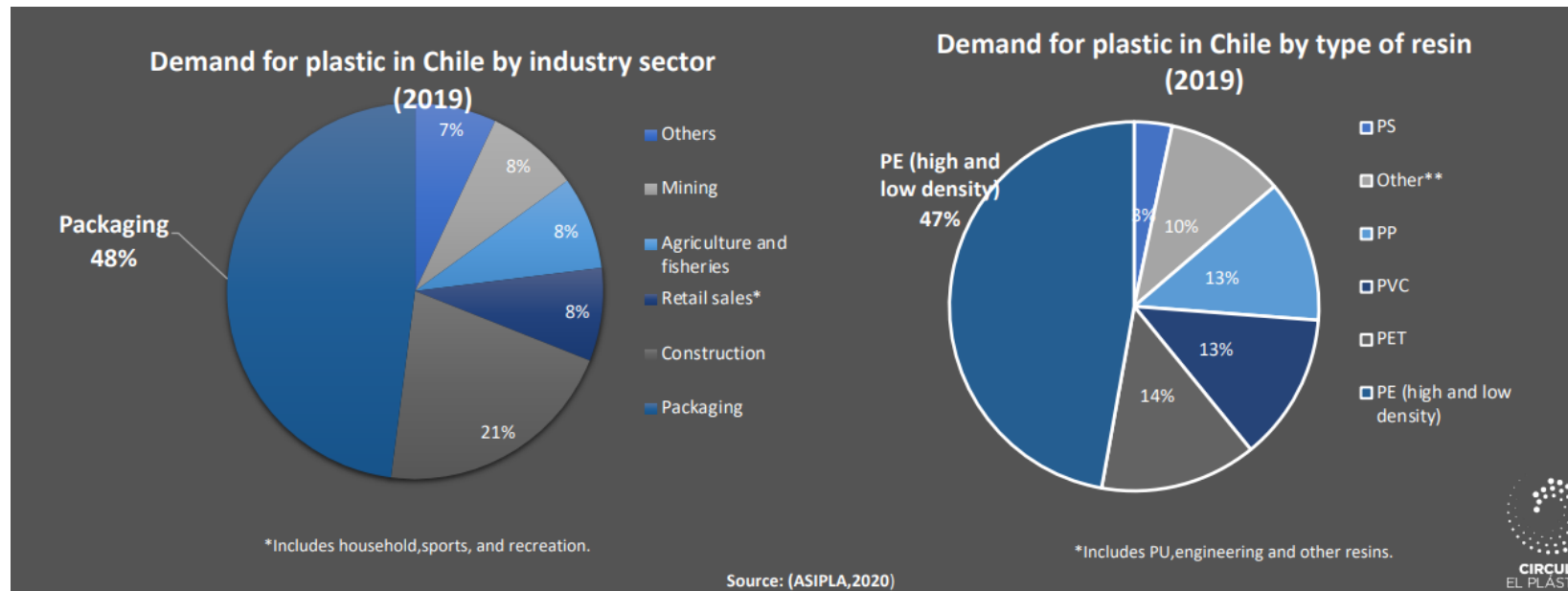
83% of the pelletizing industries and 79% of the grinding/crushing industries are located in metropolitan areas.

Summary of Data on Waste Management in Chile

	DESCRIPTION (UNITS)	QUANTITY (UNITS)
Generation and Collection MSW 2017	Per person waste generation (kg/d)	1.22kg/d
	% Collection	96%
	% Collection with recovery option	Not given
Most Recent MSW Composition Estimates	% Plastic	9.4%
	% organic (food and green waste)	53.3%
	% paper, paperboard, cardboard	12.4%
	% Metal	2.3%
	% Glass	6.6%
	% Other	16%
MSW Final Disposal Sites (Recovery Non-Included)	% Open Dump	2.4%
	% Landfill	78.2%
	% Sub-regulated Landfill	19.5%
MSW Final Disposal for Diverted Materials	% Recycling (includes informal recycling)	1.7%
	% Other recovery	1.8%

In Chile there are a total of 7,554 facilities to formally manage the different types of waste, which are divided into 7,186 “green points”, 98 “clean points”, 216 collection centers and 54 recovery companies. The Metropolitan region contains 64% of the recycling companies in the entire country.

The Chilean government considers Chile Basura Cero (Chile Zero Waste) part of its official circular economy program creating regulations and promotion that allow for recycling, proper waste management, and citizen involvement to achieve this goal.



Plastics related to POPs in Chile

In Chile if WEEE is recycled, but only 3.4% of this waste is collected and treated properly.

Chile is part of the initiative called "Strengthening of National Initiatives and Improvement of Regional Cooperation for the Environmentally Sound Management of POPs in Waste Electrical and Electronic Equipment in Latin American countries", the E-Waste Project is promoted by the Ministry of the Environment, Fundación Chile and UNIDO.

