

CURITIBA, Brazil

City Information

Population: 1,893,997 (IBGE, 2016)

Area (km²): 435,036 (IBGE, 2016)

Climate: subtropical climate (average low temperature in winter months 13 degrees Celsius, average high temperature in summer months 21 degrees Celsius).

GDP/Capita: US\$ 13,282.80¹

Main Economic Activities: Curitiba's economy is divided between services (66%) and industry (34%). It is home to many multinationals across a range of sectors such as car industry, oil & gas, paint and food manufacturing. Moreover, Curitiba Municipality is widely recognized in Brazil as an innovator in sustainable urban planning and development.

City website: <http://www.curitiba.pr.gov.br/>



Country Information

Population: 206,820,492 (IBGE, 2016)

Area (km²): 8,515,767,049 (IBGE, 2016)

Economy and GNI/Capita

Upper-middle-income: US\$15,050 PPP (2015 - World Bank)

Main Economic Activities

Agriculture: mainly coffee, soybeans, wheat, rice, corn, sugarcane, cocoa, citrus, beef;

Industry: mainly automobile, petrochemicals, machinery, electronics, cement and construction, aircraft, textiles, food and beverages, mining, consumer durables, tourism.

Government Agencies responsible for guidance on waste legislation

Ministry of Environment: <http://www.mma.gov.br/cidades-sustentaveis/residuos-solidos>

Ministry of Cities: www.cidades.gov.br

¹ Equivalent do BRL 42,315, according to exchange rate from May 09 2017: 1 BRL = 0.313 U\$S

Classification of MSW

Waste generated by households and small business such as markets, banking establishments, shops, bars, among others, including residual waste and the dry recyclables, has its collection and final disposal carried out by the municipality

The municipal service applies to waste generators, with an amount of up to 600 L per week of MSW (PGIRS, 2015). Above this quantity, the generators are responsible for contracting private services of collection, transport and final disposal (<http://www.curitiba.pr.gov.br/conteudo/sobre-a-limpeza-publica-smma/341>).



MSW Generation

The Municipality of Curitiba generates approximately 610,780 tons per year of MSW, comprising waste generated by households, small businesses and public cleansing services (2016).

The MSW per capita is 322.5 kg/person/year.

Waste or service	ton/year	tons/day
Total MSW	610,780	1,673
Residual waste from households	488,611	1338
Dry recyclables separated at source	25,543	70
Public cleansing services	21,452	59
Green waste from households	75,169	206
Hazardous waste from households	3.47	---
Other streams		
C&D from bring sites	1,521	

Collection Coverage and Type

Municipalities in Brazil are responsible for planning and implementing the collection and management of MSW. Curitiba currently delegates the collection and disposal services to private sector operators. The overall collection rate for municipal waste is in line with international best practices standards, 100% coverage of the population. A separate collection scheme for dry recyclables is in place and also serves 100% of the Municipality of Curitiba (PGIRS, 2015).

The waste collection services in Curitiba encompasses the following activities:

1. Services provided by the Municipality:

- a. Door-to-door collection of residual waste from households and small businesses. Waste is collected 3 times per week and up to 6 times per week in the city center with the highest population density. In the outskirts of Curitiba collection frequency is weekly;
- b. Door-to-door collection of dry recyclables from households and small businesses, known as “Lixo que não é lixo” program. Dry recyclables are collected once a week up to 3 times per week for the whole city;
- c. Bring sites and civic amenity sites for voluntary delivery of dry recyclables, green waste and construction and demolition waste – called Estações de Sustentabilidade;
- d. Social Action Foundation scheme to refurbish and donate furniture and home appliances through the *DISQUE SOLIDARIEDADE* service;
- e. Collection on request from households for small quantities of construction and demolition waste, green waste and hazardous waste;
- f. Collection of hazardous household waste that consists in the receipt of hazardous waste from residences for adequate final disposal. The special collection truck has specific identification, is equipped with a trunk and has different drums to store each type of hazardous waste: batteries, solvent packages, insecticides, fluorescent lamps, expired drugs, waste ink, tonner, among others. This program also receives post-consumer vegetable or animal oil, which is then recycled. The collection is performed according to an annual calendar, the truck remains in the vicinity of one of the city's 24 bus terminals once a month. This program collected about 3.47 tons of hazardous household waste in 2016.

2. Informal collection of dry recyclables by waste pickers

3. Private service providers for large generators of residual waste and dry recyclables

4. Private service providers for healthcare waste

The table below summarizes the stakeholder responsible for collection for different types of waste.

