City of Albuquerque

ONE ALBUQUERQUE environmental health

GREENHOUSE GAS INVENTORY 2020

Contact Info:
(505-768-2738)
www.cabq.gov/sustainability
sustainability@cabq.gov

TABLE OF CONTENTS

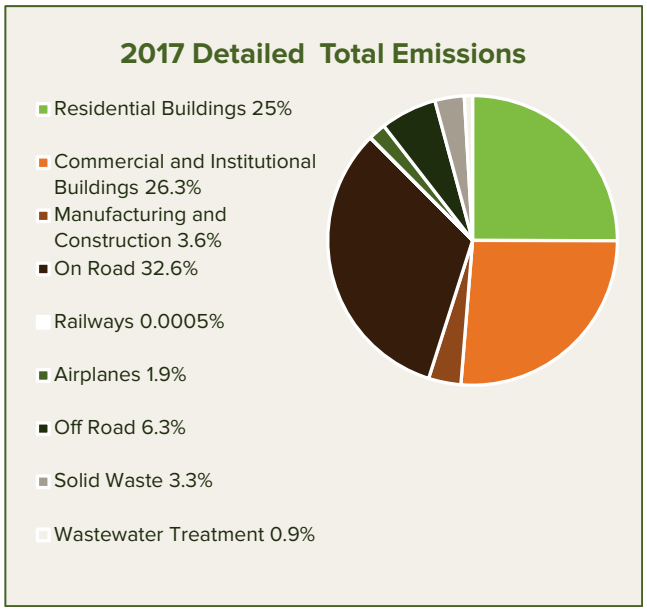
EXECUTIVE SUMMARY

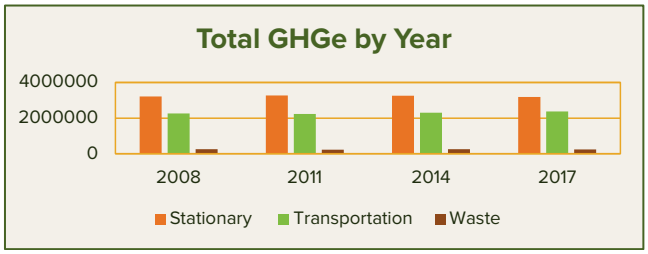
Tracking greenhouse gas data is vital for any effective climate change strategy. The City of Albuquerque created this greenhouse gas ("GHG") inventory to set a baseline understanding of where GHG emissions (GHGe) come from and the amount produced. This inventory provides a snapshot of Albuquerque's trends between 2008 and 2017 and covers stationary sources (buildings), transportation and waste. Data was prepared following the Global Protocol for Community Scale Greenhouse Gas Emission Inventories (GPC) using the City Inventory Reporting and Information System (CIRIS) tool.

In 2017, the City of Albuquerque produced 5,809,351 metric tons of CO2 equivalent, which resulted in an average of 10.37 metric tons of CO2 produced by each of Albuquerque's residents for that year. Major contributors to the City's GHG emissions include on-road transportation (33%), commercial and institutional buildings (26%), and residential buildings (25%). Between 2008 and 2017, Albuquerque's GHGe did not change significantly.

Stationary energy[1] is Albuquerque's largest emissions producer at 55% of total emissions with powering commercial and residential buildings as the major sources within this category. Transportation is the next largest producer of Albuquerque-based emissions and includes on-road and off-road transportation, railways, and aviation with the majority of emissions coming from on-road transportation. Waste only produces around 4% of Albuquerque's total emissions, but is still a significant source with emissions releasing mainly in landfills as waste starts to break down producing methane, a very powerful greenhouse gas.

The findings of this inventory will inform future climate change mitigation efforts within the City of Albuquerque. Action by many stakeholders at all levels of impact will be necessary to create a downward trajectory in the City's total emissions.





[1] Stationary energy is all the energy that is used to power commercial, institutional and residential buildings in the entire city.

