

2019 Greenhouse Gas Inventory



April 2021

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Glossary

Carbon Neutrality: Having achieved a state in which the net amount of carbon dioxide or other greenhouse gases emitted into the atmosphere is reduced to zero because it is balanced by action to reduce or offset these emissions.

Carbon Intensity: Carbon Intensity is the total amount of Carbon Dioxide (CO₂) emitted by fossil fuel power generation units (coal & natural gas) in pounds (lbs.) divided by the total power generation (mWhs.) from all generation sources including coal, natural gas, nuclear, and renewables

Community Inventory: The San Antonio community inventory encompasses all emissions, considered under the scope of the inventory effort, generated within the geographic boundary of the City of San Antonio. This includes scope 1 and scope 2 emissions from buildings, energy industries, and transportation, as well as scope 1 and scope 3 emissions from waste.

Emissions Factor: A factor that converts activity data into GHG emissions data (e.g., kg CO₂e emitted per liter of fuel consumed, kg CO₂e emitted per kilometer traveled, etc.)

Activity Data	x	Emissions Factor	=	Emissions
Electricity Consumption (kilowatt-hours)		CO ₂ emitted/kWh		CO ₂ emitted
Natural Gas Consumption (therms)		CO ₂ emitted/therm		CO ₂ emitted
Gasoline/Diesel Consumption (gallons)		CO ₂ emitted /gallon		CO ₂ emitted
Waste Generated by Government Operations (tons)		CH ₄ emitted/ton of waste		CH ₄ emitted

Global Warming Potentials (GWPs): A universal unit of measure for GHGs, expressed by relating the global warming impact to one unit of carbon dioxide. Used to evaluate the relative impact of various GHGs.

Greenhouse Gases (GHGs): Gases that absorb heat in the atmosphere near the Earth's surface, preventing it from escaping into space. As the atmospheric concentrations of these gases rise, the average temperature of the lower atmosphere gradually increases, a phenomenon known as the greenhouse effect. Greenhouse gases include, for example, carbon dioxide, water vapor, and methane.

Kilowatt-hour (kWh): A kilowatt-hour is equivalent of the amount of energy you would use if you kept a single 1,000-watt appliance running for an hour.

Metric Tons CO₂ Equivalent (CO₂e (MT)): A measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential, by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential. Often reported as metric tons CO₂ equivalent, CO₂e (MT), (metric) tCO₂e, or metric tonnes CO₂e.

Municipal Inventory: San Antonio's municipal inventory includes emissions from sources under direct control of the San Antonio city government, including city-owned facilities, city-owned vehicles, as well as city-owned and operated waste emissions sources, including city-owned landfills.

Therm: A therm is the approximate energy equivalent of burning 100 cubic feet of natural gas.

Overview

The SA Climate Ready Climate Action & Adaptation Plan requires the Office of Sustainability to complete a Greenhouse Gas (GHG) Inventory every two years. After passage of the plan in late 2019, the opportunity arose to pursue data collection for a 2019 inventory. This action allows for a more up-to-date depiction of the impact of GHG's in San Antonio.

The 2019 inventory, like the 2016 inventory, follows the Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC). Based on data that is currently available and reliable, this community inventory follows the BASIC reporting level, focusing on Scope 1 and 2 emissions and includes industrial process emissions for entities reporting to the EPA.

Scope 1 – Direct GHG emissions generated from sources within the city boundary

Scope 2 – GHG emissions occurring from the use of grid-supplied electricity, heat, and/or cooling within the city boundary.

Scope 3 – All other GHG emissions that occur outside of the city boundary as a result of the activities taking place within the city boundary. Scope 3 emissions are currently not included in San Antonio's GHG inventory.

Standard GHG accounting methodologies generally involve tracking seven key greenhouse gases: carbon dioxide, methane, nitrous oxide, perfluorinated chemicals, hydrofluorocarbons, sulfur hexafluoride, and nitrogen trifluoride. These GHGs differ in their ability to absorb energy and the amount of time they will remain in the atmosphere. So, for comparison purposes, they are all converted to a common unit: carbon dioxide equivalent (CO₂e), which is used throughout the report.

Methodology

In 2019, the Office of Sustainability used the ICLEI (Local Governments for Sustainability) ClearPath tool as the main application for completing the inventory. ClearPath was chosen because it is the leading online software platform for completing greenhouse gas inventories, forecasts, climate action plans, and monitoring at the community-wide or government-operations level. The City of San Antonio is a member of ICLEI, and over 500 cities, towns and counties have used ClearPath, making it the most widely used tool for managing local climate mitigation efforts (iclei.usa.org).

ClearPath uses calculations based on the GPC to create a holistic greenhouse gas inventory, using activity data and emission factors. Although not perfect, this calculation-based methodology is currently the best and most practical way to account for GHGs in a city. Users input raw data adhering to specific parameters, ensuring the calculations are accurate and reflect the specific City's activities. Equipped with powerful data analysis software and support from ICLEI staff, ClearPath offers the ability for the Office of Sustainability to complete future inventories in-house. In addition, this web-based tool offers forecasting calculators that can be used to assist in predicting future scenarios based on targeted emission reduction programs.

Through the City's involvement with the American Cities Climate Challenge, the Office of Sustainability received additional support from ICLEI in the form of one-on-one consulting and assistance with matching San Antonio's inventory calculations and processes to those of other comparable cities. These added value benefits went above and beyond what is normally offered through a regular license purchase.

Finally, CPS Energy contracted with Guidehouse, previously Navigant, to resolve differences in calculations for both years. Guidehouse, as Navigant, was responsible for the completion of the 2016 GHG inventory and was the resident expert on the calculations used to produce that report.

CPS Energy's carbon emissions intensity of electricity, one of the main drivers of the inventory results, decreased by 10%.

Methodology changes from 2016 to 2019:

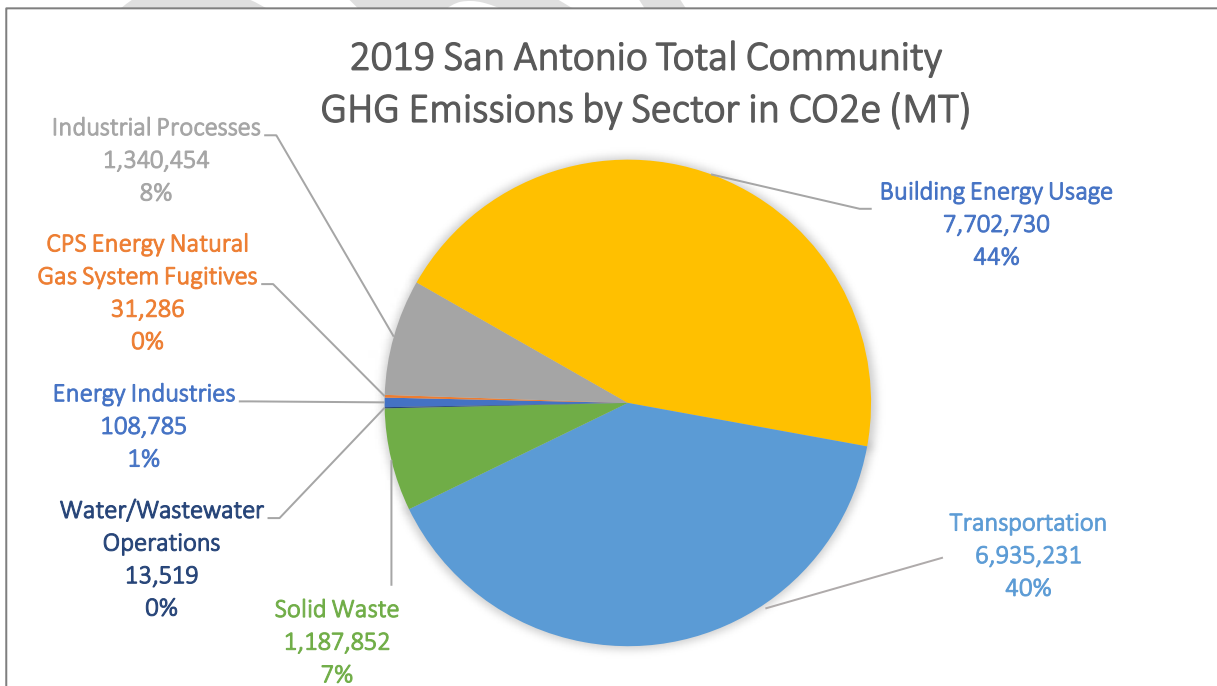
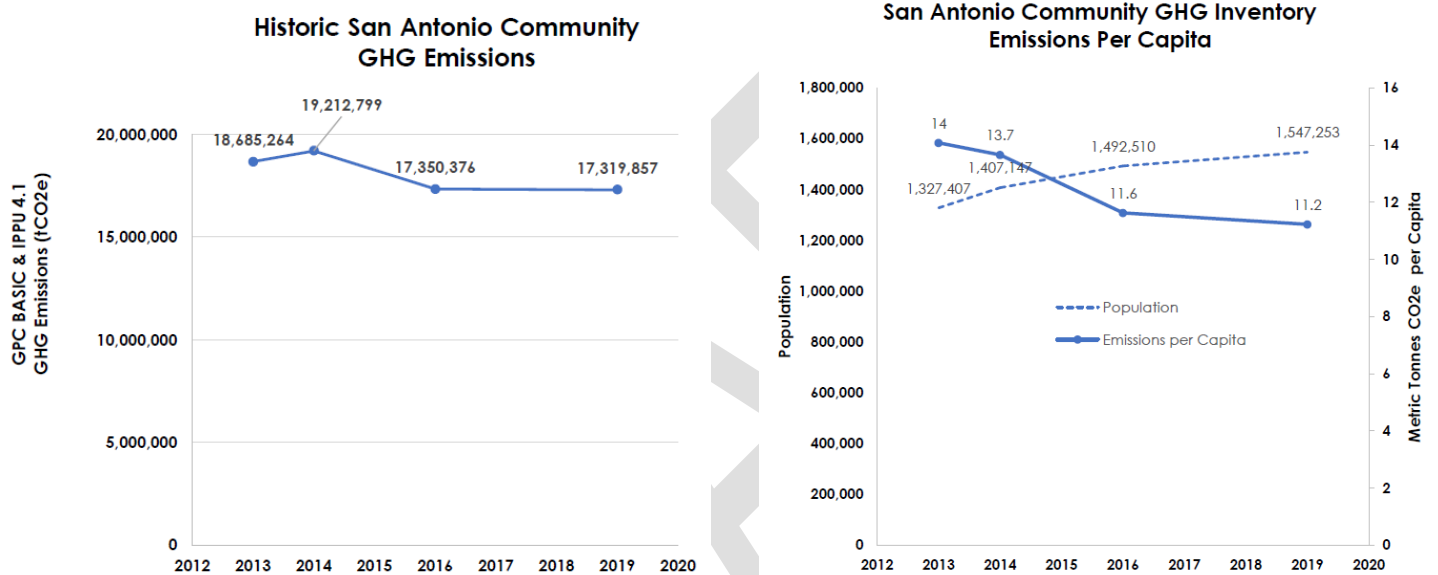
- Updated methodology for calculating emissions for commercial waste.
 - 2016 – Best guess.
 - 2019 – Estimate using municipal solid waste landfilled per capita provided by the Solid Waste Management Department and population for San Antonio.
- Removed emissions from closed landfills that do not report to the EPA, a practice on par with other cities' reporting.
- Subtracted VIA fuel data from vehicle fuel usage calculated from total San Antonio VMT. In 2016 these values had been double counted.
- Added Aviation ground support equipment emissions to the off-road fuel usage.
- Added emissions from the waste management facilities New Earth Composting and Bitters Brush Grinding.
- Added emissions from the Alamo Area Demand Response vehicles.
- No fuel used for power plant auxiliary operations or water barges in 2019 as no data was available.

