

**VALDEMINGÓMEZ
TECHNOLOGY PARK**

2023

Annual report
Executive Summary



Valdemingómez Technology Park (VTP), located in the southeastern region of Madrid, is a distinguished technological hub encompassing a range of waste management facilities administered by the City Council of Madrid (Ayuntamiento de Madrid).

Within these state-of-the-art facilities, waste materials undergo various advanced processes, including sorting, classification, and resource recovery. These processes also include the production of biogas via anaerobic digestion of organic matter (biomethanation), the refinement and injection of biomethane into the Spanish gas transport grid, and the production of compost and biostabilized materials.

Non-recoverable fractions are transformed into electricity at Las Lomas treatment plant, or they are sent to Las Dehesas controlled landfill, also situated within the Technology Park enclosure. Biogas obtained by forced degasification of both Valdemingómez operating and non-operating landfills is subjected to energy recovery.

Valdemingómez Technology Park receives 3 306 tons of waste per day, managed in eight large industrial facilities operating 24/7, every day of the year:

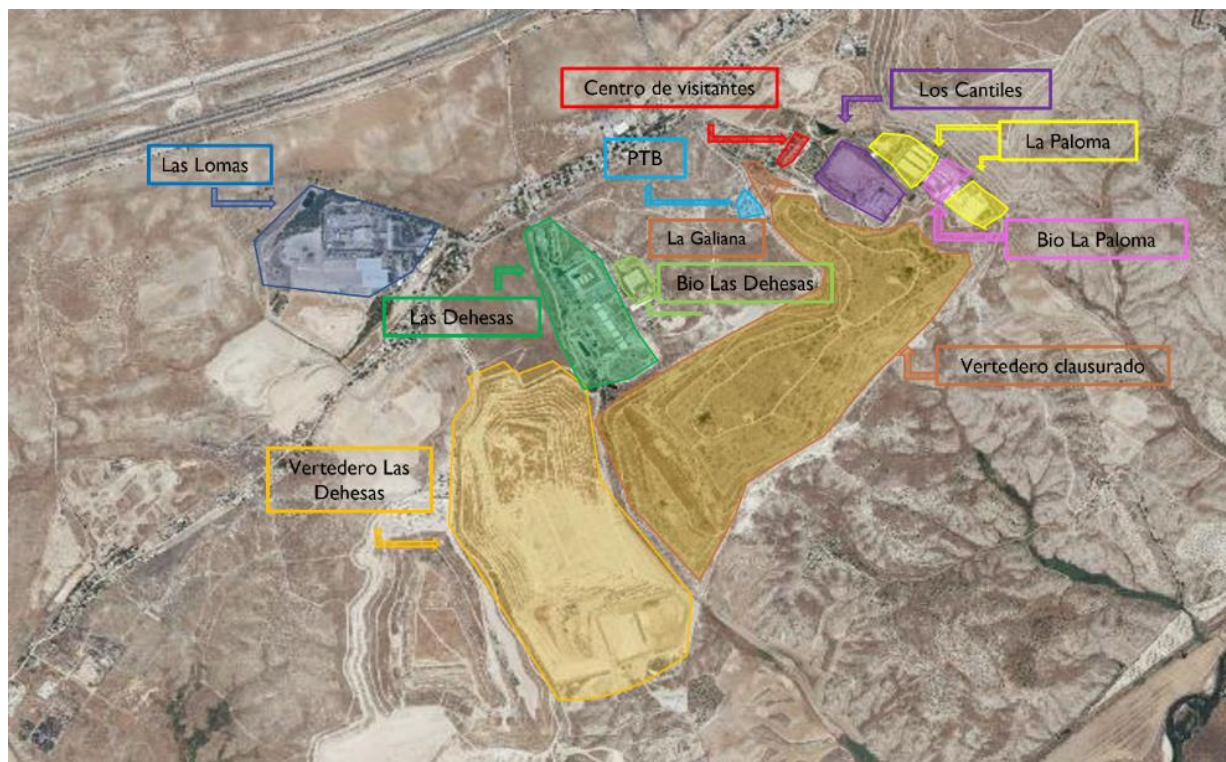
- Two waste sorting and treatment plants (La Paloma and Las Dehesas).
- Two anaerobic digestion plants (Bio La Paloma and Bio Las Dehesas), where the organic fraction of municipal waste is managed to produce biogas.
- A biogas treatment plant (PTB), where biogas is upgraded and transformed into biomethane for injection into the national gas grid.
- A waste sorting and energy recovery plant (Las Lomas), which produces electricity from the waste treatment rejects after sorting and recovery (mixed waste).
- A degasification and energy recovery plant (La Galiana) managing the biogas obtained from the Valdemingómez non-operating landfill, as well as part of the biogas produced in the anaerobic digestion plants.
- An operating landfill, next to Las Dehesas plant.

There are also other facilities for municipal offices and environmental education activities (Visitors Centre).

A new automated composting facility (Los Cantiles) is under construction and is expected to be operational in the second half of 2024. This facility will allow the composting of approximately 100,000 tons of organic matter per year through a versatile, modular, sensorized and highly automated process.

Waste management in these facilities is carried out through public service management contracts, one for each waste treatment plant. Due to their environmental relevance, these industrial facilities are subject to numerous internal and external controls and are continuously monitored to ensure compliance with strict environmental standards according to European, national, and regional legislation related to the environment and waste management.

The monitoring and supervision of these facilities are conducted by the City Council of Madrid in collaboration with companies specialized in quality and environmental control, responsible for verifying that these activities comply with contractual terms and current regulatory requirements.



Valdemingómez Technology Park map

WASTE TREATMENT IN VALDEMINGÓMEZ TECHNOLOGY PARK

Waste treatment has three main objectives:

- Recovery of recyclable materials, which are delivered to authorized recyclers for reuse in the production cycle.
- Energy recovery, which exploits the energy contained in the rejects resulting from treatment, and
- The treatment of organic matter used either for biomethanation to produce biogas or composting to obtain compost or biostabilized material.

