# Santa Fe County, New Mexico

## 2023 Community GHG Climate Action Plan

**May, 2023**

**Produced by ICLEI - Local Governments for Sustainability USA**

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# Abbreviations

| | |
|---|---|
| CMIP | Coupled Model Intercomparison Project |
| GHG | Greenhouse gas |
| IPCC | Intergovernmental Panel on Climate Change |
| NCCV | National Climate Change Viewer |
| NCEI | National Centers for Environmental Information |
| NOAA | National Oceanic and Atmospheric Administration |
| PSI | Pounds per square inch |
| RCP | Representative Concentration Pathway |
| USGS | U.S. Geological Survey |
| VPD | Vapor pressure deficit |

# Executive Summary

This plan presents forecasted business as usual community and government operations greenhouse gas (GHG) emissions for Santa Fe County, NM, and presents a plausible, practicable plan to reduce community GHG emissions by 58% between 2019 and 2030. This represents a science-based target that will allow Santa Fe County to do its part in keeping average global temperatures below the critical threshold of 1.5°C (2.7°F) above pre-industrial temperatures.

The plan includes specific annual emissions reduction targets for seven sectors: transportation; residential buildings; commercial buildings; energy production; waste and recycling; water and wastewater management; and nature-based emissions and removals. The plan recommends ways of achieving those targets, specifically taking into account the local priorities of Santa Fe County, including plans to increase tree coverage in the County, increase surface water capture, and improve soil health, as well as a planned effort to increase housing affordability by reducing utility costs to low income residents.

If the County can successfully implement these strategies, prioritized by impact, then the 2030 GHG emissions target is possible, and net zero emissions can be achieved by 2050, as shown in Table 1.

**Table 1:** Amount of greenhouse gas emissions reduction possible with low, medium, or high effort.

| Effort | Low | Medium | High |
|---|---|---|---|
| **Percent reduction from 2019 to 2030** | **26.7** | **54.0** | **76.9** |
| **Percent reduction from 2019 to 2050** | **53.8** | **98.0** | **104.1** |

This plan seeks to lay the foundation for future integrated planning efforts that bring together the County's efforts to 1) mitigate GHG emissions and 2) adapt to climate change related hazards. The plan's Climate Conditions Report outlines emerging risks and the projections of future climate and community needs related to rising temperatures, extreme rainfall, flooding, drought, and wildfire.

ICLEI USA developed this plan in partnership with the County. ICLEI is the first and largest global network of local governments devoted to solving the world's most intractable sustainability

challenges. Our standards, tools, and programs credibly, transparently, and robustly reduce GHG emissions, improve lives and livelihoods and protect natural resources in the communities we serve.

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# Climate Change in Santa Fe

## Introduction

This section of the plan summarizes Santa Fe County's exposure to climate-related hazards by synthesizing research and data about current hazards, trends, and possible future conditions. Data points from climate projections are included, when available. Further information was drawn from scientific reports and academic articles, which are referenced in the text.

## Definitions

The definitions used in this report are reprinted from multiple sources, including the U.S. Climate Resilience Toolkit glossary, Intergovernmental Governmental Panel on Climate Change (IPCC) Annex II 2014 and 2022 glossaries, and other sources as cited. Note that some definitions have been adapted for readability and relevance.

**Aridity:** The state of a long-term climatic feature characterized by low average precipitation or available water in a region.[1]

**Baseline:** The baseline, which may also be referred to as a reference period, is the state against which change is measured.[2] In this report, the baseline typically refers to the average across a modeled historical period.

**Climate change:** A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.[3]

**Climate models:** Mathematical models that simulate the physical, chemical, and biological processes that influence the climate system.[4]

**Climate projections:** Simulated responses of the climate system to a scenario of future concentrations of greenhouse gases (GHGs) and aerosols, along with changes in land use, generally derived using climate models. Climate projections vary based on the

[1] IPCC, "Annex II: Glossary," AR6 (Cambridge, UK and New York, USA, 2022), https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Annex-II.pdf.
[2] IPCC, "Annex II: Glossary," AR5 (Cambridge, UK and New York, USA, 2014), https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Annex-II.pdf.
[3] IPCC, "Annex II: Glossary," 2022.
[4] USGCRP, "Glossary," GlobalChange.gov, accessed February 21, 2023, https://www.globalchange.gov/climate-change/glossary.

emission/concentration/radiative forcing scenario used; these scenarios in turn are based on assumptions concerning, for example, future emissions and socioeconomic and technological developments that may or may not be realized.[5]

**Drought:** An exceptional period of water shortage for existing ecosystems and the human population (due to low rainfall, high temperature and/or wind).[6]

**Ensemble modeling:** Using a collection of climate model simulations to characterize a climate projection.[7]

**Evapotranspiration:** The combined processes through which water is transferred to the atmosphere from open water and ice surfaces, bare soil and vegetation that make up the Earth's surface.[8]

**Exposure:** The presence of people, assets, and ecosystems in places where they could be adversely affected by hazards.[9]

**Extreme weather event:** An extreme weather event is an event that is rare at a particular place and time of year. By definition, the characteristics of what is considered an extreme weather event vary from place to place.[10]

**Greenhouse gas (GHG):** Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of radiation emitted by the Earth's ocean and land surface, by the atmosphere itself and by clouds. This property causes the greenhouse effect. Water vapor, carbon dioxide, nitrous oxide, methane and ozone are the primary GHGs in the Earth's atmosphere.[11]

**Hazard:** An event or trend that may cause injury, illness, or death to people or damage to community assets. In this report the term "hazard" primarily refers to climate-related physical events or trends.[12]

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[5] IPCC, "Annex II: Glossary," 2022.
[6] IPCC.
[7] IPCC, "Annex II: Glossary," 2014.
[8] IPCC, "Annex II: Glossary," 2022.
[9] U.S. Federal Government, "Glossary," U.S. Climate Resilience Toolkit, accessed February 20, 2023, https://toolkit.climate.gov/content/glossary.
[10] IPCC, "Annex II: Glossary," 2014.
[11] IPCC.
[12] U.S. Federal Government, "Glossary"; IPCC, "Annex II: Glossary," 2014.

**Hydrological drought:** A period with large runoff and water deficits in rivers, lakes and reservoirs.[13]

**Megadrought:** A very lengthy and pervasive drought, lasting much longer than normal, usually a decade or more.[14]

**Meteorological drought:** A period with an abnormal precipitation deficit.[15]

**Monsoon:** A monsoon is a tropical and subtropical seasonal reversal in both the surface winds and associated precipitation, caused by differential heating between a continental-scale land mass and the adjacent ocean.[16] Monsoons result in a pattern of wet summers and dry winters.[17]

**Palmer Drought Severity Index:** The Palmer Drought Severity Index attempts to measure the duration and intensity of the long-term drought-inducing circulation patterns.[18]

**Radiative forcing:** The change in the net, downward minus upward, radiative flux at the tropopause or top of the atmosphere due to a change in an (external) driver of climate change, such as a change in the concentration of carbon dioxide, the concentration of volcanic aerosols or the output of the sun.[19]

**Representative Concentration Pathway (RCP):** Scenarios that include time series of emissions and concentrations of the full suite of GHGs and aerosols and chemically active gases, as well as land use/land cover. Four RCPs are used in the IPCC Fifth Assessment Report, which span the range from approximately below 2°C warming to high (>4°C) warming best-estimates by the end of the 21st century: RCP2.6, RCP4.5 and RCP6.0, and RCP8.5.[20]

**Vapor pressure deficit (VPD):** The difference between the amount of moisture in the air and maximum amount of water the air can hold at saturation (which is determined by temperature).[21]

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[13] IPCC, "Annex II: Glossary," 2022.
[14] IPCC.
[15] IPCC.
[16] IPCC, "Annex II: Glossary," 2014.
[17] National Weather Service, "North American Monsoon Highlights," weather.gov, accessed March 18, 2023, https://www.weather.gov/abq/northamericanmonsoon-intro.
[18] NOAA National Centers for Environmental Information (NCEI), "Historical Palmer Drought Indices," Drought.gov, accessed March 18, 2023, https://www.ncei.noaa.gov/access/monitoring/historical-palmers/overview.
[19] IPCC, "Annex II: Glossary," 2022.
[20] IPCC.
[21] Adrian Broz et al., "A Record of Vapour Pressure Deficit Preserved in Wood and Soil across Biomes," *Scientific Reports* 11, no. 1 (January 12, 2021): 662, https://doi.org/10.1038/s41598-020-80006-9.

## About Climate Models and Projections

Climate projections are the outputs of climate models, which are built on a series of assumptions about the earth system and future GHG emissions. Climate projections are not predictions for the future, but should instead be considered as an approximation of the range of possible future conditions. This is why it is important to view them in terms of multi-year averages, ranges, and trends. Climate projections are helpful tools that can be used to inform future planning; however, it is not appropriate to use them as the sole foundation for decision-making.[22] In this report, climate projections are compiled from the National Climate Change Viewer (NCCV), Climate Explorer, and Risk Factor platforms.

Most of the projections used in this report are derived from climate models of the Coupled Model Intercomparison Project Phase 5 (CMIP5) developed for the IPCC Fifth Assessment Report. CMIP model output typically has a coarse spatial resolution. To produce finer resolution, locally relevant data, various statistical downscaling techniques are applied. In this report, projections are provided on the county level. For more information about models and downscaling techniques, refer to the data platform technical documentation in the Data Platforms appendix.

Climate data included in this report uses an ensemble modeling approach. In ensemble modeling, a collection of climate model simulations is used to characterize a climate projection, instead of one model or scenario alone.[23] Using an ensemble approach has been shown to increase the reliability and skill of model projections and help to characterize the level of confidence and uncertainty of results.[24]

Except where noted, future projections are compared to the baseline, which is a simulation of historical climate, not historical observations. These historical simulations may also be referred to as modeled history. Most projections are presented as averages over 10- or 25-year periods (e.g. 2025-2049), which is standard for analyzing future climatological values. Graphs display the range of projections (10th and 90th percentiles) in addition to the model median.

[22] U.S. Federal Government, "Frequently Asked Questions," U.S. Climate Resilience Toolkit Climate Explorer, 2021, https://crt-climate-explorer.nemac.org/faq/.
[23] IPCC, "Annex II: Glossary," 2014.
[24] Claudia Tebaldi and Reto Knutti, "The Use of the Multi-Model Ensemble in Probabilistic Climate Projections," *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 365, no. 1857 (August 15, 2007): 2053–75, https://doi.org/10.1098/rsta.2007.2076.

## Modeling Extreme Events

Modeling risk of extreme events like flooding and wildfire is complex due to the variety of factors at play in these hazards.[25] For flooding, climatic changes in rainfall and snowmelt are key drivers; however, other human and natural factors, including seasonality, urbanization, land use change, dams, and stormwater and agricultural management practices are also highly relevant. Wildfires are also influenced by a myriad of factors, including temperature, soil moisture, humidity, wind, fuel characteristics, land management, and topography.

Risk Factor, a platform that provides community-level data on flood, fire, heat, and wind, uses probabilistic models developed by nonprofit First Street Foundation that take some of these factors into account.[26] For flooding, First Street Foundation models consider topography, hydrology, local climate and terrain characteristics, and future climatic changes to calculate flood risk.[27] For wildfire, First Street Foundation models consider fuels (e.g. trees, vegetation, structures), forest and fuel management, probability of ignition (based on historic fires), and weather patterns that support ignition (e.g. dryness) and help fires spread (e.g. wind), as well as future climate projections.[28]

## GHG Scenarios

GHG scenarios consider GHG emission concentration and land use change based on a set of assumptions about future trajectories. Two GHG scenarios are used in this report: RCP4.5 and RCP8.5.

Four RCPs are used in the IPCC Fifth Assessment Report, which span the range from approximately below 2°C warming to high (>4°C) warming best-estimates by the end of the 21st century: RCP2.6, RCP4.5 and RCP6.0, and RCP8.5.[29] Each RCP represents a distinct level of total radiative forcing (or warming effect) on the atmosphere at the end of 2100. Climate projections made using RCP4.5 and RCP8.5 are the most commonly available:

- RCP4.5 (sometimes referred to as the “lower emissions scenario”): a moderate stabilization scenario under which emissions peak around 2040, then decline.
- RCP8.5 (sometimes referred to as the “higher emissions scenario”): a high emissions scenario under which emissions continue rising through 2100.

[25] USGCRP, “Climate Science Special Report: Fourth National Climate Assessment, Volume I” (Washington, DC, USA: U.S. Global Change Research Program, 2017), https://science2017.globalchange.gov/.
[26] First Street Foundation, “Risk Factor,” Risk Factor, accessed March 8, 2023, https://riskfactor.com/about.
[27] First Street Foundation, “First Street Foundation Flood Model: Technical Methodology Document,” June 17, 2020, https://assets.firststreet.org/uploads/2020/06/FSF_Flood_Model_Technical_Documentation.pdf.
[28] First Street Foundation, “First Street Foundation Wildfire Model: Technical Methodology,” 2022, https://assets.firststreet.org/uploads/2022/05/First_Street_Foundation_Wildfire_Technical_Methodology.pdf.
[29] IPCC, “Annex II: Glossary,” 2022.

This report includes projections from both RCP4.5 and RCP8.5, though projections from RCP8.5 are more frequently referenced in the text and included in the appendix. This decision was made because awareness of—and preparedness for—RCP8.5 reflects a more risk-averse approach (i.e. more of a "worst case" scenario). RCP8.5 is associated with over 4°C of warming by 2100. Note that when considering near-term (2050 and earlier) planning and policy, the choice of scenario (RCP4.5 or RCP8.5) is less important, as projections under RCP4.5 and RCP8.5 do not substantially diverge until after 2050.[30]

### Navigating Uncertainty

Human-caused climate change is scientific consensus. However, the precise nature of these changes, including their magnitude, timeline, and local impacts, is less certain. Numerous factors contribute to this uncertainty, including the natural variability of Earth's climate (for example, due to semi-cyclical phenomena such as El Niño), climate model uncertainty, evolving knowledge on the Earth system, and uncertainty around future GHG trajectories and land development.[31] The possibility of reaching "tipping points" that trigger major shifts in the Earth's climate system is another contributor. For example, rapid, irreversible loss of the West Antarctic and Greenland ice sheets is a tipping point that could lead to significantly higher sea level rise than currently anticipated.[32]

Climate modeling and uncertainty remain an area of active research. Scientific understanding of the Earth system is constantly improving, as are models used to project future climate. Studying historical trends, evaluating multiple different climate models (ensemble modeling), considering the range of possible outcomes, and adopting flexible, adaptive management techniques can help planners navigate amidst uncertainty.[33]

## Local Summary: Climate-Related Hazards in Santa Fe County

Santa Fe County is located in the Arizona/New Mexico Plateau ecoregion, a semi-arid grassland area in the southwestern US.[34] Santa Fe's high elevation and topography contribute to

[30] Cal-Adapt, "Which RCP (Emissions) Scenario Should I Use in My Analysis?," cal-adapt.org, accessed March 1, 2023, https://cal-adapt.org/help/faqs/which-rcp-scenarios-should-i-use-in-my-analysis/.
[31] ClimateData.ca, "Uncertainty in Climate Projections," ClimateData.ca, accessed March 7, 2023, https://climatedata.ca/resource/uncertainty-in-climate-projections/.
[32] IPCC, "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" (Cambridge, UK and New York, USA, 2018), https://www.ipcc.ch/sr15/chapter/chapter-3/.
[33] ClimateData.ca, "Uncertainty in Climate Projections."
[34] Jana Ruhlman, Leila Gass, and Barry Middleton, "Arizona/New Mexico Plateau Ecoregion," in *Status and Trends of Land Change in the Western United States—1973 to 2000*, ed. Benjamin M. Sleeter, Tamara S. Wilson, and William Acevedo, 4 vols., U.S. Geological Survey Professional Paper 1794–A, 2012, 263–71, https://pubs.usgs.gov/pp/1794/a/chapters/pp1794a_chapter26.pdf.

significant variations in climate from nearby, lower-elevation areas.[35] Rainfall is variable and limited; the natural environment exhibits a long-term trend towards increasing aridity.[36]

To understand how climate change is impacting Santa Fe County, ICLEI USA reviewed available resources and climate projections to learn more about the climate-related hazards the County is exposed to in the present day, as well as how those hazards could change in a future of higher GHG emissions. Findings and associated climate projections (when available) on these hazards are summarized in the following section.

## Rising Temperatures

In the state of New Mexico, historical data shows that, on average, temperatures have increased by over 2°F since 1900 (Figure 1). Statewide temperature projections estimate 5-7°F of warming over the next 50 years.[37]

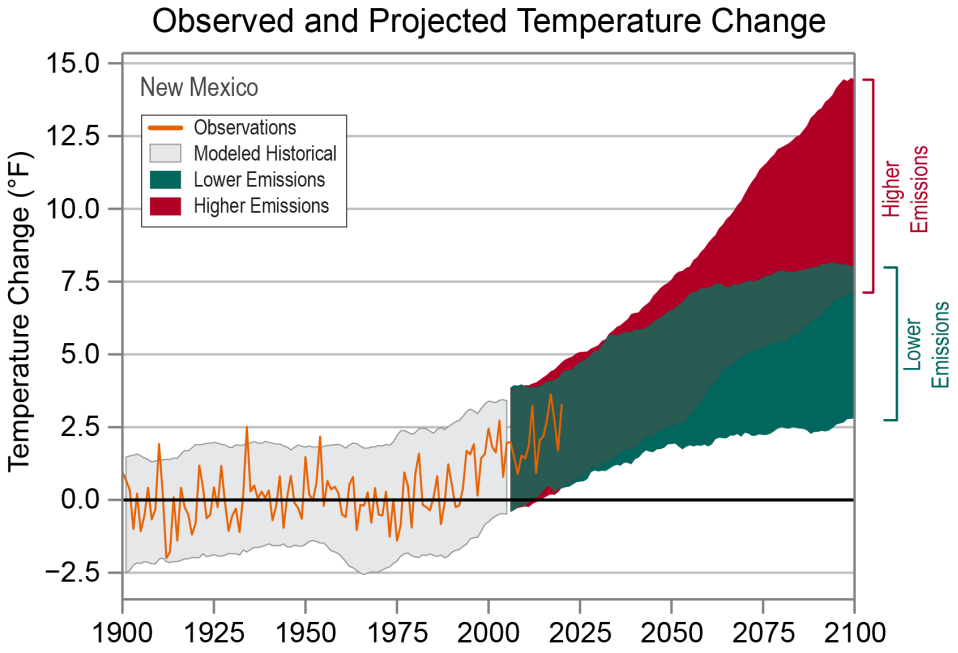



**Figure 1.** Observed and projected temperature change compared to 1901-1960 historic average for New Mexico.[38] The red shaded area shows the range of possible temperature change under a higher emissions pathway (RCP8.5). The green shaded area shows the range of possible temperature change under a lower emissions pathway (RCP4.5). The gray shaded area shows modeled historical temperatures and the orange line shows observed temperature.

[35] Nelia W. Dunbar et al., "Climate Change in New Mexico Over the Next 50 Years: Impacts on Water Resources," Bulletin (New Mexico Bureau of Geology and Mineral Resources, December 2022), https://geoinfo.nmt.edu/publications/monographs/bulletins/downloads/164/B-164_FullResolution.pdf.
[36] Jana Ruhlman, Leila Gass, and Barry Middleton, "Arizona/New Mexico Plateau Ecoregion."
[37] Nelia W. Dunbar et al., "Climate Change in New Mexico Over the Next 50 Years: Impacts on Water Resources."
[38] "New Mexico State Climate Summary 2022," NOAA Technical Report NESDIS (Silver Spring, MD: NOAA/NESDIS, 2022), https://statesummaries.ncics.org/chapter/nm/.

In Santa Fe County, annual mean (in other words, the year-round average) temperature projections show a similar warming trajectory to those of the state (Figure 2). Under RCP8.5, annual mean temperatures are projected to increase by 3.3°F in the 2025-2049 period, 6.1°F in the 2050-2074 period, and by 9°F in the 2075-2099 period (Table A1).