INTRODUCTION

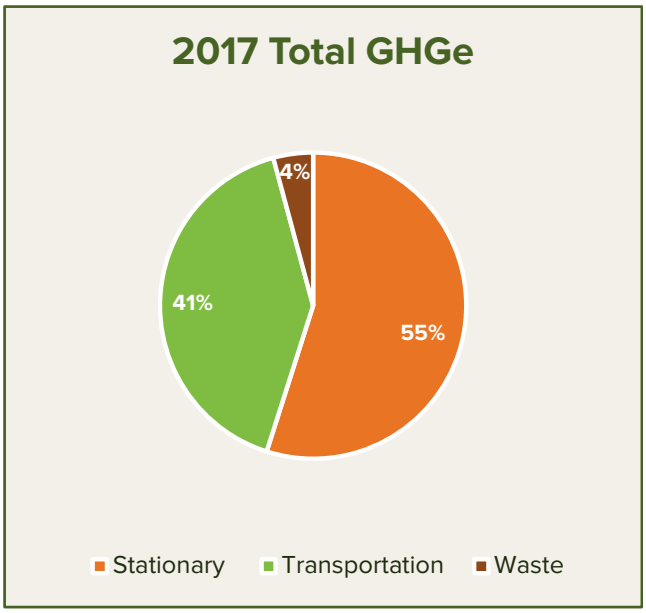
Situated between the scenic Sandia Mountains and the Rio Grande, Albuquerque's arid climate, natural beauty, and abundant resources have attracted people and wildlife for centuries. The City now stands as an epicenter of trade, industry, and innovation, resulting in continued and projected population growth. [2] Key to sustainable growth is matching future development with actions to curb increases in greenhouse gas emissions.

Greenhouse gas emissions and climate change have dramatic impacts on everyone. With even the modest increase of 1°C seen over 2019, there has been a large increase in wildfires leading to respiratory health effects. Climate change can also lead to food insecurity, disruptions to water quality, as well as allergy and disease spread. Rising temperatures, extreme rainfall events, and drought all lead to major health effects that can still be unpredictable.[3]

This report marks one of the central steps in a citywide effort to take quick action to lessen Albuquerque's contribution to climate change and prepare for future impacts. The Albuquerque GHG Inventory Report will serve as a baseline to track emissions — providing a snapshot of the types of human activity resulting in significant GHG emissions by different sectors (stationary sources, transportation, and waste). Now with a clear view of Albuquerque's emissions landscape, city leaders and residents can strategically prioritize and implement actions to safeguard environmental and human health.

DID YOU KNOW?

The City of Albuquerque uses a "ZEV First" policy to replace vehicles with low and no emissions alternatives.



[2] University of New Mexico Geospatial and Population Studies (n.d.) Population Projections. Retrieved September 22, 2020, from https://gps.unm.edu/pru/projections.

[3] Ecosystem Management, Inc. (2014). Climate Change Effects on Central New Mexico's Land Use, Transportation System and Key Natural Resources. Retrieved on September 22, 2020 from https://www.mrcog-nm.gov/DocumentCenter/View/2222/Effects-of-Climate-Change-on-Central-New-Mexico-PDF?bidId=

INVENTORY SCOPE

The City of Albuquerque Greenhouse Gas Inventory was prepared in accordance with the GPC using the CIRIS tool. The GPC is an internationally accepted method for transportation, waste production, and energy use. This report provides a snapshot of emissions from human activity for 2008, 2011, 2014, and 2017 within Albuquerque's city limits from the most prevalent emissions sources. The inventory spans the three emissions source categories seen below.

Throughout the report, total greenhouse gas emissions are referenced by their carbon dioxide equivalent (CO2e). This means that other greenhouse gas emissions will be converted to represent how many metric tons of CO2 it would require to have the same warming effect (see Appendix A).

This report also focuses on providing a snapshot of emissions from Albuquerque's residents, employees, and visitors within or originating from the city limits. It does not include GHG emissions related to the consumption of goods within the city limits that originated elsewhere. This report also does not include non-energy related industrial activities or agriculture, forestry, or other land-use emissions or sinks.

SCOPE 1

STATIONARY SOURCES

Electricity generation and combustible fuel use, including natural gas for building heating, cooking, etc.

