SANTA FE, NEW MEXICO

2021 Inventory of Community-Wide Greenhouse Gas Emissions

Prepared For:

City of Santa Fe,
New Mexico

Produced By:

ICLEI – Local Governments
for Sustainability USA
January 27, 2023

Table of Contents

Tables and Figures

List of Tables

List of Figures

Letter from the Mayor

Dear Friends,

Alan Webber, Mayor of Santa Fe, New Mexico

It is my pleasure to introduce the Santa Fe updated Greenhouse Gas Inventory. We are all well aware that greenhouse gas emissions from human activity pose a serious threat to our health and prosperity. That's why I am committed to taking action to reduce those emissions in our community.

This inventory shows the incredible progress we've made in reducing those emissions. It shows a 15% total decrease in greenhouse gas emissions since 2015, and that happened while an extra 5,000 people moved to our city. This is a major accomplishment. It reflects the decisions of all of us to use clean energy, choose cleaner commutes, and more.

Our actions now have a very real impact on future generations, and together, we have all prioritized eliminating greenhouse gas emissions in Santa Fe. This requires us to rethink how we generate electricity, how we build buildings, and how we get around. This latest inventory shows that our efforts are working.

The City of Santa Fe is committed to being carbon neutral by 2040. That means eliminating all the greenhouse gas emissions we can. The rest will be accounted for in our parks and green spaces where trees and other vegetation turn those emissions into oxygen for us to breathe.

Here at the City of Santa Fe, we think it's important to lead by example. We are investing in 17 new solar arrays. We have reduced energy use in our facilities, and we are transitioning our city-owned fleet to all-electric vehicles.

With the Solarize Santa Fe program, we have made it easier and more affordable for homeowners to install solar panels on their homes. Renters will also soon be able to subscribe to community solar, offsite solar arrays that residents subscribe to on their electric bills. Our green building code is making homes more energy efficient. We are installing electric vehicle charging stations at our parking garages, and as we continue to build more affordable housing, people have shorter commutes to their workplaces.

We still have a long way to go. As the Mayor of the City of Santa Fe, I will continue doing everything in my power to make Santa Fe the most sustainable city in the country. In order to continue to be successful, we need your help.

For tips on what you can do, visit our Santa Fe Sustainability Dashboard at santafenm.gov/sustainability.

Thank you!

Alan Webber
Mayor of Santa Fe, New Mexico

Key Findings

Figure 1 shows community-wide emissions by sector. The largest contributor is Transportation, with 34% of emissions. The next largest contributors are Residential Energy (31%) and Commercial Energy (27%). Solid Waste, Process & Fugitive Emissions, Industrial Energy, and Water & Wastewater were responsible for the remaining (less than 6.2%) emissions. The Sustainable Santa Fe 25-Year Plan outlines actions to reduce emissions in all of these sectors.

The Inventory Results section of this report provides a detailed profile of emissions sources within Santa Fe, information that is key to guiding local reduction efforts. These data will also provide a baseline against which the city will be able to compare future performance and demonstrate progress in reducing emissions.