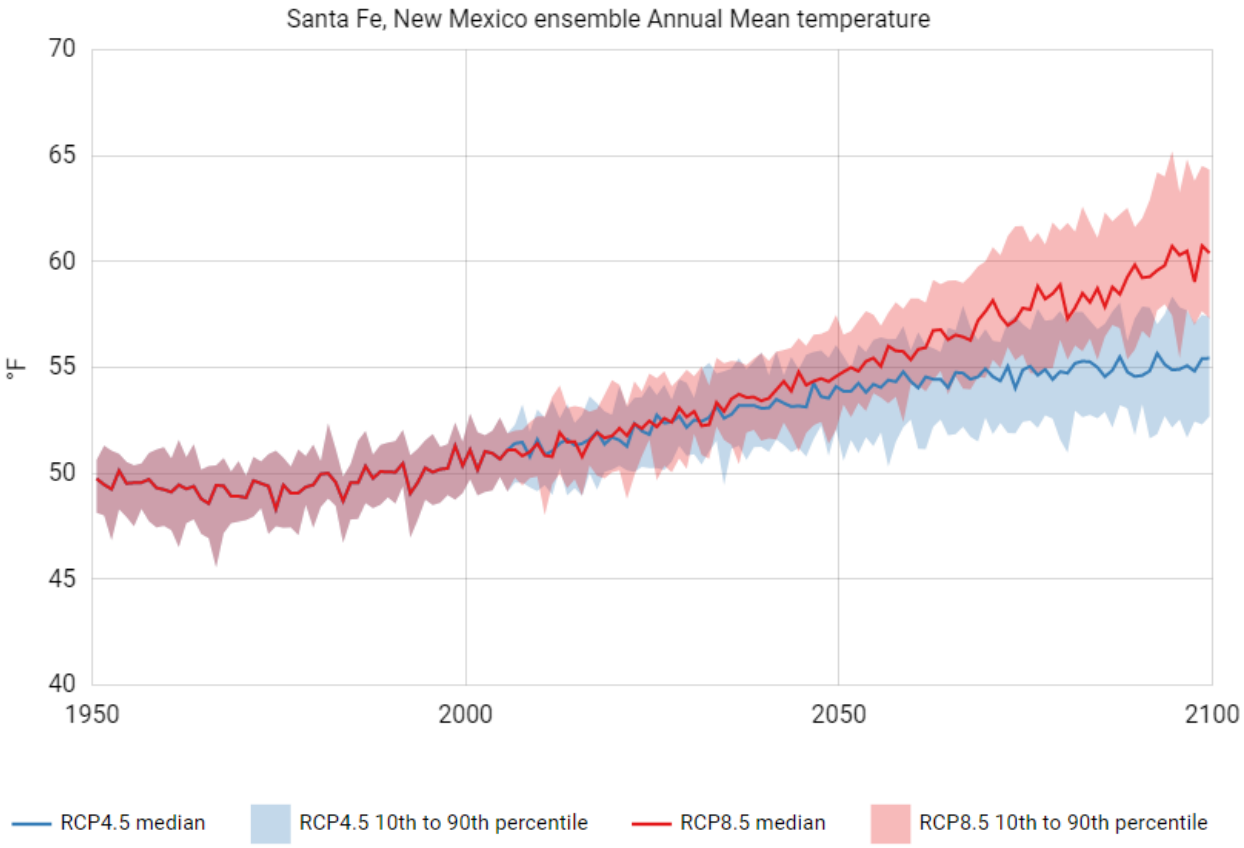



**Figure 2.** Annual mean temperature (°F) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[39] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

Rising temperatures are evident seasonally (Table A1). In Santa Fe County, the baseline summertime mean temperature is 68.7°F. By the 2075-2099 period, the mean summertime temperature is projected to rise by almost ten degrees (78.3°F). Winter temperatures are also rising. At baseline, winter mean temperature is near freezing, at 32.3°F. As the climate warms, winter mean temperatures rise above freezing: in the 2025-2049 period, winter mean temperature is projected to be around 35.5°F. By the end of the century, winter mean temperatures could exceed 40°F. Models indicate that despite increases, winter minimum

[39] USGS, "National Climate Change Viewer," Data Platform, accessed February 24, 2023, https://apps.usgs.gov/nccv/maca2/maca2_counties.html.

temperatures will likely remain below freezing (Figure A3). View the trends in summer and winter mean temperatures in Figure A1 and Figure A2.

In a future where GHG emissions do not rise as much, temperatures in the County would still increase; however, that increase would be at a more moderate rate. This lower rate of increase is shown by the blue line and shaded area (RCP4.5) in Figure 2.

**RCP8.5 Climate Projections Snapshot: Rising Temperatures**[40]

| **Annual Mean Temperature** | **Summer Mean Temperature** |
|---|---|
| Baseline (1981-2010): 50.3°F<br>2025-2049: +3.3°F<br>2050-2074: +6.1°F<br>2075-2099: +9.0°F | Baseline (1981-2010): 68.7°F<br>2025-2049: +3.3°F<br>2050-2074: +6.3°F<br>2075-2099: +9.6°F |
| **Winter Mean Temperature** | **Winter Minimum Temperature** |
| Baseline (1981-2010): 32.3°F<br>2025-2049: +3.2°F<br>2050-2074: +5.8°F<br>2075-2099: +8.5°F | Baseline (1981-2010): 19.6°F<br>2025-2049: +3.1°F<br>2050-2074: +5.3°F<br>2075-2099: +7.8°F |

Jump to the data on Minimum, Mean, and Maximum Temperature

## Hotter Summers and Extreme Heat Events

In New Mexico, dangerously hot conditions, including extremely hot days and warm nights, have risen significantly since 1900.[41] In the future, summer maximum temperatures in Santa Fe County are projected to rise under both RCP4.5 and RCP8.5 (Figure 3), though increases are significantly more pronounced under RCP8.5 in the middle and end of the century. The baseline summer maximum temperature in Santa Fe County is 84.1°F. Under RCP8.5, summer maximum temperature rises to 87.6°F in the 2025-2049 period, 90.6°F in the 2050-2074 period, and 94.1°F in the 2075-2099 period (Table A1).

[40] USGS.
[41] "New Mexico State Climate Summary 2022."

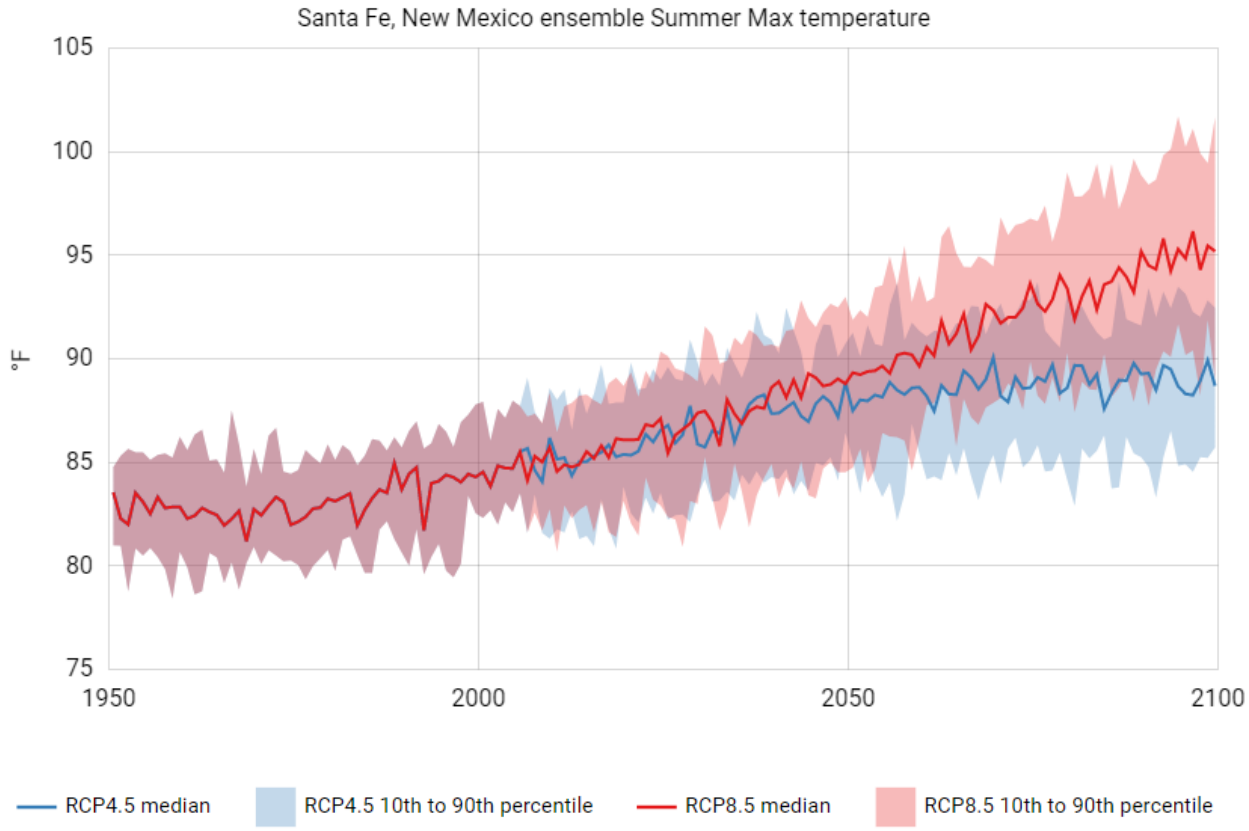



**Figure 3.** Summer maximum temperature (°F) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[42] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

Extremely hot days, defined as days on which the maximum temperature exceeds 100°F, are rarely documented in historical observations (Figure 4). Projections for the middle and end of the century under the higher emissions scenario show occurrences of these days rising to around 8 days each year (2060s) and around 18 days (2080s). The relatively large shaded area in Figure 4 indicates that there is a wide range in model projections (i.e. some models predict many more extremely hot days than others). Towards the end of the century under RCP8.5, some models predict as many as 50 or more extremely hot days each year.

[42] USGS, "National Climate Change Viewer."

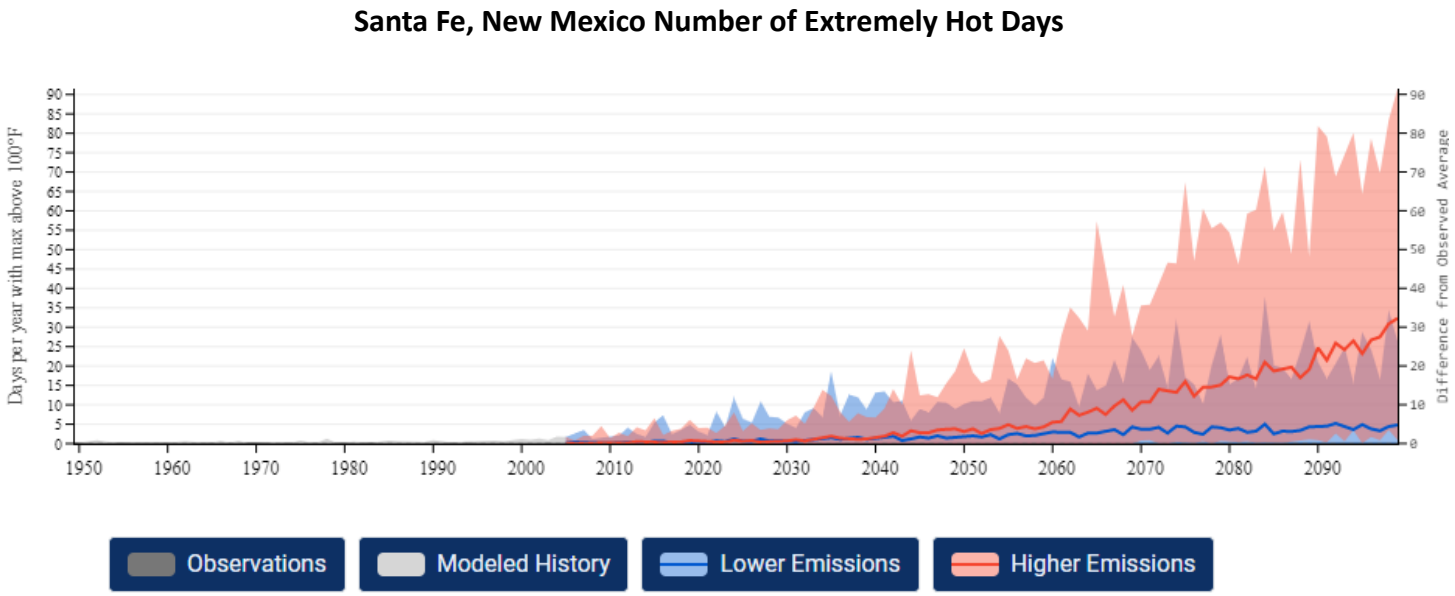



**Figure 4.** Number of extremely hot days (maximum temperature > 100 °F) per year in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[43] The solid blue and red lines show the ensemble median. Shaded blue and red areas show the range from the highest to the lowest projected value. Dark gray bars show historical observations and light gray areas show modeled history (both are so low on this graph that they are barely visible).

**RCP8.5 Climate Projections Snapshot: Hotter Summers and Extreme Heat Events**

| **Summer Maximum Temperature**[44] | **Extremely Hot Days**[45] |
|---|---|
| Baseline (1981-2010): 84.1°F<br>2025-2049: +3.5°F<br>2050-2074: +6.7°F<br>2075-2099: +10.0°F | Observed Average (1960-1991): 0 days<br>2030s: 1.2 days<br>2060s: 8.2 days<br>2080s: 18.3 days |

Jump to the data on Summer Maximum Temperature and Extremely Hot Days

[43] U.S. Federal Government, "U.S. Climate Resilience Toolkit Climate Explorer," Data Platform, 2021, https://crt-climate-explorer.nemac.org/.
[44] USGS, "National Climate Change Viewer."
[45] U.S. Federal Government, "U.S. Climate Resilience Toolkit Climate Explorer."

## Precipitation Patterns

Broadly, precipitation projections for the state of New Mexico point toward constant precipitation totals that do not differ substantially from natural climatic variation.[46] No clear, significant trend emerges for the state.[47] While historical evidence and the observational record indicate highly variable precipitation is the norm in New Mexico, it is possible that climate change will increase precipitation variability.[48] County projections are also variable (Figure 5).

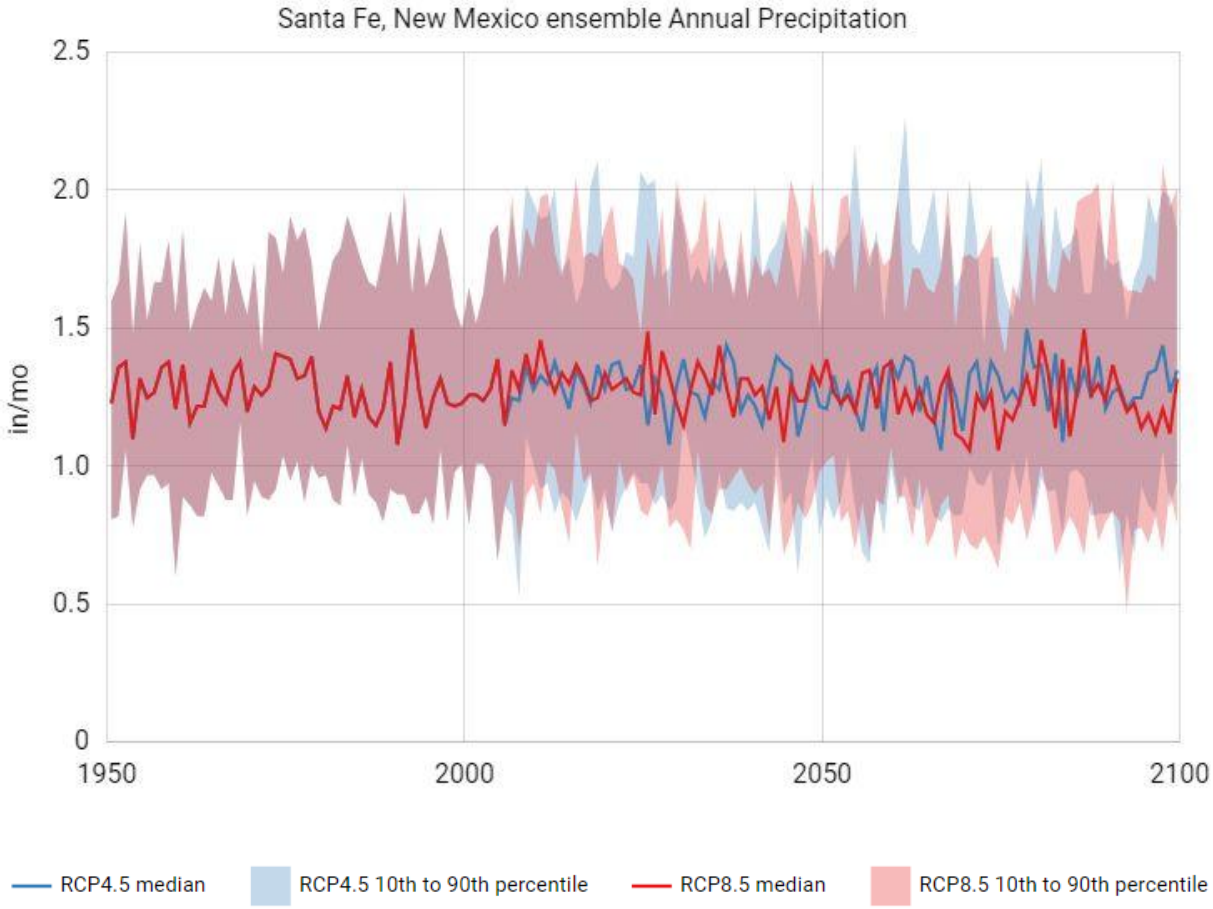



**Figure 5.** Total annual precipitation (in/mo) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[49] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

Precipitation projections for Santa Fe County show a nearly flat trend (Table A3). However, averages mask significant year-to-year variation (Figure 5). Precipitation projections show a

[46] USGCRP, "Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II" (Washington, DC, USA: U.S. Global Change Research Program, 2018), https://nca2018.globalchange.gov/.
[47] Nelia W. Dunbar et al., "Climate Change in New Mexico Over the Next 50 Years: Impacts on Water Resources."
[48] Nelia W. Dunbar et al.
[49] USGS, "National Climate Change Viewer."

large range of variation across models, with some models projecting increased precipitation, and others projecting decreases (Figure A4). This means that the directionality of expected precipitation changes is uncertain and confidence in these projections is low. Some statewide research indicates declines in spring precipitation and slight increases in winter precipitation in northern mountain areas.[50] Local projections for Santa Fe County do show a slight downward trend in spring precipitation (Figure A5).

The North American Monsoon system, which provides needed summer rainfall, is already highly variable from year to year.[51] It is uncertain how climate change will impact monsoonal precipitation in New Mexico.[52]

While extreme precipitation events have increased in much of the continental US, this trend is not evident in recorded data from New Mexico. Historically, extreme precipitation days vary and fluctuate without an observable trend, similar to total annual precipitation.[53] Projections for Santa Fe show roughly constant model medians of an average of 0.5 extreme precipitation events each year (Figure 6). Extreme precipitation events occur on days in which more than one inch of precipitation is received in a single day/ There is significant variation across models, however, with some models predicting as many as three to four 1-inch precipitation days in some years, which exceeds the range of historic observations. This indicates the potential for more frequent occurrence of high intensity rainstorms in Santa Fe.

**RCP8.5 Climate Projections Snapshot: Precipitation Patterns**

| **Annual Precipitation**[54] | **Extreme Precipitation Events**[55] |
|---|---|
| Baseline (1981-2010): 1.3 in/mo<br>2025-2049: 1.3 in/mo<br>2050-2074: 1.3 in/mo<br>2075-2099: 1.3 in/mo | Observed Average (1960-1991): 0.5 days<br>2030s: 0.5 days<br>2060s: 0.5 days<br>2080s: 0.6 days |

Jump to the data on Annual Precipitation and Extreme Precipitation Events

[50] "New Mexico State Climate Summary 2022."
[51] "New Mexico State Climate Summary 2022."
[52] Nelia W. Dunbar et al., "Climate Change in New Mexico Over the Next 50 Years: Impacts on Water Resources."
[53] "New Mexico State Climate Summary 2022."
[54] USGS, "National Climate Change Viewer."
[55] U.S. Federal Government, "U.S. Climate Resilience Toolkit Climate Explorer."