<i>Types of waste</i>	<i>Municipal service</i>	<i>Informal collection</i>	<i>Private service providers</i>
Residual waste	for households and small businesses	NA	for large generators
Dry recyclables	Program “Lixo que não é lixo” for households and small businesses	for households and small businesses	for large generators
Bulky waste	Bring sites and civic amenity sites; collection on request; social action foundation	NA	for large generators
Green waste		NA	
C&D		NA	
Healthcare waste	NA	NA	for specific generators

Waste Composition

The composition analysis refers to the MSW collected by the public service and delivered to the landfill site. The main fraction is organic waste (i.e. food waste and green waste), while the main dry recyclable fraction is paper; the cellulosic fraction (i.e. paper and cardboard) account for about 22% of the total residual waste produced.

Material	%
Paper	15.90
Cardboard	6.03
Plastic film	10.01
Hard plastic	7.8
Ferrous metals	1.88
Non-ferrous metals	0.82
Glass	4.64
Tetra Pak	1.08
Wood	0.82
Rags	4.51
Leather	0.71
Diapers	5.48
Rubber	1.95
Others	0.64
Organic waste	37.73

PGIRS, 2015

Waste Management Practice

From 1,673 tons of solid waste collected per day, around 1,385 tons (82.8%) are collected as residual waste and almost 288 tons (17.2%) are dry recyclables collected separately by different collection schemes. The overall coverage of the collection service for municipal waste is in line with international best practices standards, reaching a rate of 100%.

Below are described the city's waste management programs:

- *Lixo que não é lixo (Translation: waste that is not waste)*
This is a separate collection scheme for dry recyclables that has had this denomination since its beginning. The material collected is delivered to different facilities: a material recovery facility called UVR², managed by a NGO called Instituto Pró-Cidadania de Curitiba, which receives 27% of waste collected by the scheme, and to among the 21 sites called “Ecocidadão” registered by the Municipality to formally integrate the informal system, which receives 73% remaining waste. The sites are operated by waste pickers associations and/or small businesses. It is estimated that about 60% of the quantities sorted at the recycling facilities are send to recycling.

This program collected about 21,889.95 tons of recyclables 2016.

² The UVR contract with the Municipality is in process of restructuring and so the facility is not receiving the waste temporarily

- *Estações de Sustentabilidade (translation: sustainability stations)*

The “Estações de Sustentabilidade” are collection banks or civic amenity sites for voluntary delivery of dry recyclables by residents of the area where they are located. The stations are divided into two types:

- TYPE I site – consists of a container with different windows where people can dispose up to 12 different materials such as glass, metals, plastics, paper and cardboard. There are currently 10 sites distributed around the city; the site is unmanaged, acting as a bring scheme
- TYPE II site has the container described above, and a small collection center, managed by an operator of the municipality service, with additional containers for collecting: green waste, bulky waste and construction and demolition waste. There are currently there Type II sites.

<i>Estações de Sustentabilidade – TYPE I (bring bank only)</i>	<i>Estações de Sustentabilidade – TYPE II (bring bank + delivery point for green waste and C&D)</i>
	

This initiative received about 136 tons of dry recyclables, 264.5 tons of green waste, 1,521 tons of C&D waste and 339 tons of tyres in 2016.

- *Câmbio Verde (translation: green change)*

The “Câmbio Verde” Program is a partnership between the Municipal Secretariat of Environment (SMMA) and the Federation of Producers of Paraná (FEPAR), which represents small and medium local farmers of the Metropolitan Region of Curitiba. It consists of an exchange of dry recyclables for seasonal fruits and vegetables offered at lower prices; it is a local policy to combat hunger and that also covers issues such as waste, income generation, environmental protection, among others. The funding utilized for the purchase of the food comes from the SMMA budget.

Each citizen can bring up to 80 kg of dry recyclables per event - every 4 kg is equivalent to 1 kg of fruits and vegetables, which can also be exchanged by 2 liters of vegetable oil. The exchange takes place fortnightly in each of the 100 selected spots located in the city and an average of 60 persons attend each spot.

This initiative collected about 3,653 tons of recyclables in 2016.

- *Ecocidadão (translation: eco-citizen)*

The Ecocidadão program started in 2007. It now operates in cooperation with the Cataparaná Cooperative Network as an attempt to integrate the informal system of waste pickers organizations and small businesses. Currently, the 21 registered sites account for around 550 waste pickers, which are remunerated for the volume of material that arrives at the sites delivered by the “Lixo que não é

Lixo” program, and from the collection scheme “Estações de Sustentabilidade” and the “Câmbio Verde” spots. The capacity varies from site to site, but it can be up to 100 tons per month. In addition to the material delivered by the Municipality, the sites can also receive materials from large generators, under specific contracts.