SCOPE 2

TRANSPORTATION

Driving within city limits

SCOPE 3

WATER & WASTEWATER

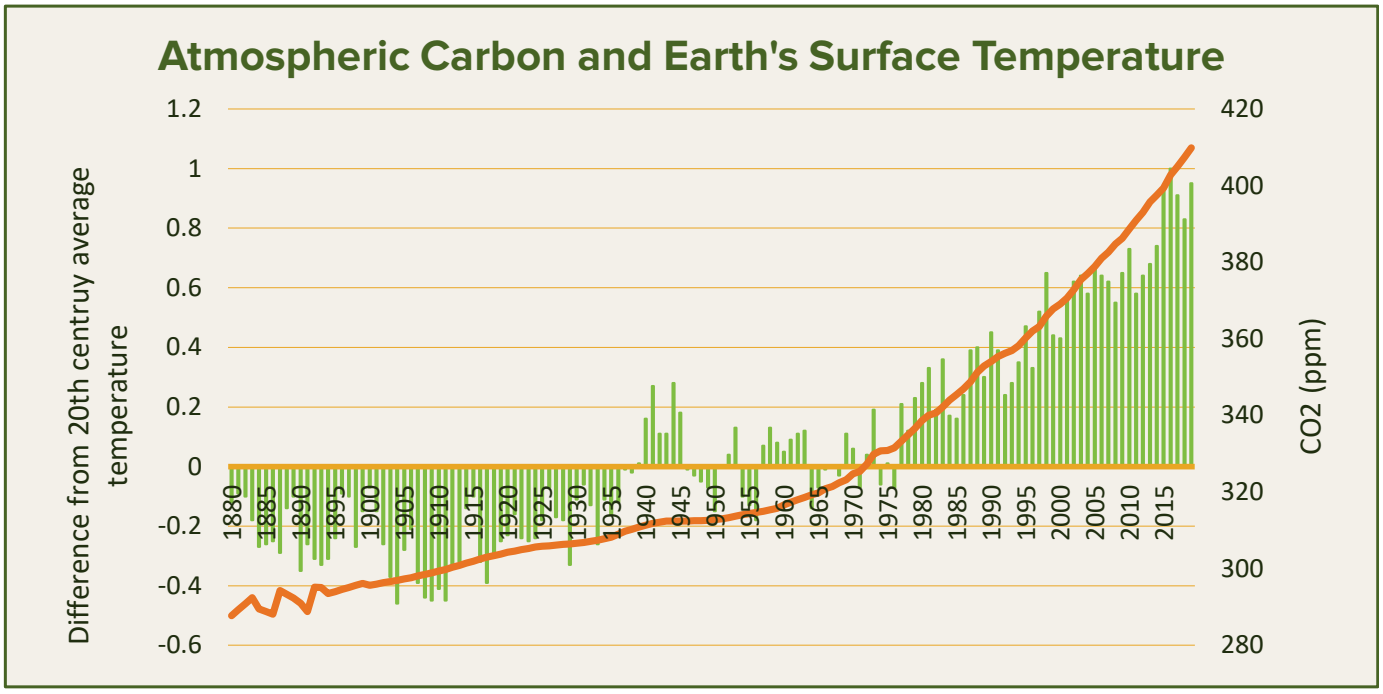
Waste generation

GREENHOUSE GASES AND CLIMATE CHANGE

Greenhouse gases are gas molecules that trap heat in our atmosphere and create a warming effect, much like in a greenhouse. Our atmosphere has natural levels of GHGs; however, the industrial revolution began an exponential increase in GHG concentration as societies started burning fossil fuels on a massive scale. As seen in the graph below, as more carbon dioxide has been released into the air over time, the world's atmosphere has trapped more heat than ever before, resulting in the process we know as climate change.

Greenhouse gases include multiple chemical compounds and some are more common than others. Carbon dioxide (CO2) is the most prevalent, accounting for approximately 81% of all GHGe released in the U.S. [4] Humans produce CO2 when we breathe and when we burn fossil fuels. Other common GHGs include methane (CH4) (approximately 10% of all GHG emissions in the U.S.), nitrous oxide (N2O) (~7%), and fluorinated gas (~3%).

The warming potential for each GHG varies as each compound traps a different amount of heat. For example, hydrofluorocarbons, sometimes used as refrigerants or fire suppressing agents, are hundreds to thousands of times more potent than CO2. For a more comprehensive list of GHG and their CO2 equivalents, refer to Appendix A.