In Chile, the Management of Construction and Demolition Waste is recently being discussed, especially rubbish and its reuse, but the issue of plastic has not been mentioned. However, on May, 2016, the Recycling and Extended Producer Responsibility Law (REP) was enacted, which essentially obliges manufacturers and importers of six priority products to recover a percentage of them once they end their life useful (that is, when they become waste). Within this law it is also wanted to manage buildings and construction waste.



BASEL CONVENTION
*the world environmental
agreement on wastes*



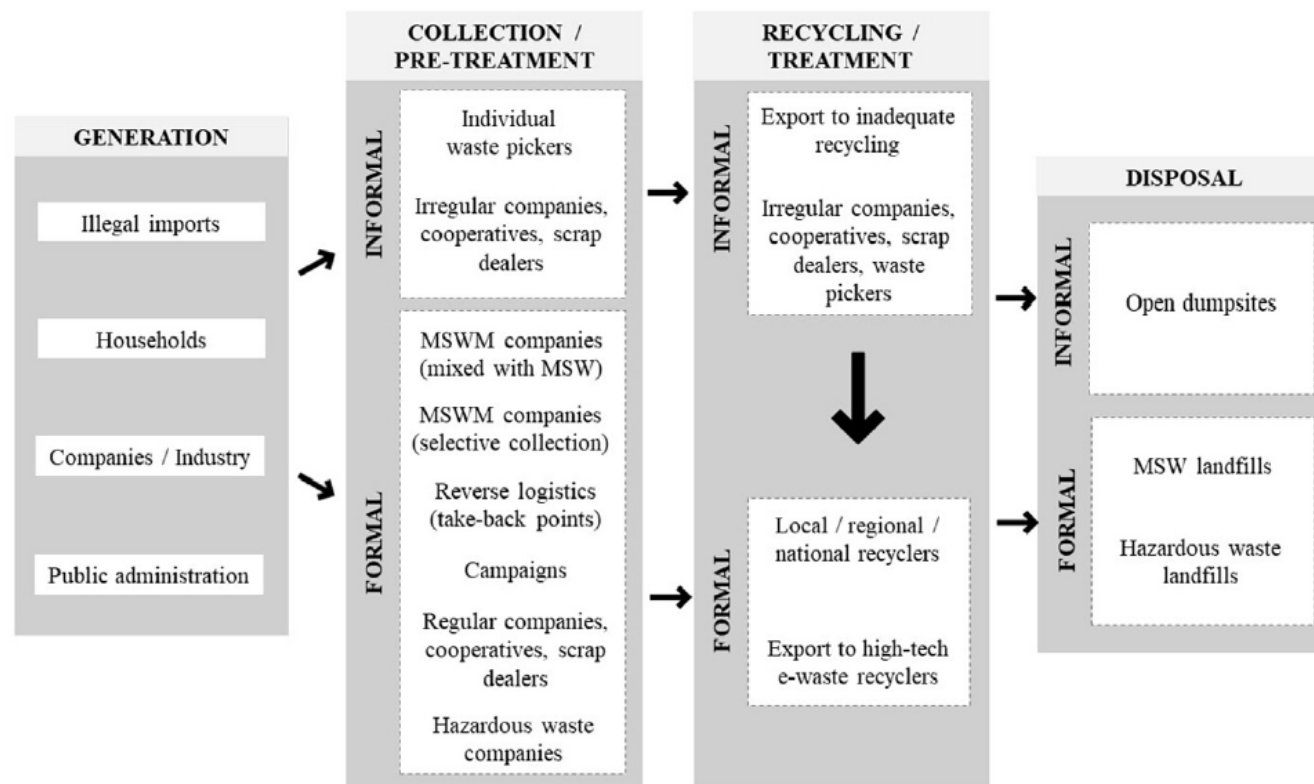
**ROTTERDAM
CONVENTION**



**STOCKHOLM
CONVENTION**

UNEP-GMP Project samples

Polymer type	Brazil	Argentina	Chile
ABS	8	3	3
HDPE	<i>n.a.</i>	4	7
HIPS	2	1	4
LDPE	<i>n.a.</i>	4	<i>n.a.</i>
MDPE	<i>n.a.</i>	1	<i>n.a.</i>
PA	5	<i>n.a.</i>	1
PC	1	<i>n.a.</i>	2
PE	3	<i>n.a.</i>	1
PET	<i>n.a.</i>	<i>n.a.</i>	1*
PMMA	<i>n.a.</i>	1	<i>n.a.</i>
PP	16	11	6
Prene	1	<i>n.a.</i>	<i>n.a.</i>
PS	<i>n.a.</i>	<i>n.a.</i>	1
PVC	3	<i>n.a.</i>	<i>n.a.</i>
Total	39	25	25



Thank you very much for your attention

