

# Quantification and characterization of waste disposed at the San Mateo Sanitary Landfill, in the municipality of Naucalpan de Juárez, State of Mexico

## *Summary for Decision Makers*

Methane is a greenhouse gas that, during its lifetime, is more than 80 times more potent than carbon dioxide in driving climate change, and accounts for nearly half a degree Celsius of warming to date (IPCC, 2021). Significant cuts in methane emissions will result in a slowing of global warming and could prevent 0.3 degrees Celsius of warming along with numerous public health and ecological benefits (UNEP and CCAC, 2021). The waste sector is the third largest source of human-driven methane emissions and presents one of the best opportunities for mitigation today, with up to 60% of mitigation measures having low or negative costs (UNEP and CCAC, 2021). Barriers to implementation include, among others, a lack of information and data identifying sources of methane from landfills and dumpsites and access to best practices and evidence-based methane mitigation measures. The remainder of this document provides a brief description of efforts undertaken to address these barriers for the development of a waste methane mitigation initiative in Naucalpan de Juárez (Naucalpan).

RMI and Clean Air Task Force (CATF), with funding from the Global Methane Hub launched the **Waste Methane Assessment Platform (Waste MAP)** to provide an accessible online tool that highlights emissions, mitigation opportunities, and best practices to reduce solid waste methane emissions, providing a clear pathway for achieving the Global Methane Pledge and other national and subnational greenhouse gas reduction targets. As part of the Waste MAP project in Mexico, CATF is helping the municipality of Naucalpan to update the necessary studies to support decision-making on diverting organic waste being disposed at the San Mateo Landfill and treating it using an anaerobic digester.

The municipality of Naucalpan in the State of Mexico (shown in Figure 1) is located on the northwest border of Mexico City. It covers an area of 157.04 km<sup>2</sup> with an estimated population of 934,537 in 2023 (COESPO, 2019). Naucalpan includes integrated waste management in its Municipal Development Plan (PDM) 2022-2024 (Municipio de Naucalpan, 2022) which is aligned with both State and National Plans, which are in turn aligned with the country's regulatory framework and the United Nations 2030 Sustainable Development Goals. The municipality disposes all municipal solid waste (MSW) at the San Mateo Landfill, except for recyclables that are removed from the waste stream by waste collectors and the informal sector. The municipality is interested in mitigating waste methane by diverting organic waste from the landfill and processing it using an anaerobic

digester. However, to successfully scope and develop, this requires an understanding of the quantity and characteristics of waste entering the landfill, specifically the amount of organic material in the waste stream.

*Soluciones Integrales para la Problemática Ambiental* (SIPRA), a consulting company in Mexico, conducted the quantification and characterization study of MSW disposed at the San Mateo Landfill from May 22 to 26, 2023. This study builds upon and updates the “Waste Characterization Study: Naucalpan Transfer Station” by the United States Environmental Protection Agency that was conducted in 2017 (USEPA).

Figure 1: Map of the municipality of Naucalpan de Juárez, State of Mexico



Forty-six trucks were sampled and classified according to their collection route during the study; half of these corresponded to popular areas (lower-income areas defined by the municipality) and half to residential areas (higher-income areas defined by the municipality). A sample of 90 to 120 kg of waste was obtained from each truck.

Samples were manually sorted into 31 subcategories (identified in Table 1) and, for calculation purposes, regrouped into 11 categories, in accordance with the Mexican standard NMX-AA-022-1985 and with the previous characterization conducted in 2017 for comparability purposes (USEPA, 2017).