[4] EPA (2020). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018. Retrieved on September 22, 2020 from https://www.epa.gov/sites/production/files/2020-04/documents/us-ghg-inventory-2020-main-text.pdf

STATIONARY ENERGY

Albuquerque's stationary energy emissions equaled 3,189,800 metric tons of CO2 and account for more than half (55%) of the City's total GHGe in 2017. Of that, 48% is from commercial/institutional sources, 46% is from residential, and 7% is from manufacturing and construction.

The GHGe from this section derive from two sources: the burning of natural gas, and the use of electricity. In Albuquerque, all natural gas is supplied by one publicly regulated entity: the New Mexico Gas Company (NMGC). Natural gas is used for heating, cooking, and electricity generation.

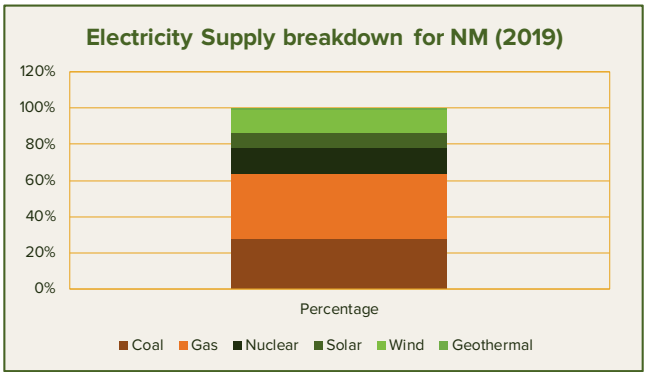
GHGe for electricity are challenging to inventory because each unit of generated electricity produces a different amount of GHGe. This is due to the differing types of energy sources used to generate electricity. Currently, Public Service New Mexico (PNM), Albuquerque's electric utility, generates energy from coal, natural gas, nuclear, solar, wind and geothermal, as shown in the chart below.[5]

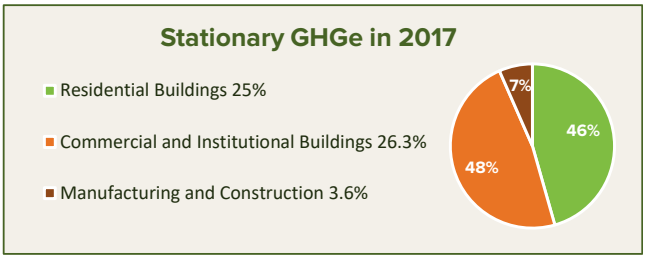
The types of energy sources used for power generation vary based on consumer demand, which changes hour-to-hour, and season-to-season. When energy needs are high (e.g. mid-day, mid-winter), utilities typically use peak load energy supply which can include natural gas and wind. In off-peak hours, baseload energy such as coal and solar with storage can be used. Weather conditions also affect the productivity of renewables, causing some higher and lower production at certain times of the year.

As of 2019, PNM has committed to phasing out its coal and some natural gas-fired power plants and increasing its reliance on solar to achieve a goal of 100% emissions free energy generation by 2040.[6] As the trajectory of adopting emissions-free energy unfolds, the City can expect to see declines in GHGe produced through power generation.

Although energy efficiency measures can help to lessen the buildings' energy consumption thereby reducing GHGe produced, phasing out emissions-producing energy sources is vital to eliminating power generation emissions. Take the City of Albuquerque's electricity use for municipal buildings for example. As seen in the chart above, from 2010-2017 consumption steadily declined thanks to investments in energy efficiency upgrades, yet the GHGe produced from the production of that electricity fluctuates.

In New Mexico, multiple programs and efforts support both commercial and residential energy efficiency. The New Mexico Mortgage Finance Authority (MFA) utilizes federal and local utility funding to support home energy upgrades for