Treated Waste

During 2023, a total of 1,206,573 tons of domestic waste was treated at Valdemingómez Technology Park, 1.2% less than in 2022, mainly due to the socioeconomic situation. Of these, 1,099,083 tons (91.1%) were managed in the industrial processes developed in the complex's plants, and 107,490 tons (8.9%) were directly deposited in a landfill due to their non-recoverable nature. Notably, there has been a 25.9% reduction in direct landfill disposal compared to 2022.

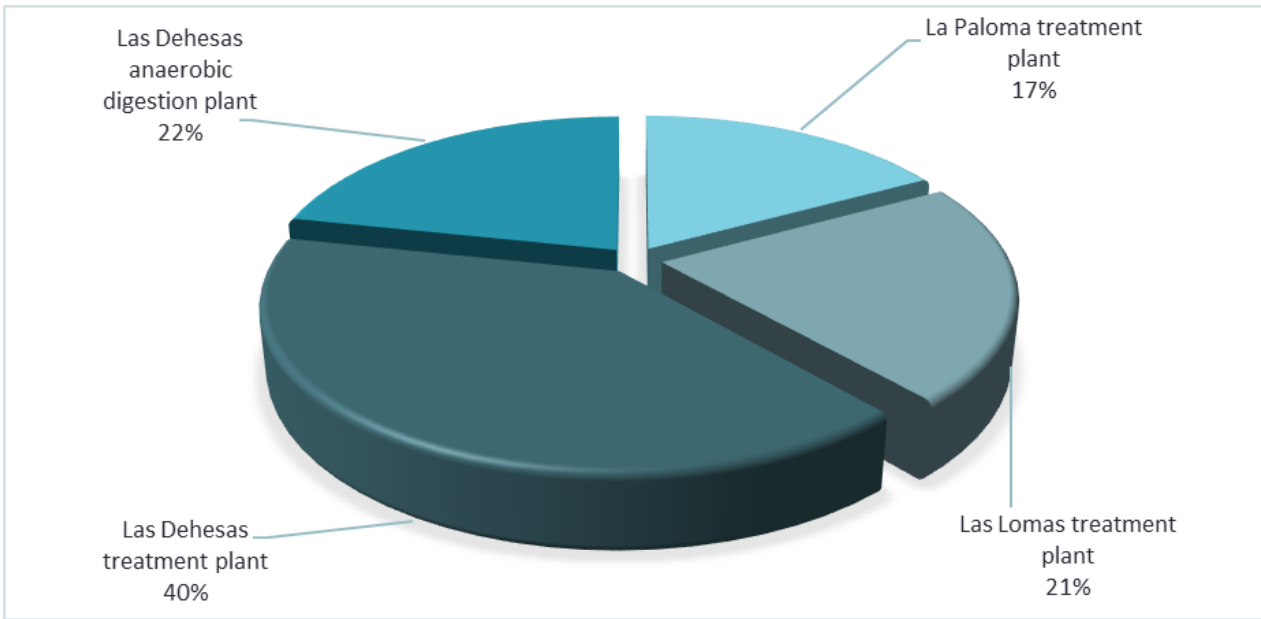
There were also 64,081 tons of glass (1.4% more than in 2022) from the city's separate collection managed through the transfer station located in the Las Dehesas plant. Additionally, there was a 13.8% increase in the collection of biodegradable garden and park waste (11,658 tons) and a 25.8% increase in treated bulky waste (39,723 tons) compared to the previous year.

Analysing the 2019-2023 evolution of waste fractions generated in the City of Madrid (excluding waste treated at Valdemingómez Technology Park from other municipalities), there has been a reduction in the mixed waste fraction and an increase in the biowaste and packaging fractions.

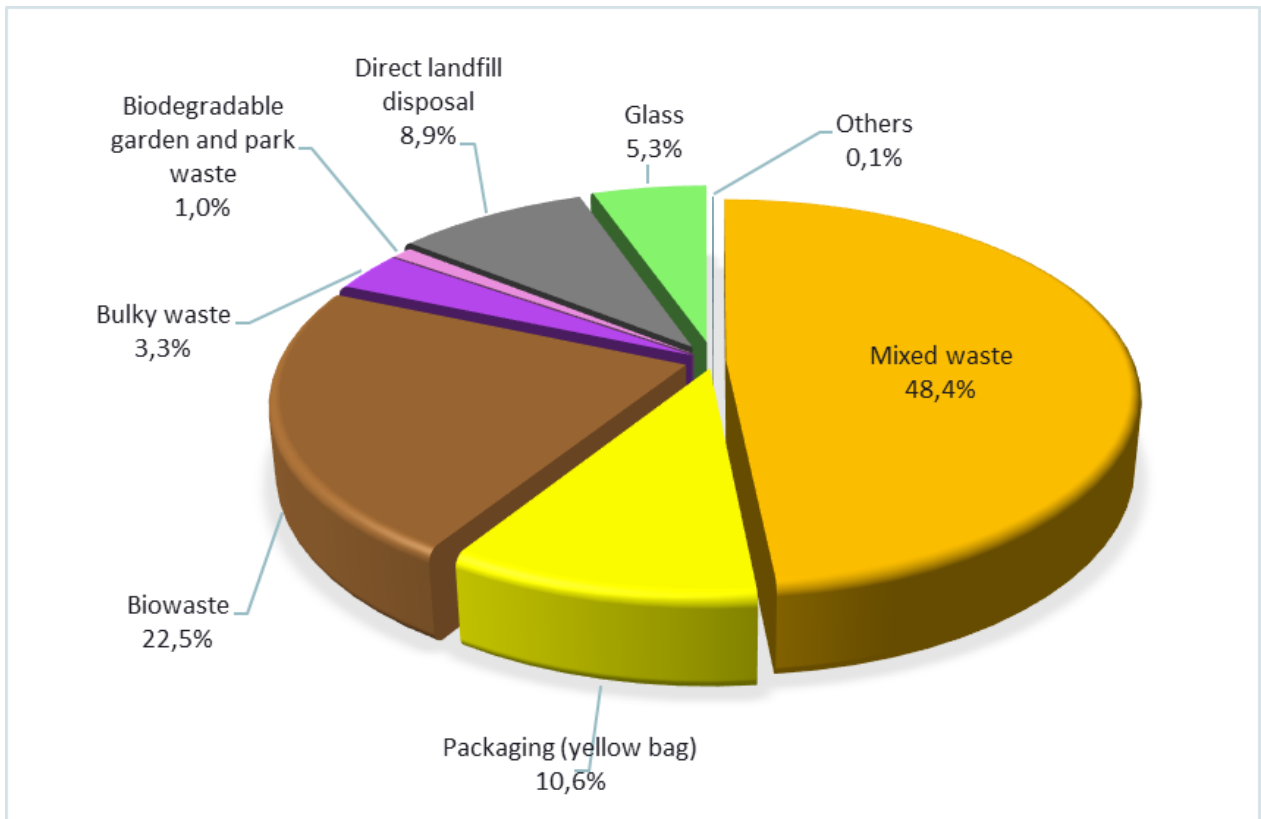
It is remarkably that direct landfill disposal has decreased by approximately 134,704 tons over five years, related to the implementation of various municipal measures in waste collection and treatment. These include operational measures in the different plants of the Technology Park and improvements in new contracts for waste collection, street cleaning, and green area services, allowing for better separation of different fractions at the source before treatment.