Key Findings & Trends

Key findings from the 2019 community Greenhouse Gas Inventory include:

- Emissions from Building & Energy Usage and Transportation continue to be the top two contributors to San Antonio's GHG Inventory.
- San Antonio's total community emissions decreased 0.2% (from 17,350,376 to 17,319,857 CO₂e (MT)) between 2016 and 2019.
- This marginal decrease was driven by population, total building energy consumed, and transportation emissions.
 - Although population increased by 4%, per capita emissions decreased by 4%, largely evening out the results.
 - From 2016 to 2019, there was an increase of 13% in cooling days (days when AC is needed) and 38% in heating days (days when heating is needed).
- Total emissions remained relatively steady due to a reduction in CPS Energy's emissions intensity of electricity, as well as an updated methodology used to calculate landfill and waste emissions.

- CPS Energy is a key partner in reaching San Antonio's goal of full carbon neutrality by 2050, and both organizations are committed to working together to find solutions to help us achieve this goal.
- CPS Energy's emissions intensity of electricity, one of the main drivers of the inventory results, decreased by 10%. Emission factors are a way to relate quantity of a pollutant released to the atmosphere with the activity it is associated with. CPS Energy lowered its emission factors in 2019 by introducing more renewables into the energy mix and the closing of the Deely Coal Power Plant Unit in 2018.
- CPS Energy's total service area territory GHG emissions from electricity generation decreased by 1.7% between 2016 and 2019; 11,283,200 to 11,089,427 CO₂e (MT), respectively.



Total Emissions by Sector (CO ₂ e (MT))			
Sector	2016	2019	% Change
Total	17,350,376	17,363,019	0.1%
Industrial Processes (Cement Plant & Manufacturing)	1,338,942	1,340,454	0.1%
Building & Energy Usage	8,100,647	7,745,892	-4.4%
Transportation	6,614,448	6,935,231	4.8%
Solid Waste	1,122,451	1,187,852	5.8%
Water/Wastewater Operations	12,425	13,519	8.8%
Energy Industries (Auxiliary Electricity Use & Fuel Gas Combustion)	130,269	108,758	-16.5%
CPS Energy Natural Gas System Fugitives	31,198	31,286	0.3%

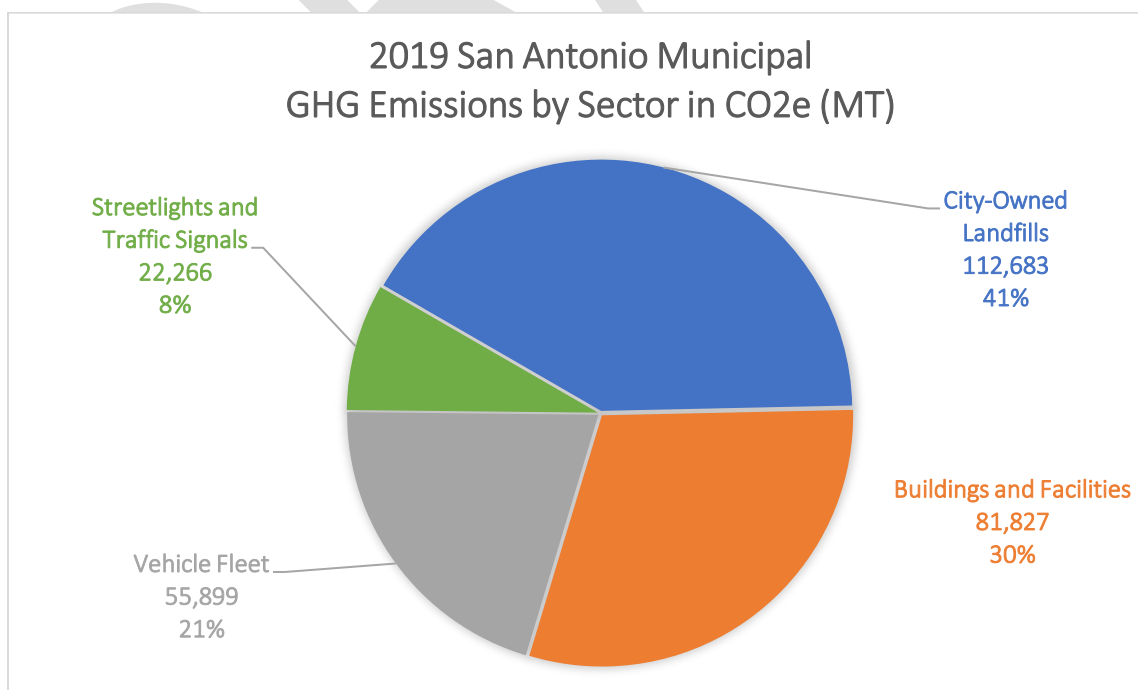
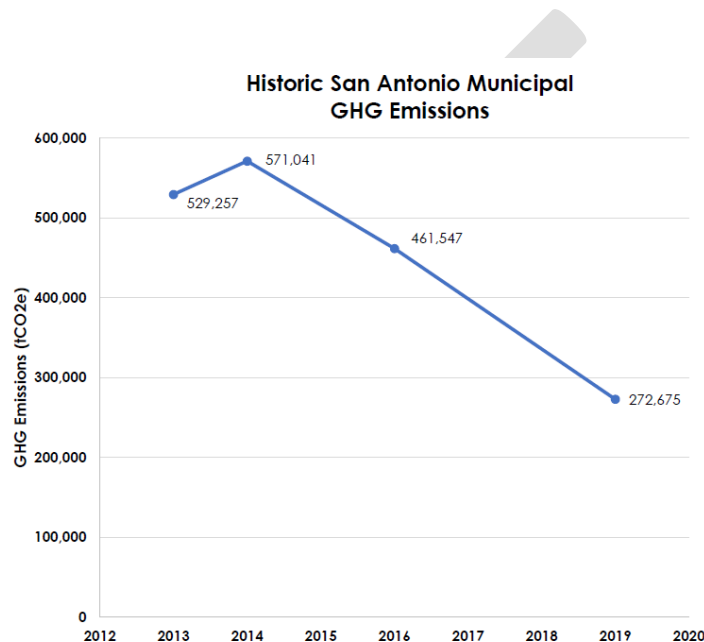
Energy Use by Sector – Electricity (kWh)			
Sector/Provider	2016	2019	% Change
Residential Electricity Consumption	6,494,910,499	6,751,061,867	3.9%
Commercial Electricity Consumption	9,425,732,079	9,683,094,807	2.7%
Traffic & Street Lights Electricity Consumption	64,602,337	59,157,228	-8.4%
Industrial Electricity Consumption	699,730,207	606,250,691	-13.4%

Note: All electric consumption is supplied by CPS Energy.

Energy Use by Sector – Natural Gas (Therms)			
Sector/Provider	2016	2019	% Change
Residential Natural Gas Consumption/ Grey Forest Energy	2,524,234	2,245,481	-11.0%
Residential Natural Gas Consumption/CPS Energy	72,532,411	84,462,123	16.4%
Commercial Natural Gas Consumption/CPS Energy	119,731,959	131,707,232	10.0%
Commercial Natural Gas Consumption/ Grey Forest Energy	2,265,638	3,546,220	56.5%
Industrial Natural Gas Consumption/CPS Energy	6,727,062	15,151,787	125.2%
Industrial Natural Gas Consumption/ Grey Forest Energy	1,486,768	770,342	-48.2%

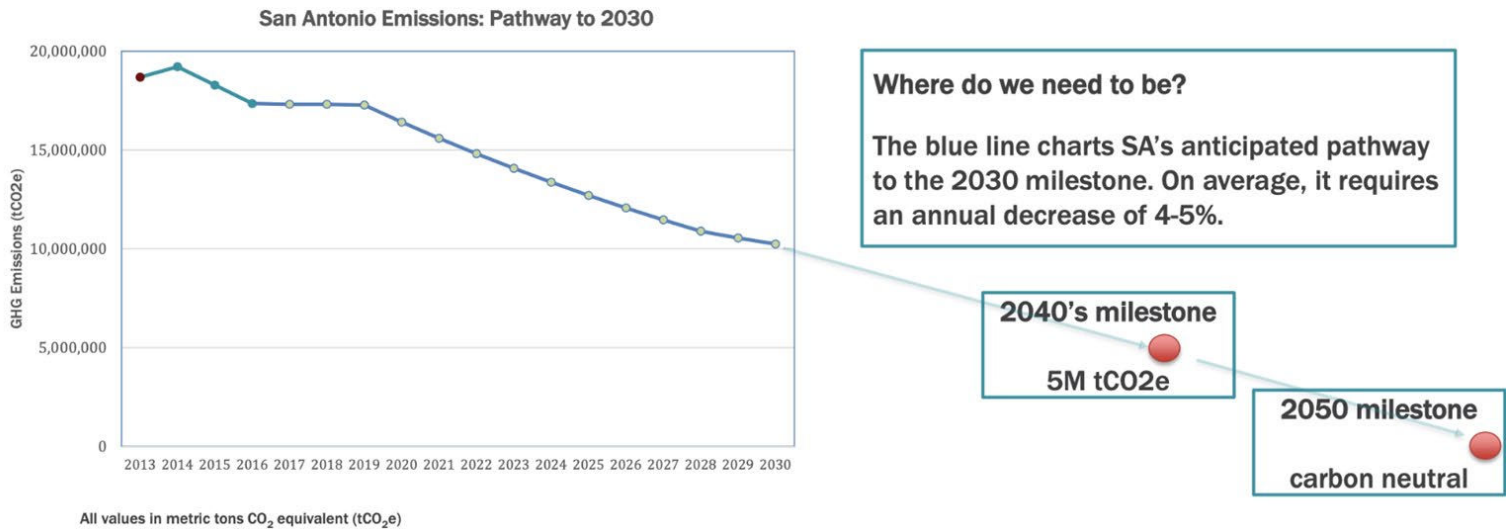
Key findings from the 2019 municipal Greenhouse Gas Inventory include:

- San Antonio's total municipal emissions decreased by 41% (from 461,547 to 272,675 CO₂e (MT)) between 2016 and 2019.
- This decrease was primarily driven by methodology changes:
 - Eliminating emissions from closed landfills that do not report to the EPA, up to par with best practices.
- Emissions trends:
 - Building emissions decreased by 19.5%
 - Fleet emissions increased by 9.1%



Supporting graphs and supplemental information regarding specific sector data can be found in the Guidehouse document, San Antonio 2016 - 2019 Trends, in Appendix I.