**Santa Fe, New Mexico Number of Extreme Precipitation Events**

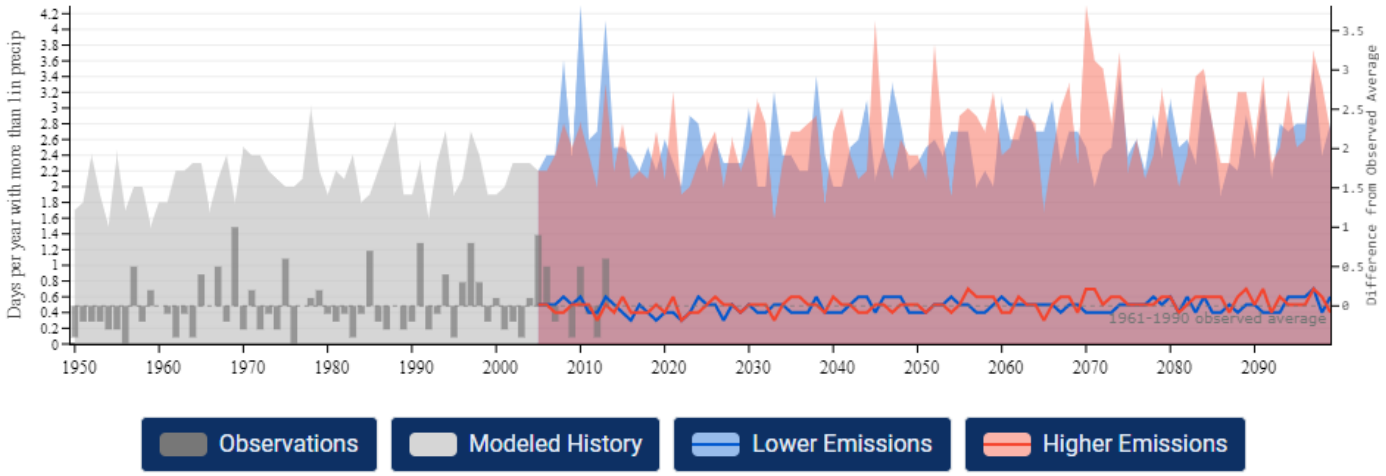



**Figure 6.** Number of extreme precipitation events (days with > 1 inch precipitation) per year in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[56] The solid blue and red lines show the ensemble median. Shaded blue and red areas show the range from the highest to the lowest projected value. The dashed gray line shows the 1961-1990 observed average. Dark gray bars show historical observations. Bars that are above the dashed line are higher than the historical average; bars that are below the dashed line are lower than the historical average. The light gray shaded area shows modeled history.

## Flooding

Flooding is a complex phenomenon linked to multiple causal factors, including heavy precipitation, stream dynamics, topography, storms, land cover, and development patterns. In New Mexico, localized high-intensity storms (usually monsoonal) are a main driver of flood risk.[57] This type of storm is challenging to simulate with climate models. Studies suggest these storms may occur more often in the future; storm severity is not projected to increase.[58] The higher end of the range of model variation (the red shaded area in Figure 6) in days with more than 1 inch of precipitation in Santa Fe County may point toward this trend.

The results of probabilistic flood modeling for Santa Fe County on the Risk Factor platform indicate that there are around 4,188 properties (7% of the total) with more than a 26% chance of being affected by flooding between 2021 and 2051.[59] The platform reports that 429 of these properties were protected by 6 “known adaptation measures” (e.g. gray infrastructure) as of

[56] U.S. Federal Government.
[57] Nelia W. Dunbar et al., “Climate Change in New Mexico Over the Next 50 Years: Impacts on Water Resources.”
[58] Nelia W. Dunbar et al.
[59] First Street Foundation, “Santa Fe County, New Mexico Flood Factor,” Risk Factor, accessed March 17, 2023, https://riskfactor.com/county/santa-fe-county-nm/35049_fsid/flood.

March 17, 2023, though the precise nature and location of these measures is not disclosed. Flood risk may be increasing, somewhat: if a 100-year flood event were to occur in 2051, Risk Factor estimates an 51 additional properties would be affected compared to 2021 numbers.

Based on severity of impact, roads and commercial properties are the main drivers of flood risk in Santa Fe, though those two categories of assets are by no means alone in facing risk (Table 2).

**Table 2.** Property and facility overall flood risk level (by property/facility type) and estimated number of assets at risk in 2021.[60] Risk level reflects the level of risk to properties/facilities based on flood likelihood and depth, not the proportion of properties/facilities that are at risk.[61]

| Asset Type | Level of Risk | Number of Assets at Risk |
|---|---|---|
| Residential | Minor | 3,732 out of 58,293 properties |
| Roads | Moderate | 1,145 out of 5,123 miles of roads |
| Commercial | Moderate | 543 out of 4,771 properties |
| Critical Infrastructure | Minor | 3 out of 68 facilities |
| Social Facilities | Minor | 77 out of 467 facilities |

Note that there are multiple variables that could increase the County's exposure beyond what is reflected in Table 2. Risk Factor models are based on RCP4.5 (lower emissions scenario); were GHG concentrations to continue increasing significantly in line with RCP8.5, it is possible that more properties would be exposed. Furthermore, Risk Factor models do not consider future development. If construction occurs in at-risk areas that are more prone to flooding, that would increase the County's exposure.

## Drought and Water Availability

Droughts in the greater Southwest region are expected to worsen under climate change. Severe drought, aridification, and groundwater depletion combined with land use change and population growth are expected to worsen existing water shortages in New Mexico.[62] Review of the evidence on historical climate in New Mexico shows a pattern of frequent wet and dry periods, as well as droughts more severe than any documented in historical records (Figure 7).[63]

[60] First Street Foundation.
[61] First Street Foundation, "Community Methodology - Is Your Community at Risk of Flooding?," Risk Factor, March 17, 2023, https://help.riskfactor.com/hc/en-us/articles/4408457052055-Community-methodology-Is-your-community-at-risk-of-flooding-.
[62] USGCRP, "Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II."
[63] "New Mexico State Climate Summary 2022."

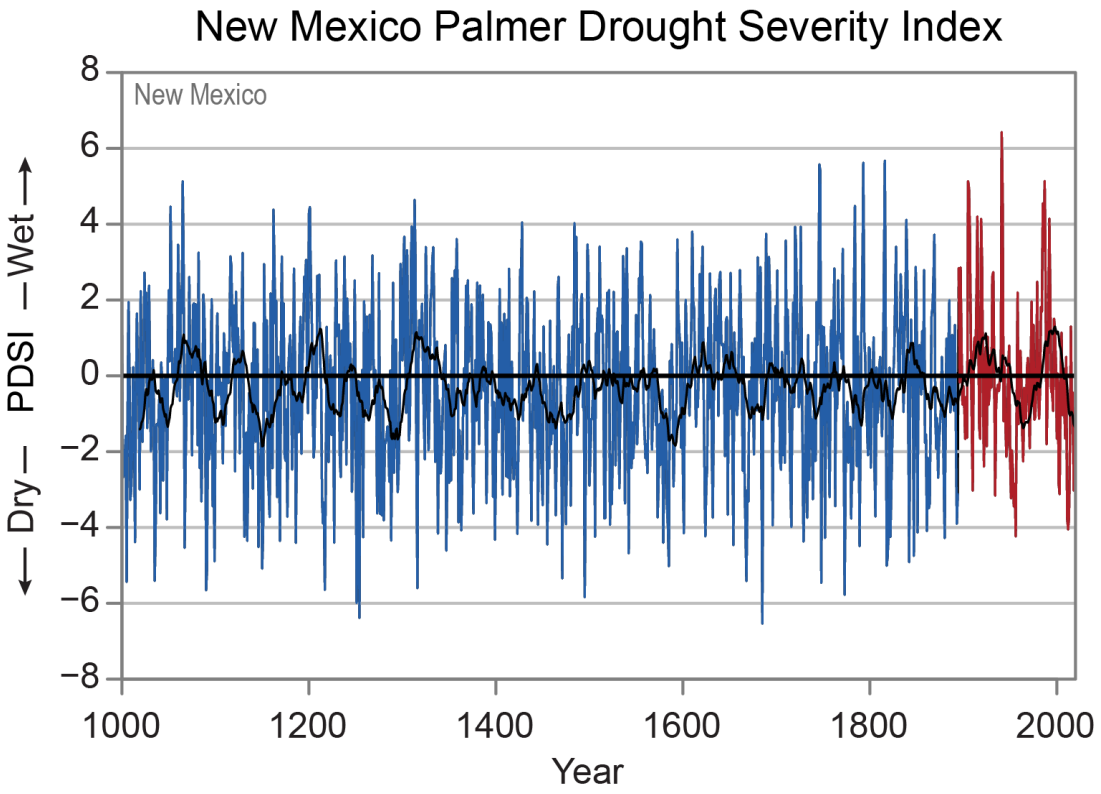



**Figure 7.** New Mexico Palmer Drought Severity Index, 1000-2020. Red lines indicate values based on precipitation and temperature measurements. Blue lines (period prior to 1895) indicate values estimated from indirect sources (e.g. tree rings). The fluctuating black line is the 20-year period average.[64]

Regional projections indicate that droughts in New Mexico may become more frequent, severe, and long-lasting in the future. Rising temperatures coupled with flat precipitation trends signal increasingly arid conditions. In hotter weather, evapotranspiration (water transfer to the atmosphere from land and vegetation) increases, making it more difficult for precipitation to replenish water bodies and soil moisture. This will result in reduced streamflow and drier soil, increasing drought intensity.[65] Furthermore, models indicate that hotter temperatures in the Southwest significantly increase the probability of multi-decadal megadroughts.[66]

In the spring, snowmelt flows into major rivers, including the Rio Grande, which are important surface water sources for New Mexico communities. Hotter temperatures and earlier spring heat are linked to reductions in snowpack in the region. These conditions (heat and decreased snowpack) were shown to have amplified recent hydrological drought and severe water

[64] "New Mexico State Climate Summary 2022."
[65] "New Mexico State Climate Summary 2022."
[66] USGCRP, "Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II."

shortages in the Rio Grande and Colorado River Basins.[67] Under RCP8.5, hydrologic models project significant declines in the Rio Grande Basin.[68]

Local projections for Santa Fe County point to worsening drought. While there is no single indicator used to project drought, there are related indicators that signify drought conditions. Evaporative deficit, a measure of aridity, increases substantially by the end of the century (Figure 8). Soil storage (water stored in the soil) in Santa Fe County is projected to decline by almost 50% by the 2075-2099 period (Table A6 and Figure A6). Runoff shows declines, though on a smaller scale (Table A7 and Figure A7).

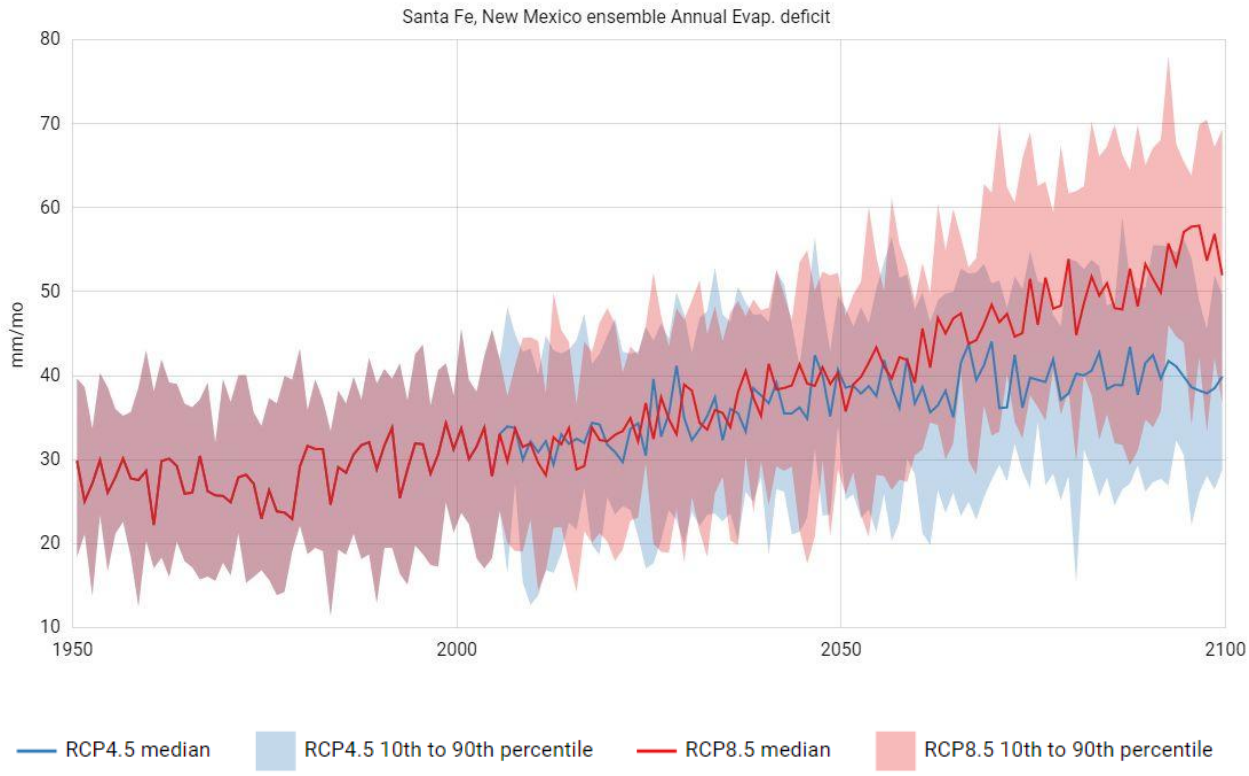



**Figure 8.** Average annual evaporative deficit (mm/month) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[69] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[67] USGCRP.
[68] USGCRP.
[69] USGS, "National Climate Change Viewer."

**RCP8.5 Climate Projections Snapshot: Water Availability and Drought**[70]

| **Annual Average Evaporative Deficit** | **Annual Soil Storage** |
|---|---|
| Baseline (1981-2010): 30.07 mm/mo<br>2025-2049: 36.81 mm/mo<br>2050-2074: 44.12 mm/mo<br>2075-2099: 51.33 mm/mo | Baseline (1981-2010): 1.23 in/mo<br>2025-2049: 1.06 in/mo<br>2050-2074: 0.82 in/mo<br>2075-2099: 0.63 in/mo |
| **Annual Runoff**<br><br>Baseline (1981-2010): 0.15 in/mo<br>2025-2049: 0.15 in/mo<br>2050-2074: 0.13 in/mo<br>2075-2099: 0.12 in/mo | |

Jump to the data on Evaporative Deficit, Soil Storage, and Runoff

## Wildfire

Wildfire in the Southwest has been on the rise in recent decades, due in part to climate change (Figure 9).[71] As temperatures rise, climate models project that increased drought and aridity in New Mexico will contribute to more frequent and intense wildfires.[72]

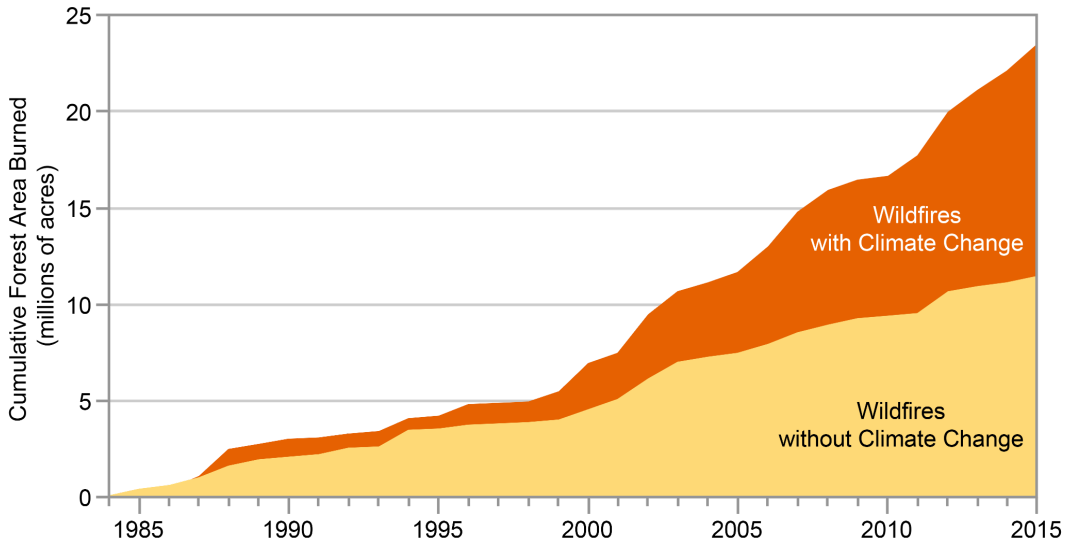



**Figure 9.** Cumulative forest area burned over the 1984-2015 period, estimated with and without influence of climate change.[73]

[70] USGS.
[71] USGCRP, "Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II."
[72] "New Mexico State Climate Summary 2022."
[73] USGCRP, "Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II."

Recent increases in vapor pressure deficit (i.e. how "thirsty" the atmosphere is) have contributed to increased incidence of wildfire in the Southwest.[74] A recent study showed that observed increases in vapor pressure deficit are strongly linked to climate change.[75] Under RCP8.5, annual average and summertime vapor pressure deficit increase significantly in Santa Fe County. Compared to the baseline, annual and summer average vapor pressure deficits increase by around 25% by the 2025-2049 period, and by almost 50% by the 2075-2099 period (Table A8). The rising trend is visible in Figure 10.

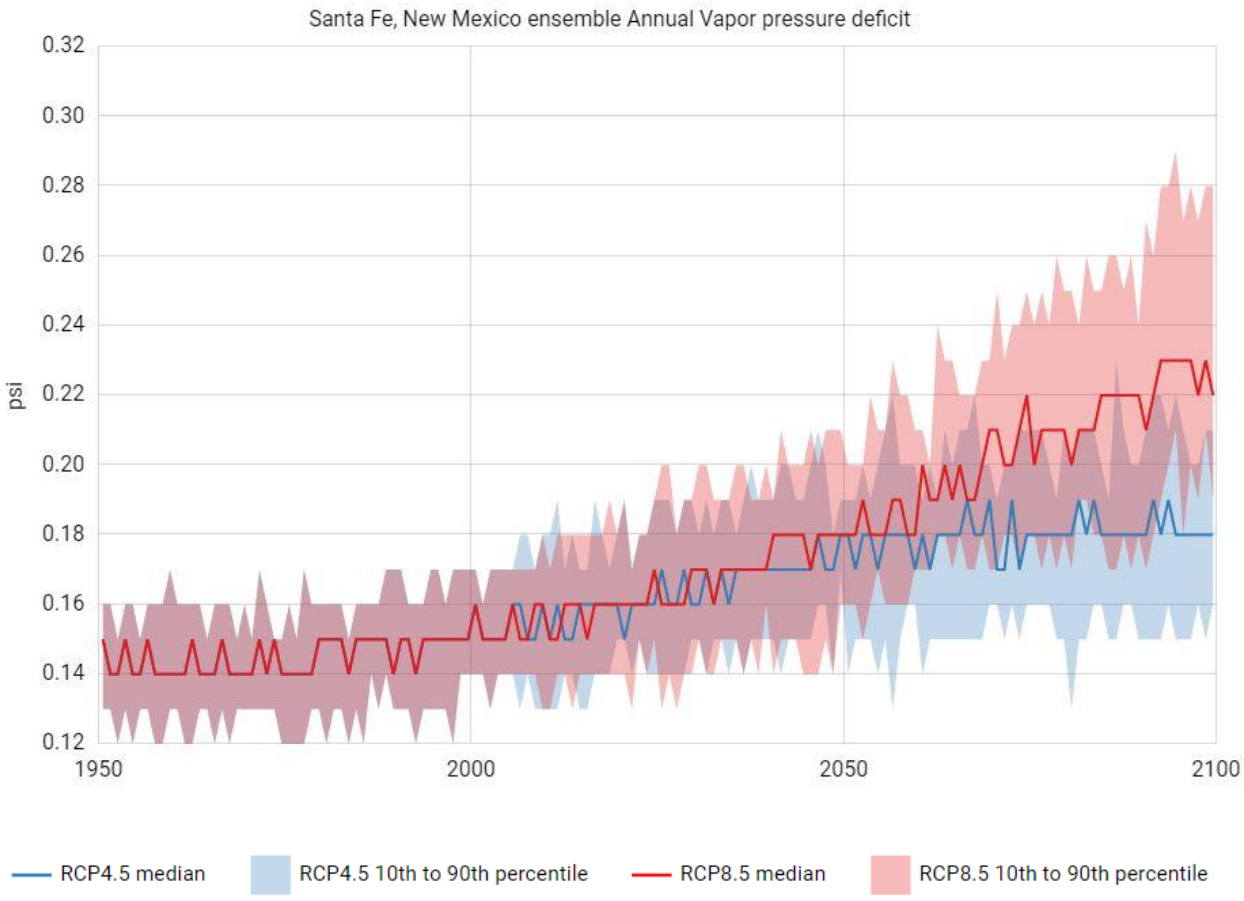



**Figure 10.** Average annual vapor pressure deficit (psi) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[76] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[74] Rong Fu, "Study Shows That Climate Change Is the Main Driver of Increasing Fire Weather in the Western U.S.," Drought.gov, November 9, 2021, https://www.drought.gov/news/study-shows-climate-change-main-driver-increasing-fire-weather-western-us.
[75] Yizhou Zhuang et al., "Quantifying Contributions of Natural Variability and Anthropogenic Forcings on Increased Fire Weather Risk over the Western United States," *Proceedings of the National Academy of Sciences* 118, no. 45 (November 9, 2021): e2111875118, https://doi.org/10.1073/pnas.2111875118.
[76] USGS, "National Climate Change Viewer."