WASTE INPUT TO VALDEMINGÓMEZ TECHNOLOGY PARK BY FRACTION AND PLANT IN 2023						
TREATMENT	FRACTION	LA PALOMA	LAS LOMAS	LAS DEHESAS	Anaerobic digestion LAS DEHESAS	TOTAL
MIXED WASTE fraction treatment	Mixed waste bag	146.792	205.668	160.158		
	Cleaning		48.144	3.017		
	Commercial activity	8	4.332	15.832		
	Other		59	19		
	TOTAL MIXED WASTE	146.800	258.203	179.026		584.029
PACKAGING fraction treatment ("yellow bag")	Packaging bag	46.646		79.742		
	Cleaning			335		
	Commercial activity	5		601		
	Other			6		
	TOTAL PACKAGING	46.651		80.684		127.335
BIO-WASTE fraction treatment	Bio-waste	12.370			239.253	
	Commercial activity				19.952	
	TOTAL BIOWASTE	12.370			259.205	271.575
Bulky waste treatment	Bring-in collection points			11.079		
	Furniture processing					
	Cleaning			27.643		
	Commercial activity			998		
	Other			3		
	TOTAL BULKY-WASTE			39.723		39.723
Dead animals	TOTAL DEAD ANIMALS			110		110
Biodegradable garden and park waste	Garden and park waste	14		9.221	2.424	
	TOTAL GARDEN AND PARK WASTE	14		9.221	2.424	11.658
Waste to energy recovery	Private authorized		570			
	TOTAL PRIVATE AUTHORIZED TO RECOVERY		570			570
Direct landfill disposal	Mixed waste			5.348		
	Other			219		
	Commercial activity (private authorized)			12.600		
	Commercial activity (big producers)			39.479		
	Garden and park cleaning			47.631		
	Destructions			2.218		
	TOTAL DIRECT LANDFILL DISPOSAL			107.490		107.490
Glass transfer station	Glass			63.407		
	Commercial activity			674		
	TOTAL GLASS			64.081		64.081
TOTAL ENTRIES		205.835	258.774	480.336	261.629	1.206.573

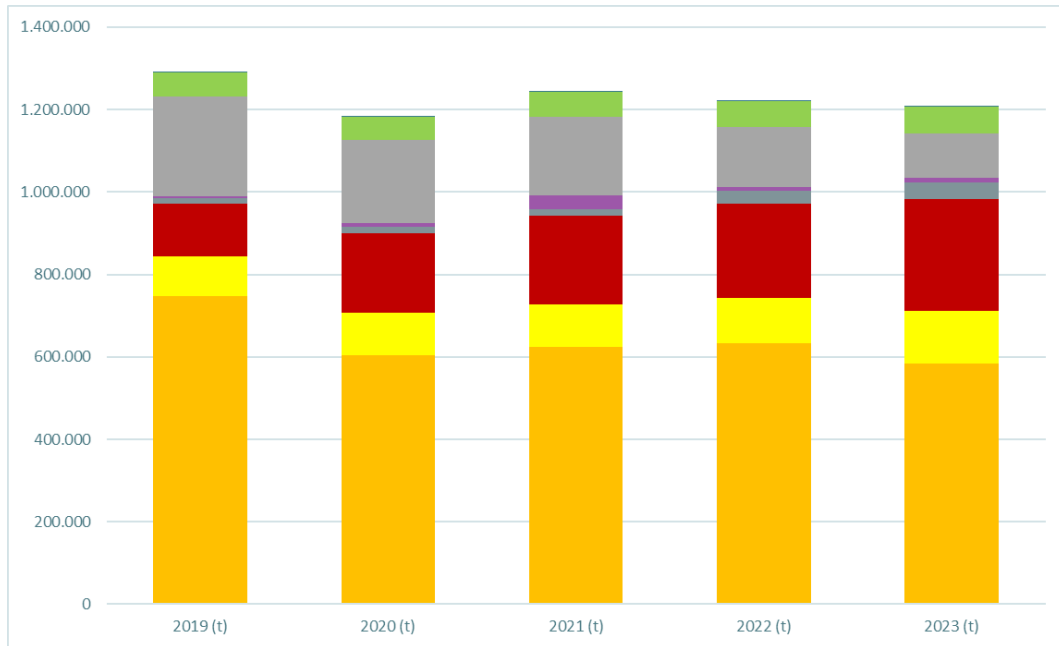
Treated waste destination in Valdemingómez Technology Park (2023, in tons)



Waste input distribution in the Valdemingómez Technology Park, per plant, 2023



Waste input distribution in the Valdemingómez Technology Park, per fractions, 2023