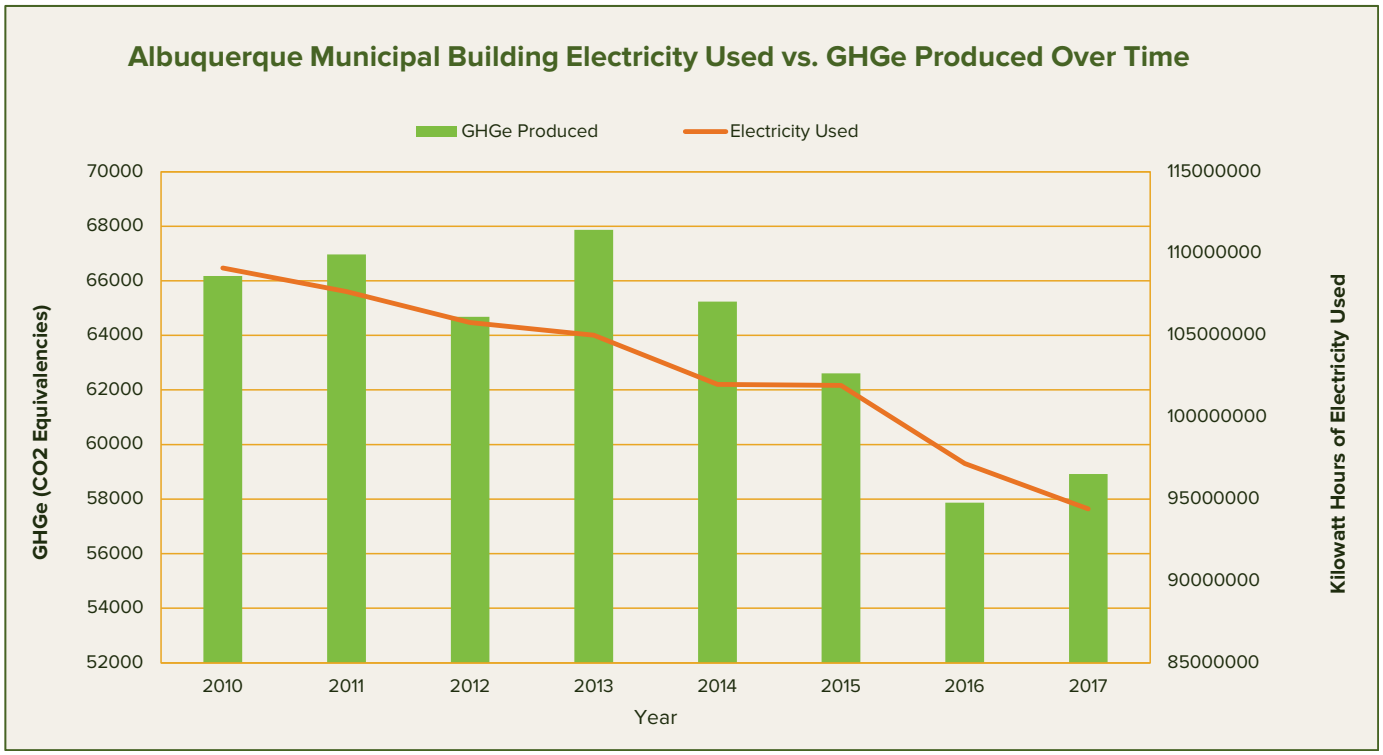
[5] PNM (2019). Energy Sources. Retrieved on September 22, 2020 from https://www.pnm.com/energy-sources
[6] PNM (2020). Our Commitment. Retrieved on November 6, 2020 from https://www.pnm.com/our-commitment

low income homes through its NM Energy$mart Program. Following the passage of the 2005 Efficient Use of Energy Act, utilities have created a variety of energy-use reduction programs including audits and upgrades for low-income and multifamily homes.

In 2020, the City of Albuquerque adopted the 2018 International Energy Conservation Code, which sets more energy efficient standards for new construction. Finally, the State of New Mexico offers the Sustainable Building Tax Credit to encourage private sector design and construction of energy efficient buildings for commercial and residential use.

DID YOU KNOW?

The City of ABQ makes investments in its own facilities to increase energy efficiency with a carve-out from its capital improvement budget known as the 3% for Energy Conservation Fund.