Final disposal

The final disposal of the MSW from Curitiba Metropolitan region is largely managed by Conresol (Consórcio Intermunicipal para Gestão de Resíduos Sólidos Urbanos), a consortium formed by 23 of the 29 municipalities of the Metropolitan area, including Curitiba itself. Currently waste from the city and most of the other municipalities in the area is disposed at Estre Landfill, which opened in 2010 and has an operational lifetime of at least 20 years. The landfill is located at South, 30 km far from the center of Curitiba, in Fazenda Rio Grande municipality. It is owned and operated by Estre Ambiental, a private company.

The gate fee for disposing MSW at the Estre Landfill R\$ 70.00/ton. There is no landfill-tax.

Financing of MSW

The cost of managing solid waste in the city is covered partially by the budget of the municipality allocated to solid waste management in the amount of about US\$ 118³ million for 2017. Additionally, in exchange for the provision of waste management services, Curitiba charges a waste tax to commercial producers and households for a total income that amounts to approximately U\$S 29,386⁴ millions/year; the tax is paid mainly on a monthly basis, through a levy that is applied on urban property tax.

On average the budget for MSW management, accounts for approx. U\$S 78⁵/person/year

Waste Management Challenges

Curitiba faces on-going challenges with regard to waste generation and management such as low recycling rates and high disposal and transportation costs - which require the development of more sustainable solutions. In exchange for the provision of waste management services, the Municipality also recognizes that there are opportunities to gain more value from the waste and to move its management up the waste hierarchy, thereby reducing the amount of waste going to landfill, with a specific focus on recycling of materials.

Technical Assistance

A technical assistance proposal to Curitiba was presented by ABRELPE and approved by the Lead Partners of the Waste Initiative of the Coalition. The Stage 2 Assistance (Work Plan) needs to generate outcomes that will lead the Municipality to take straightforward actions to reduce its SLCPs emissions in its waste management. Curitiba wants to take action on deviating the organic fraction from landfilling, but lacks technical guidance on planning and safe treatment options to invest and take the first step.

³ Equivalent do BRL 378 million, according to exchange rate from May 09 2017: 1 BRL = 0,313 U\$S

⁴ Equivalent do BRL 93,617 million, according to exchange rate from May 09 2017: 1 BRL = 0,313 U\$S

⁵ Equivalent do BRL 249, according to exchange rate from May 09 2017: 1 BRL = 0,313 U\$S

The project under implementation started in February 2017 and will be finalized by December 2017; it is divided in two main pillars:

The Activity 1 intends to address this issue and will be started by rising awareness on types and potentials for the recovery of the organic waste generated within the city, and run the OrganEcs tool to provide a decision-making deliverable with financial and technical information on the best options for organic waste treatment, as well as measuring the potential for real emissions reduction by using CCAC emissions estimation tools. Running these tools in a real case will also contribute to its improvement and to help other municipalities worldwide. A second deliverable is a roadmap on organic waste management focused in mitigating SLCPs emissions, a leaflet showing possible paths and suitable technologies for Brazilian municipalities with similar characteristics of Curitiba.

The Activity 2 will focus on the improvement of Curitiba's communication and awareness skills in the MSW management and its fundamental role to mitigate climate change impacts. The teamwork agrees that communication is crucial in the waste sector and must be a "two-way street" to efficiently get the stakeholders "on board" in order to contribute to the success of the planned measures. In this sense, this activity plans to first identify Curitiba's communication strategy and its comprehensiveness, strengths and weaknesses; meanwhile, a benchmark on best communication practices will occur so to identify potential interchange of experiences with other Brazilian and South American municipalities. The deliverables will be a report to Curitiba and a guide/handbook of the best practices identified, intended to be spread and inspire other municipalities.

MSW Sector Overview: Country Level

General description and overview of common practice

More than 3,300 of the 5,570 Brazilian municipalities still dispose off their waste in dumpsites or controlled landfills (ABRELPE, 2016). Of the waste collected, 17.2% goes to open dumps, 24.1% to controlled landfills and 58.7% ends up in sanitary landfills. Approximately 10% of the national territory still does not have regular services to collect their waste, although the household collection service in urban areas has reached almost a universal level.

Organic matter generated in households accounts for more than 50 percent of the total waste collected and disposed of in sanitary landfills, of which around 5% is used in composting processes (MMA, 2012).