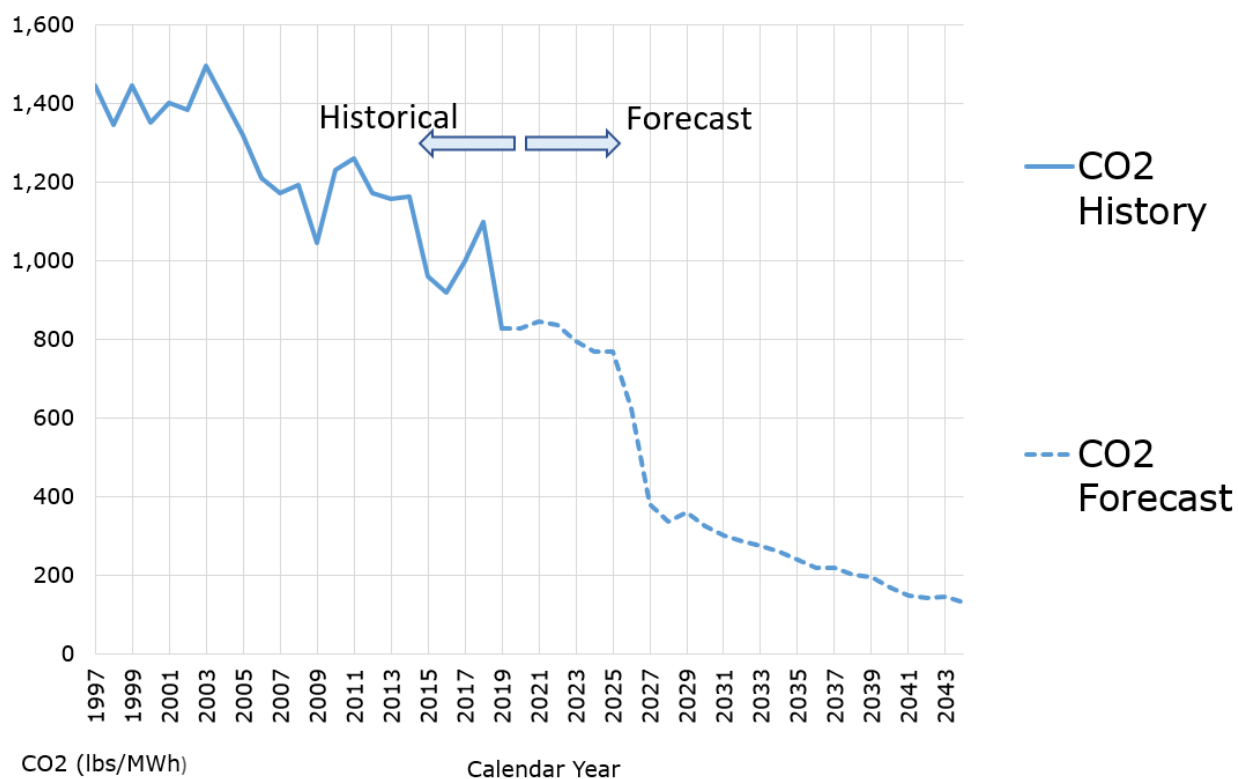
While the community and key partners have made great strides in decreasing the impact of GHG's, results from the 2019 GHG Inventory show that it is imperative that policies, initiatives, and strategy intensify in order to achieve our goal of net neutrality by 2050.



CPS: Flexible PathSM Projections

The climate-benefiting decrease in CPS Energy's carbon footprint will continue into the future as CPS Energy implements the Flexible PathSM strategy. CPS Energy is committed to reducing net carbon emissions 80% by 2040 (from the baseline of 2016) and work towards full carbon neutrality by 2050 in support of the City of San Antonio's Climate Action & Adaptation Plan (CAAP). To learn more, please visit www.cpsenergy.com/flexpath.

Flexible Path Reductions





APPENDIX I

San Antonio

2016 – 2019 Trends

November 12, 2020

Executive Summary

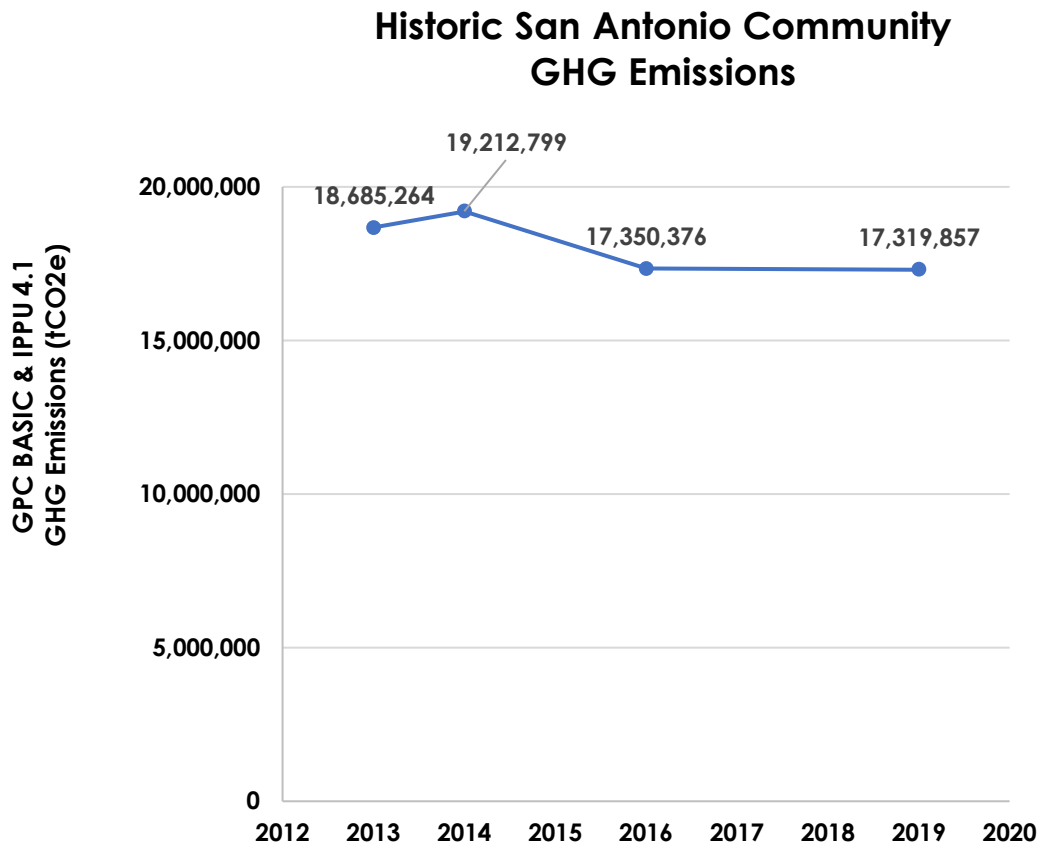
- **2016 Baseline:** 2016 inventory in ClearPath tool now matches previously reported inventory, no critical changes identified in harmonization process.
- **2019 Community Inventory**
 - 0.2% decrease (total GHG emissions), 4% reduction (per capita) over 2016
 - Increase in energy usage (kWh & therms)
 - Increase in transportation emissions
 - Increase in solid waste emissions, due to methodology update
 - Decrease in CPS Energy's emissions factor – primary factor offsetting the increases and the key reason that emissions remain virtually flat
 - The inventory also encompasses a few methodology updates from ICLEI best practices, mostly in the transportation category—the impact of these methodology changes is less than 0.5%
- **2019 Municipal Inventory**
 - 41% reduction (total GHG emissions)
 - 25% reduction due to a decrease in solid waste emissions from a methodology change eliminating emissions from closed landfills that don't report to the EPA (these emissions were included in the 2016 inventory)
 - Additional 16% reduction primarily due to a decrease in CPS Energy's emissions factor



2019 CoSA Community-Wide Inventory Methodology and Data Updates

2019 CoSA Community-Wide Inventory Methodology & Data Updates	GHG Emissions Impact (MT CO ₂ e)	Percent of Total
Updated the methodology for calculating emissions from commercial waste after conversations with SWMD. In 2016, a best guess was used, due to lack of data. In 2019, an estimation of MSW landfilled per capita was provided by SWMD and used along with the population to find a commercial waste value.	264,304	1.5%
Removed emissions from closed landfills that do not report to the EPA.	-172,362	-1.0%
Subtracted VIA fuel data from vehicle fuel usage calculated from total CoSA VMT. In 2016 these values had been double counted.	-68,827	-0.4%
Added GSE Aviation equipment emissions to the offroad fuel usage determined using TexN tool. In 2016, these values were not included due to lack of data.	+6,765	0.04%
Added waste management facilities New Earth Composting and Bitters Brush Grinding. In 2016, these values were not included due to lack of data.	+3,727	0.02%
Added Alamo Area Demand Response vehicles. In 2016, these values were not included due to lack of data.	+1,626	0.01%
No fuel used for power plant auxiliary operations in 2019. This was included in 2016.	-594	<0.01%
No fuel usage for water barges in 2019. This value was included in 2016.	-242	<0.01%
Moved some emissions between GPC categories due to functionality constraints of ICLEI tool and detailed review of LGOP	0	0%