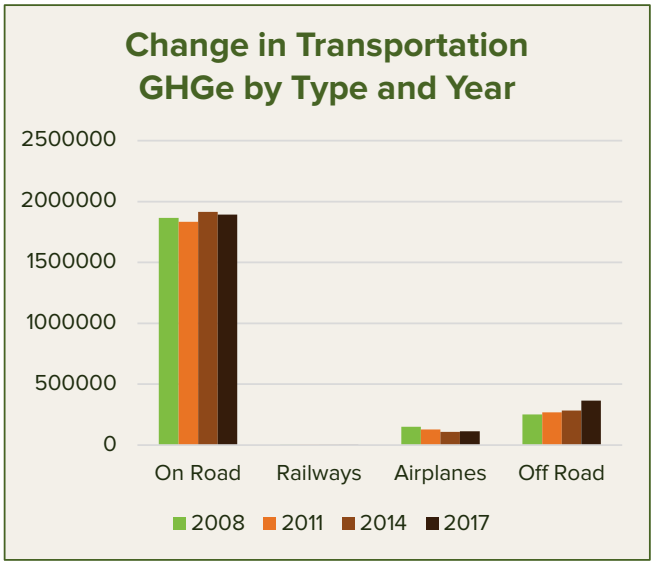


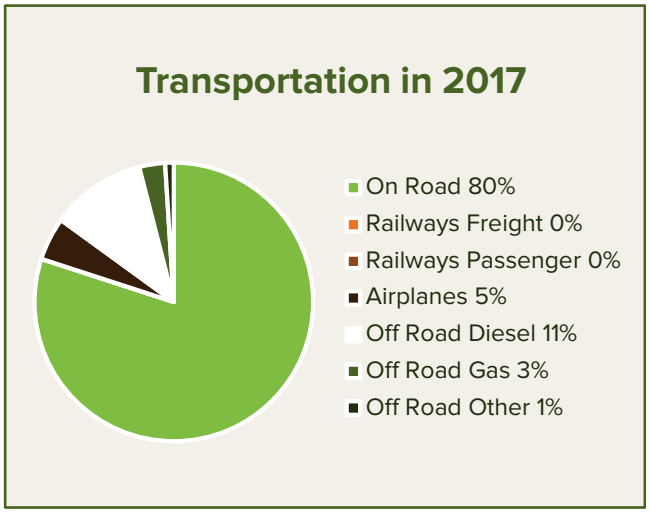
TRANSPORTATION

With an international airport, rail, and interstate connections, Albuquerque is the state's major transportation hub and a spread-out, southwestern city. Both of these factors contribute to the City's significant levels of GHG emissions deriving from transportation, which equal to forty percent of Albuquerque's total emissions and approximately 2,310,992 metric tons of CO2. A majority of these emissions come from on-road travel that produces about 1,914,544 tons CO2e. On-road transportation is made up of all the travel that has to take place in a vehicle every day, such as commuting to and from work. The remaining emissions within the transportation sector come from off-road travel, aviation and railways.

While GHG emissions from travel can be challenging to calculate, this report utilized the best data available to estimate all journeys by road, rail, and air, including inter-city and international travel from within the city limits.[7] As seen in the accompanying graph, changes in transportation GHGe have not shown significant downward trends overtime. Airplane emissions have made some downward progress while off-road emissions have increased.

The amount of vehicle-based travel occurring every day calls for creative ways to reduce GHG emissions. Looking to the future of tackling transportation emissions, the City has updated its vehicle procurement policy to prioritize low and no emissions vehicles in all classes and is committed to increasing electric vehicles (EV) charging infrastructure. The City also supports expanding options for active transportation options through efforts to improve pedestrian safety and bike lanes, while also supporting public transit.





[7] Data for on-road travel is estimated from MRCOG's travel demand forecast; rail from BNSF Railway and Amtrak Railroad financial reports, Aviation from EPA's National Inventory Data; and off-road transportation from EPA's National Emissions Inventory Data.

WASTE

Waste accounts for about 4% of the City of Albuquerque's GHG emissions for a total of 243,627 metric tons of CO2. There are two forms of waste included in this sector: solid waste and wastewater treatment.

Solid waste is garbage or trash thrown away by residents, typically sent to the landfill. Solid waste in Albuquerque is sent to the Cerro Colorado Landfill located on the top of the west downtown area.

Each year, the Cerro Colorado landfill accepts about 525,000 tons of residential and commercial trash.[8] This waste will release chemicals into the atmosphere and surrounding land as it decomposes. In particular, organic waste can form methane as the material breaks down. Methane is a potent greenhouse gas, so to reduce these emissions, methane from the landfill is captured, transported by pipeline two miles, and sold to Bernalillo County's Metropolitan Detention Center where it is used to heat water, reducing the demand for fossil fuel at that site.