EMISSIONS AT A GLANCE

1 **Transportation** 34.6%

2 **Residential Energy** 31.7%

3 **Commercial Energy** 27.4%

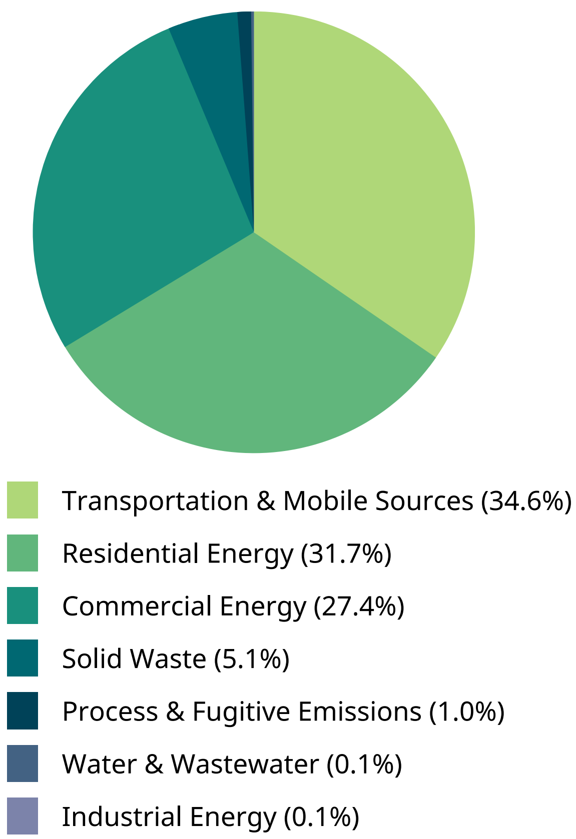


Figure 1: Community-Wide Emissions by Sector

Introduction to Climate Change

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases (GHGs) and changing the global climate. The most significant contributor is burning fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other GHGs into the atmosphere.

Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise, threatening the safety, quality of life, and economic prosperity of global communities. Although the natural greenhouse effect is needed to keep the earth warm, a human-enhanced greenhouse effect with the rapid accumulation of GHG in the atmosphere leads to too much heat and radiation being trapped. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report confirms that human activities have unequivocally caused an increase in carbon emissions[1]. Many regions are already experiencing the consequences of global climate change, and Santa Fe is no exception.

GRID ELECTRICITY MIX

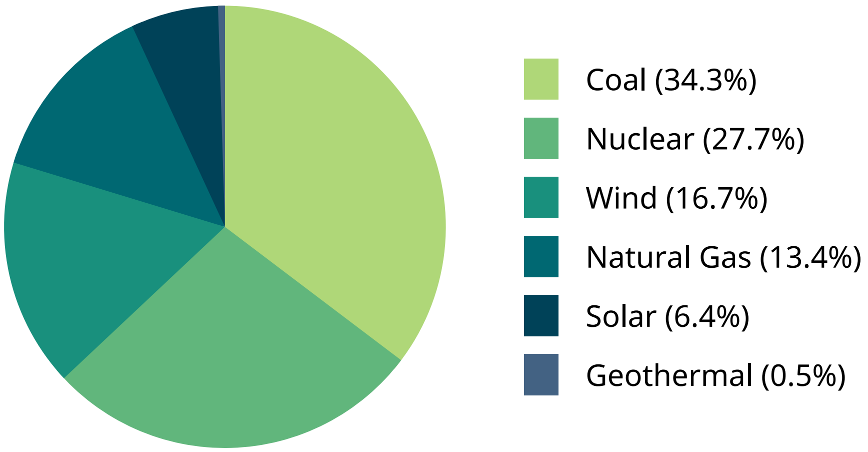


Figure 1: PNM Resources electricity resource mix [2].

[1] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

[2] Director of Government Affairs, email message to Neal Denton, September 16, 2022.

Human activities are estimated to have caused approximately 1.0°C (1.8°F) of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C (1.4°F to 2.2°F). Global warming is likely to reach 1.5°C (2.7°F) between 2030 and 2052 if it continues to increase at the current rate (high confidence). Warming from anthropogenic emissions from the pre-industrial period to the present will persist for centuries to millennia and will continue to cause further long-term changes in the climate system, such as sea-level rise, with associated impacts (high confidence), but these emissions alone are unlikely to cause global warming of 1.5°C (2.7°F; medium confidence). Climate-related risks for natural and human systems are higher for global warming of 1.5°C (2.7°F) than at present, but lower than at 2°C (3.6°F; high confidence). These risks depend on the magnitude and rate of warming, geographic location, levels of development and vulnerability, and the choices and implementation of adaptation and mitigation options (high confidence)[3].

According to the 2019 National Climate Assessment, the southwest U.S. will experience potentially devastating impacts from seasonal changes and hazards occurring at unprecedented magnitudes. Santa Fe is at particular risk for drought, flooding, and wildfire that will continue to intensify with the changing climate. So many people visit and move to his region to enjoy the beautiful mountains and forests, but those same forests are also an extreme fire risk. In addition, climate change will continue to reduce winter snowfall accumulations. Combined with the earlier melting of snowpack, it threatens many sectors within Santa Fe and the greater region, most notably tourism, public health, and agriculture [4].

[3] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

[4] U.S. Global Change Research Program. 2019. National Climate Assessment – Ch 25: Southwest. Retrieved from https://nca2019.globalchange.gov/chapter/25/.