In 2015, around 65% of Brazilian municipalities declared having some initiative related to separate collection (ABRELPE, 2016), and recycling rates of dry materials are estimated in 4%, not considering the informal sector.

While in some Northern and North-eastern cities the waste generation per capita is less than 0.4kg per day, in some neighbourhoods in Sao Paulo's districts, this value can be over four times higher.

Waste Generation (per capita/year)

390kg/person/year (ABRELPE, 2016)

Collection Coverage

Approximately 10% of the national territory still does not have regular services to collect their waste, although the household collection service in urban areas has reached almost a universal level.

Number of Landfills/MSW Disposal rate (tonnes/year)

According to ABRELPE (2016), approximately 117,000 tons/day (58.7%) of what is collected are disposed in sanitary landfills; and 82,000 tons/day (41.3%) are disposed in controlled dumps or open dumps.

Recycling Rate

Plastics 22%, Cardboard 75%, Paper 29%, Aluminum cans 98%, Steel cans 47%, Glass 45%, Tyre 85%, PET 57% (Cempre, 2013).

Waste management of organic fraction (composting, anaerobic digestion)

About 5% of the organic fraction of urban waste in Brazil is composted. The country has about 211 municipalities with composting facilities, most of which concentrating in the state of Minas Gerais and Rio Grande do Sul, with 78 and 66 facilities respectively (Cempre, 2013).

Energy Recovery Rate

Energy recovery is still very low. Landfill gas is collected only at some of the state-of-the art sanitary landfills, while anaerobic digestion and thermal treatment plants are very few in the country.

City Level

Aimed at improving Waste Management in General

The Municipal Solid Waste Master Plan (PGIRS) was launched in 2013 and reviewed in 2015. The PGIRS main goal is to be aligned to the guidelines, strategies, goals, programs and actions defined in the National Solid Waste Plan, of August 2012; compose the Municipal Basic Sanitation Plan, as provided for in article 19 of Law No. 11.445 of 2007, which is not related to urban cleaning and solid waste management; and meet prerequisite for access to National Government resources, enterprises and services related to urban cleaning and solid waste management.



Curitiba wishes to develop a solid waste management system comprising collection, transportation, treatment and potentially any value recovery schemes

Dry Recyclables - structural goals

The following goals were set in the PGIRS, in 2015.

The priority program for the diversion of dry recyclables from the landfill should include concepts and practices aimed to recognize reusable and recyclable solid waste as an economic good and of social value, shared responsibility for the product life cycle, presence of dry (recyclable) waste in conventional collection, sustainable consumption and conscious consumption, source separation, disassembly of packaging, incentive for the implementation of sorting units and economic worth of waste, with the incentive of businesses focused on collection, reuse and recycling. In this line, a study should be carried out in order to know the potential energy utilization of the non-recyclable or non-compostable wastes from the dry and wet plots, respectively, which can be transformed into refuse-derived fuel (RDF).

Organic Waste - structural goals

The following goals were set in the PGIRS, in 2015:

- Induce the composting, the energetic use of the biogas generated in biodigestors or in landfills or other technologies aiming at the generation of energy from the wet fraction of the MSW;
- Elaborate guides and handbooks as well as to carry out training activities for public managers, associations, collector cooperatives, civil society organizations, community in general, on the importance of adequate segregation at source and treatment by composting at home and opportunities for use of the resulting materials;
- Stimulate household composting as a destination for organic waste;
- Induce and encourage large generators such as supermarkets, wholesalers, Ceasa, condominiums, government agencies, events and small business to prioritize the recycling of wet waste;

- promote formal and non-formal environmental education actions specifically applied to the composting theme, encouraging the correct practice of separation of organic waste and different types of household composting.

Aimed at addressing Climate change and reducing SLCPs through waste related activities

The following goals were set in the PGIRS, in 2015:

- Implementation of the fourth axis in part of the truck fleet of the household collection;
- Implementation of the “Estações de Sustentabilidade”, which allow a lower frequency of door-to-door collection and reduce vehicle circulation;
- Collect and produce energy from the landfill gas generated by the Estre landfill.

Country Level

Aimed at improving Waste Management in General

The National Waste Law (12.305/2010) brings principles, objectives and instruments and sets forth guidelines for integrated solid waste management, generators' responsibilities and applicable economic instruments.