GHG emissions are also created by treating wastewater at Albuquerque Water Authority's Southside Wastewater Reclamation Plant. Each day, the plant treats about 55 million gallons of wastewater.[9] As the wastewater is treated and breaks down, methane and other GHGs are generated. Methane is captured from organic waste and used to generate about 6.6 MWh of electricity at the site, about 70% of the plant's energy needs. Any stabilized biosolids are dewatered and used as rangeland compost.

Reducing emissions created by waste often relies on diverting organic waste sent to the landfill. Recycling, composting and reducing the use of paper waste and other organic materials are some ways of reducing emissions created by organic waste breakdown.[10] Food waste is often a major contributor to waste GHG emissions, with a recent report citing that as much as 10% of human-induced greenhouse gas emissions globally.[11] Planning purposefully around food consumption, committing to food reuse and composting when possible are some recommended best practices.

[8] City of Albuquerque. Solid Waste Department. Retrieved on November 6, 2020 from https://www.cabq.gov/solidwaste/trash-collection/cerro-colorado-landfill

[9] Albuquerque Bernalillo County Water Utility Authority. Water Resources Education. Retrieved on November 6, 2020 from https://abcwua.org/education/30_SWRP.html

[10] U.S. Environmental Protection Agency. Climate Change and Municipal Solid Waste. Retrieved on November 6, 2020 from https://archive.epa.gov/wastes/conserve/tools/payt/web/html/factfin.html

[11] Allison Aubrey, National Public Radio. How to Reduce Food Waste. Retrieved on November 6, 2020 from https://www.npr.org/2019/12/10/786867315/how-to-reduce-food-waste

WHAT'S NEXT?

Climate Change is predicted to present a variety of challenges for Albuquerque including rising summer temperatures, haze from ground-level ozone, and uncertainty regarding water supply. There is room for action to mitigate and adapt to climate change at all levels of the community. It will take continuous engagement by industry, government and individuals to make a real impact in reducing greenhouse gas emissions. By completing this GHG Inventory, Albuquerque can now begin more informed discussions on the current reality that can lead to new programs, policies and investments.

Vital to Albuquerque's climate future is understanding that climate change impacts fall more heavily on some than others. Low-income communities across the world and even within our city limits are already experiencing a disproportionate burden of the impacts of climate change. Frontline communities are often more exposed to the negative effects of climate change and have the hardest time recovering from these impacts.[12] In order to fight climate change we must be able to allocate more resources to the communities who need it the most.

While the GHG Inventory provides direction founded in data, it is just one of many steps Albuquerque is taking to solidify itself as a sustainable, resilient, and equitable city. Albuquerque City government under the leadership of Mayor Keller has aligned itself with the goals of the Paris Climate Agreement and set out ambitious goals to achieve 100% renewable energy use by 2030, as well as leading in increasing energy efficiency and electric vehicle adoption. The City is also committed to environmental equity — ensuring that frontline communities are supported in obtaining the benefits of low and zero-emission technology. Despite uncertainties in looking to the future of our planet, Albuquerque is committed to leading in a collective response to climate change.

DID YOU KNOW?

Based on a study in 2015 for all residential houses in the US, airconditioning was found to be the biggest consumer of electricity (16.9%), followed by space heating (14.8%), water heating (13.7%), then lighting (10.3%).

[12] S. Nazrul Islam and John Winkel (2017) Climate Change and Social Inequality, Department of Economic and Social Affairs. Retrieved on October 1, 2020 from https://www.un.org/esa/desa/papers/2017/wp152_2017.pdf

GLOSSARY

ENERGY INTERMITTENCY: energy that is irregular in supply, i.e. that is subject to interruption. For renewable energy, wind and solar production has issues with energy intermittency because energy can only be produced when the wind is blowing or the sun shining. This is challenging for planning electricity supply.

ENERGY MIX: the combination of electric production methods that result in an area's total energy supply.

GHG POTENCY: a measure of the effectiveness of a given greenhouse gas at warming the atmosphere, typically denoted in CO2 equivalents or Global Warming Potential.