Although rising temperatures do not pose as much of a threat in Santa Fe as the rest of the southwest, the rising heat still poses a threat as many dwellings in Santa Fe do not have a cooling method. Additionally, the higher heat means a dryer forest and an increased likelihood of wildfires. The increased frequency and intensity of wildfires has already been seen in Santa Fe, and wildfires occur earlier in the year. Wildfire smoke affects all populations, especially vulnerable populations such as outdoor workers and elderly individuals. The summer monsoon season is also expected to become more intense due to increased evaporation in the Pacific Ocean, bringing more moisture to Santa Fe in extreme weather events. This poses an increased threat of urban floodings, like the unprecedented flood in 2017.

Many communities in the United States have started to take responsibility for addressing climate change at the local level. Reducing fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs. In addition, when residents save on energy costs, they are more likely to spend at local businesses and add to the local economy. Reducing fossil fuel use improves air quality, and increasing opportunities for walking and bicycling improves residents' health.

Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

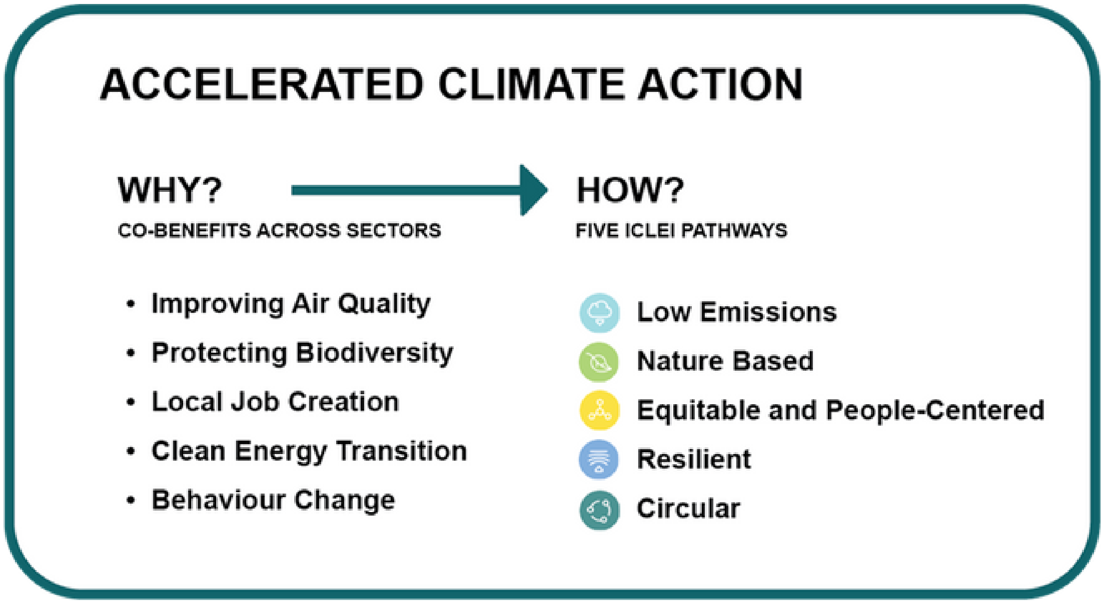
Facing the climate crisis requires the concerted efforts of local governments and their partners, those that are close to the communities directly dealing with the impacts of climate change.

Cities, towns and counties are well placed to define coherent and inclusive plans that address integrated climate action — climate change adaptation, resilience and mitigation. Existing targets and plans need to be reviewed to bring in the necessary level of ambition and outline how to achieve net-zero emissions by 2050 at the latest. Santa Fe aims to achieve carbon neutrality by 2040. The Sustainable Santa Fe 25-Year Plan outlines a roadmap to reach this goal, among others, while considering climate justice, inclusiveness, local job creation and other benefits of sustainable development.

To complete this inventory, Santa Fe utilized tools and guidelines from ICLEI - Local Governments for Sustainability (ICLEI), which provides authoritative direction for greenhouse gas emissions accounting and defines climate neutrality as follows:

> The targeted reduction of greenhouse gas (GHG) emissions and GHG avoidance in government operations and across the community in all sectors to an absolute net-zero emission level at the latest by 2050. In parallel to this, it is critical to adapt to climate change and enhance climate resilience across all sectors, in all systems and processes.