The results of probabilistic fire modeling for Santa Fe on the Risk Factor platform indicate that essentially all Santa Fe properties (77,058 in total, or 99%) have at least some risk of being impacted by wildfire between 2022 and 2052.[77] Fire models indicate major risk across all property and infrastructure types (Table 3). Figures 11 and 12 provide a visual of Santa Fe's increasing fire risk. By the 2041-2050 period, properties in a greater proportion of the county's area have 1 or 2% annual risk of being affected by wildfire.

**Table 3.** Property and facility overall wildfire risk level (by property/facility type) and estimated number of assets at risk in 2022.[78] Risk level reflects the level of risk to properties/facilities based on average probability of being in a wildfire and/or exposed to embers, not the proportion of properties/facilities that are at risk.[79]

| Asset Type | Level of Risk | Assets at Risk |
|---|---|---|
| Residential | Major | 58,295 out of 58,304 properties |
| Commercial | Major | 4,756 out of 4,771 properties |
| Critical Infrastructure | Major | 290 out of 290 facilities |
| Social Facilities | Major | 467 out of 467 facilities |

Similar to flood risk, there are multiple variables that could increase the County's wildfire exposure beyond what is reflected in Table 3. A higher emissions scenario (RCP8.5 as opposed to RCP4.5, which is used in Risk Factor models) could increase exposure, as could development in at-risk areas (e.g. WUI zones).

Wildfires are associated with a number of secondary impacts on people and the environment. Areas that have been burned are vulnerable to erosion and landslides; heavy precipitation events can compound that risk and cause dangerous debris flows.[80] Loosened ash sediment that flows into rivers and waterbodies reduces water quality and reservoir storage[81] and has been linked to reduced native aquatic species abundance in New Mexico.[82] Smoke inhalation is a public health risk.

[77] First Street Foundation, "Santa Fe County, New Mexico Fire Factor," Risk Factor, accessed March 17, 2023, https://riskfactor.com/county/santa-fe-county/35049_fsid/fire.
[78] First Street Foundation.
[79] First Street Foundation, "Community Wildfire Risk FAQ," Risk Factor, accessed March 18, 2023, https://help.riskfactor.com/hc/en-us/articles/5720773111063?_gl=1*kpdv54*_ga*MTk2MDQzNzE2Ni4xNjY4NjMzMTUw*_ga_74PQ3C54LC*MTY3OTE3MDkzMi44LjEuMTY3OTE3MDk0My40OS4wLjA.
[80] USGCRP, "Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II."
[81] USGS, "Increases in Wildfire-Caused Erosion Could Impact Water in the West," 2017, https://www.usgs.gov/news/national-news-release/increases-wildfire-caused-erosion-could-impact-water-supply-and-2.
[82] USGCRP, "Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II."

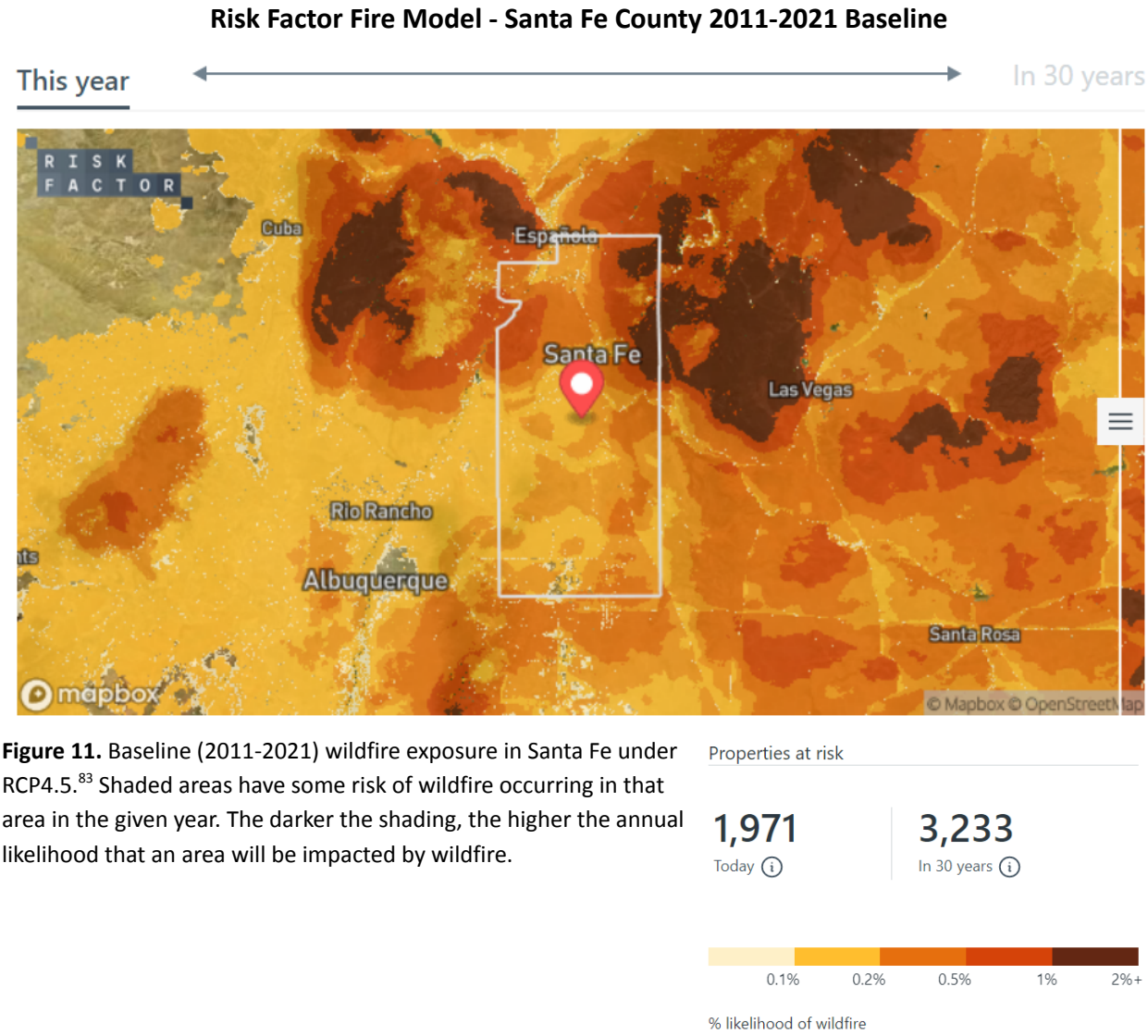



**Figure 11.** Baseline (2011-2021) wildfire exposure in Santa Fe under RCP4.5.[83] Shaded areas have some risk of wildfire occurring in that area in the given year. The darker the shading, the higher the annual likelihood that an area will be impacted by wildfire.

[83] First Street Foundation, "Santa Fe County, New Mexico Fire Factor."

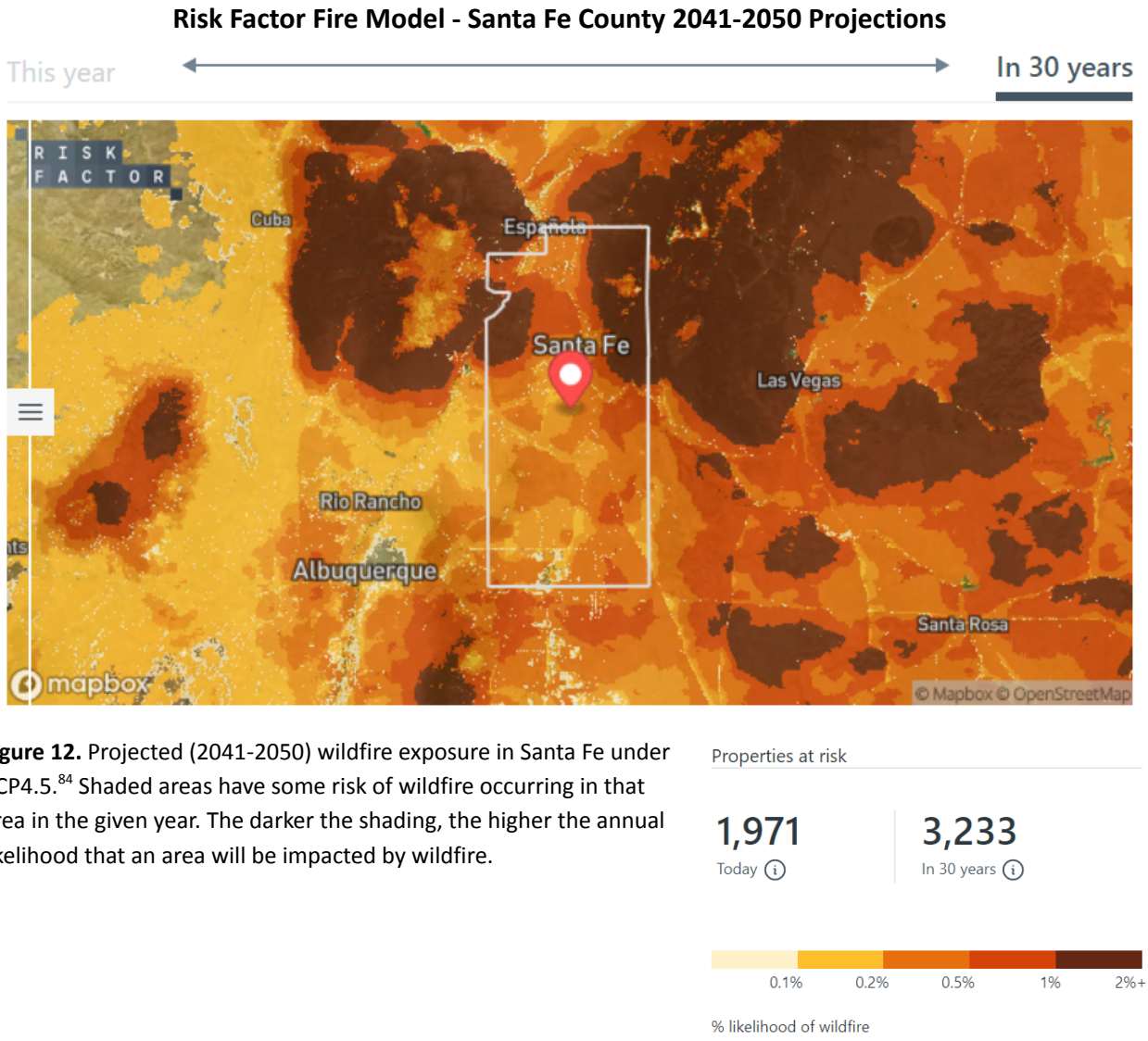



**Figure 12.** Projected (2041-2050) wildfire exposure in Santa Fe under RCP4.5.[84] Shaded areas have some risk of wildfire occurring in that area in the given year. The darker the shading, the higher the annual likelihood that an area will be impacted by wildfire.

**RCP8.5 Climate Projections Snapshot: Wildfire**[85]

| **Annual Average Vapor Pressure Deficit** | **Summer Vapor Pressure Deficit** |
|---|---|
| Baseline (1981-2010): 0.15 psi<br>2025-2049: 0.17 psi<br>2050-2074: 0.19 psi<br>2075-2099: 0.22 psi | Baseline (1981-2010): 0.26 psi<br>2025-2049: 0.29 psi<br>2050-2074: 0.33 psi<br>2075-2099: 0.38 psi |

Jump to the data on Vapor Pressure Deficit

[84] First Street Foundation.
[85] USGS, "National Climate Change Viewer."

## Conclusion

Review of climate projections for Santa Fe makes it clear that the County will be more exposed to climate-related hazards in a future of continued GHG emissions. The research and climate projections reviewed for this report indicate that warming trends in Santa Fe will continue, leading to hotter summers, warmer winters, and extreme heat events. Drought will pose increasing challenges for water management. As the climate becomes drier, the County will be at greater risk from wildfire impacts. Changing rainfall patterns could worsen extreme events, making flooding more likely.

It is imperative that the County consider its shifting hazard landscape in future planning efforts. In order to build resilience, the County will need to work with a strong, inclusive coalition of partners. The County's Climate Action Plan introduces several strategies for building resilience, including conventional "gray" infrastructure approaches and nature-based solutions (e.g. green stormwater infrastructure). These and other strategies can serve as an entrypoint for the County's efforts to adapt to the changing climate.

# Climate Action Plan Introduction

In 2017, Santa Fe County approved Resolution #2017-68, aligning the County with the 2015 Paris Agreement goals of reducing GHG emissions to net zero by 2050. In 2020 the County passed Resolution #2020-93, in support of the 30x30 global initiative to protect 30% of all County lands and water by 2030. More recently, Santa Fe County joined the Race to Zero, pledging to focus on high impact actions to reduce GHG emissions from built environments in the County by 60% Countywide by 2030 as a quick track to achieve the overarching net zero emissions goal. Net zero refers to reducing greenhouse gas emissions where practicable, and offsetting remaining emissions with greenhouse gas removals or other offsets. As an interim goal, the County has a science-based target (SBT) for emissions reductions by 2030, which encompasses the Race to Zero and nature based solution action steps. SBTs are climate goals in line with the latest climate science. They represent a community's fair share of the ambition necessary to meet the Paris Agreement commitment to keep warming below 1.5°C (2.7°F). 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%. To this end, the County is working on a two-track approach: reduction of greenhouse gas emissions that occur specifically as a result of County government operations; and reducing the emissions of the County's community as a whole, while increasing energy efficiency and PV funding access to LMI households.

County staff have completed GHG inventories—an accounting of all GHG sources, types, and amounts–for both of these tracks. These inventories, which cover the 2019 calendar year, help identify sectors where emissions reductions will be most effective, as well as providing a baseline against which to provide a quantitative account of successes in subsequent years. In 2022, the County adopted a plan to reduce emissions associated with County government operations. This Climate Action Plan will provide a high-level roadmap and strategies for reducing the County's community-wide emissions.
San
The Plan uses the 2019 GHG inventory, as well as projected population growth for the County and a reasonable estimate of reductions in power plant emissions to create a business-as-usual projection of emissions from 2019 to 2050. The Plan provides a matrix of common-sense high-impact actions and specific strategies to reduce greenhouse gas emissions. The Plan also takes into account the local priorities of Santa Fe County, including plans to increase tree coverage in the County, increase surface water capture, soil health, and a planned effort to increase housing affordability by reducing utility costs to low income residents.

# Purpose

The global scientific community has determined that increasing global average temperature beyond 1.5˚C (2.7˚F) above pre-industrial levels will greatly increase the negative consequences of global climate change. In order to prevent temperatures from rising, global net emissions of greenhouse gases must reach zero by 2050. Scientists also recommend a global interim emissions reduction goal for 2030, based on 2018 emissions. For a given community, the SBT takes into account the human development index of the community to assign a per-capita reduction target, and the projected growth of the community to assign an absolute reductions target.

The purpose of this Plan is to calculate the SBT for the Santa Fe County community, and then develop a high-level roadmap to achieving that emission reduction goal. The Plan provides reasonable per-year reduction targets in several sectors, as well as general recommendations on how to meet those targets. These targets are tailored to the Santa Fe County community by taking into account existing County goals and policies, as well as meeting with County staff to discuss the County's policy priorities. Lastly, the Plan provides suggested sources of federal funding for implementing the plan.

# Scope and Process

ICLEI used the County's 2019 community-wide GHG inventory, which was completed using ICLEI's ClearPath Climate Planner, to estimate baseline emissions for the County. This inventory included only sources of emissions in the land use sector, such as removal of trees. However, carbon dioxide uptake by existing trees, as well as additional trees in the County actually make this sector a net sink of GHGs. Additionally, the County's 2022 Nature Based Solutions report was used to prioritize strategies to develop a Climate Action Plan that will allow the County to reach its 2030 SBT emissions goal. The Plan specifically recommends action in the following areas in order of impact:

- Transportation
- Commercial buildings
- Residential buildings
- Energy production
- Waste and recycling
- Water and wastewater management

- Nature-based emissions and removals

Community-wide emissions were projected using the following variables:

1. *Santa Fe Projected Population Growth*

As a community's population grows, per-capita emission reductions can be offset. Santa Fe staff suggested that ICLEI base projected growth on an increase of 9.8% in population between 2019 and 2030. ICLEI assumed that this growth rate would continue past 2030 until 2050.

2. *Preliminary Energy Mix Roadmap*

A major source of emissions for any community is the use of fossil fuels to produce electricity. However, across the country, emissions associated with electricity use are dropping as cheap renewable energy offsets fossil fuel power generation. ICLEI assumed a standard 80% reduction in emissions associated with grid electricity between 2019 and 2030, as well as a total 99% reduction in grid emissions between 2019 and 2050.

3. *On-Road Transportation Fuel Efficiency Standards[86] (CAFE Standards)*

Fuel efficiency standards are used to project the reduction of emissions intensity for each mile driven by gasoline on-road vehicles. Fuel efficiency standards decrease emissions due to federally mandated improvements in vehicle fuel economy. ICLEI developed variables from fuel efficiency projections provided by the Center for Climate and Energy Solutions (C2ES)[87].

ICLEI used these three items in its ClearPath Climate Planner to create a business-as-usual projection of community-wide emissions if no other climate mitigation measures were adopted. We then modeled the effect of various emissions reduction strategies, such as building more efficient buildings, promoting electric vehicles, and reducing landfill waste, to find a way for Santa Fe County to meet its 2030 emissions target. Finally, we reviewed County policies and met with County staff to determine the County's priorities for these strategies, to allow the County to meet its targets while also meeting the needs of its own unique community.

[86] ICLEI USA, "ClearPath Reference Sheet – Default Carbon Intensity Factors," accessed May 11, 2023, https://docs.google.com/document/d/1WwVVIpNBxY8vkbN1zVqv5J2JOtYld4CV/edit.
[87] C2ES, "Federal Vehicle Standards," accessed May 11, 2023, https://www.c2es.org/content/regulating-transportation-sector-carbon-emissions/.

# Results and Recommended Actions

## Baseline, Business-as-Usual, and Target Emissions

Santa Fe County's 2019 emissions were reported as 1,864,100 metric tons carbon dioxide equivalent ($MTCO_2e$).[88] However, the 2019 inventory only included processes that emit GHGs, and did not include processes, such as tree growth, that remove GHGs. ICLEI's analysis of total emissions associated with land use in the County suggests that, rather than being a source of GHG in 2019, existing and new tree growth in the County *removed* a net total of 192,183 MTCO2e from the atmosphere that year. As a result, total baseline emissions for 2019 were 1,671,917 MTCO2e for 2019.

Based on the changes in population, emissions associated with grid electricity, and improving fuel efficiency of on-read vehicles discussed above, as well as the assumption that vegetation in the County would continue to absorb the same amount of GHG each year, ICLEI calculated emissions for 2030 and 2050 under a business-as-usual scenario (BAU; where no other changes occur to raise or reduce emissions). Those results can be seen in Table 4.

**Table 4:** Baseline and projected emissions in a business-as-usual scenario (MTCO2e)

| Year | Total GHG Emissions (MTCO2e) |
|---|---|
| **2019** | 1,671,917 |
| **2030** | 1,414,858 |
| **2050** | 1,187,353 |

The BAU scenario, due to decreased emission associated with electricity and vehicle fuel use, does show a reduction in emissions of 15% between 2019 and 2030. However, ICLEI calculated that based on the community's Human Development Index, the per-capita SBT for emissions reduction is 63% per-capita reduction of 2019 emissions by 2030. This translates into a 59% total reduction of 2019 emissions when adjusted for population growth. Therefore, emissions reduction strategies must be implemented by the community to achieve the SBT.

[88] Carbon dioxide equivalent is a standard method of reporting GHG emissions that compares the warming potential of other GHGs to carbon dioxide. For example, methane has an effect on climate that is 28 times greater than carbon dioxide, so one ton of methane equals 28 MTCO2e.