Some of its content that is important to highlight:

- An integrated municipal solid waste management must follow some steps: waste generation reduction, re-utilization, destination to treatment (recycling, composting, energy recovery) and final disposal;
- The sanitary landfills are considered the only environmentally-adequate final disposal for municipal solid waste;
- All states and municipalities must have an Integrated Solid Waste Plan, in order to be in compliance with the law and to have access to funds provided by the national government to solid waste management actions at the city level.
- Separate collection has to be part of the municipal solid waste management system, and must prioritize the integration of waste pickers' cooperatives in the formal system.

Aimed at addressing Climate change and reducing SLCPs through waste related activities

In late 2009, the Brazilian Government assumed a voluntary, nationwide commitment to set mitigation measures in order to reduce the country's GHG emission by 36.1 – 38.9% against their business-as-usual by 2020.

This commitment was established under Law # 12,187 of December 29, 2009, which launched the National Policy on Climate Change (PNMC). The PNMC was regulated by Decree # 7,390 of December 9, 2010.

There is no specific legislation in Brazil that specifically refers to a GHG emission reduction plan for solid waste and landfills. However, the potential inclusion of such legislation in this sector has been discussed, and new segments might be adopted for the years to come, such as hydro resources and solid waste, among others. Another important aspect to consider is the possibility of the creation of a Brazilian carbon market, which could allow credit trading among the regulated sectors and set reduction targets. This trading scheme is being studied by Brazilian authorities, and could reflect realities that are consolidated in other countries.

Legislation

City Level

Legislation governing MSW management

Law 9.380/1998

<https://leismunicipais.com.br/a/pr/c/curitiba/lei-ordinaria/1998/938/9380/lei-ordinaria-n-9380-1998->

Law 14.596/2015

<https://leismunicipais.com.br/a/pr/c/curitiba/lei-ordinaria/2015/1459/14596/lei-ordinaria-n-14596->

[2015-](#)

Decree # 983

<http://multimidia.curitiba.pr.gov.br/2010/00086367.pdf>

Inspection activities/supervision and enforcement of legislation

The Public Cleaning Department (MALP) belongs to the Municipal Secretariat of Environment and is responsible for managing and supervising the services performed by the contractors and the municipal staff. The MALP has 80 municipal employees distributed in management, administrative and supervisory activities and also has more than 2700 workers from outsourced companies performing public cleaning services.

National Level

Legislation governing MSW management

Law 12305/2010 - National Waste Law

http://www.planalto.gov.br/ccivil_03/ato2007-2010/2010/lei/l12305.htm

Decree # 7404

http://www.planalto.gov.br/ccivil_03/ato2007-2010/2010/Decreto/D7404.htm

National Policy on Climate Change (12.187/2009)

http://www.planalto.gov.br/ccivil_03/ato2007-2010/2009/lei/l12187.htm

Decree # 7390

http://www.planalto.gov.br/ccivil_03/Ato2007-2010/2010/Decreto/D7390.htm

2nd Brazilian GHG Annual Emissions Estimation report

http://www.mct.gov.br/upd_blob/0226/226591.pdf

Current Projects or Activities Aimed at Reducing SLCP Emissions

Those three goals established in the PGIRS were accomplished by date:

- Currently the Estre landfill collects its landfill gas and turns it into electricity, which is sold to the grid of the local concessionary. Actual electricity generation is 4.6 MW;
- The fourth axis in part of the collection fleet was implemented. This action allowed the reduction in the number of trucks, thus contributing to the reduction of emissions of GHG;
- Currently, 13 “Estações de Sustentabilidade” sites have been implemented.

The project assistance to Curitiba under implementation by ABRELPE with funds from the Waste Initiative of the Coalition intends to lead Curitiba to a step forward: start a systematic management and treatment of the organic fraction. The baseline scenario of the methane and black carbon emissions from the MSW system, as well as the viable options of their reduction, are one of the outputs of the project.

Key Stakeholders

- Brazilian Association of Public Cleansing and Waste Management Companies (www.abrelpe.org.br);
- Municipal Secretariat of Environment (Public Cleaning Director and Environment Management Superintendent);
- Municipal Secretariat of Metropolitan Affairs (Solid Waste Manager);
- Municipal Secretariat of Food Supplies (Urban Agriculture Manager and Industrial District Manager);
- International Relations Office.

Additional Useful Information

Curitiba is an ICLEI member since the 1990's and a C40 Cities member since February 2014, in which the main objective of the agreement is to reduce the local GHG emissions and the climate risks. In 2010, Curitiba was chosen to receive the Globe Award Sustainable City with the program "Biocidade", which projects involved a campaign to encourage the separation of recyclable waste. In 2016, the city also won the C40 Prize in the Sustainable Cities category, with the initiative of urban agriculture.

Contacts

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