To achieve ambitious emissions reduction, and move toward climate neutrality, Santa Fe has set a goal to achieve carbon neutrality by 2040. Climate action is an opportunity for our community to experience a wide range of co-benefits, such as creating socio-economic opportunities, reducing poverty and inequality, and improving the health of people and nature.



ICLEI Climate Mitigation Milestones

In response to the climate emergency, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries, as well as influencing regional emissions through partnerships and advocacy. Through proactive measures around land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and more, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts.

ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along with Five Milestones, also shown in Figure 2:

1. Conduct an inventory and forecast of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions Science-Based Target [5];
3. Develop a climate action plan for achieving the emissions reduction target;
4. Implement the climate action plan; and,
5. Monitor and report on progress.

This report represents ICLEI's Climate Mitigation Milestone Five and provides an evaluation of greenhouse gas emissions in Santa Fe.

Figure 2: ICLEI Climate Mitigation Milestones

[5] Science-Based Targets are calculated climate goals, in line with the latest climate science, that represent your community's fair share of the ambition necessary to meet the Paris Agreement commitment of keeping warming below 1.5°C. To achieve this goal, the Intergovernmental Panel on Climate Change (IPCC) states that we must reduce global emissions by 50% by 2030 and achieve climate neutrality by 2050. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations reduce their emissions by more than 50%.

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas (GHG) emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from the Santa Fe community as a whole. The government operations inventory is mostly a subset of the community inventory, as shown in Figure 3. For example, data on commercial energy use by the community include energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles.

Figure 3: Relationship of Community and Government Operations Inventories

As local governments continue to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Community Protocol) and the Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions (LGO Protocol), both of which are described below.

Three greenhouse gases are included in this inventory: carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Many of the charts in this report represent emissions in “carbon dioxide equivalent” (CO2e) values, calculated using the Global Warming Potentials (GWP) for methane and nitrous oxide from the IPCC 5th Assessment Report.

Table 1: Global Warming Potential Values (IPCC, 2014)

Greenhouse Gas	Global Warming Potential
Carbon Dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous Oxide (N_2O)	265

Community Emissions Protocol

Version 1.2 of the U.S. Community Protocol for Accounting and Reporting GHG Emissions [6] was released by ICLEI in 2019, and represents a national standard in guidance to help U.S. local governments develop effective community GHG emissions inventories. It establishes reporting requirements for all community GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities, and provides a number of optional reporting frameworks to help local governments customize their community GHG emissions inventory reports based on their local goals and capacities.

The community inventory in this report includes emissions from the five Basic Emissions Generating Activities required by the Community Protocol. These activities are:

- Use of electricity by the community
- Use of fuel in residential and commercial stationary combustion equipment
- On-road passenger and freight motor vehicle travel
- Use of energy in potable water and wastewater treatment and distribution
- Generation of solid waste by the community

The community inventory also includes the following activities:

- Wastewater treatment processes
- Industrial Processes
- Carbon sequestration emissions and removals
- Aviation

Quantifying Greenhouse Gas Emissions

Sources and Activities

Communities contribute to greenhouse gas (GHG) emissions in many ways. Two central categorizations of emissions are used in the community inventory: 1) GHG emissions that are produced by "sources" located within the community boundary, and 2) GHG emissions produced as a consequence of community "activities."

Table 2: Source vs. Activity for Greenhouse Gas Emissions (GHG)

Source	Activity
Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere.	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions.

[6] ICLEI. 2012. US Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Retrieved from http://www.icleiusa.org/tools/ghg-protocol/community-protocol

By reporting on both GHG emissions sources and activities, local governments can develop and promote a deeper understanding of GHG emissions associated with their communities. A purely source-based emissions inventory could be summed to estimate total emissions released within the community's jurisdictional boundary. In contrast, a purely activity-based emissions inventory could provide perspective on the efficiency of the community, even when the associated emissions occur outside the jurisdictional boundary. The division of emissions into sources and activities replaces the scopes framework that is used in government operations inventories, but that does not have a clear definition for application to community inventories.

Base Year

The inventory process requires the selection of a base year with which to compare current emissions. Santa Fe's community GHG emissions inventory utilizes 2015 as its baseline year because it is the most recent year for which the necessary data are available.