PEAK DEMAND: the time in a given period where the demand or need for electricity is at its highest. For example, PNM's highest energy demand occurs from 4-6 pm in summer, and 7-9 pm in winter and the lowest demand is 2-6 am year-round.[13]

[13] PNM (2017). Integrated resource plan 2017-2036. Retrieved on September 21, 2020 from https://www.pnm.com/documents/396023/396193/PNM+2017+IRP+Appendices+Final.pdf/84196a57-1ba5-4c33-b346-1f15fc7bdaf6

APPENDIX A: GLOBAL WARMING POTENTIAL VALUES FOR GREENHOUSE GASES

Table 5.2 GWP of major GHG gases

Name	Formula	GWP values in IPCC Second Assessment Report[19] (CO_2e)	GWP values in IPCC Third Assessment Report[20] (CO_2e)	GWP values in IPCC Fourth Assessment Report[21] (CO_2e)	GWP values in IPCC Fifth Assessment Report[22] (CO_2e)
Carbon dioxide	CO_2	1	1	1	1
Methane	CH_4	21	23	25	28
Nitrous oxide	N_2O	310	296	298	265
Sulfur hexafluoride	SF_6	23,900	22,200	22,800	23,500
Carbon tetrafluoride	CF_4	6,500	5,700	7,390	6,630
Hexafluoroethane	C_2F_6	9,200	11,900	12,200	11,100
HFC-23	CHF_3	11,700	12,000	14,800	12,400
HFC-32	CH_2F_2	650	550	675	677
HFC-41	CH_3F	150	97	92	116
HFC-125	C_2HF_5	2,800	3,400	3,500	3,170
HFC-134	$C_2H_2F_4$	1,000	1,100	1,100	1,120
HFC-134a	CH_2FCF_3	1,300	1,300	14,300	1,300
HFC-143	$C_2H_3F_3$	300	330	353	328
HFC-143a	$C_2H_3F_3$	3,800	4,300	4,470	4,800
HFC-152a	$C_2H_4F_2$	140	120	124	138
HFC-227ea	C_3HF_7	2,900	3,500	3,220	3,350
HFC-236fa	$C_3H_2F_6$	6,300	9,400	9,810	8,060
HFC-245ca	$C_3H_3F_5$	560	950	1,030	716
Nitrogen trifluoride	NF_3	-	-	17,200	16,100

19. IPCC. 1995, IPCC Second Assessment Report: Climate Change 1995

20. IPCC. 2001, IPCC Third Assessment Report: Climate Change 2001

21. IPCC. 2007, IPCC Fourth Assessment Report: Climate Change 2007

22. IPCC. 2013, IPCC Fifth Assessment Report: Climate Change 2013

APPENDIX B: DATA CLARIFICATIONS

RELEVANCE AND COMPLETENESS:

The data was estimated using the processes identified by the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories by the Greenhouse Gas Protocol. Resources and full written protocol can be found at https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities#supporting-documents.

This report includes the majority of the applicable emissions sources within city limits when taking into consideration the activities and consumption patterns of the city. Data processes are estimations and should only be compared to other GHG estimates using the same estimation processes.

CONSISTENCY:

The City of Albuquerque commits to ensuring all emission calculations in this report are as consistent in approach, boundary, and methodology as possible between the baseline and current year for the purposes of understanding trends within the city over time. The protocol also serves as a standard for possible comparison with various other participating municipalities. However, some methodology choices could differ between municipalities.

TRANSPARENCY:

Full report, data, links and calculations are available on the City of Albuquerque's Sustainability at http://www.cabq.gov/sustainability

ACCURACY:

All GHG calculations made in this report are as accurate as possible. Stationary energy emissions come from the energy used by buildings and facilities. This includes all emissions related to the burning of natural gas for heating, and the emissions created by electricity generation inside and outside city limits. In this section, data was collected from New Mexico Gas Company and PNM for all consumption of electricity and natural gas for buildings within the city. It does not include fugitive emissions, which are emissions of gas that occur during the extraction, transformation, and transportation of primary fossil fuels. This section also does includes but does not break-out stationary sources of GHG from agriculture, forestry, and other non-specific sources of emissions.

Refer to descriptions listed in the excel spreadsheets for additional information.

GREENHOUSE GAS INVENTORY

505-768-2738

sustainability@cabq.gov

www.cabq.gov/sustainability