Overview: San Antonio Total Emissions Trend



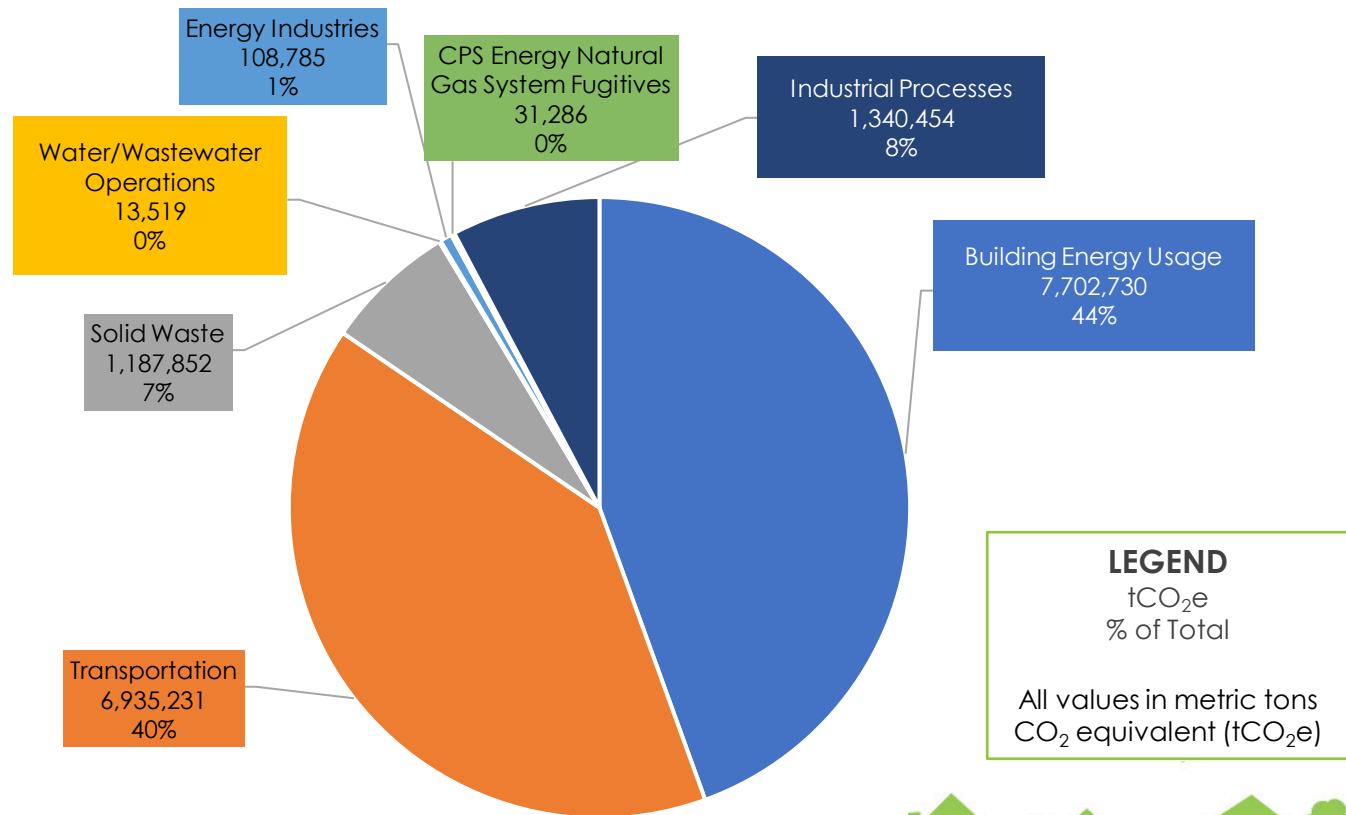
All values in metric tons CO₂ equivalent (tCO₂e)

San Antonio's GHG emissions decreased **0.2%** between 2016 and 2019.

- San Antonio saw increases in its population, total energy consumed, and transportation emissions.
- Despite these increases, total emissions remained relatively steady, from:
 - >10% reduction in CPS Energy's emissions intensity of electricity
 - Increase in solid waste emissions from an updated methodology.

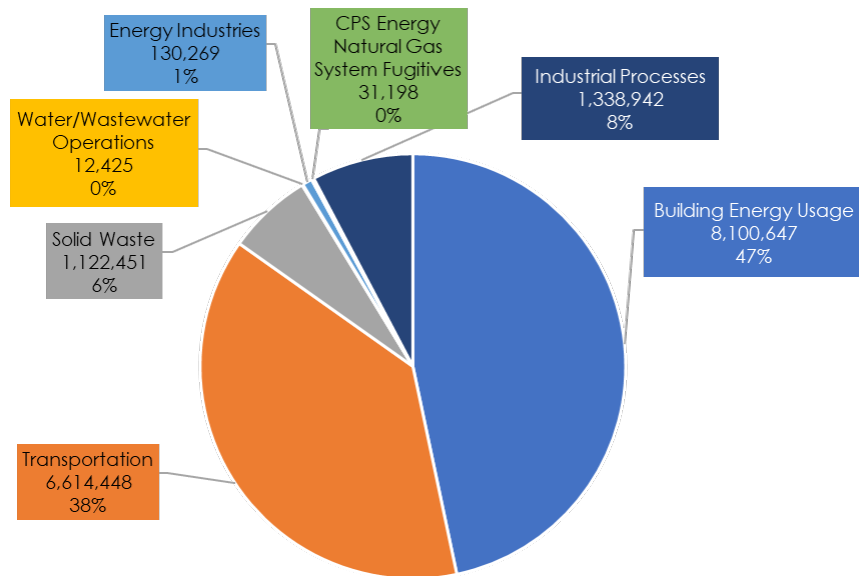
Community: 2019 Total Emissions by Sector

**2019 San Antonio Total Community
GHG Emissions by Sector**
17,319,857 tCO₂e total

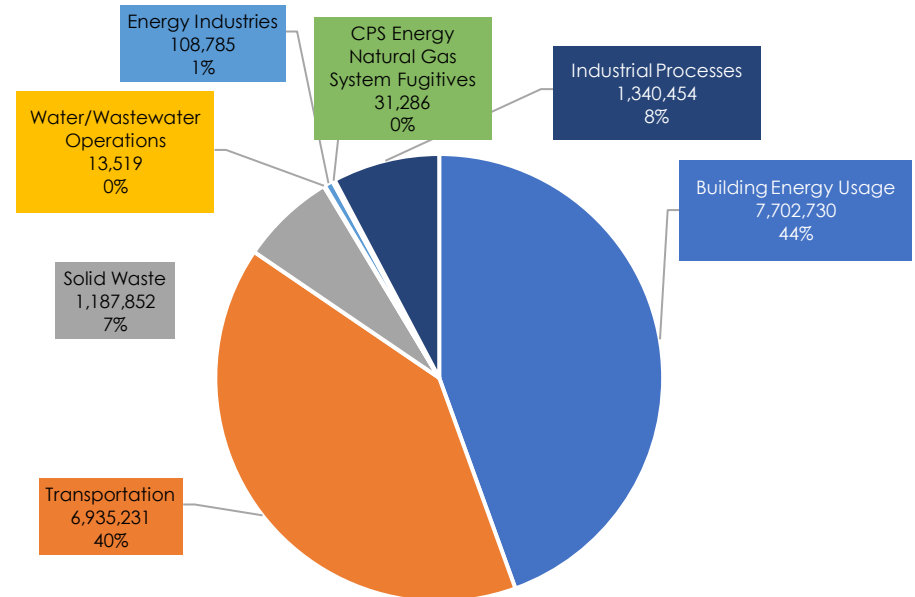


Community: 2019 Total Emissions by Sector

**2016 San Antonio Total Community
GHG Emissions by Sector**
17,350,376 tCO₂e total



**2019 San Antonio Total Community
GHG Emissions by Sector**
17,319,857 tCO₂e total



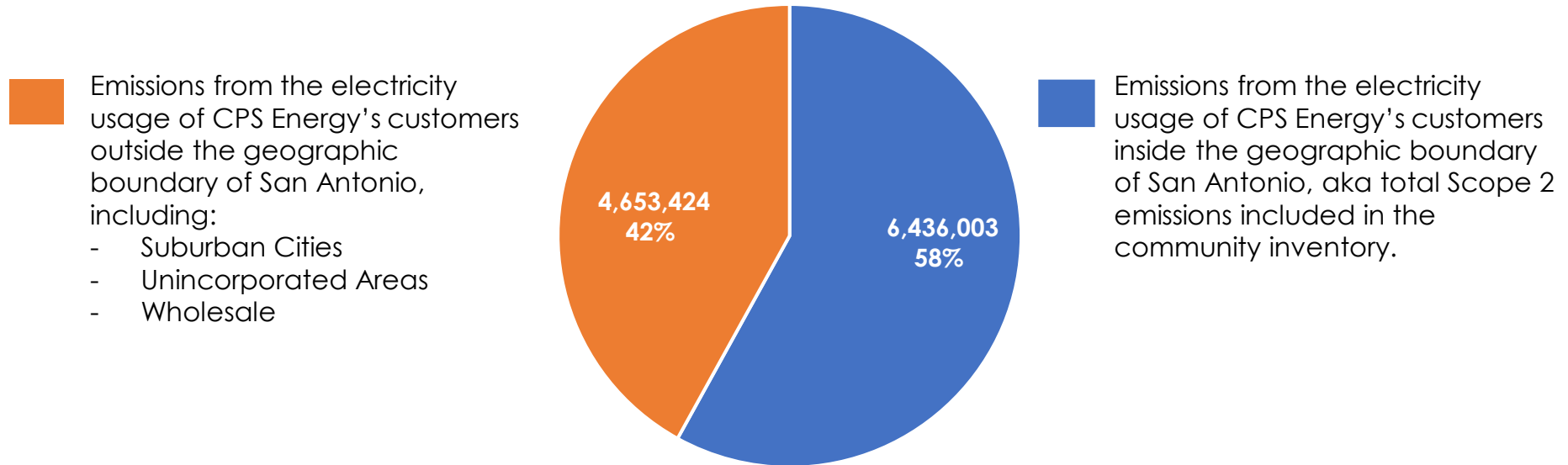
The breakdown of emissions by sector stayed fairly consistent between 2016 and 2019, with notable changes including:

- Decrease in percentage of emissions from building energy usage
- Increase in percentage of emissions from transportation

LEGEND
tCO₂e
% of Total
All values in metric tons
CO₂ equivalent
(tCO₂e)

Overview: CPS Energy's 2019 Total Emissions

CPS Energy's Total 2019 GHG Emissions from Electricity Generation 11,089,427 tCO₂e

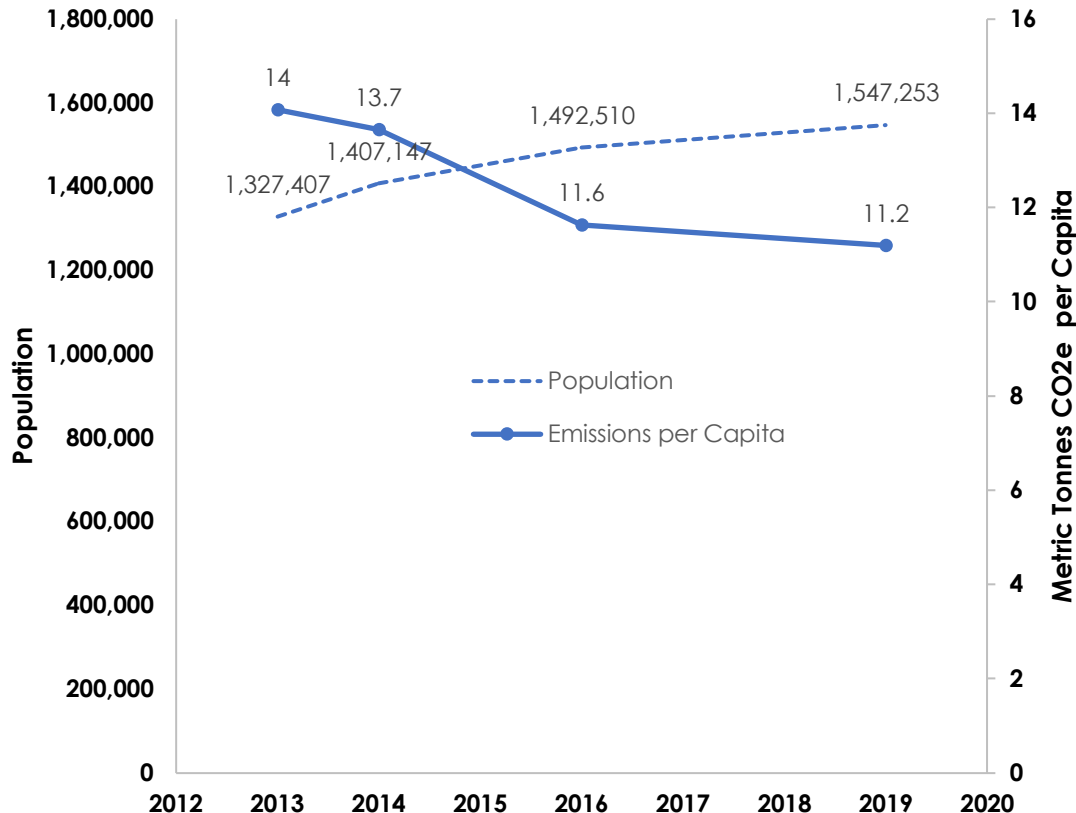


Note that only the emissions shown in blue are part of the community inventory. This is consistent with the methodology used in 2016 and is consistent with requirements from GPC protocol.

All values in metric tons CO₂ equivalent (tCO₂e)

Overview: San Antonio Emissions per Capita

San Antonio Community GHG Inventory
Emissions Per Capita



2019 population source: <https://www.census.gov/search-results.html?q=san+antonio+tx+2016+population&page=1&stateGeo=none&searchtype=web&cssp=SERP>

San Antonio's population grew 4% between 2016 and 2019.

On a per capita basis, San Antonio's 2019 GHG emissions reflect a 4% decrease from 2016. Again, this decrease is driven primarily by the reduction of CPS Energy's emissions factor.

Community: Energy & Buildings Emissions

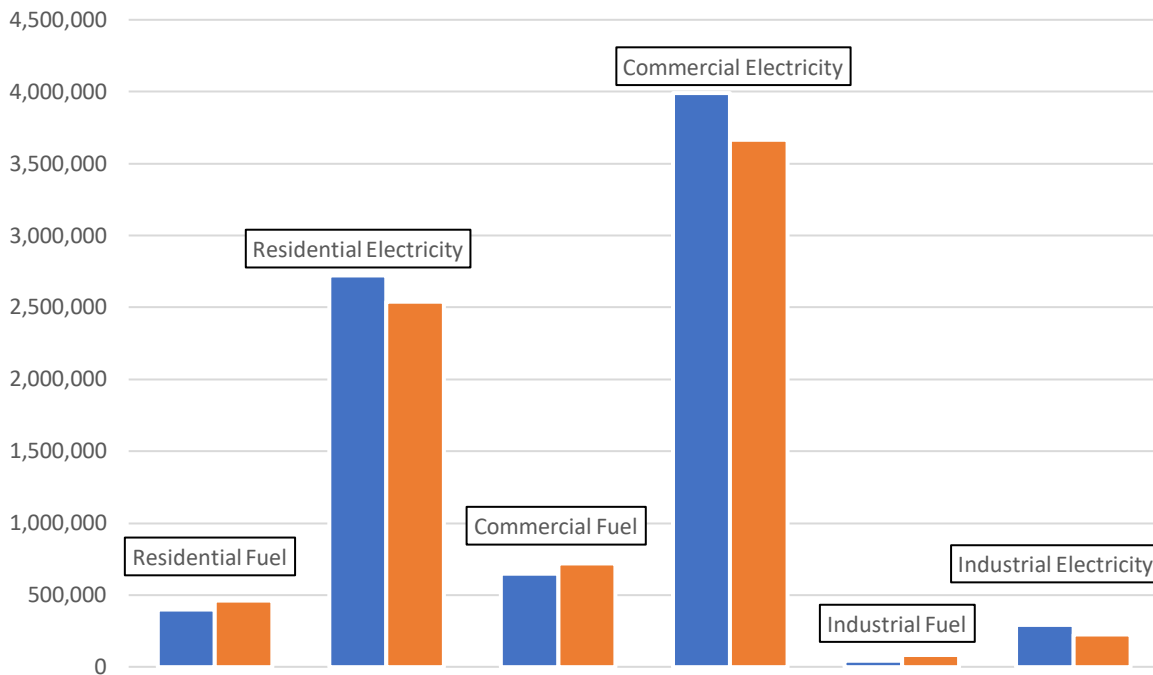
LEGEND

tCO₂e

■ 2016 ■ 2019

All values in metric tons
CO₂ equivalent (tCO₂e)
Fuel = delivered fuels, i.e.
natural gas

San Antonio Community 2016-2019 Buildings GHG Emissions



- Total energy and buildings emissions dropped **397,917 tCO₂e (5%)** from 2016.
- All fuel sources increased in emissions due to more fuel being used.
- All electricity sources decreased in emissions despite an overall increase in energy consumed. This is due to the CPS energy factor continuing to decrease.

Community: Transportation Emissions

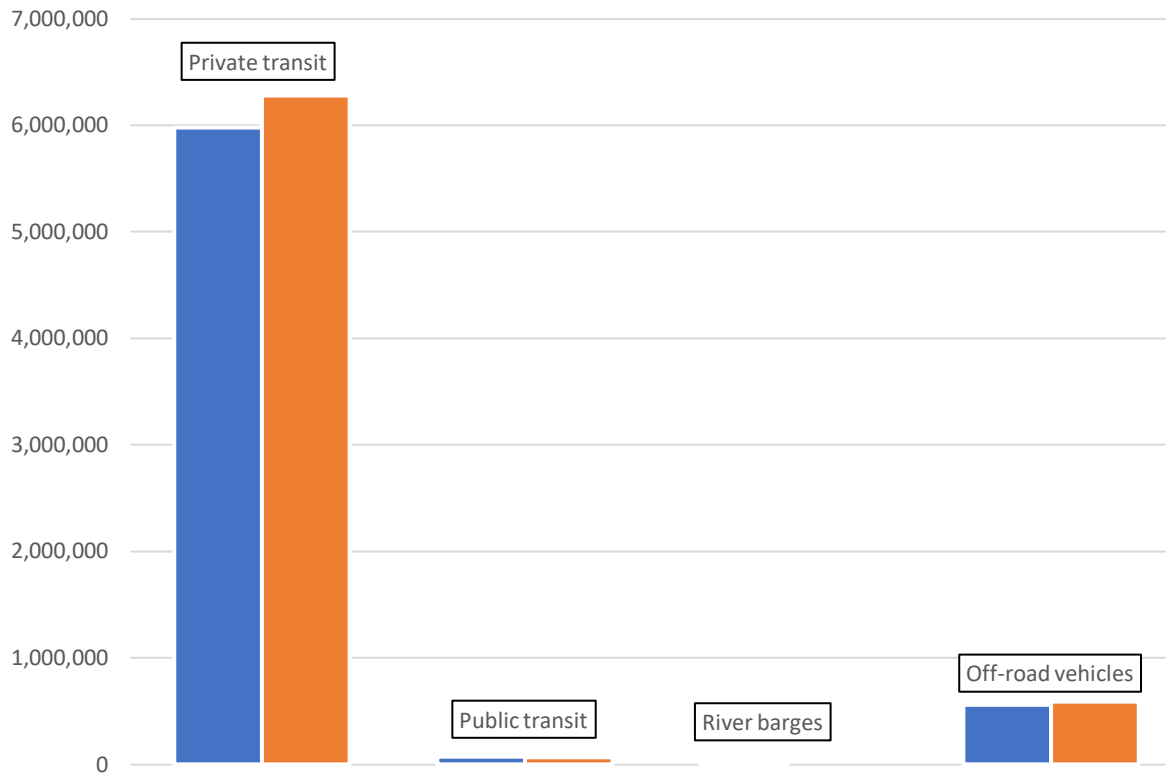
LEGEND

tCO₂e

■ 2016 ■ 2019

All values in metric tons
CO₂ equivalent (tCO₂e)