Quantification Methods

GHG emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of GHG emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used:

Activity Data x Emission Factor = Emissions

Most emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see the appendices for a detailed listing of the activity data used in composing this inventory.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO2/kWh of electricity). For this inventory, calculations were made using ICLEI's ClearPath Climate Planner Climate Planner tool.

Community Emissions Inventory Results

The total community-wide emissions for the 2021 inventory are shown in Table 3 and Figure 4.

Table 3: Community-Wide Emissions Inventory

Sector	Fuel or Source	2021 Usage	Usage Unit	2021 Emissions ($MTCO_2e$)
Residential Energy	Electricity	259,749,242	kWh	123,246
	Natural Gas	36,935,401	Therms	196,446
	Residential Energy Total			**319,692**
Commercial Energy	Electricity	361,753,781	kWh	171,646
	Natural Gas	19,575,183	Therms	104,114
	Commercial Energy Total			**275,760**
Industrial Energy	Electricity	715,360	kWh	339
	Natural Gas	54,817	Therms	291
	Industrial Energy Total			**630**
Transportation & Mobile Sources	Gasoline	595,864,338	VMT	245,560
	Diesel	63,569,414	VMT	92,647
	Aviation	1,089,897	Gallons	9,088
	Rail	86,882	Gallons	895
	Transportation & Mobile Sources Total			**348,190**
Solid Waste*	Waste Sent to Landfill	81,962	Tons	50,859
	Compost	4,550	Tons	269
	Flaring of Landfill Gas			53
	Solid Waste Total			**51,181**

*Blank cells are a result of variability in the format of available data by sector and fuel or source type.

Table 3: Community-Wide Emissions Inventory (continued)

Sector	Fuel or Source	2021 Usage	Usage Unit	2021 Emissions ($MTCO_2e$)
Water & Wastewater*	Wastewater - Digester Gas Flaring			263
	N2O			368
	Water & Wastewater Total			**631**
Process & Fugitive Emissions	Natural Gas Distribution	5,656,540	MMBtu	9,814
	Process & Fugitive Emissions Total			**9,814**
	Total Gross Emissions			**1,005,898**
Forests and Trees*	Removals from Forests			3,212
	Removals from Trees Outside of Forests			-4,470
	Forest and Trees Emissions Total			**-1,258**
	Total Emissions with Sequestration			**1,004,640**

*Blank cells are a result of variability in the format of available data by sector and fuel or source type.

Figure 4 shows the distribution of community-wide emissions by sector. Transportation is the largest contributor, followed by Residential & Commercial Energy.