	2019 (t)	2020 (t)	2021 (t)	2022 (t)	2023 (t)
Mixed waste	746.701,07	604.472,40	624.172,11	633.525,91	584.029
Packaging (yellow bag)	96.396,04	101.746,98	103.009,16	108.807,82	127.335
Biowaste	127.777,20	194.634,17	215.485,42	228.547,16	271.575
Bulky waste	13.449,10	13.605,18	15.591,56	31.579,32	39.723
Biodegradable garden and park waste	4.990,66	10.235,66	33.640,68	10.241,04	11.658
Direct landfill disposal	242.194,40	201.344,54	189.624,76	145.038,57	107.490
Glass	59.227,36	56.816,80	60.398,76	63.182,96	64.081
Others	407,86	1541,5	1270	635,98	680
TOTAL	1.291.143,69	1.184.397,23	1.243.192,45	1.221.558,76	1.206.573

Input flow evolution in the Valdemingómez Technology Park

Developments in Waste Collection and Containerization

From November 1, 2022, collection and transport frequencies were modified for each waste fraction to promote selective collection and ensure compliance with state and EU regulations. The mixed fraction (non-recyclables) ceased to be collected on Sundays and holidays, resulting in mixed waste being collected six days a week in 2023. This change aims to improve separation at the source and minimize waste in the mixed fraction container while encouraging the use of selective collection containers for different fractions (plastics, metals, cartons, biowaste, paper-cardboard, glass, textiles, etc.). The yellow fraction (recyclables) was also extended to include plastics, metals, and cartons (not just packaging), except for bulky waste, which must be managed differently.

Recovery of Recyclable Materials

Once treated, 77,289 tons of recyclable materials were recovered in 2023, a 10% increase from 2022. Notable improvements include a 107.7% increase in the recovery of burnt ferrous scrap due to enhancements at Las Lomas plant, a 42.6% increase in carton recovery, and a 9.4% increase in plastic recovery. However, there was a reduction in the recovery of other non-packaging metals (29.8%) and paper-cardboard (9.9%) due to better source separation by citizens, driven by increased awareness.

RECOVERED RECYCLABLE MATERIALS	YEAR				
	2019	2020	2021	2022	2023
Paper-cardboard (recovered in plant)	16.215	10.046	11.416	10.858	9.793
Glass (recovered in plant)	583	361	306	223	220
Plastics	29.760	30.548	31.431	32.403	35.440
Ferromagnetic	14.197	13.772	12.131	11.546	10.836
Other metals (no packaging)	644	620	608	662	465
Burnt ferrous scrap	5.780	5.570	5.254	5.802	12.052
Aluminium	2.568	3.101	2.762	3.015	3.252
Ferrous scrap recovered (Anaerobic digestion plants)	307	299	296	349	401
Carton	3.868	3.522	3.513	3.387	4.831
TOTAL RECYCLABLE MATERIALS	73.923	67.839	67.715	68.246	77.289

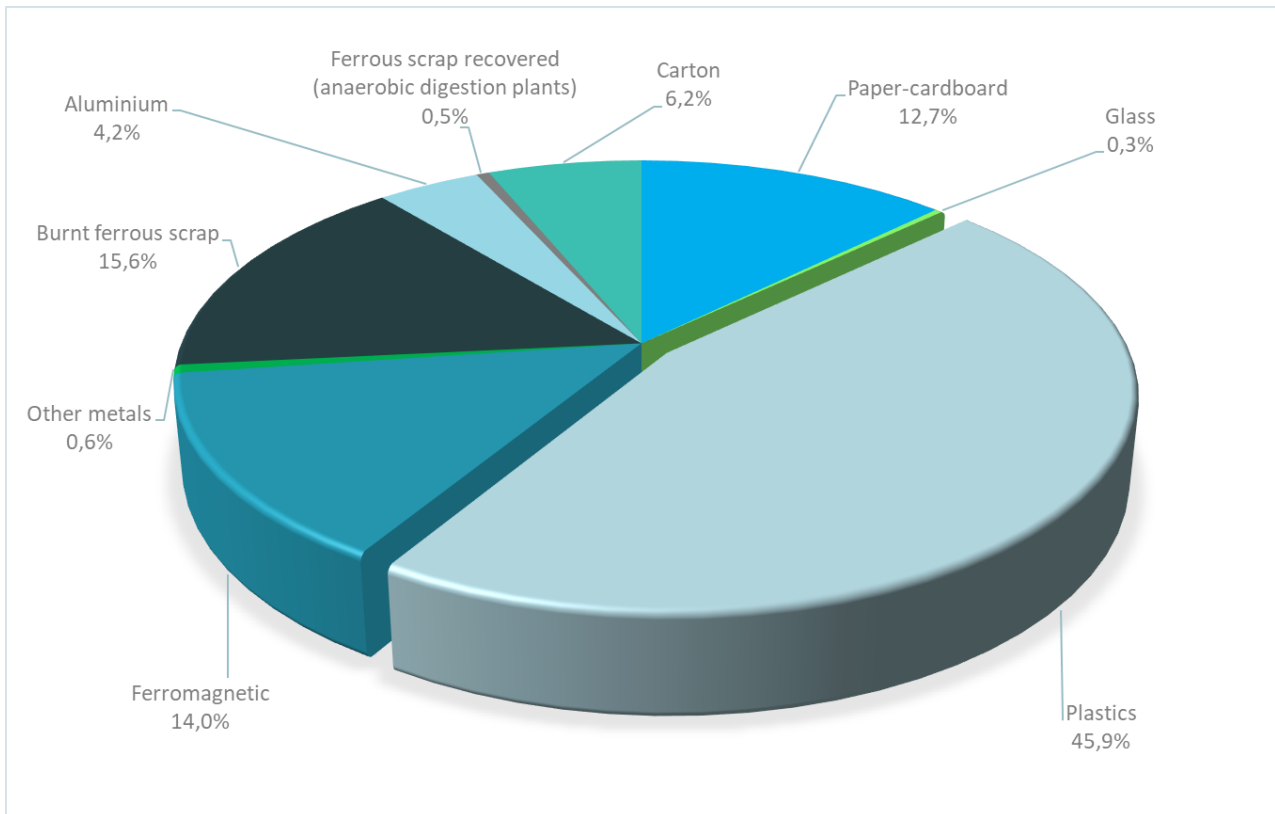
Recovered materials in Valdemingómez Technology Park (2019-2023, in tons)

From the organic matter in household waste, two types of materials are obtained: compost (from selective collection at source, OFSC¹) and biostabilized material (from other fractions). These materials can be used as soil structuring agents or fertilizers due to their physicochemical characteristics. In 2023, the management of organic matter resulted in 10,670 tons of biostabilized material and compost, 16.8% less than in 2022, with 4,556 tons coming from separately collected organic matter.