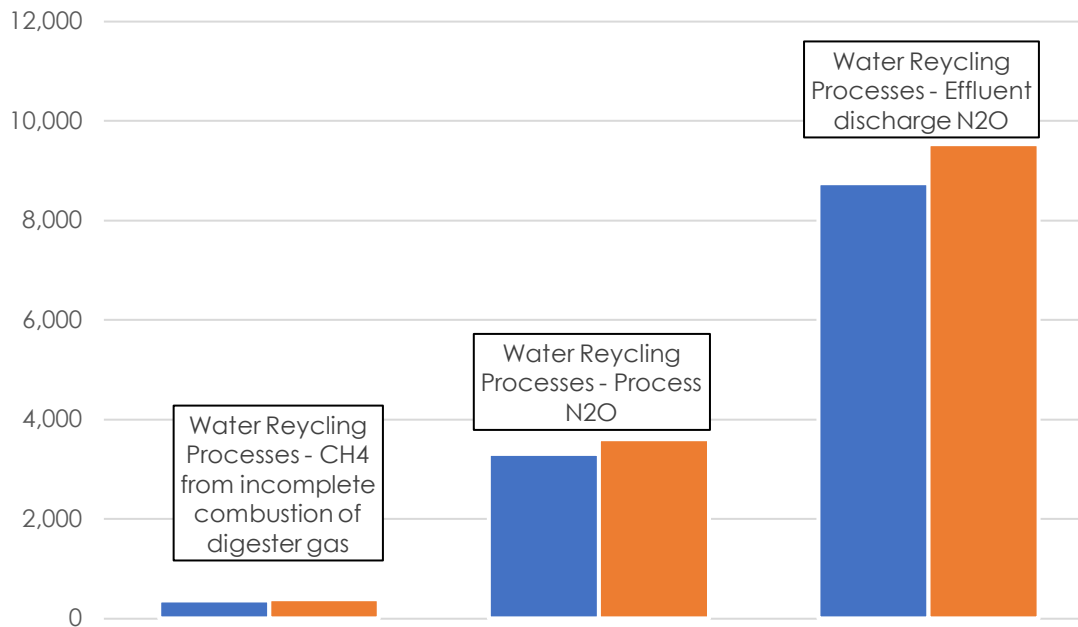
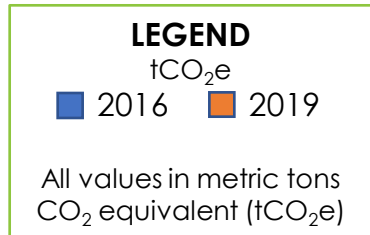
2016-2019 San Antonio Community Transportation GHG Emissions



- Total transportation emissions increased **320,784 tCO₂e (5%)** from 2016 to 2019.
- Private transit emissions and off-road emissions each increased by roughly 5% from 2016.
- Public transit emissions decreased by about 8% from 2016.

Community: Water & Natural Resources

2016-2019 San Antonio Community Water/Wastewater Operations GHG Emissions

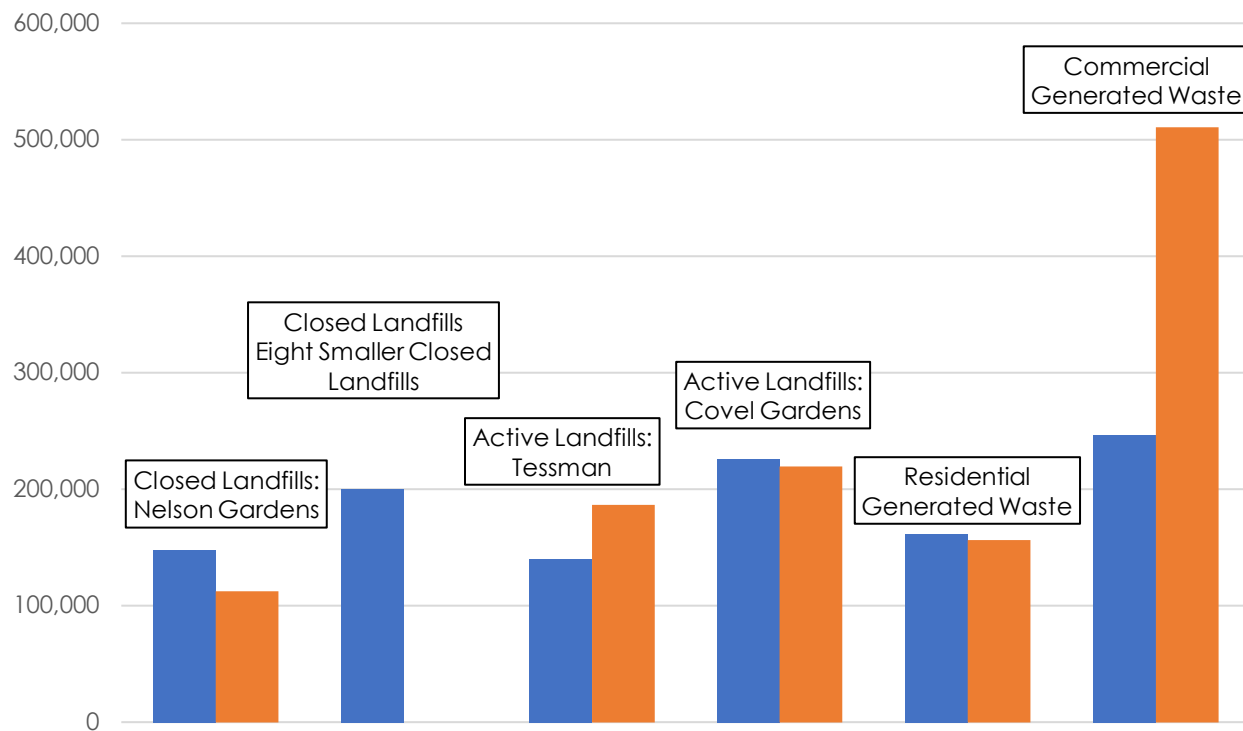


- The total emissions increase for wastewater was **1,094 tCO₂e (9%)** from 2016.
- From 2016 to 2019, all types of wastewater emissions increased, driven by San Antonio's population increase.
- The largest increase was due to the effluent discharge category.
- Wastewater emissions are insignificant compared to the rest of the community inventory.

Community: Solid Waste Resources

LEGEND
tCO₂e
■ 2016 ■ 2019
All values in metric tons
CO₂ equivalent (tCO₂e)

**2016-2019 San Antonio Community
Solid Waste GHG Emissions**



- Solid waste emissions increased overall from 2016 by **66,776 tCO₂e (6%)**.
- The methodology for calculating commercial waste was updated, resulting in an emissions increase.
- Closed landfill emissions were eliminated from the footprint.
- Emissions from Tessman Landfill, as reported to the EPA, increased.
- Emissions from residential waste, Covel Gardens and Nelson Gardens decreased.