**Table 1: Categories and subcategories for the characterization study**

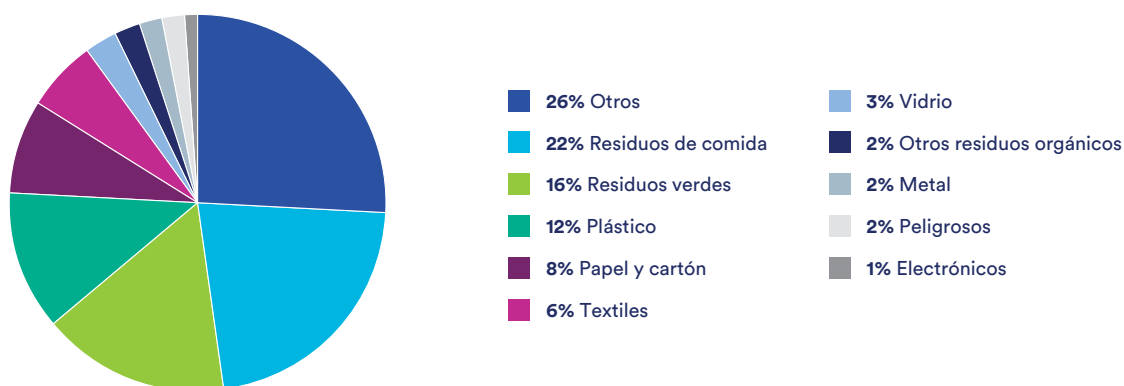
Category	Subcategory	Examples
Food waste	Food waste	Leftovers of vegetables, fruit, meat, bread, tortillas
Green waste	Wood	Wooden pallets, pieces or residues of wood
	Vegetable fiber	Hats, sacks, ropes, raffias, strings
	Garden waste	Rest of pruning (foliage), grass
	Bone	Bones
Other organic waste	Leather	Belts, bags, shoes
	Rubber (gloves)	Gloves, balloons, some pieces of toys
	Cotton	Cotton
Textiles	Clothing/textile	Clothing such as T-shirts, jeans, blouses
	Rags	Shapeless pieces of textiles
Waxed containers	Newspaper	Newspaper
	Corrugated cardboard	Packaging boxes
	Recyclable paper	Magazines, notebooks, office paper, bond paper
	Waxed containers	Tetra Pak containers (e.g., milk and juice containers)
Plastic	Plastic bins #1-7 identified	Soda bottles, yogurt, cleaning products, PVC pipe, hoses
	Plastic film	Grocery bags, garbage bags, food packaging, saran wrap
	Polystyrene	Cutlery or disposable cups, packaging
	Other rigid plastic	Buckets, toys, furniture and containers
Metal	Metal waste	Waste pipes such as copper, bathroom faucets, keys
	Ferrous material	Food cans, aerosols, soups
	Non-ferrous material	Aluminum cans of beer or soda or other drinks
Glass	Colored glass	Green or amber wine bottles, olive oil bottles
	Clear glass	Clear glass bottles
Electronic	Electronic waste	Telephones, cell phones, computers and radio
Others	Ceramics	Plates, glasses, cups, decoration
	Construction materials	Gravel, bricks, rubble remains, asphalt
	Tires	Tires, synthetic rubber waste
	Disposable diapers	Diapers
	Fine waste	Small indistinguishable material < 2cm
	Other municipal waste	Materials that do not correspond to any other category, toilet paper, sanitary napkins
Hazardous	Hazardous waste	Paint, batteries, chemicals and medical waste

The composition of the sampled waste for each area, as well as the entire municipality, are shown in Figure 2 and Table 2. Organic waste represents approximately 40% of the MSW disposed of in the San Mateo Landfill. Organic waste represents a higher share (46%) in residential areas than in popular areas (37%), however, this is primarily due to a much larger percentage of green waste coming from residential areas (23.91% versus 7.08%). The amount of inorganic recyclables generated is likely higher than what is disposed at the landfill due to informal segregation of recoverable materials, both by workers in the informal sector and municipal sanitation workers along the collection route. However, this does not affect the current study as the objective is to characterize the waste being disposed at the landfill.

**Table 2: Composition of MSW by percentage of weight in popular and residential areas, and the entire municipality of Naucalpan**

Category	Fraction by weight (%) popular area	Fraction by weight (%) residential area	Fraction by weight (%) municipality
Food waste	24.59	19.94	22.33
Green waste	7.08	23.91	15.82
Other organic waste	2.04	2.11	2.07
Textiles	8.20	2.96	6.00
Paper and paperboard	9.81	6.41	8.06
Plastic	13.63	9.93	11.84
Metal	1.51	1.76	1.68
Glass	2.77	3.68	3.21
Electronic	0.34	3.02	1.31
Others	28.92	24.67	26.30
Hazardous	1.11	1.61	1.38
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

**Figure 2: Overall composition of MSW in Naucalpan de Juárez**



The characterization study was conducted at the start of the rainy season in the metropolitan area of the Valley of Mexico, so appropriate measures were taken to prevent the waste from acquiring moisture associated with the rain. Additionally, qualitative observations were taken on the humidity of the sampled waste. Even with these considerations, nearly 50% of the waste corresponds to the organic category that could be amenable to biodigestion or composting. The share of the organic waste in this study is comparable to the study in 2017 which indicated a 50% share. The share of food waste has gone down from 30.9% to 22.3% and the share of garden waste has increased from 10.1 % to 13.77%. Additionally, recyclable materials make up approximately 17% of the waste stream in 2023, up from the 12% in 2017.

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## References

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