## Recommended Actions

For most communities, large-scale emissions reductions can be achieved through three general strategies: reducing overall energy consumption; accelerating the adoption of renewable and non-emitting electricity production for the grid; and replacing fuel-based building systems and transportation with electric-based systems (to take advantage of generally better efficiencies and decreasing electricity-based emissions). These general strategies can be applied to the major emission sectors: the residential, commercial, and industrial built environment; transportation; solid waste; and water and wastewater. Additionally, changes to land use, such as the increase and improvement of natural areas described in Santa Fe's 30 X 30 plan, can offset emissions by removing carbon from the atmosphere. To explore possible reductions in emissions, three scenarios were modeled, representing low, medium, and high effort, with corresponding low, medium, and high emissions reductions. The recommended strategies are described here, and the amount of implementation of each is shown in Table 5.

*Transportation*

- Promote electric vehicles (EVs). The main perceived barriers to EV ownership are up-front cost and "range anxiety", the fear of being stranded unable to find charging equipment when the vehicle's battery is low. Installation of public EV charging equipment at County facilities and amending zoning ordinances to remove barriers to EV charging equipment at developments, such as landscaping or setback restrictions, can facilitate installation of EV charging equipment. Electrifying County vehicles to provide an example to the community can also promote EV adoption, especially if the County focuses on high-use vehicles. Recently proposed EPA rules on tailpipe emissions may force more carmakers to produce EVs, lowering the cost of these vehicles and increasing availability in vehicle types which have not been widely available in electric form, such as pick-up trucks.
- Reduce per-capita vehicle miles traveled. Improving availability and safety of bicycle lanes and pedestrian sidewalks, as well as increasing development density and mixed use development to reduce travel distances can reduce the amount that residents need to drive, reducing emissions, but also saving residents money that would be spent on fuel and vehicle maintenance, as well as reducing time spent in traffic.

*Residential, commercial, and industrial built environments*

- Increase residential, commercial, and industrial building efficiency. Improving building efficiency not only reduces GHG emissions, but can also reduce the overall cost of homeownership, making living in the County more affordable. Educating residents on programs which can fund efficiency improvements, such as the Weatherization

Assistance Program, can allow them to lower their cost of living while reducing the up-front costs of energy efficiency.

- Educate residents on household energy savings. Partnering with local electrical utilities to provide Home Energy Reports to residents allows residents to compare their energy use to their peers, and can often prompt significant reductions in usage. Combined with County-supplied information on simple ways to save household energy, as well as information on the long-term cost savings that result from using less energy, can help residents implement real improvements in their homes.
    - If any part of the County is within the Xcel Energy service area, this utility distributes free, annual Community Energy Reports that give information, including greenhouse gas emission estimates, at the city or county level. This can assist the County tracking emissions in order to gauge the success of programs. More information, including an application link here: Community Energy Reports | Xcel Energy.
- Increasing building electrification. Replacing oil and natural gas heating systems at end of life in homes and businesses with heat pumps minimizes the up-front cost associated with electrical heating systems. The high efficiency of electric heat pumps reduces long term costs, and also shields residents and businesses from fuel-price shocks.
- Install residential solar. Installing on-site solar panels, especially with battery storage can reduce emissions, lower residents' power bills, and provide back-up power in case of a grid outage. Additionally, the high amount of solar irradiance in New Mexico makes Santa Fe County an ideal location for solar power.[89] However, the up-front cost of on-site solar can be daunting. These costs can be reduced by participating in New Mexico's community solar program, which allows residents to offset their emissions, buy purchasing shares in, or leasing a portion of, a commercial solar array. This program will open up solar power to residents who have shaded roofs, or who rent.[90] 30% of all projects will be dedicated to serving low income households. Additionally, Santa Fe County can partner with organizations such as Solar United Neighbors, a non-profit that specializes in helping form County-level purchasing cooperatives to reduce the up-front cost of solar panels.

*Solid Waste*

- Promoting and educating on recycling and reusing materials can help reduce landfilled waste, which produces greenhouse gases as it decomposes. By reducing the amount of material that goes into the landfill, residents can save money. Remember, everything

[89] NREL, "Solar Resource Maps and Data," accessed May 11, 2023, https://www.nrel.gov/gis/solar-resource-maps.html.
[90] New Mexico Public Regulations Commission, "Community Solar," accessed May 11, 2023, https://www.nm-prc.org/utilities/community-solar/.

that goes into the garbage has been paid for in some way by the person throwing it away. Additionally, reducing the amount of material going into the landfill can extend the lifetime of the landfill.

*Water and wastewater energy use*

- As with other efficiency measures, reducing water use can reduce costs to the County community. Santa Fe County's high altitude, semiarid steppe, grass, shrub and woodland, coniferous national forested landscapes make water a precious resource for the community.

*Expand Forest and Non-Forest Tree Coverage*

- Increasing the quality and amount of natural area in Santa Fe in line with the County's 30x30 and Nature Based Solution Plans, can significantly offset community greenhouse gas emissions and are essential to the County meeting its SBT emissions goals.

**Table 5:** Baseline and projected emissions in a business-as-usual scenario (MTCO2e)

| Strategy | Low Effort | Medium Effort | High Effort | Unit |
|---|---|---|---|---|
| **Replace gasoline vehicles with electric vehicles** | 1 | 6 | 10 | % vehicles each year |
| **Reduce resident driving mileage** | 5 | 10 | 20 | % reduction per capita miles by 2050 |
| **Increase residential building efficiency** | 1 | 5 | 10 | % efficiency increase per year |
| **Educate residents on household energy savings** | 3,000 | 4,500 | 6,000 | Number of households educated |
| **Install residential solar** | 1 | 2 | 3 | % of households per year |
| **Convert residential buildings to electric** | 1 | 5 | 10 | % of buildings each year |
| **Increase commercial building efficiency** | 1 | 2 | 3 | % efficiency increase per year |
| **Convert commercial buildings to electric** | 1 | 5 | 10 | % of buildings each year |
| **Perform commercial building benchmarking** | 1 | 2 | 3 | % of buildings each year |
| **Reduce industrial building energy usage** | 1 | 2 | 3 | % efficiency increase per year |
| **Reduce landfilled municipal solid waste** | 1 | 5 | 10 | % reduction each year |
| **Reduce water usage** | 1 | 2 | 3 | % reduction each year |
| **Increase carbon sequestration through land use** | 15 | 30 | 30 | % increased sequestration by 2050 |

## Results

Figures 13 to 14 show the results of these strategies, and Tables 6 and 7 quantify the emissions for 2030 and 2050.

**Figure 13:** Results of low-effort implementation of strategies

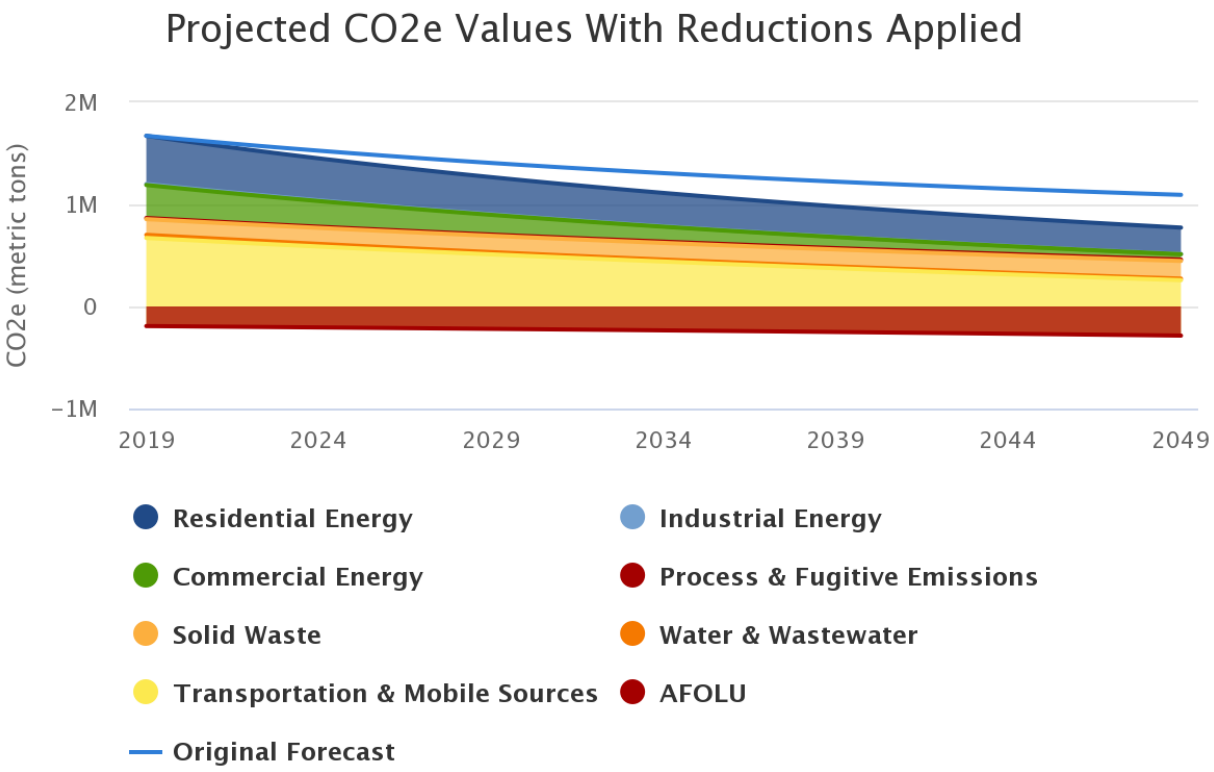


**Figure 14:** Results of medium-effort implementation of strategies

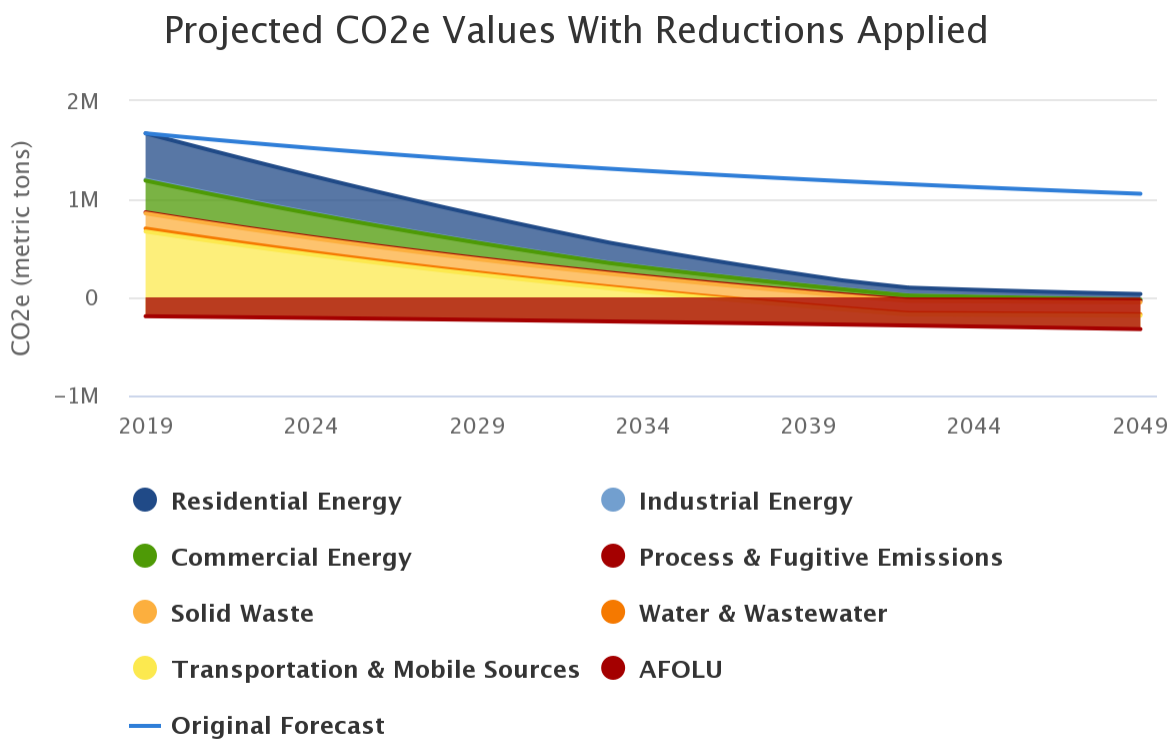



**Figure 15:** Results of high-effort implementation of strategies

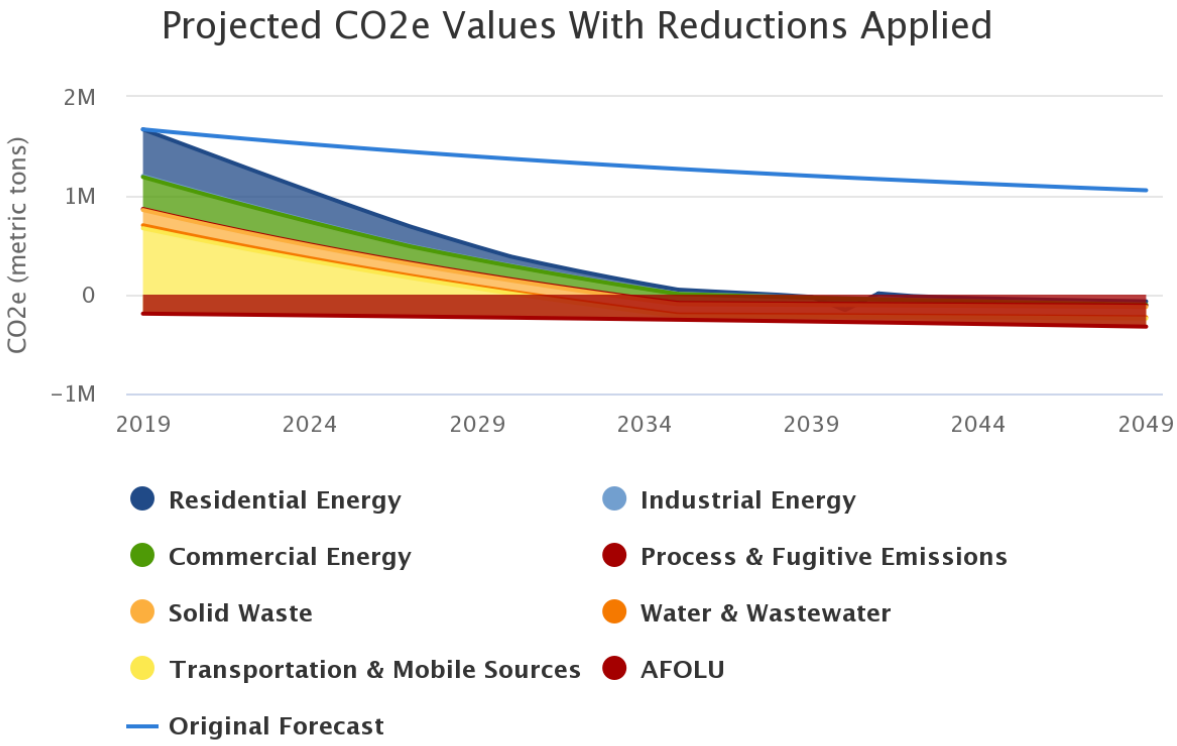


**Table 6:** Projected 2030 emissions reductions due to low, medium, and high-effort implementation of strategies (MTCO2e)

| Sector | Low | Medium | High |
|---|---|---|---|
| **Transportation** | 718,530 | 429,329 | 245,753 |
| **Residential Energy** | 355,085 | 259,806 | 90,742 |
| **Commercial Energy** | 183,471 | 141,946 | 134,634 |
| **Industrial Energy** | 5,642 | 5,046 | 4,508 |
| **Solid Waste** | 160,874 | 133,281 | 111,735 |
| **Water and Wastewater** | 21,214 | 20,124 | 19,149 |
| **Land Use** | -222,253 | -232,669 | -232,669 |
| **Process and Fugitive** | 11,656 | 11,656 | 11,656 |
| **Total** | **1,234,209** | **768,429** | **385,508** |
| **Percent reduction from 2019** | **26.2** | **54.0** | **76.9** |

**Table 7:** Projected 2050 emissions reductions due to low, medium, and high-effort implementation of strategies (MTCO2e)

| Sector | Low | Medium | High |
|---|---|---|---|
| **Transportation** | 543,616 | 137,677 | 82,042 |
| **Residential Energy** | 258,580 | 56,026 | 31,876 |
| **Commercial Energy** | 52,293 | 13,609 | 9,653 |
| **Industrial Energy** | 2,043 | 1,507 | 1,108 |
| **Solid Waste** | 173,611 | 121,468 | 104,362 |
| **Water and Wastewater** | 14,799 | 13,808 | 13,058 |
| **Land Use** | -285,654 | -323,570 | -323,570 |
| **Process and Fugitive** | 13,699 | 13,699 | 13,699 |
| **Total** | **777,978** | **34,224** | **-67,736** |
| **Percent reduction from 2019** | **53.8** | **98.0** | **104.1** |

Under the medium scenario, the total emissions of 644,591 MTCO2e in 2030 represents a 54% reduction from total 2019 emissions, close to the SBT, and almost completely reduces emissions in 2050. Very little additional action would be required to reach the SBT by 2030 and net zero emissions by 2050.

## Additional Recommendations

As well as implementing plans to reduce community emissions, Santa Fe County can reduce emissions in its own local government operations. This will allow the County to act as a model and inspiration for community members, as well as reaping the long-term cost savings associated with emissions reductions. We recommend:

- Establishing an Energy Manager position to analyze County utility usage, and plan and implement efficiency strategies in County operations. By tracking utility usage in County operations in specific energy tracking software such as EnergyCAP, an Energy Manager can find and address inefficiencies in County buildings and infrastructure, and reduce the County's operational costs. Establishing an Energy Manager position can often pay for itself. Additionally, by tracking the cost savings that are associated with implementing specific efficiency measures, the Energy Manager can quantify those savings, and potentially divert some of the cost savings back into additional energy efficiency actions. Use of programs such as the Green Revolving Investment Tracking System (GRITS) to do this can also pay for itself. An Energy Manager can also provide analytics for GHG emissions reduction policy recommendations throughout the County
- Creating an infrastructure-focused cross departmental team (CDT) can offer many benefits, as long as there is buy-in from elected officials and high-level staff. A regularly meeting, high-level CDT composed of staff responsible for County facilities, as well as public infrastructure, can provide a single channel for implementing and streamlining energy efficiency strategies. For example, an infrastructure CDT can simplify data collection for greenhouse gas inventorying by bringing all of the County's energy users to one forum. A CDT can have additional benefits. For example, in Palm Beach County, FL, the infrastructure CDT worked to align water utility and engineering strategic plans so that the two departments could combine pipe installations with road resurfacing. This saved the County money and reduced inconvenience for residents.
- Partnership with other local governments. For example, the City of Santa Fe also conducts greenhouse gas inventories and is implementing a climate action plan. By working together with the City where these inventories and plans overlap, the County can reduce redundancy.

## Recommendations to Increase Resiliency in Response to Climate Change

As outlined in the Climate Conditions Report, climate change is increasing Santa Fe's environmental hazard risk. Research and data on future climate indicate that climate change is likely to lead to warmer year-round temperatures and hotter summers. Water scarcity, drought, and aridity–already part of life in the Southwest–are likely to be worsened by climate change, as are extreme events, including heavy rainfall, flooding, and of significant concern, wildfire.

To achieve meaningful reductions in climate-related hazard risk, the County will need to work in partnership with local residents and businesses. There are multiple avenues through which the

County can act to build resilience, including deployment of conventional or "gray" infrastructure (e.g. constructed fire breaks) and nature-based solutions (e.g. urban tree canopy). The nature-based concept describes the potential for intact, functioning natural systems and assets to enhance our own ability to mitigate GHG emissions and adapt to the impacts of climate change (for more on nature-based solutions, see County Nature Based Solutions EMPSi Report).

Conventional/Built Infrastructure:

- **Resilience hubs:** Resilience hubs are typically pre-existing community facilities (e.g. houses of worship, schools, community centers) that are augmented to support residents in the event of a natural disaster. Resilience hubs can serve as a community home base from which resources, communications, and services are coordinated. Ideally, resilience hubs advance multiple goals, including those related to social equity, community self-determination and empowerment, climate resilience, and GHG mitigation.
- **Shade structures and pop-up cooling stations:** Shade structures and mobile, pop-up cooling stations are flexible ways to provide residents relief from the heat.
- **Energy resilience:** Support energy resilience with strategic installation of microgrids and dispatchable batteries.