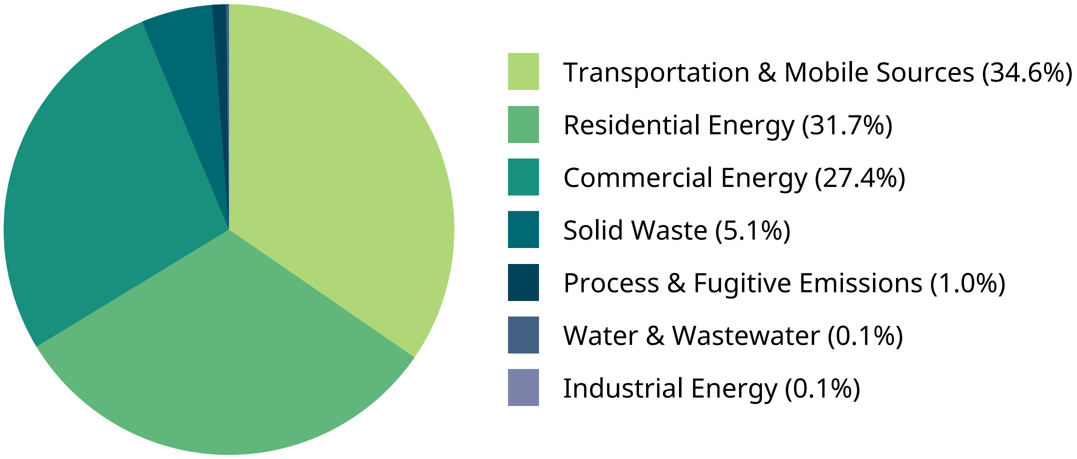


Figure 4: Community-Wide Emissions by Sector

Table 4: 2015 and 2021 Primary Community-Wide Emissions Comparison

Sector	Fuel or Source	2015 Usage	2021 Usage	2015 Emissions	2021 Emissions	Percent Change
Residential Energy	Electricity	224,194,127	259,749,242	136,033	123,246	-9%
	Natural Gas	30,634,330	36,935,401	162,933	196,446	21%
Residential Energy Total				**298,966**	**319,692**	**7%**
Commercial Energy	Electricity	296,912,661	361,753,781	180,156	171,646	-5%
	Natural Gas	18,009,665	19,575,183	95,787	104,114	9%
Commercial Energy Total				**275,943**	**275,760**	**0%**
Industrial Energy*	Electricity		715,360		339	N/A
	Natural Gas	90,631	54,817	481	291	-40%
Industrial Energy Total				**481**	**630**	**31%**
Transportation & Mobile Sources	Gasoline	861,075,150	595,864,338	373,537	245,560	-34%
	Diesel	98,874,850	63,569,414	138,244	92,647	-33%
	Aviation	1,089,897	1,089,897	9,304	9,088	-2%
	Rail	117,055	86,882	1,206	895	-26%
Transportation & Mobile Sources Total				**522,290**	**348,190**	**-33%**
Solid Waste*	Waste Sent to Landfill	71,592	81,962	44,425	50,859	14%
	Compost	4,096	4,550	210	269	28%
	Flaring of Landfill Gas			21	53	158%
Solid Waste Total				**44,656**	**51,181**	**15%**
Water & Wastewater*	Wastewater Digester Gas Flaring			261	263	1%
	N2O			695	368	-47%
Water & Wastewater Total				**956**	**632**	**-34%**

*Blank cells are a result of variability in the format of available data by sector and fuel or source type.

Table 4: 2017 and 2021 Primary Community-Wide Emissions Comparison

Sector	Fuel or Source	2015 Usage	2021 Usage	2015 Emissions	2021 Emissions	Percent Change
Process and Fugitive	Natural Gas Distribution	4,873,522	5,656,540	8,455	9,814	16%
	Process and Fugitive Total			**8,455**	**9,814**	**16%**
	Total Gross Emissions			**1,026,069**	**1,005,898**	**-1.97%**
Forests & Trees*	Removals from Forests				3,212	N/A
	Removals from Trees Outside of Forests				-4,470	N/A
	Forest & Trees Total				**-1,258**	N/A
	Total Emissions with Sequestration			**1,026,069**	**1,005,898**	**-12.66%**

*Blank cells are a result of variability in the format of available data by sector and fuel or source type.

Comparison Discussion

The above table compares 2015 and 2021 activity data and emissions (MT CO2e). When comparing inventories six years apart, it must be recognized that the data collection and the inventory process could have been conducted differently. Most notably, data collection methodologies have become more accurate. The various patterns and outliers displayed in the above table might be partly based on the aforementioned inventory changes. For example, daily nitrogen load data was not available in 2015; therefore, the quality of the data sources changed between 2015 and 2017. Additionally, 2021 aviation data was not available, and 2015 data was used in its place. As shown in Table 4, greenhouse gas (GHG) emissions increased for Residential Energy, Industrial Energy, Solid Waste, and Process and Fugitive emissions between 2015 and 2021. GHG emissions from Transportation and Water & Wastewater decreased, while Commercial Energy remained the same. Emissions from Forests & Trees and electricity for Industrial Energy were not accounted for in the 2015 inventory.

Next Steps

The inventory should be used to focus and prioritize actions to reduce emissions. Based on the inventory results, the following areas have the greatest potential for emissions reduction:

- On-road transportation
  - Vehicle electrification- Transition from internal combustion engine vehicles (passenger, transit fleets, municipal fleets, etc.) to electric-powered
  - Land use/infrastructure planning- Improving infrastructure to incentivize public transit usage, walking, and biking
  - Work with communities to expand public transportation options
- Community electricity use
  - Increase distributed solar
- Community stationary fuels use
  - Electrify building heating- Convert gas-powered heating appliances (e.g., water heaters) to electric powered
- Solid Waste
  - Improve recycling and composting programs to reduce organic waste content in waste streams

Completion of another GHG inventory in two to five years is recommended to assess progress resulting from any actions implemented. The detailed methodology section of this report, as well as notes and attached data files in the ClearPath Climate Planner tool and a master data Excel file provided to the City, will help the City with completing a future inventory consistent with this one.