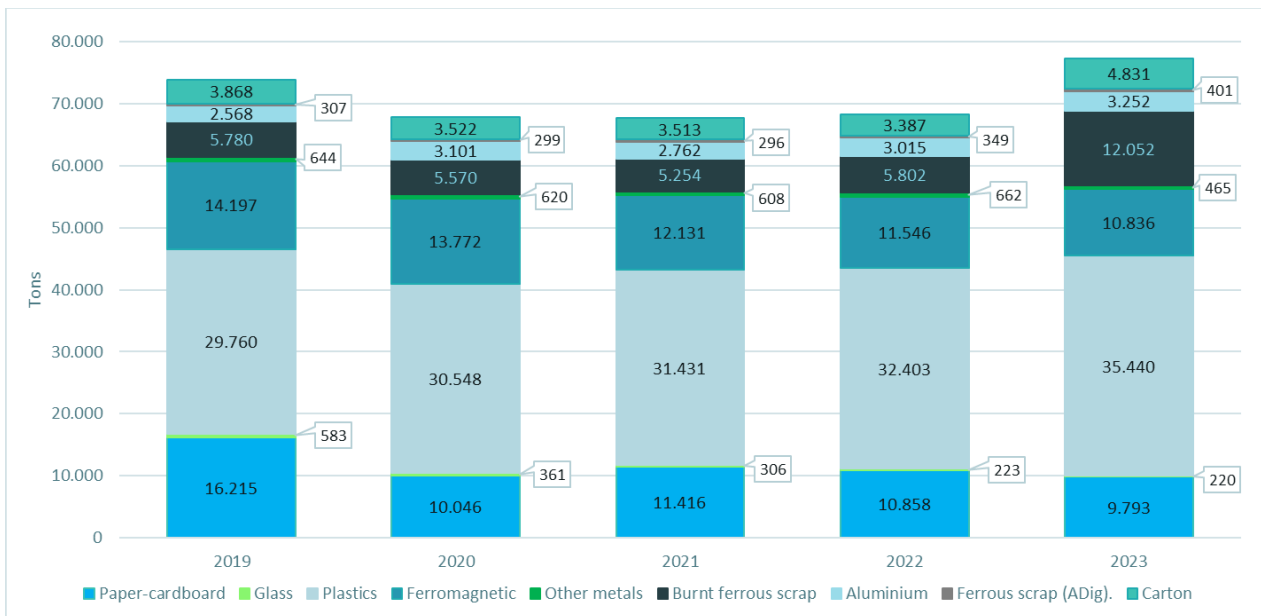
OTHER RECOVERED MATERIALS	AÑO				
	2019	2020	2021	2022	2023
Biostabilized material	13.275	5.740	6.734	6.630	6.114
Compost from separately collected organic matter	692	7.052	6.674	6.192	4.556
TOTAL OTHER MATERIALS	13.967	12.792	13.409	12.822	10.670

Recovered products from organic matter (2019-2023, in tons)

¹ OFSC: Organic Fraction from Selective Collection



Recovery percentage for each material with respect to total recovery (2023)



Recovered materials in the Valdemingómez Technology Park, in tons.

Waste Energy Recovery

In 2023, energy recovery from the separation and classification process rejects, as well as the biogas generated from both operating and non-operating landfills, provided 243,799 MWh of electricity, enough to supply approximately 76,187 households for one year (average annual consumption per household of 3.2 MWh). Of the total electricity generated, 64,708 MWh (26.5%) was used for self-consumption within the facilities, and the remaining 179,090 MWh (73.5%) was exported to the electricity grid.

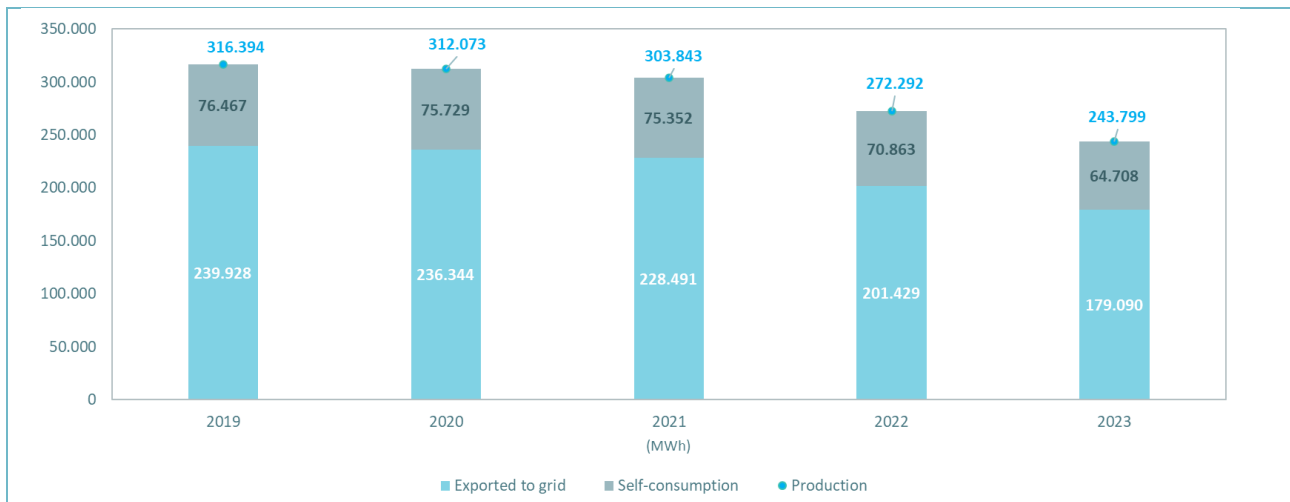
The biogas treatment plant injected 14,424,063 Nm³ of biomethane into the gas grid, equivalent to 155,673 MWh of thermal energy, 11.47% more than in 2022. This amount of biomethane could supply more than 30,542 households (average annual gas consumption per household of 5.097 MWh) or 479 buses of the Municipal Transport Company (Empresa Municipal de Transportes).