Nature-based Solutions:

- **Urban forestry and green streets program:** Intact tree canopy can mitigate extreme heat, provide wildlife habitat, and reduce stormwater runoff, in addition to many other co-benefits.
- **Climate-smart landscaping practices:** Climate-smart landscaping practices can include interventions like replacing lawns with native plants, reducing/eliminating pesticide application, and creating rain gardens. These practices have benefits for ecosystems and can support a more resilient landscape by increasing infiltration of stormwater for building healthier soils, increasing biodiversity, and improving soil moisture.
- **Require green infrastructure:** Green infrastructure, which includes features like wetlands and bioswales, can help naturally manage stormwater and reduce flooding while creating co-benefits (e.g. wildlife habitat, community greening). The County could encourage adoption of green infrastructure by, for example, mandating its adoption on County property or passing ordinance for green infrastructure, mandating its use throughout County for larger structures and in key identified, high impact areas.

Other Recommendations:

- **Incorporate climate resilience into comprehensive plans:** Comprehensive planning, through a Cross Departmental Team (CDT), previously mentioned, are critical interdisciplinary partnering strategies for identifying and planning for effectively and efficiently addressing a regional government's critical priorities across multiple thematic areas, including land use, governance, natural resource management, transportation planning, public works, infrastructure, and community development. Incorporating climate resilience into comprehensive plans with such a group helps to decrease silos and local governments to move the needle on climate action planning toward implementation more cooperatively and cohesively.
- **Climate-smart codes and zoning:** Codes and zoning regulations can significantly reduce wildfire risks to life and property. For example, Wildland Urban Interface (WUI) codes create minimum requirements for building and development. WUI codes, which combine relevant rules in one place, make it easier for developers and residents to understand their risk and comply with regulations. In general, climate-smart zoning can be used to shift development away from high-risk areas.
- **Youth outreach:** Other municipalities have successfully broadened their reach and advanced partnerships with underserved communities through youth outreach, such as by supporting a Climate Ambassadors program.

# Potential Funding Opportunities

The main upcoming sources of federal funding for climate mitigation initiatives are the Inflation Reduction Act of 2022, the Infrastructure Investment and Jobs Act, the Environmental Protection Agency's Climate Pollution Reduction Grant (CPRG) program, and the Department of Energy's Energy Efficiency and Conservation Block Grants (EECBG).

Funding sources in those acts relevant to this plan include:

*Inflation Reduction Act of 2022*

- Ability for tax-exempt entities such as the County to monetize tax incentives in certain programs, such as the Alternative Fuel Vehicle Refueling Property Tax Credit and Energy-Efficient Commercial Buildings Tax Deduction https://www.epa.gov/green-power-markets/inflation-reduction-act
- The Investment Tax Credit will provide a 30% tax credit for investments in clean energy, as well as an extra 20% tax credit for investments in low income communities.

https://home.treasury.gov/system/files/136/Fact-Sheet-IRA-Equitable-Clean-Energy-Economy.pdf

- $1.9 billion specifically to improve neighborhood walkability through the Neighborhood Access and Equity Grant Program. This funding has an 80% federal share, or a 100% federal share for underserved communities. Deadlines and application information have not yet been released. https://fundingnaturebasedsolutions.nwf.org/programs/neighborhood-access-and-equity-grant-program/

*Infrastructure Investment and Jobs Act*

- The National Electric Vehicle Incentive (NEVI) program, which will provide $5 billion nationally to fund electric vehicle charging equipment. It is expected that $38 million will be allocated to New Mexico. Deadlines and funding amounts have not yet been announced. https://www.dot.nm.gov/nevi/
- New competitive grant programs for charging and fueling infrastructure, which will provide 2.5 billion nationally for public electric vehicle charging and alternate fuels along pre-designated Alternative Fuel Highways, including Interstate I-25 in Santa Fe County. https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-funding-and-financing/federal-funding-programs
- $193 million between 2022 and 2026 for public transit investments. https://www.transit.dot.gov/funding/grants/fta-program-fact-sheets-under-bipartisan-infrastructure-law

*Additional funding*

- The U.S. Department of Agriculture Forest Service has received $1.5 billion to support urban tree-planting, urban forest planning and management, and related activities, particularly in disadvantaged communities, including $1.9 million for New Mexico. https://www.fs.usda.gov/managing-land/urban-forests/ucf
- The U.S. Department of Energy is offering grants up to $400,000 for energy and efficiency upgrades in disadvantaged communities through their Building Upgrade Program. Up to $5,000 is available for assistance with applications, and applications are open now on a rolling basis. https://www.energy.gov/eere/articles/us-department-energy-announces-buildings-upgrade-prize

# Appendix A: Climate Data

## Data Platforms

| Platform | Description |
|---|---|
| National Climate Change Viewer (NCCV) | The NCCV, created by the US Geological Survey (USGS) allows users to visualize and download data on projected climatic changes across climate indicators (temperature and precipitation) as well as simulated water balance indicators (snow water equivalent, runoff, soil water storage, and evaporative deficit) for states and counties in the US. See technical documentation for more information. |
| Climate Resilience Toolkit Climate Explorer | The Climate Explorer, created by several federal government science agencies, allows users to view and download graphs and maps showing past observations and projected climate conditions for counties in the US. Projections are provided for temperature, precipitation, and indicators relating to heating/cooling and agriculture. See About page for more information. |
| Risk Factor | Risk Factor is an online platform created by the nonprofit First Street Foundation that provides data on climate hazards and exposure. As of April 2023, Risk Factor provides free access to high-level information and data on exposure to flooding, wildfires, extreme heat, and severe wind at the city, county, zip code and address level. Detailed property-level information is available for purchase. See Risk Factor's About page for more information. |

## Seasons

| Season | Months |
|---|---|
| Winter | December, January, February |
| Spring | March, April, May |
| Summer | June, July, August |
| Fall | September, October, November |

## Indicators

| Indicator (Unit) | Description | Source |
|---|---|---|
| **Temperature** | | |
| Mean Temperature (°F) | The average of minimum and maximum annual or seasonal air temperature | NCCV |
| Maximum Temperature (°F) | The maximum annual or seasonal air temperature | NCCV |
| Minimum Temperature (°F) | The minimum annual or seasonal air temperature | NCCV |
| Extremely Hot Days (days) | Number of days with maximum temperature > 100°F | Climate Explorer |
| **Precipitation** | | |
| Average Precipitation (in/month) | The average annual or seasonal accumulated monthly precipitation (inches per month) | NCCV |
| Extreme Precipitation Events (days) | Number of extreme precipitation events (days with > 1 inch precipitation) | Climate Explorer |
| **Hydrological** | | |
| Evaporative Deficit (mm/month) | The average annual or seasonal difference between potential evapotranspiration and actual evapotranspiration | NCCV |
| Soil Storage (in/month) | The average annual or seasonal amount of water stored in the soil column | NCCV |
| Runoff (in/month) | The average annual or seasonal amount of runoff (sum of direct runoff) that occurs from precipitation and snowmelt and surplus runoff which occurs when soil moisture is at 100% capacity | NCCV |
| **Other** | | |
| Annual Vapor Pressure Deficit (psi) | The difference between the amount of moisture in the air and maximum amount of water the air can hold at saturation | NCCV |

# Climate Data and Projections Detailed View

## Temperature

### Minimum, Mean, and Maximum Temperature

**Table A1.** Minimum, mean, and maximum temperatures (°F) annually and by season averaged across three 25-year climatology periods for Santa Fe County under RCP8.5.[91] All values are the ensemble median. 1981-2010 baseline provided for comparison.

| RCP 8.5 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Baseline (1981-2010) | | | 2025-2049 | | | 2050-2074 | | | 2075-2099 | | |
| **Season** | Min | Mean | Max | Min | Mean | Max | Min | Mean | Max | Min | Mean | Max |
| Annual | 35.88 | 50.28 | 64.69 | 38.88 | 53.53 | 68.18 | 41.43 | 56.37 | 71.31 | 44.21 | 59.32 | 74.43 |
| Winter | 19.63 | 32.28 | 44.93 | 22.7 | 35.46 | 48.23 | 24.97 | 38.05 | 51.13 | 27.41 | 40.78 | 54.15 |
| Spring | 34.14 | 49.33 | 64.52 | 36.76 | 52.39 | 68.03 | 39.06 | 55.21 | 71.36 | 41.53 | 57.9 | 74.27 |
| Summer | 53.39 | 68.74 | 84.1 | 56.51 | 72.06 | 87.6 | 59.35 | 75.06 | 90.78 | 62.55 | 78.3 | 94.05 |
| Fall | 36.36 | 50.78 | 65.19 | 39.52 | 54.18 | 68.84 | 42.31 | 57.12 | 71.94 | 45.31 | 60.25 | 75.2 |

[91] USGS, "National Climate Change Viewer."

## Summer Mean Temperature

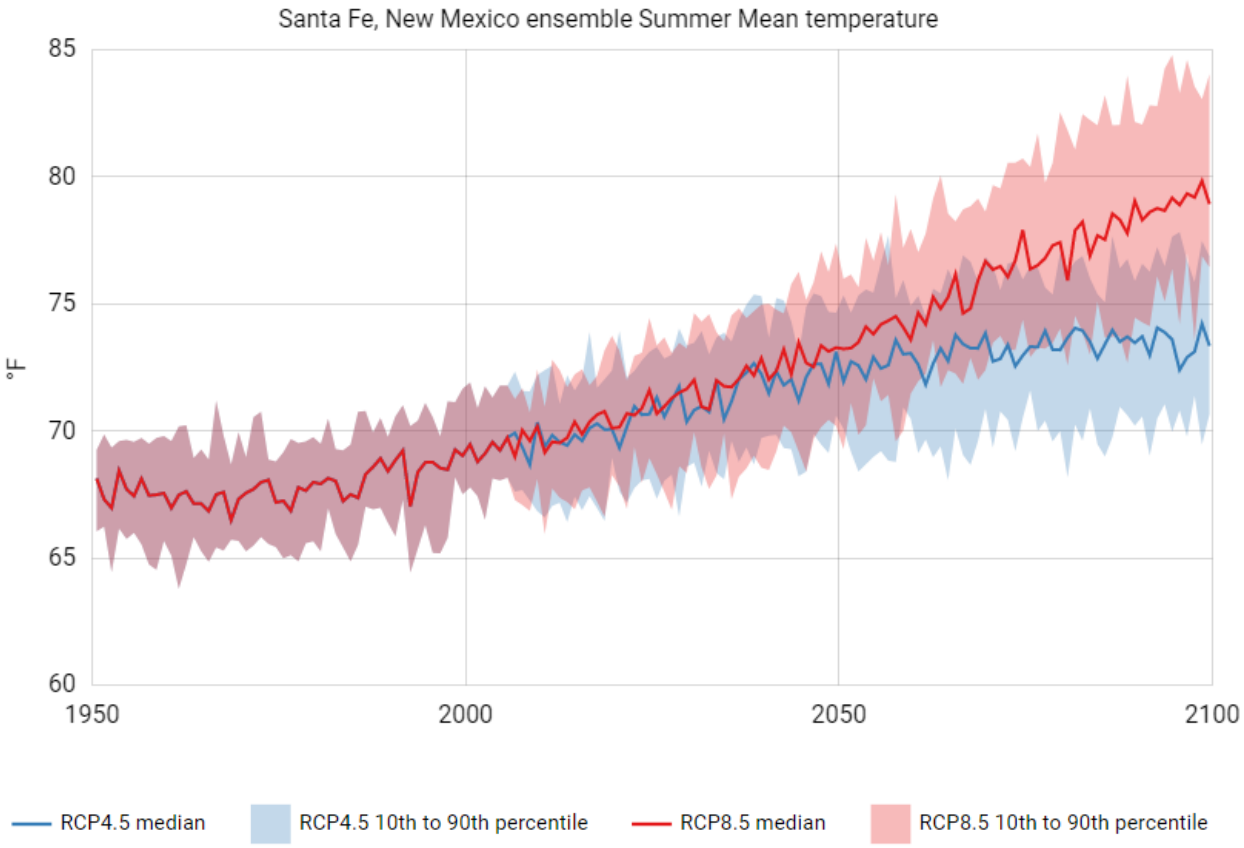



**Figure A1.** Summer mean temperature (°F) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[92] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[92] USGS.

## Winter Mean Temperature

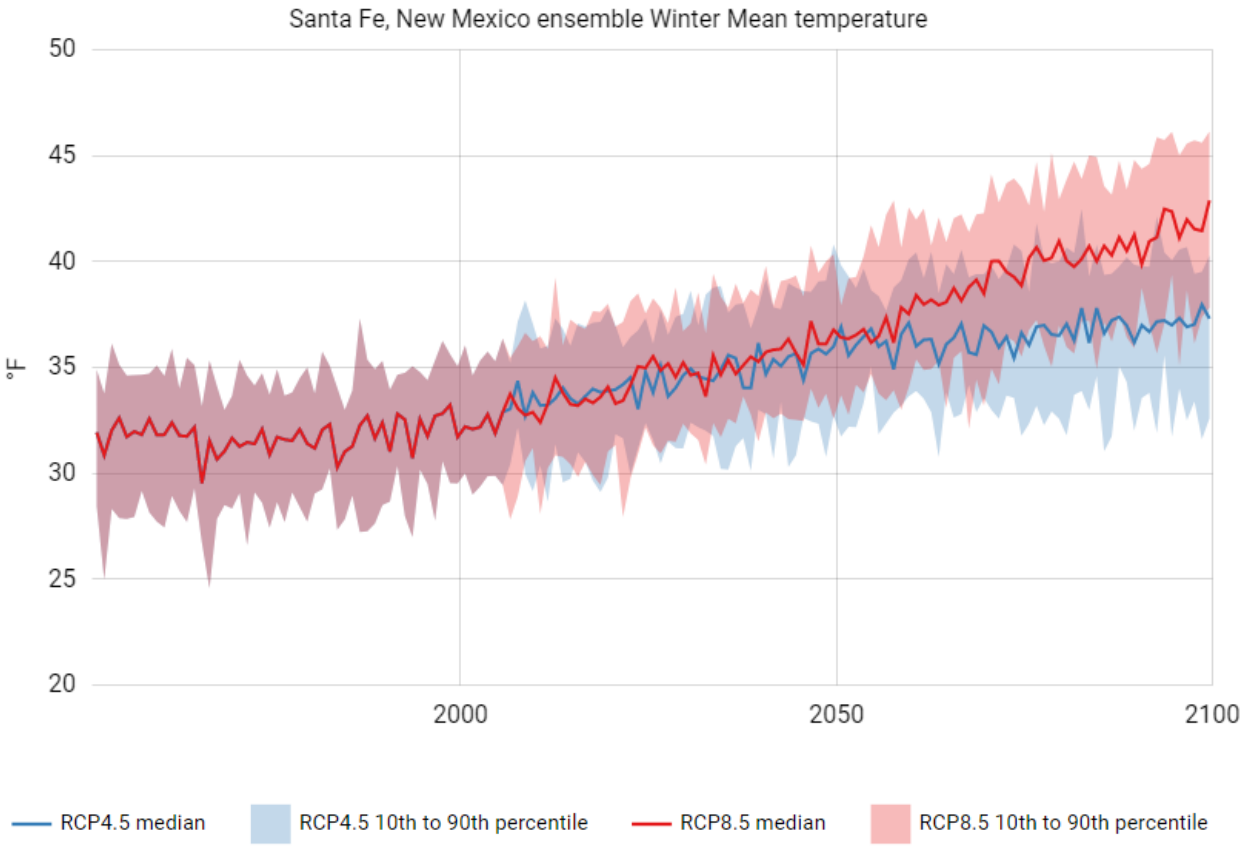



**Figure A2.** Winter mean temperature (°F) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[93] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[93] USGS.

## Winter Minimum Temperature

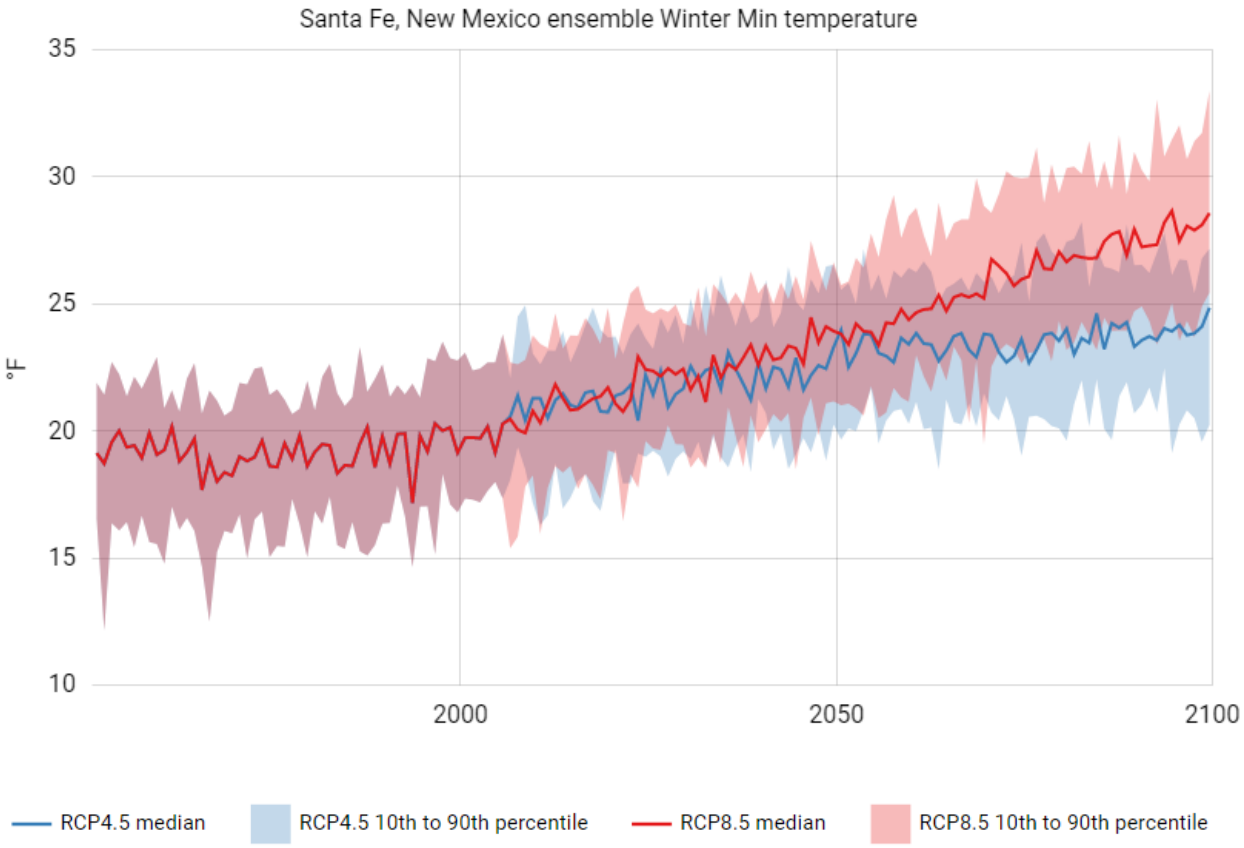



**Figure A3.** Winter minimum temperature (°F) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[94] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[94] USGS.

## Extremely Hot Days

**Table A2.** Number of extremely hot days (maximum temperature > 100 °F) per year in Santa Fe County projected under RCP8.5 averaged by decade.[95] All values are the ensemble median. Historical observations (not modeled history) are provided for comparison.

| RCP 8.5 | |
|---|---|
| **Time Period** | **Decadal Average** |
| *Historical Observations (1960-1991)* | *0* |
| 2010s | 0.4 |
| 2020s | 0.6 |
| 2030s | 1.2 |
| 2040s | 2.8 |
| 2050s | 3.8 |
| 2060s | 8.2 |
| 2070s | 13.5 |
| 2080s | 18.3 |
| 2090s | 26.3 |

[95] U.S. Federal Government, "U.S. Climate Resilience Toolkit Climate Explorer."

## Precipitation

### Annual and Seasonal Average Precipitation

**Table A3.** Annual and seasonal precipitation (inches/month) averaged across three 25-year climatology periods for Santa Fe County under RCP8.5.[96] All values are the ensemble median. 1981-2010 baseline provided for comparison.

| RCP 8.5 | | | | |
|---|---|---|---|---|
| **Season** | **Baseline (1981-2010)** | **2025-2049** | **2050-2074** | **2075-2099** |
| Annual | 1.3 | 1.31 | 1.27 | 1.26 |
| Winter | 0.83 | 0.86 | 0.85 | 0.83 |
| Spring | 1 | 0.97 | 0.9 | 0.89 |
| Summer | 2.05 | 2.04 | 1.98 | 1.98 |
| Fall | 1.3 | 1.37 | 1.34 | 1.34 |

[96] USGS, "National Climate Change Viewer."