Community: Other Stationary Sources

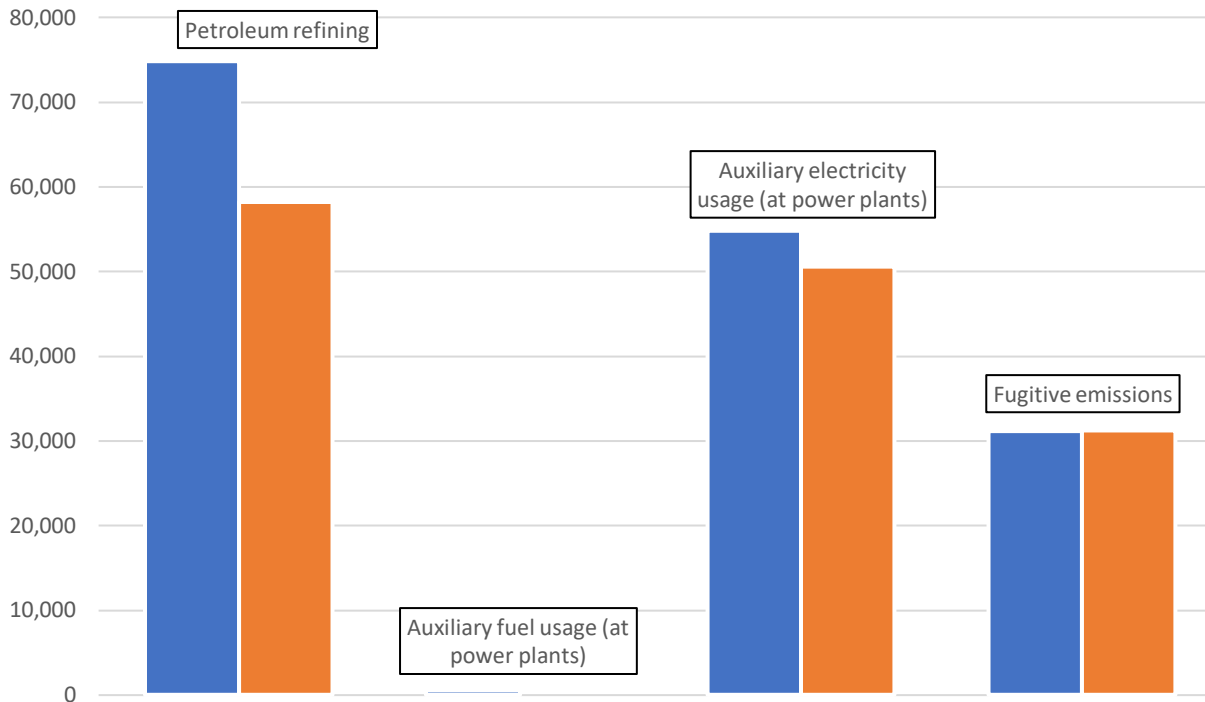
LEGEND

tCO₂e

■ 2016 ■ 2019

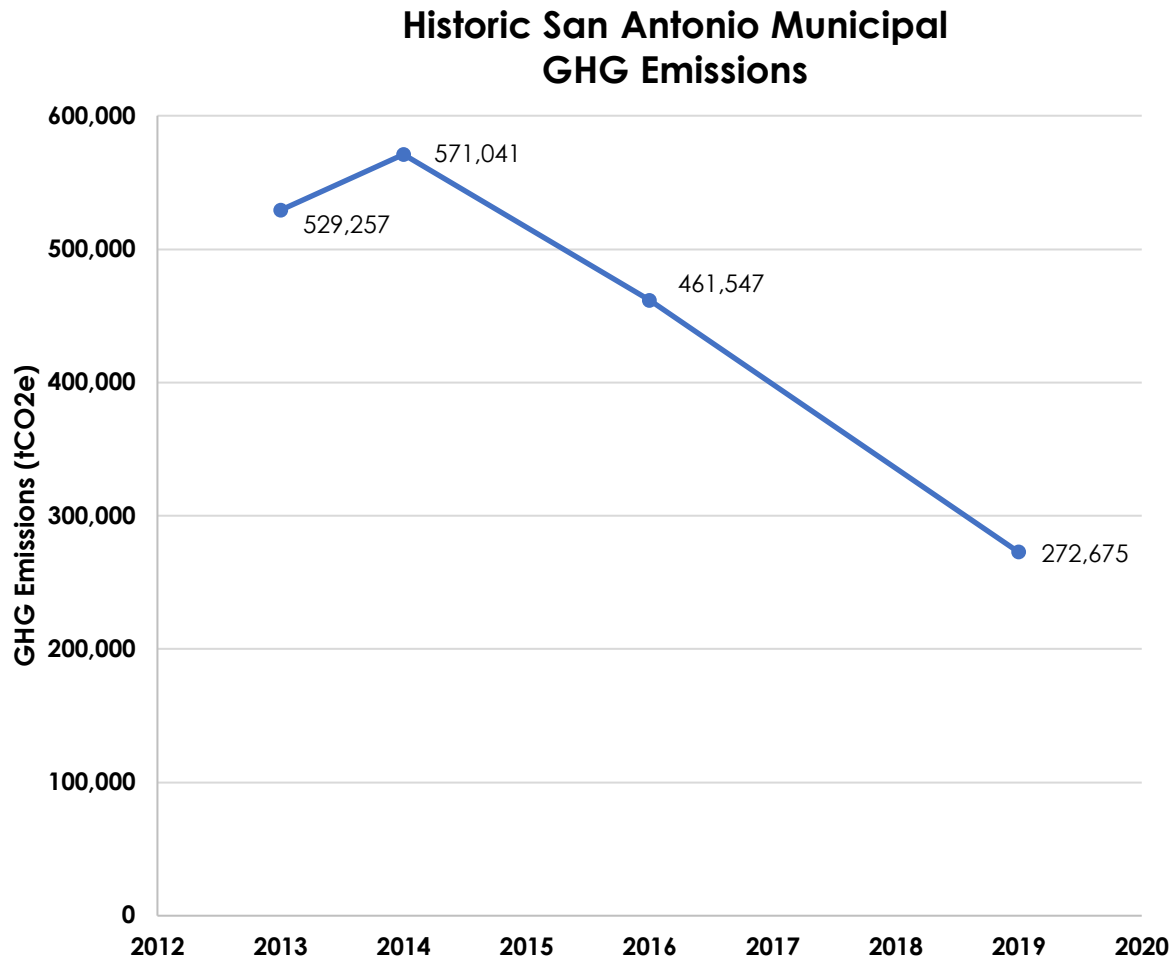
All values in metric tons
CO₂ equivalent (tCO₂e)

2016-2019 San Antonio Community Other Stationary Sources GHG Emissions



- Other stationary sources emissions decreased by **21,396 tCO₂e (13%)** from 2016.
- Other than a negligible increase in fugitive emissions, all categories decreased from 2016 to 2019 in this category.
- Note that as with the building emissions, total kWh used for auxiliary energy use increased, but emissions decreased due to the CPS energy factor decrease.

Municipal: Total Emissions Trend



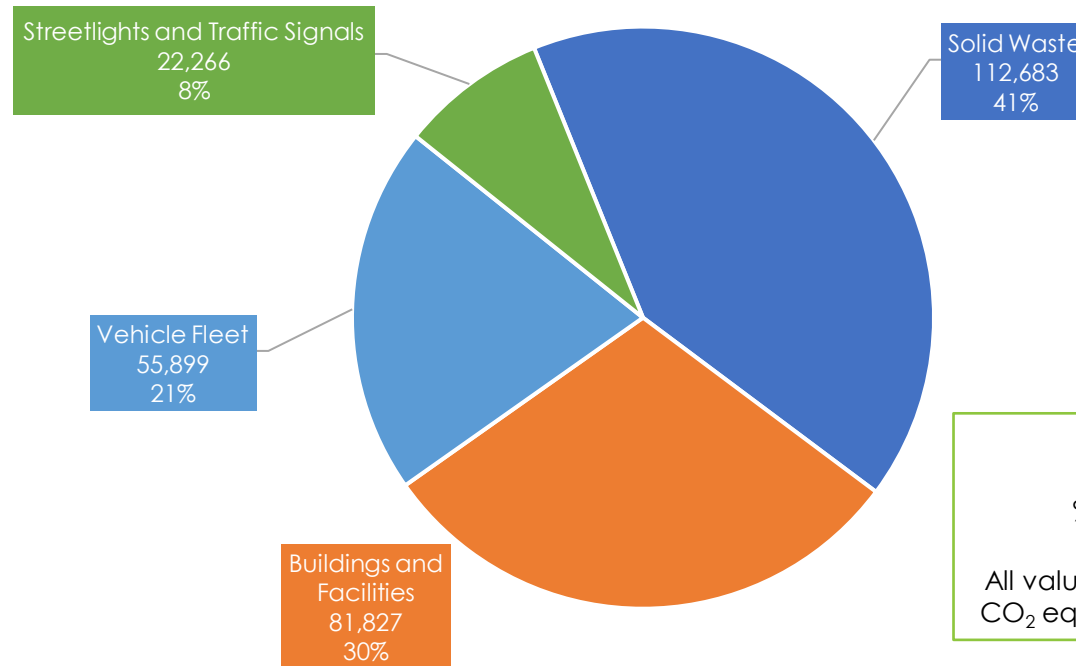
In 2019, emissions decreased by **188,871 MT CO₂e (41%)** from 2016.

- A 114,912 MT CO₂e (25%) reduction due to a decrease in solid waste emissions from a methodology change eliminating emissions from closed landfills that do not report to the EPA (these emissions were included in the 2016 inventory)
- Additional 16% reduction primarily due to a decrease in CPS Energy's emissions factor

All values in metric tons CO₂ equivalent (tCO₂e)

Municipal: 2019 Total Emissions by Sector

**2019 San Antonio Municipal
GHG Emissions by Sector**
272,675 tCO₂e total



The 2019 emissions are led by solid waste emissions, comprising just over 40% of total municipal emissions. Buildings/facilities, vehicle fleet, and streetlights/traffic signals comprise the remaining 60% of the inventory.

LEGEND

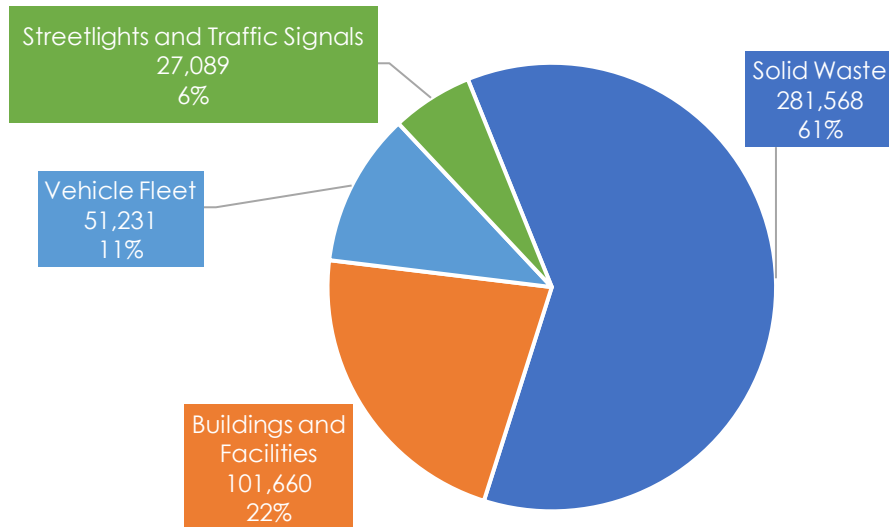
tCO₂e
% of Total

All values in metric tons
CO₂ equivalent (tCO₂e)

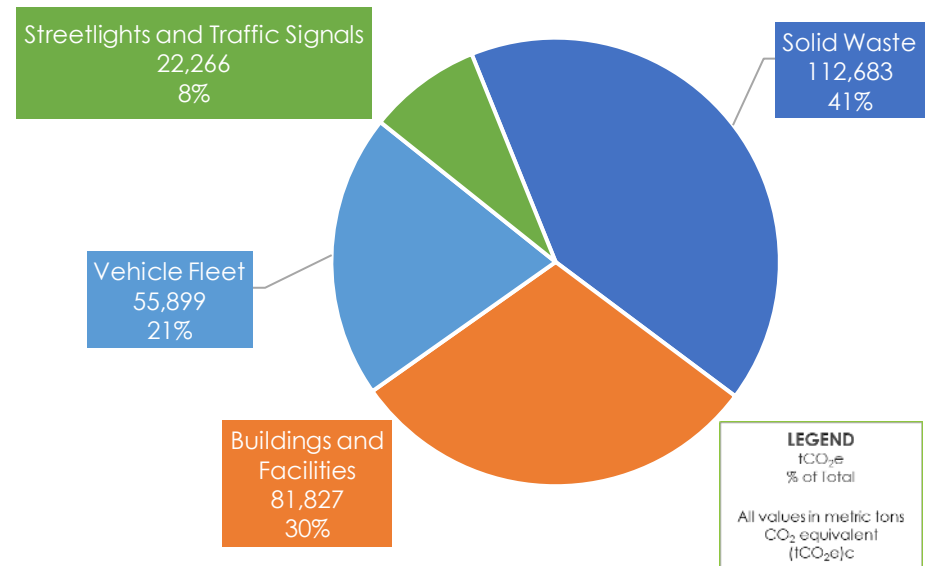
The solid waste sector accounts for such a high proportion of government operations' emissions because methane has a global warming potential (GWP) 28x greater than CO₂.

Municipal: 2019 Total Emissions by Sector

**2016 San Antonio Municipal
GHG Emissions by Sector**
461,547 tCO₂e total



**2019 San Antonio Municipal
GHG Emissions by Sector**
272,675 tCO₂e total



The breakdown of emissions by sector changed dramatically between 2016 and 2019 because 114,912 MT CO₂e of solid waste emissions were removed from the inventory. This was result of a methodology change which eliminated emissions from closed landfills that don't report to the EPA.