Conclusion

This inventory marks the completion of Milestone Five of the Five ICLEI Climate Mitigation Milestones. The next steps are to continue forecasting emissions, setting emissions-reduction targets, and to build upon the existing Sustainable Santa Fe 25-Year Plan, as needed.

The Intergovernmental Panel on Climate Change (IPCC) states that to meet the Paris Agreement commitment of keeping warming below 1.5°C we must reduce global emissions by 50% by 2030 and reach climate neutrality by 2050. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations reduce their emissions by more than 50%. More than ever, it is imperative that countries, regions, and local governments set targets that are ambitious enough to slash carbon emissions between now and mid-century.

Science-Based Targets are calculated climate goals, in line with the latest climate science, that represent a community's fair share of the global ambition necessary to meet the Paris Agreement commitment. Community education, involvement, and partnerships will be instrumental to achieve a science-based target.

To support the bold climate action of Santa Fe, ICLEI has calculated the city's Science-Based Targets [7]:

- **Per-Capita SBT: 62.9%**
- **Absolute SBT: 61.5%**

Science-Based Targets are climate goals in line with the latest climate science. They represent the city's fair share of the ambition necessary to meet the Paris Agreement commitment to keep warming below 1.5°C.

In addition, Santa Fe will continue to track key energy use and emissions indicators on an on-going basis. It is recommended that communities update their inventories on a regular basis, especially as plans are implemented to ensure measurement and verification of impacts. Regular inventories also allow for "rolling averages" to provide insight into sustained changes and can help reduce the change of an anomalous year being incorrectly interpreted. This inventory shows that residential and commercial energy as well as community-wide transportation patterns will be particularly important to focus on. Through these efforts and others, Santa Fe can achieve environmental, economic, and social benefits beyond reducing emissions.

[7] "Science Based Climate Targets: A Guide for Cities." Science Based Targets Network, November 4, 2021. https://sciencebasedtargetsnetwork.org/.

Appendix: Methodology Details

Energy

Table 5: Energy Data Sources

Activity	Data Source	Data Gaps/Assumptions
Residential Electricity	PNM Resources	N/A
Commercial Electricity	PNM Resources	N/A
Industrial Electricity	PNM Resources	N/A

Table 6: Emissions Factors for Electricity Consumption

Emissions Factor/ Year	CO_2 (lbs./MWh)	CH_4(lbs./GWh)	N_2O (lbs./GWh)	Data Gaps and Assumptions
PNM 2021	1,039	106.32	15.38	

Transportation

Table 7: Transportation Data Sources

Activity	Data Source	Data Gaps/Assumptions
On-road transportation	2020 default from US Community Protocol (Google EIE)	This record represents all gas vehicles on the road.
Railway	City of San Antonio	Combustion for railway transportation within city boundary considered negligible and not reported

For vehicle transportation, it is necessary to apply average miles per gallon and emissions factors for CH4 and N2O to each vehicle type. The factors used are shown in Table 8.

Table 8: MPG and Emissions Factors by Vehicle Type

Fuel	Vehicle Type	MPG	CH_4 (g/mile)	N_2O (g/mile)
Gasoline	Passenger car	24.38	0.018	0.0074
Gasoline	Motorcycle	24.38	0.018	0.0074
Diesel	Passenger car	24.38	0.0005	0.001
Diesel	Light truck	17.87	0.019	0.013
Diesel	Heavy truck	5.38	0.072	0.061

Wastewater

No data gaps or assumptions, data collected directly from utility.

Potable Water

No data gaps or assumptions, data collected from natural gas provider/s.

Solid Waste

No data gaps or assumptions, data collected from landfill/s.

Fugitive Emissions

No data gaps or assumptions, data collected from natural gas provider/s.

Inventory Calculations

The 2021 inventory was calculated following the US Community Protocol and ICLEI's ClearPath Climate Planner software. As discussed in Inventory Methodology, the IPCC 5th Assessment was used for global warming potential (GWP) values to convert methane and nitrous oxide to CO2 equivalent units. ClearPath Climate Planner's inventory calculators allow for input of the sector activity (i.e. kWh or VMT) and emission factor to calculate the final carbon dioxide equivalent (CO2e) emissions.