## Change in Annual Average Precipitation

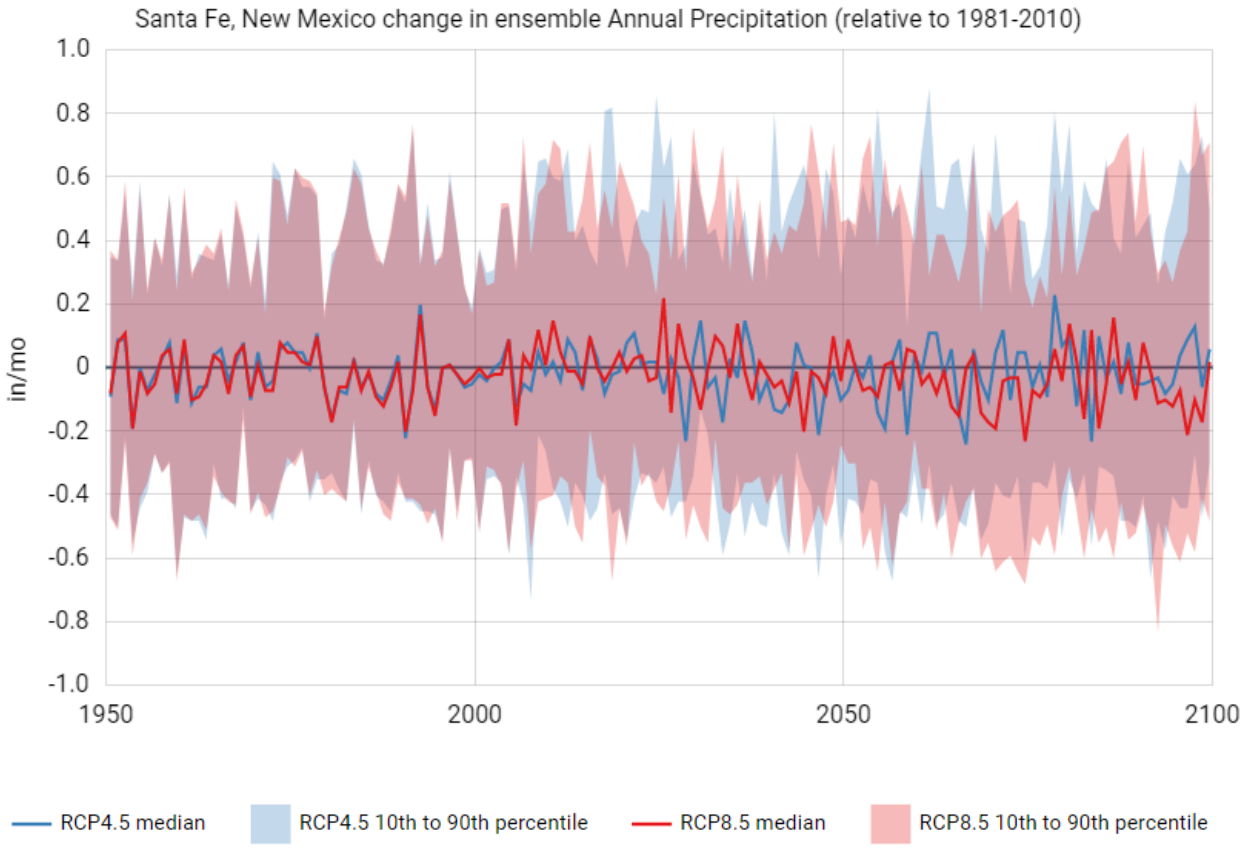



**Figure A4.** Change in annual average precipitation (in/mo) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[97] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[97] USGS.

## Spring Average Precipitation

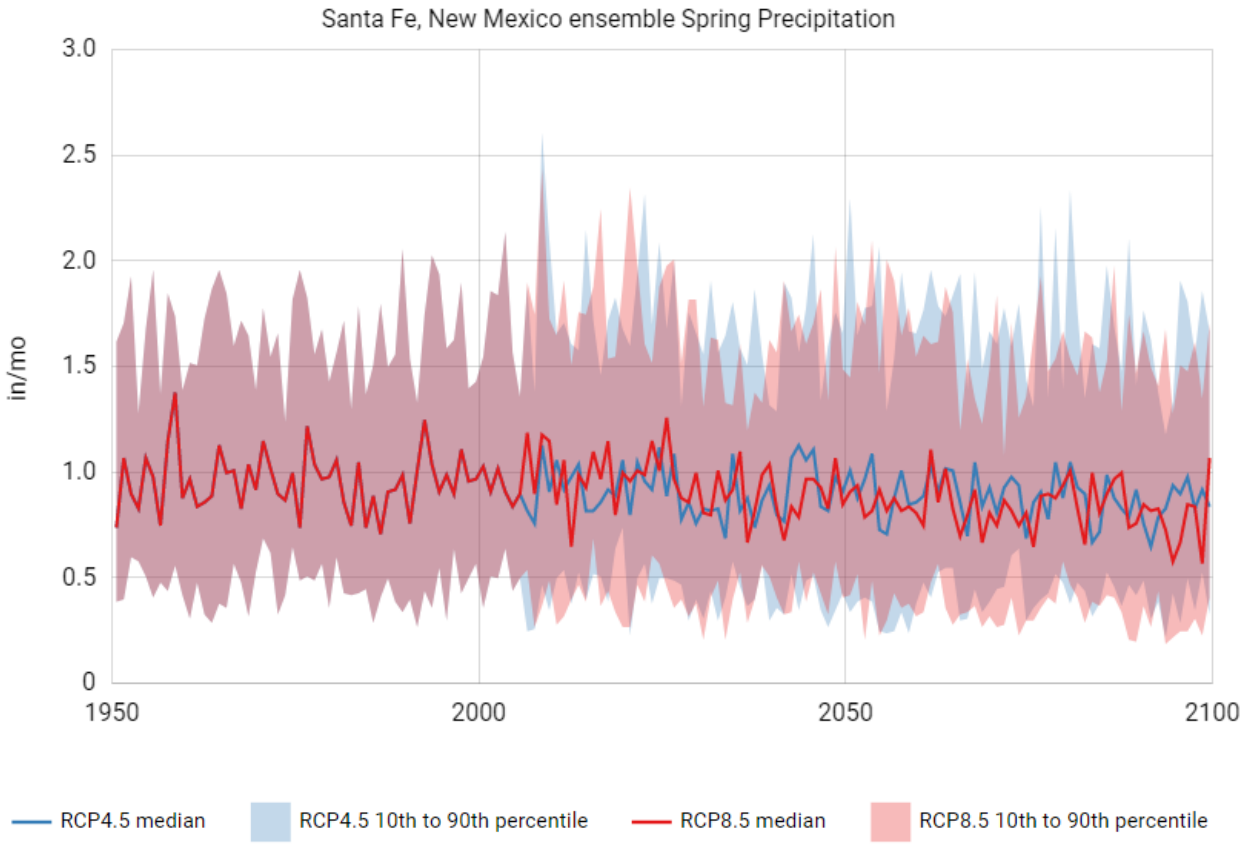



**Figure A5.** Spring precipitation (in/mo) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[98] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[98] USGS.

## Extreme Precipitation Events

**Table A4.** Number of extreme precipitation events (days per year with > 1 inch of precipitation) in Santa Fe County projected under RCP8.5 averaged by decade.[99] All values are the ensemble median. Historical observations (not modeled history) are provided for comparison.

| RCP 8.5 | |
|---|---|
| **Time Period** | **Decadal Average** |
| *Historical Observations (1960-1991)* | *0.5* |
| 2010s | 0.4 |
| 2020s | 0.5 |
| 2030s | 0.5 |
| 2040s | 0.5 |
| 2050s | 0.5 |
| 2060s | 0.5 |
| 2070s | 0.6 |
| 2080s | 0.6 |
| 2090s | 0.5 |

[99] U.S. Federal Government, "U.S. Climate Resilience Toolkit Climate Explorer."

# Drought

## Evaporative Deficit

**Table A5.** Annual and seasonal average evaporative deficit (mm/month) averaged across three 25-year climatology periods for Santa Fe County under RCP8.5.[100] 1981-2010 baseline provided for comparison.

| RCP 8.5 | | | | |
|---|---|---|---|---|
| **Season** | **Baseline (1981-2010)** | **2025-2049** | **2050-2074** | **2075-2099** |
| Annual | 30.07 | 36.81 | 44.12 | 51.33 |
| Winter | 0.22 | 1.17 | 3.26 | 6.6 |
| Spring | 24.43 | 33.96 | 44.9 | 55.06 |
| Summer | 71.87 | 83.43 | 94.69 | 105.04 |
| Fall | 23.77 | 28.7 | 33.58 | 38.55 |

[100] USGS, "National Climate Change Viewer."

## Soil Storage

**Table A6.** Annual and seasonal average soil storage (in) averaged across three 25-year climatology periods for Santa Fe County under RCP8.5.[101] 1981-2010 baseline provided for comparison.

| RCP 8.5 | | | | |
|---|---|---|---|---|
| **Season** | **Baseline (1981-2010)** | **2025-2049** | **2050-2074** | **2075-2099** |
| Annual | 1.23 | 1.06 | 0.82 | 0.63 |
| Winter | 2.04 | 2.02 | 1.73 | 1.38 |
| Spring | 1.92 | 1.48 | 1.05 | 0.74 |
| Summer | 0.34 | 0.21 | 0.13 | 0.09 |
| Fall | 0.63 | 0.52 | 0.37 | 0.3 |

[101] USGS.

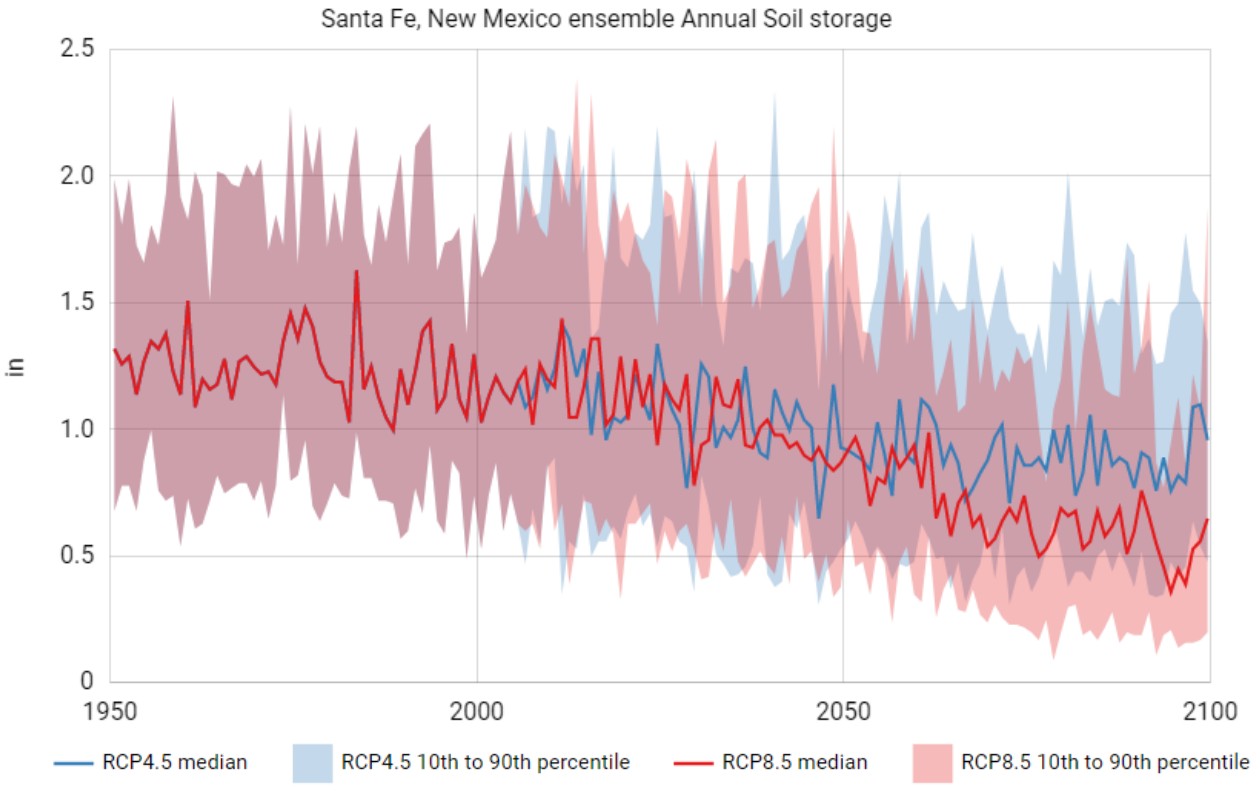



**Figure A6.** Annual soil storage (in/month) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[102] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[102] USGS.

## Runoff

**Table A7.** Annual and seasonal average runoff (in/mo) averaged across three 25-year climatology periods for Santa Fe County under RCP8.5.[103] 1981-2010 baseline provided for comparison.

| RCP 8.5 | | | | |
|---|---|---|---|---|
| **Season** | **Baseline (1981-2010)** | **2025-2049** | **2050-2074** | **2075-2099** |
| Annual | 0.15 | 0.15 | 0.13 | 0.12 |
| Winter | 0.04 | 0.07 | 0.08 | 0.09 |
| Spring | 0.23 | 0.22 | 0.18 | 0.15 |
| Summer | 0.24 | 0.19 | 0.15 | 0.13 |
| Fall | 0.11 | 0.11 | 0.09 | 0.09 |

[103] USGS.

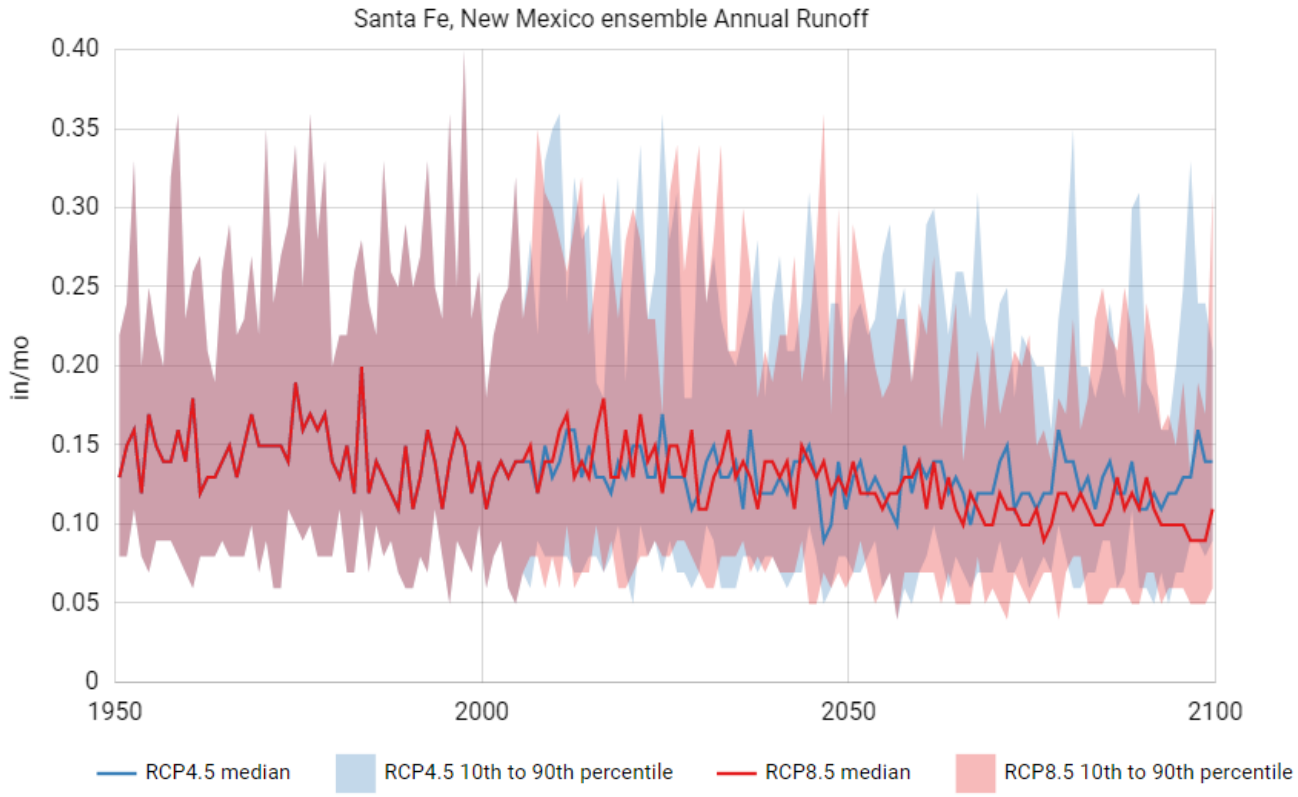



**Figure A7.** Runoff (in/month) in Santa Fe County projected through 2099 under RCP4.5 (blue) and RCP8.5 (red).[104] The solid lines show the ensemble median. Shaded areas show the 10th to 90th percentile range of projections.

[104] USGS.

## Wildfire

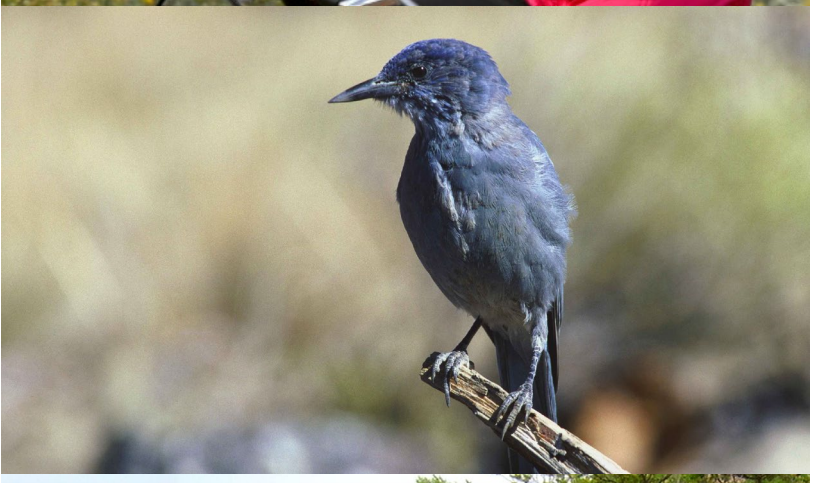
### Vapor Pressure Deficit

**Table A8.** Annual and seasonal vapor pressure deficit (psi) averaged across three 25-year climatology periods for Santa Fe County under RCP8.5.[105] 1981-2010 baseline provided for comparison.

| RCP 8.5 | | | | |
|---|---|---|---|---|
| **Season** | **Baseline (1981-2010)** | **2025-2049** | **2050-2074** | **2075-2099** |
| Annual | 0.15 | 0.17 | 0.19 | 0.22 |
| Winter | 0.06 | 0.07 | 0.07 | 0.08 |
| Spring | 0.15 | 0.17 | 0.2 | 0.22 |
| Summer | 0.26 | 0.29 | 0.33 | 0.38 |
| Fall | 0.14 | 0.16 | 0.18 | 0.2 |

[105] USGS.

# Appendix B: 2019 Inventory of Countywide Greenhouse Gas Emissions



# Santa Fe County, NM

## 2019 Inventory of Countywide Greenhouse Gas Emissions

JUNE 2022

**Produced by the Santa Fe County Office of Sustainability**
with Assistance from ICLEI – Local Governments for Sustainability USA

# Credits and Acknowledgements

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Thank you to all the personnel at the City of Santa Fe, North Central Regional Transit District, Buckman Direct Diversion, Santa Fe Solid Waste Management Agency, New Mexico Gas Company, EMW Gas Association, Public Service Company of New Mexico, Jemez Mountains Electric Cooperative, Central New Mexico Electrical Cooperative, and Mora-San Miguel Electric Cooperative who provided data for this inventory.

Photo credits: From top to bottom, cover photos courtesy of Santa Fe County; MARELBU; Menke Dave, U.S. Fish and Wildlife Service; and The AgriGate of Santa Fe County.