ENERGY BALANCE OF THE VALDEMINGÓMEZ TECHNOLOGY PARK	YEAR				
	2019	2020	2021	2022	2023
Electrical energy produced (MWh)	316.394	312.073	303.843	272.292	243.799
Thermal energy produced (MWh)	100.276	103.476	98.333	139.651	155.673

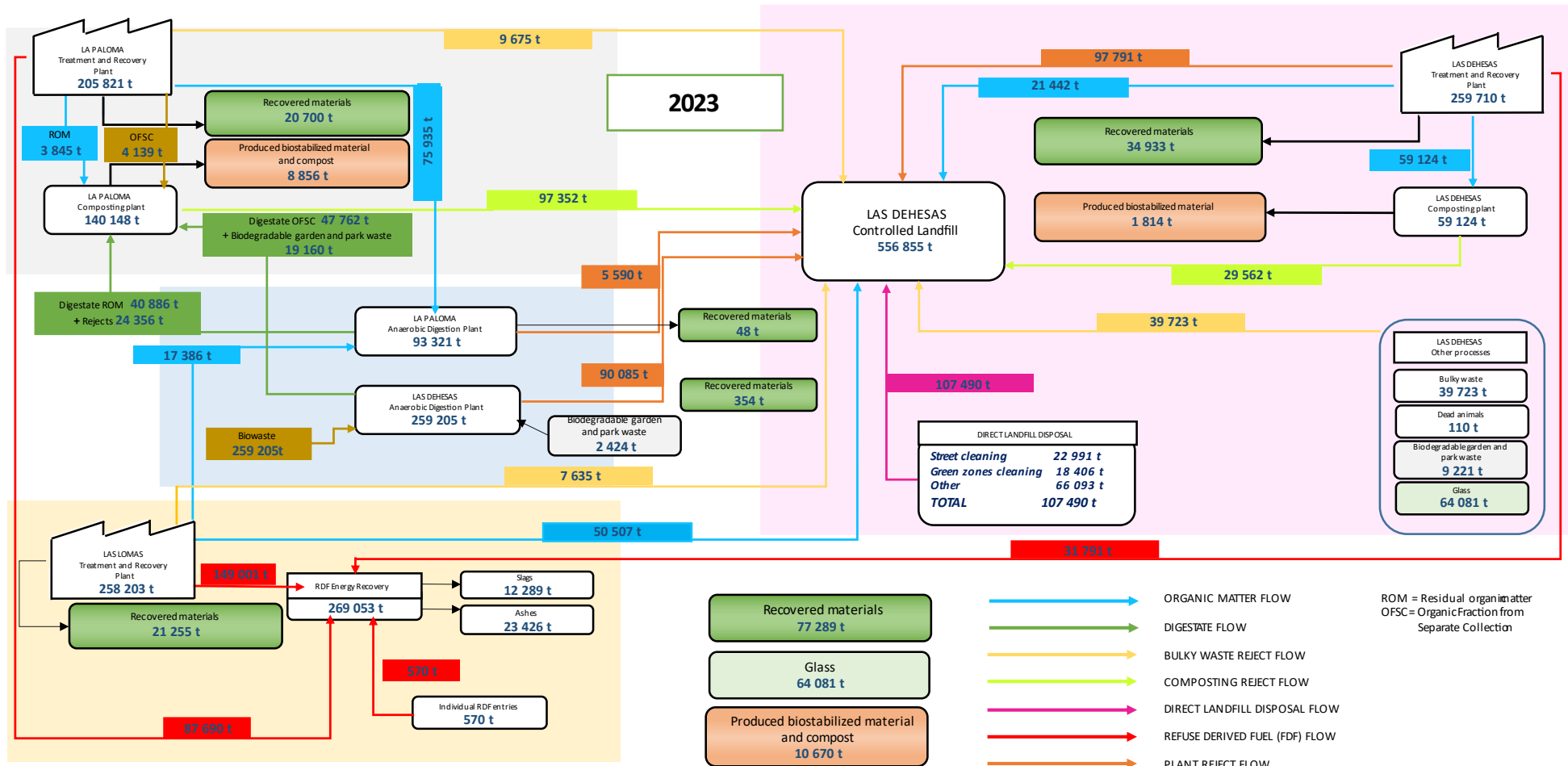
Biogas production in the Valdemingómez Technology Park (2019-2023)

The waste management activities at Valdemingómez Technology Park contribute to the Circular Economy by reintroducing materials into the market and providing numerous environmental benefits, including:

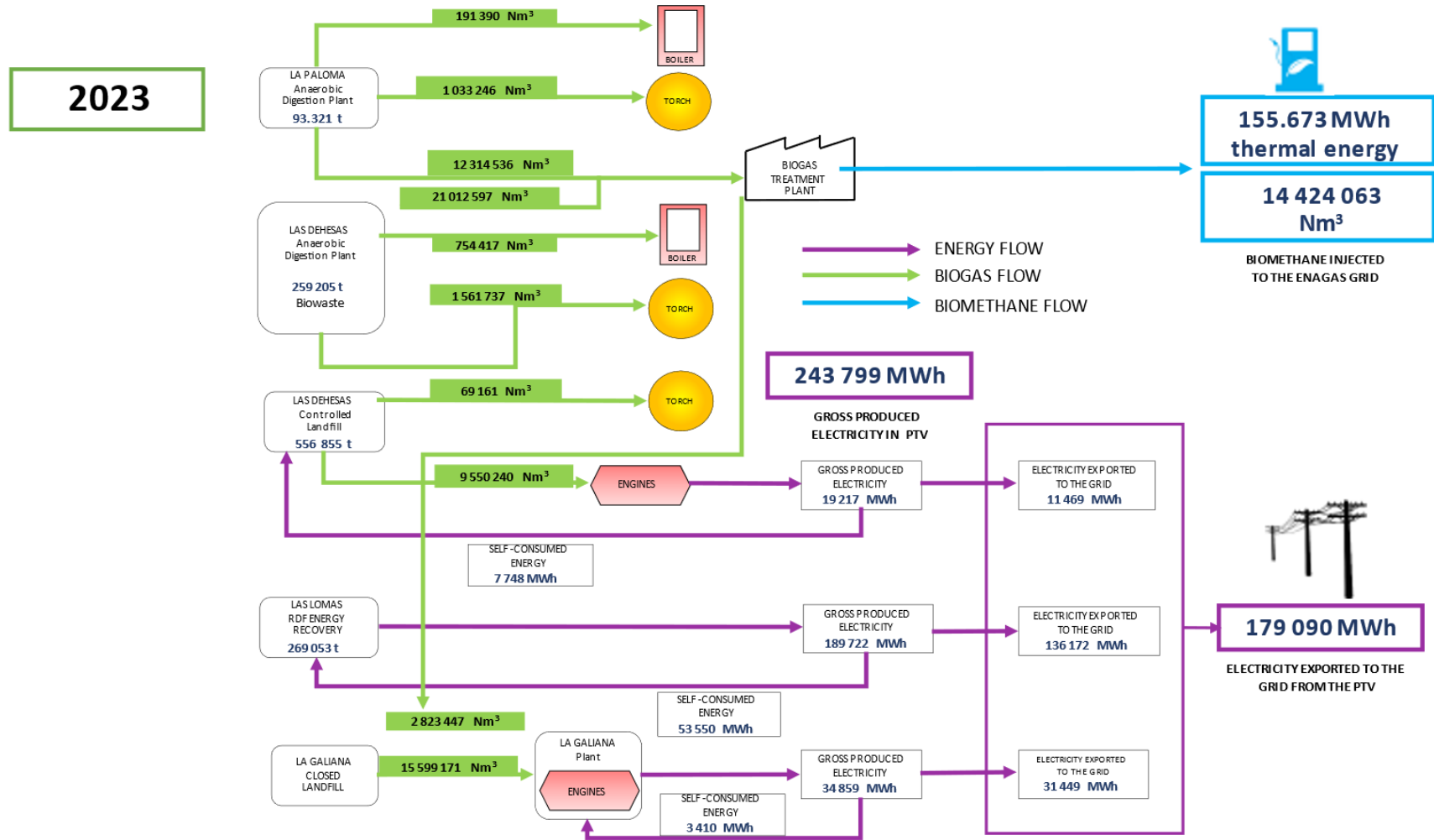
- Saving natural resources through material recovery.
- Reducing the volume of waste sent to landfills by producing electricity and biogas.
- Reducing greenhouse gas emissions by substituting emissions from other energy sources (e.g., fossil fuels) with renewable energy/biomethane.



Production and destination of the electrical energy in the Valdemingómez Technology Park (2019-2023)



Main material flows of the Valdemingómez Technology Park (2023)



Main biogas and energy flows of the Valdemingómez Technology Park (2023)



FERTILISER AND SOIL AMENDMENT PRODUCTION **COMPOST + BIOSTABILIZED: 10 670 t**



RECOVERY OF RECYCLABLE MATERIALS **77 289 t (CARTONS , CANES , CB , GLASS) + 64 081 t (S.C. GLASS*)**
*Separate Collected Glass



BIOFUELS PRODUCTION **36 867 923 Nm³ BIOGAS y 155 673 MWht BIOMETHANE**

+30 542 Homes (gas) **+ 479 Buses EMT**



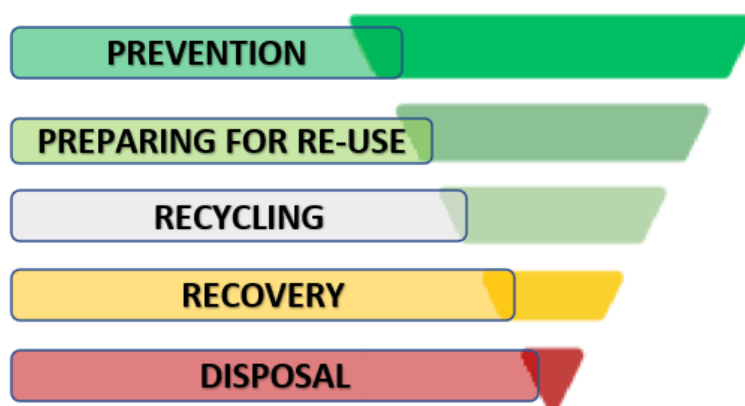
ELECTRICITY PRODUCTION **243 799 MWh**

+ 76 187 Homes (electricity)

Main work lines of the Valdemingómez Technology Park for Circular Economy (2023)

Compliance with Recycling and Landfill Targets in the City of Madrid

The waste hierarchy defines the order of priorities in national and European waste management legislation: (a) prevention; (b) preparation for reuse; (c) recycling; (d) other types of recovery (e.g., energy recovery); and (e) disposal. The goal is to maximize resource utilization and move towards a circular economic model that prolongs resource use in the production cycle.



European and national legislation set ambitious waste management targets: by 2035, 65% of municipal waste must be recycled and only a maximum of 10% of this waste can be disposed in landfill.