2019 CoSA Municipal Inventory Methodology and Data Updates

2019 CoSA Municipal Inventory Methodology & Data Updates	GHG Emissions Impact (MT CO ₂ e)	Percent of Total
Removed emissions from closed landfills that do not report to the EPA.	-114,912	-42%
Updated emissions calculations associated with chilled water. Chiller type updated and methodology updated to use the ICLEI calculators for chilled water emissions.	-7,701	-3%
Removed steam usage from inventory, as it was confirmed that the municipal buildings no longer use any district steam for heat.	-1,012	-0.4%

APPENDIX II - ClearPath: GPC Overview Report

Year	Global Warming Potential	GPC Reference Number	Scope	GHG Emissions Source (By Sector and Subsector)	Notation Keys	CO2	CH4	N2O	HFC	PFC	SF6	NF3	Total CO2e	CO2(b)	Activity Data Quality	Emission Factors Quality
	IPCC 5th Assessment 100 Year Values	I		STATIONARY ENERGY												
2019	IPCC 5th Assessment 100 Year Values	I.1		Residential buildings												
2019	IPCC 5th Assessment 100 Year Values	I.1.1	1	Emissions from fuel combustion within the city boundary		459,724	43	1					461,167		High; High	High; High
2019	IPCC 5th Assessment 100 Year Values	I.1.2	2	Emissions from grid-supplied energy consumed within the city boundary		2,532,467	35	28					2,540,992		High	High
2019	IPCC 5th Assessment 100 Year Values	I.1.3	3	Transmission and distribution losses from grid-supplied energy												
2019	IPCC 5th Assessment 100 Year Values	I.2		Commercial and institutional buildings and facilities												
2019	IPCC 5th Assessment 100 Year Values	I.2.1	1	Emissions from fuel combustion within the city boundary	IE	718,780	68	1					721,054		High; High; High; High; High; High	High; High; High; High; High; High
2019	IPCC 5th Assessment 100 Year Values	I.2.2	2	Emissions from grid-supplied energy consumed within the city boundary	IE	3,654,527	50	41					3,666,828		High; High; High; High	High; High; High; High
2019	IPCC 5th Assessment 100 Year Values	I.2.3	3	Transmission and distribution losses from grid-supplied energy												
2019	IPCC 5th Assessment 100 Year Values	I.3		Manufacturing industries and construction												
2019	IPCC 5th Assessment 100 Year Values	I.3.1	1	Emissions from fuel combustion within the city boundary		84,419	2	0					84,506		High; High	High; High
2019	IPCC 5th Assessment 100 Year Values	I.3.2	2	Emissions from grid-supplied energy consumed within the city boundary		227,418	3	3					228,183		7,702,730	High
2019	IPCC 5th Assessment 100 Year Values	I.3.3	3	Transmission and distribution losses from grid-supplied energy												
2019	IPCC 5th Assessment 100 Year Values	I.4		Energy industries												
2019	IPCC 5th Assessment 100 Year Values	I.4.1	1	Emissions from energy production used in power plant auxiliary operations within the city		108,785							108,785			
2019	IPCC 5th Assessment 100 Year Values	I.4.2	2	Emissions from grid-supplied energy consumed by energy industries												
2019	IPCC 5th Assessment 100 Year Values	I.4.3	3	Emissions from transmission and distribution losses from grid-supplied energy used in power plant auxiliary operations												
2019	IPCC 5th Assessment 100 Year Values	I.4.4	1	Emissions from energy generation supplied to the grid												
2019	IPCC 5th Assessment 100 Year Values	I.5		Agriculture, forestry and fishing activities												
2019	IPCC 5th Assessment 100 Year Values	I.5.1	1	Emissions from fuel combustion within the city boundary	IE											
2019	IPCC 5th Assessment 100 Year Values	I.5.2	2	Emissions from grid-supplied energy consumed within the city boundary	IE											
2019	IPCC 5th Assessment 100 Year Values	I.5.3	3	Transmission and distribution losses from grid-supplied energy												
2019	IPCC 5th Assessment 100 Year Values	I.6		Non-specified sources												
2019	IPCC 5th Assessment 100 Year Values	I.6.1	1	Emissions from fuel combustion within the city boundary												
2019	IPCC 5th Assessment 100 Year Values	I.6.2	2	Emissions from grid-supplied energy consumed within the city boundary												
2019	IPCC 5th Assessment 100 Year Values	I.6.3	3	Transmission and distribution losses from grid-supplied energy												
2019	IPCC 5th Assessment 100 Year Values	I.7		Fugitive emissions from mining, processing, store, and transportation of coal												
2019	IPCC 5th Assessment 100 Year Values	I.7.1	1	Fugitive emissions from mining, processing, storage, and transportation of coal within the city boundary												
2019	IPCC 5th Assessment 100 Year Values	I.8		Fugitive Emissions from oil and natural gas systems												
2019	IPCC 5th Assessment 100 Year Values	I.8.1	1	Fugitive emissions from oil and natural gas systems within the city boundary		35	1,116						31,286		High	High
2019	IPCC 5th Assessment 100 Year Values	II		TRANSPORTATION												
2019	IPCC 5th Assessment 100 Year Values	II.1		On-road transportation												
	IPCC 5th Assessment 100 Year Values	II.1.1	1	Emissions from fuel combustion on-road transportation occurring in the city		6,345,490	42	4					6,347,687	367132.35	Medium; Medium; Medium; High; High; High; Medium; Medium	High; High; High; High; High; High; High; High; High; High
2019	IPCC 5th Assessment 100 Year Values	II.1.2	2	Emissions from grid-supplied energy consumed in the city for on-road transportation		681	0	0					683		Medium; Medium	High; High
2019	IPCC 5th Assessment 100 Year Values	II.1.3	3	Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use												
2019	IPCC 5th Assessment 100 Year Values	II.2		Railways												

2019	IPCC 5th Assessment 100 Year Values	II.2.1		1	Emissions from fuel combustion for railway transportation occurring in the city	NE; NE													
2019	IPCC 5th Assessment 100 Year Values	II.2.2		2	Emissions from grid-supplied energy consumed in the city for railways	NE													
2019	IPCC 5th Assessment 100 Year Values	II.2.3		3	Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use														
2019	IPCC 5th Assessment 100 Year Values	II.3			Waterborne navigation														
2019	IPCC 5th Assessment 100 Year Values	II.3.1		1	Emissions from fuel combustion for waterborne navigation occurring in the city														
2019	IPCC 5th Assessment 100 Year Values	II.3.2		2	Emissions from grid-supplied energy consumed in the city for waterborne navigation														
2019	IPCC 5th Assessment 100 Year Values	II.3.3		3	Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use														
2019	IPCC 5th Assessment 100 Year Values	II.4			Aviation														
2019	IPCC 5th Assessment 100 Year Values	II.4.1		1	Emissions from fuel combustion for aviation occurring in the city	NE; NE													
2019	IPCC 5th Assessment 100 Year Values	II.4.2		2	Emissions from grid-supplied energy consumed in the city for aviation														
2019	IPCC 5th Assessment 100 Year Values	II.4.3		3	Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use														
2019	IPCC 5th Assessment 100 Year Values	II.5			Off-road transportation														
2019	IPCC 5th Assessment 100 Year Values	II.5.1		1	Emissions from fuel combustion for off-road transportation occurring in the city		586,860							586,860		Low		Medium	
2019	IPCC 5th Assessment 100 Year Values	II.5.2		2	Emissions from grid-supplied energy consumed in the city for off-road transportation														
2019	IPCC 5th Assessment 100 Year Values	II.5.3		3	Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use														
2019	IPCC 5th Assessment 100 Year Values	III			WASTE														
2019	IPCC 5th Assessment 100 Year Values	III.1			Solid waste disposal														
2019	IPCC 5th Assessment 100 Year Values	III.1.1		1	Emissions from solid waste generated in the city and disposed in landfills or open dumps within the city		36,769							1,029,521		Low		High	
2019	IPCC 5th Assessment 100 Year Values	III.1.2		3	Emissions from solid waste generated in the city but disposed in landfills or open dumps outside the city		5,580							156,240					
2019	IPCC 5th Assessment 100 Year Values	III.1.3		1	Emissions from waste generated outside the city and disposed in landfills or open dumps within the city														
2019	IPCC 5th Assessment 100 Year Values	III.2			Biological treatment of waste														
2019	IPCC 5th Assessment 100 Year Values	III.2.1		1	Emissions from solid waste generated in the city that is treated biologically in the city		11	7						2,091				High	
2019	IPCC 5th Assessment 100 Year Values	III.2.2		3	Emissions from solid waste generated in the city but treated biologically outside of the city														
2019	IPCC 5th Assessment 100 Year Values	III.2.3		1	Emissions from waste generated outside the city boundary but treated in the city														
2019	IPCC 5th Assessment 100 Year Values	III.3			Incineration and open burning														
2019	IPCC 5th Assessment 100 Year Values	III.3.1		1	Emissions from waste generated and treated within the city														
2019	IPCC 5th Assessment 100 Year Values	III.3.2		3	Emissions from waste generated within but treated outside of the city														
2019	IPCC 5th Assessment 100 Year Values	III.3.3		1	Emissions from waste generated outside the city boundary but treated within the city														
2019	IPCC 5th Assessment 100 Year Values	III.4			Wastewater treatment and discharge														
2019	IPCC 5th Assessment 100 Year Values	III.4.1		1	Emissions from wastewater generated and treated within the city		14	50						13,519		High; Medium; High		High; High; High	
2019	IPCC 5th Assessment 100 Year Values	III.4.2		3	Emissions from wastewater generated within but treated outside of the city														
2019	IPCC 5th Assessment 100 Year Values	III.4.3		1	Emissions from wastewater generated outside the city boundary but treated within the city														
2019	IPCC 5th Assessment 100 Year Values	IV			INDUSTRIAL PROCESSES and PRODUCT USES (IPPU)														
2019	IPCC 5th Assessment 100 Year Values	IV.1		1	Emissions from industrial processes occuring in the city boundary									1,340,454		High; High; High		High; High; High	
2019	IPCC 5th Assessment 100 Year Values	IV.2		1	Emissions from product use occurring within the city boundary														
2019	IPCC 5th Assessment 100 Year Values	V			AGRICULTURE, FORESTRY and OTHER LAND USE (AFOLU)														
2019	IPCC 5th Assessment 100 Year Values	V.1		1	Emissions from livestock	NO													
2019	IPCC 5th Assessment 100 Year Values	V.2		1	Emissions from land	NO													

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