The following intermediate objectives has been established:

OBJETIVOS	AÑO			
	2020	2025	2030	2035
Municipal waste management for recycling and reuse (%)	50	55	60	65
Municipal waste direct disposal in landfill (%)		<40	<20	<10

The city of Madrid has fulfilled the following objectives in 2023:

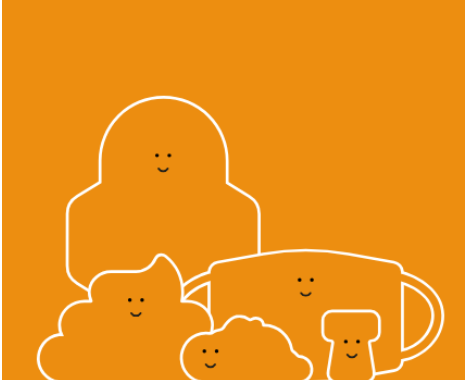
DOMESTIC AND COMMERCIAL WASTE MANAGED IN THE PTV		DOMESTIC WASTE MANAGED BY THE CITY COUNCIL OF MADRID		DOMESTIC WASTE MANAGED BY THE CITY COUNCIL OF MADRID AND COMMERCIAL WASTE MANAGED BY PRIVATE MANAGERS	
% PREPARING FOR RE-USE AND THE RECYCLING	32%	% PREPARING FOR RE-USE AND THE RECYCLING	38%	% PREPARING FOR RE-USE AND THE RECYCLING	53%
% ENERGY RECOVERY	22%	% ENERGY RECOVERY	20%	% ENERGY RECOVERY	15%
% LANDFILL DISPOSAL	46%	% LANDFILL DISPOSAL	42%	% LANDFILL DISPOSAL	32%

Calculations are made on the basis of the black box model, i.e. the total amount of waste managed annually is divided into 3 categories: waste that has been disposed in landfill (Las Dehesas), waste that has been sent to energy recovery (Las Lomas plant) and managed waste for recycling and reuse.


Traceability of the Final Treatment of Domestic Waste at Valdemingómez Technology Park

Based on production data for the year 2023, which includes plant balances and information on the processes applied to each waste fraction managed by the Madrid City Council, the treatment and ultimate recovery of various waste types, categorized by fractions, are outlined below:

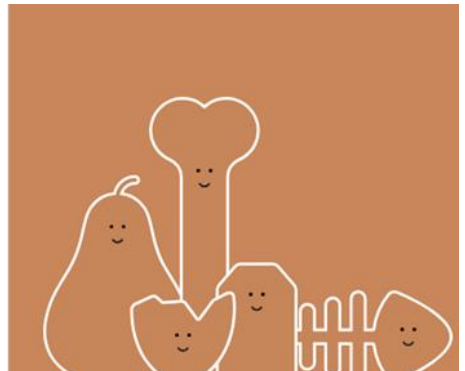
Mixed Waste Fraction (non recyclables): non-selective mixing of municipal waste (LER 20 03 01).

	<u>18%</u>	Management for recycling and reuse. Treatment in separation and sorting plants. R12. Exchange of wastes for submission to any of the operations numbered R1 to R11.
	<u>41%</u>	Reject energy recovery in Las Lomas plant. R0101. Main use as fuel in waste incineration facilities (combustion).
	<u>41%</u>	Deposit in landfill of non-valuable fraction: D0502. Deposit in non-hazardous waste landfills.

Separately Collected Glass (LER 15 01 07).

	<u>100%</u>	Management for recycling and reuse. Storage in glass transfer plant (Las Dehesas). R1301. Waste storage, in the scope of collection.
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Separately Collected Organic Fraction: organic biowaste (LER 20 01 08).

	<u>48%</u>	Deposit in landfill of non-valuable fraction: D0502. Deposit in non-hazardous waste landfills.
	<u>52%</u>	<p>Management for recycling and reuse. Management in the anaerobic digestion plant Las Dehesas.</p> <ul style="list-style-type: none"> • R12. Exchange of wastes for submission to any of the operations numbered R1 to R11. • R0302. Anaerobic digestion. Treatment of digestate at the composting plant (La Paloma) • R0301 Composting.

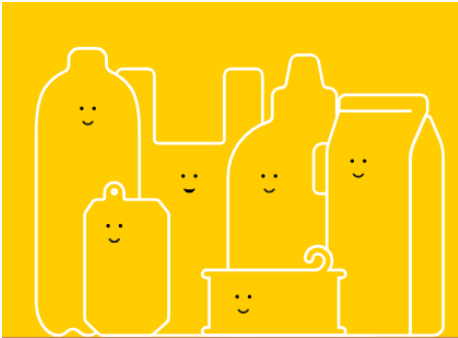
Biodegradable Garden and Park Waste: (LER 20 02 01).

<u>100%</u>	Management for recycling and reuse. Biowaste management (Las Dehesas). R12. Exchange of wastes for submission to any of the operations numbered R1 to R11 (including pretreatment for recovery).
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Bulky Waste (LER 20 03 07).

<u>100%</u>	Deposit in landfill. D13. Blending or mixing prior to submission to any of the operations numbered D1 to D12
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Plastics, Metals and Carton Fraction: yellow container (LER 15 01 06).

	<u>30%</u>	Deposit in landfill of non-valuable fraction: D0502. Deposit in non-hazardous waste landfills.
	<u>16%</u>	Energy recovery.
	<u>54%</u>	Management for recycling and reuse. Treatment in separation and sorting plants (yellow bag). R12. Exchange of wastes for submission to any of the operations numbered R1 to R11. (including pretreatment for recovery).

ENVIRONMENTAL EDUCATION

The Environmental Education program conducted at the Valdemingómez Technology Park provides a comprehensive view of the industrial processes currently employed in waste management. This unique facility, both technically and educationally, is dedicated to fostering environmental awareness among citizens through training and informative activities centered on waste management and treatment and recycling.

Programmed activities cater to various demographic groups, offering tailored visits. These visits offer insights into the technical, economic, and human resources required daily to ensure that the waste generated by a large city like Madrid undergoes the necessary treatment in accordance with environmental protection and legislation.

For more information on these visits and educational resources, please visit www.madrid.es/valdemingomez .