## ICLEI-Local Governments for Sustainability USA

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# Definitions

| | |
|---|---|
| Activity | The use of energy, materials, and/or services by members of the community that result in the creation of greenhouse gas (GHG) emissions either directly (e.g., use of household furnaces and vehicles with internal combustion engines) or indirectly (e.g., use of electricity created through combustion of fossil fuels at a power plant, consumption of goods and services whose production, transport and/or disposal resulted in creation of GHG emissions). |
| Activity data | Data on the magnitude of a human activity resulting in emissions taking place during a given period of time. Data on energy use, fuel used, miles traveled, input material flow, and product output are all examples of activity data that might be used to compute GHG emissions. |
| Anthropogenic emissions | GHG emissions that are a direct result of human activities or are the result of natural processes that have been affected by human activities. |
| Base(line) year emissions | GHG emissions in chosen year against which a community's emissions are compared over time. |
| Biochemical oxygen demand (BOD5) | The oxygen used in meeting the metabolic needs of aerobic microorganisms in water rich in organic matter (such as water polluted with sewage). |
| British thermal unit (Btu) | A measure of the heat content of fuels or energy sources. It is the quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit at the temperature that water has its greatest density (about 39.2 degrees Fahrenheit). |
| Carbon dioxide ($CO_2$) | The most common of the six primary GHGs, consisting of a single carbon atom and two oxygen atoms, and providing the reference point for the GWP of other gases (the GWP of $CO_2$ is equal to 1). |
| Climate resilience | The ability to anticipate, prepare for, respond, and adapt to hazardous events, trends, or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks to social, economic, and ecological systems, and taking equitable |

| | |
|---|---|
| | and proactive steps and policy actions to better cope with these risks. |
| $CO_2$ equivalent ($CO_2e$) | The universal unit for comparing emissions of different GHGs expressed in terms of the GWP of one unit of carbon dioxide. |
| Community | Residents, businesses, industries, and government co-located within a jurisdictionally defined area. |
| Double counting | Two or more reporting entities taking ownership of the same emissions or reductions, or the same reporting entity counting the same emissions twice. |
| Emission factor | A unique value for determining an amount of a GHG emitted on a per unit activity basis (for example, metric tons of $CO_2$ emitted per million Btus of coal combusted, or metric tons of $CO_2$ emitted per kWh of electricity consumed). |
| Fossil fuel | A fuel, such as coal, oil, and natural gas, produced by the decomposition of ancient (fossilized) plants and animals. |
| Fugitive emissions | Emissions that are not physically controlled but result from the intentional or unintentional release of GHGs. They commonly arise from the production, processing, transmission, storage and use of fuels or other substances, often through joints, seals, packing, gaskets, etc. |
| Global warming potential (GWP) | The ratio of radiative forcing (degree of warming to the atmosphere) that would result from the emission of one mass-based unit of a given GHG compared to one equivalent unit of carbon dioxide ($CO_2$) over a given period of time. |
| Greenhouse gas (GHG) emissions | Greenhouse gas emissions are gases that trap heat in the atmosphere. Some GHGs such as carbon dioxide occur naturally and are emitted into the atmosphere through natural processes and human activities. Other GHGs are created and emitted solely through human activities. The principal GHGs that enter the atmosphere because of human activities are carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), and fluorinated gases (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride). |
| In-boundary emissions | GHG emissions released within the jurisdictional boundary of a community. Examples include GHG emissions from natural gas combustion in household furnaces and gasoline combustion in motor vehicles driven on roads within the community's jurisdictional boundary. |

| | |
|---|---|
| Intergovernmental Panel on Climate Change (IPCC) | International body of climate change scientists. The role of the IPCC is to assess the scientific, technical and socio-economic information relevant to the understanding of the risk of human-induced climate change (www.ipcc.ch). |
| Inventory | A comprehensive, quantified list of a community's or organization's GHG emissions and sources. |
| Liquefied petroleum gas (LPG) | A group of hydrocarbon-based gases derived from crude oil refining or natural gas fractionation. They include propane, propylene, butane, butylene, isobutene A-14 and isobutylene. For convenience of transportation, these gases are liquefied through pressurization. |
| Methane ($CH_4$) | One of the six primary GHGs, consisting of a single carbon atom and four hydrogen atoms, possessing a GWP of 28, and produced through the anaerobic decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion. |
| Metric ton (MT) | Common international measurement for the quantity of GHG emissions, equivalent to about 2,204.6 pounds or 1.1 short tons. |
| Mitigation | Reduction of annual GHG emissions from a source or activity. |
| Mobile combustion | Emissions from the combustion of fuels in transportation sources (e.g., cars, trucks, buses, trains, airplanes, and marine vessels) and emissions from off-road equipment such as what is used in construction, agriculture, and forestry. A piece of equipment that cannot move under its own power, but that is transported from site to site (e.g., an emergency generator) is a stationary, not a mobile, combustion source. |
| Net zero | Net zero refers to a state in which the amount of greenhouse gases produced by human activity is balanced by the removal of greenhouse gases from the atmosphere. This condition must be achieved by 2050 to limit global warming to 1.5°C. |
| Nitrous oxide ($N_2O$) | One of the six primary GHGs, consisting of two nitrogen atoms and a single oxygen atom, possessing a GWP of 265, and typically generated as a result of soil cultivation practices, particularly the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning. |
| Process emissions | Emissions from physical or chemical processing rather than from fuel combustion. Examples include emissions from manufacturing cement, aluminum, adipic acid, ammonia, etc. |

| | |
|---|---|
| Reporting frameworks | Various approaches or lenses that a local government can use to identify and represent GHG emissions associated with a given community. |
| Scope(s) | Scopes are used in the context of reporting on GHG emissions associated with individual organizational entities (e.g., the operations of a business or local government). In that context, the scopes framework can be used to categorize direct (scope 1) emissions (e.g., smoke stacks or tailpipes that release emissions within an organizational boundary), indirect energy-related (scope 2) emissions (e.g., the use of purchased or acquired electricity, heating, cooling, or steam regardless of where the energy is generated), and other indirect (scope 3) emissions not covered in scope 2 (e.g., upstream and downstream emissions from the extraction and production of purchased materials and fuels). The U.S. Community Protocol does not use scopes as a framework for categorizing emissions in community inventories because the organization-related definitions of scopes do not translate to the community scale in a manner that is applicable, clear, and valuable. |
| Short ton (ton) | Common measurement for a ton in the U.S. and equivalent to 2,000 pounds or about 0.907 metric tons. |
| Source(s) | Any physical process that releases GHG emissions into the atmosphere (e.g., vehicle exhaust from combustion of gasoline, furnace exhaust from the combustion of natural gas, power plant exhaust from combustion of coal for the production of electricity). |
| Stationary combustion | Emissions from the combustion of fuels to produce electricity, steam, heat, or power using equipment (boilers, furnaces, etc.) in a fixed location. |

*Glossary of terms courtesy of the U.S. Community Protocol for Accounting and Reporting of GHG Emissions. Version 1.2. July 2019. ICLEI–Local Governments for Sustainability USA.*

# Acronyms

| | |
|---|---|
| °C | degrees Celsius |
| ACS | American Community Survey |
| AFOLU | Agriculture, Forestry and Other Land Use |
| BCC | Board of County Commissioners |
| BOD5 | five-day biochemical oxygen demand |
| C&D | construction and demolition |
| $CH_4$ | methane |
| CNG | compressed natural gas |
| CNMEC | Central New Mexico Electrical Cooperative |
| $CO_2$ | carbon dioxide |
| $CO_2e$ | carbon dioxide equivalent |
| DOT | U.S. Department of Transportation |
| eGRID | Emissions and Generation Resource Integrated Database |
| EIA | U.S. Energy Information Administration |
| EIE | Environmental Insights Explorer |
| EMW | Town of Estancia, City of Moriarty, and Village of Willard Gas Association |
| EPA | U.S. Environmental Protection Agency |
| EV | electric vehicle |
| FLIGHT | Facility Level Information on GreenHouse gases Tool |
| FY | fiscal year |
| GHG | greenhouse gas |
| GWh | gigawatt hour(s) |
| GWP | global warming potential |
| ICLEI | Local Governments for Sustainability<br>(formerly International Council for Local Environmental Initiatives) |
| IPCC | Intergovernmental Panel on Climate Change |
| JMEC | Jemez Mountains Electric Cooperative |
| kVA | kilovolt-ampere |
| kWh | kilowatt hour(s) |
| lb(s) | pound(s) |
| LEARN | Land Emissions And Removals Navigator |
| LP | liquefied petroleum |
| LPG | liquefied petroleum gas |
| MMBtu | metric million British thermal unit |
| MPG | miles per gallon |
| MSMEC | Mora-San Miguel Electric Cooperative |
| MSW | municipal solid waste |
| MT $CO_2e$ | metric tons of carbon dioxide equivalent |
| MWh | megawatt hour(s) |

| | |
|---|---|
| $N_2O$ | nitrous oxide |
| NCRTD | North Central Regional Transit District |
| NEI | National Emissions Inventory |
| NM | New Mexico |
| NMGC | New Mexico Gas Company |
| NTD | National Transit Database |
| PNM | Public Service Company of New Mexico |
| SAF | Santa Fe Municipal Airport |
| SWMA | Santa Fe Solid Waste Management Agency |
| USDA | U.S. Department of Agriculture |
| USGCRP | U.S. Global Change Research Program |
| VMT | vehicle miles traveled |
| VRM | vehicle revenue miles |

# Executive Summary

Santa Fe County recognizes that greenhouse gas (GHG) emissions from human activities are catalyzing profound climate change, the consequences of which pose substantial risks to the future health, wellbeing, and prosperity of our community.

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 in land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and other steps, local governments can dramatically reduce emissions in their communities.

In June 2017, the Santa Fe County Board of County Commissioners (BCC) voted to adopt and support the goals of the Paris Agreement, committing to reducing greenhouse gas emissions within the County and the community in order to limit global mean temperature increase. In April 2021, the County joined the "Race to Zero", pledging to reduce emissions from the building sector by 60% across County facilities by 2025, and countywide by 2030. In May 2021, the BCC voted to approve the publication of the greenhouse gas emissions inventory of County government operations during the years of 2005, 2017, and 2018.[1] The BCC then approved the publication and implementation of the Greenhouse Gas Emissions Reduction Plan through Resolution 2022-4. The plan is a comprehensive guide for implementing concrete actions to reduce the County's operational emissions.

As a next step in the overarching goal of reducing greenhouse gas emissions countywide, the BCC directed staff to create a Climate Action Plan. This plan will include sector-specific strategic approaches to reduce emissions and equitably adapt to the impacts of climate change. This report quantifies the greenhouse gas emissions resulting from activities in Santa Fe County as a whole in 2019, and serves as a baseline to inform climate change mitigation targets and strategies for the Climate Action Plan.

Santa Fe County collaborated with ICLEI, a global network of local and regional governments committed to sustainable urban development, to complete this GHG emissions inventory. ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones:

[1] Santa Fe County. 2021. Santa Fe County Greenhouse Gas Emissions Inventory, Baseline 2005 and Years 2017 and 2018. Retrieved from https://www.santafecountynm.gov/media/files/Sustain/Santa-Fe-County-GHG-Inventory-Operations-2005-2017-2018.pdf.

1. Conduct an inventory and forecast of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions science-based target;
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 the County's completion of ICLEI's Climate Mitigation Milestone One, and provides a foundation for future work to reduce greenhouse gas emissions in Santa Fe County.

The inventory estimates all of the emissions from within the geographical boundaries of Santa Fe County, including areas that are not within the jurisdiction of the government of Santa Fe County, such as sovereign tribal nations (Pueblos of Nambe, Tesuque, San Ildefonso, and Pojoaque), incorporated municipalities (City of Santa Fe, Town of Edgewood, and part of the City of Espanola), and State and Federal lands. The selected inventory year is 2019, the most recent "normal" year. All source data is from 2019 when possible, using the best available data.

## Key Findings

Inventoried GHG emissions in Santa Fe County totaled 1,858,627 MT $CO_2e$ in 2019**.** Nearly half of this total (46%), was attributed to Transportation and Mobile Sources, the largest contributor to Santa Fe County's overall emissions in the inventory year (Figure 1). The next largest emitting sectors were Residential Energy (25%) and Commercial Energy (17%). Actions to reduce emissions in all of these sectors will be a key part of the County's Climate Action Plan going forward. Solid Waste, Water and Wastewater, Industrial

Energy, Process and Fugitive Emissions, and emissions from Agriculture, Forestry, and Other Land Uses (AFOLU) were responsible for the remaining 11% of emissions (Figure 1).

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

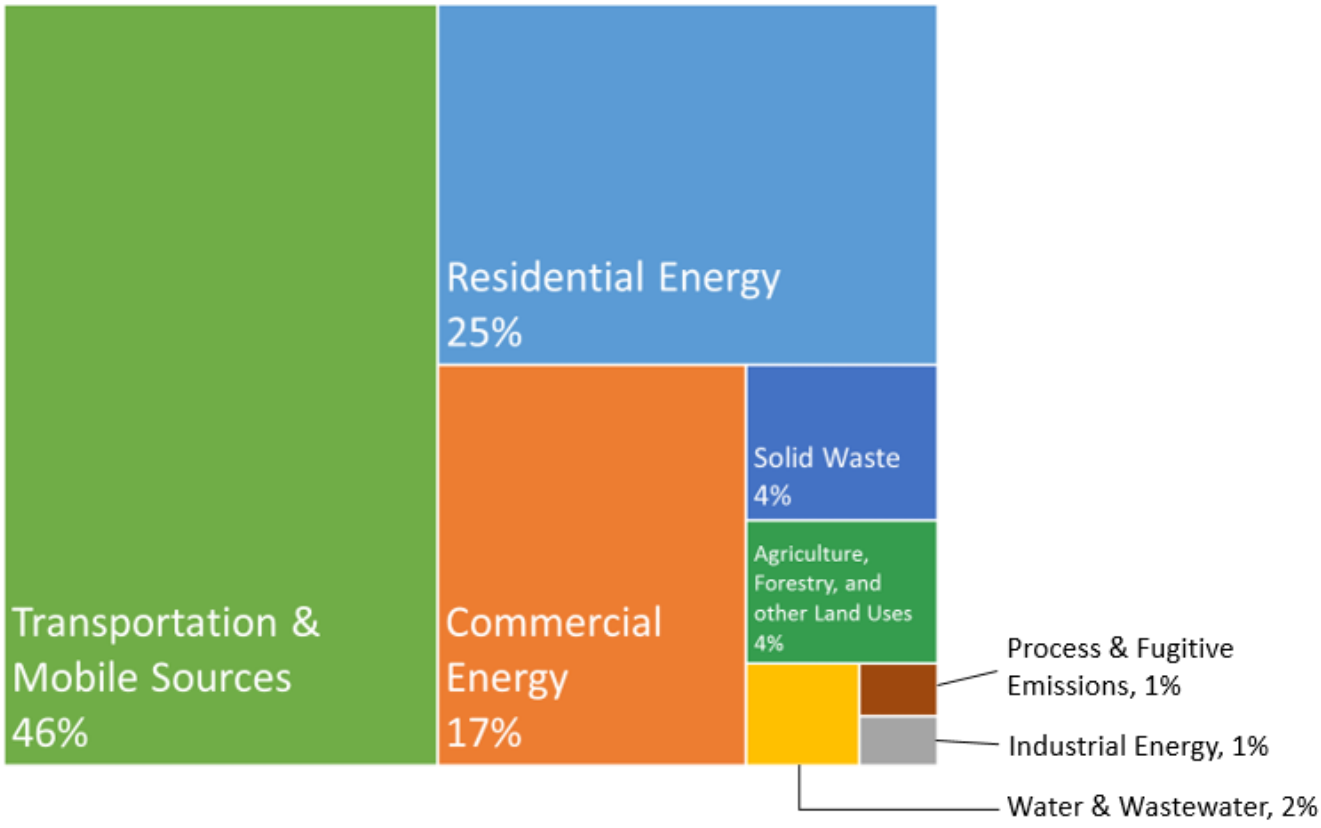


**Figure 1: Countywide Emissions by Sector**

# 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 and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases 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, the rapid release of greenhouse gases into the atmosphere from human activities is enhancing the greenhouse effect, leading to too much heat and radiation trapped in the atmosphere and resulting in life-threatening changes in the earth's climate. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report confirms that human activities have unequivocally caused an increase in carbon emissions.[2] Many regions of the globe, including Santa Fe County, are already experiencing the consequences of global climate change.

The IPCC further reports that human activities are estimated to have already caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is expected to reach 1.5°C 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 (medium confidence). Climate-related risks for natural and human systems are higher for global warming of 1.5°C than at present, but lower than at 2°C (high confidence). These risks depend on the magnitude and rate of warming, geographic location, levels of development and vulnerability, and on the choices and implementation of adaptation and mitigation strategies (high confidence).[3]

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[2]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* [Masson-Delmotte, 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.

[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.

According to the 2018 National Climate Assessment, the southwestern U.S. is experiencing intensifying droughts, wildfires, and occasional large floods due in part to human-caused climate change. The integrity of Southwest forests and other ecosystems and their ability to provide natural habitat, clean water, and economic livelihoods have declined as a result of recent droughts and wildfires. Traditional foods, natural resource-based livelihoods, cultural resources, and the spiritual well-being of Indigenous peoples in the Southwest are increasingly affected by climate hazards. Drought, heat, and reduction of winter chill hours can harm crops and livestock, exacerbate competition for water among agriculture and municipal uses, and increase future food insecurity. Declining water supplies for people and nature is increasing the need for equitable allocation of water to accommodate a growing population in the Southwest. New Mexico, including Santa Fe County, is at particular risk for increases in extreme heat events. Heat waves increase the exposure of people to heat stroke and other illnesses that could result in death.[4] Heat extremes and changes in precipitation will also influence the distribution and occurrence of vector-borne diseases like the West Nile virus, plague, and hantavirus pulmonary syndrome, which already disproportionately affect the Southwest region.[5]

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. Local land use planning that incentivizes retrofitting homes and businesses to be more efficient stimulates the economy through the creation of local jobs and businesses in this specialized industry. Reducing fossil fuel use also improves air quality and residents' health.[6]

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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] USGCRP, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. U.S. Global Change Research Program, Washington, DC, 312 pp. doi:10.7930/J0R49NQX.

[5] U.S. Global Change Research Program. 2018. National Climate Assessment – Ch. 25: Southwest. Retrieved from https://nca2018.globalchange.gov/chapter/25/.

[6] Vohra, K., A. Vodonos, J. Schwartz, E.A. Marais, M.P. Sulprizio, and L.J. Mickley. 2021. Global mortality from outdoor fine particle pollution generated by fossil fuel combustion: Results from GEOS-Chem. *Environmental Research*. Volume 195, 110754. https://doi.org/10.1016/j.envres.2021.110754.

## Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

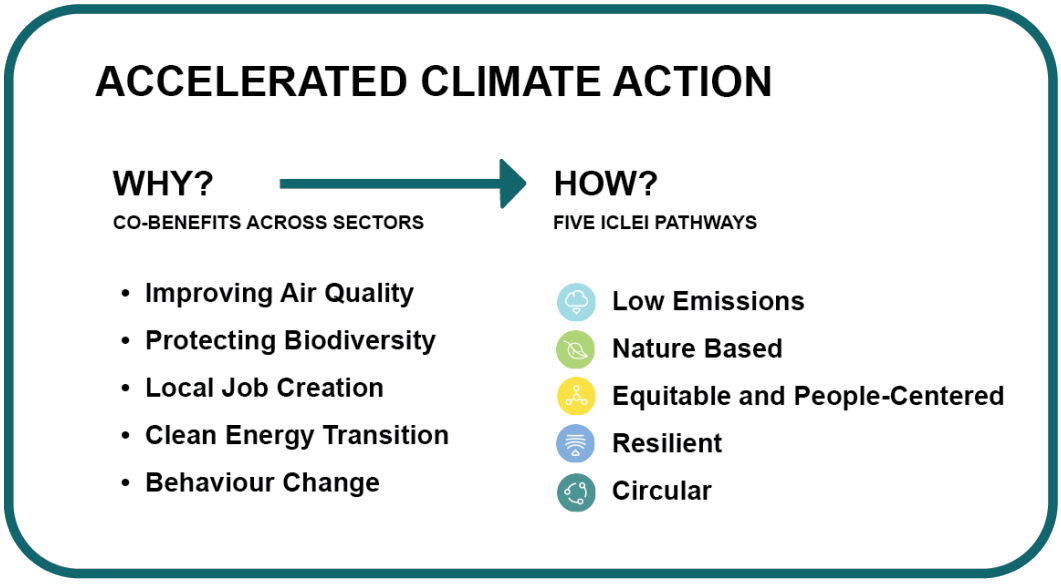
Facing the climate crisis effectively requires the concerted efforts of the organizations that are closest to the communities dealing with the impacts of climate change. Santa Fe County serves all unincorporated areas in the County and is charged with the responsibility of addressing the community needs associated 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 mitigation, adaptation, equity, and resilience. Creating a roadmap for climate neutrality requires Santa Fe County to identify priority sectors for action, while considering climate justice, inclusiveness, local job creation and other benefits of sustainable development.

To complete this inventory, Santa Fe County utilized tools and guidelines from 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 reductions, and move toward climate neutrality, Santa Fe County aims to set a clear goal and act rapidly following a holistic and integrated approach. Climate action is an opportunity for Santa Fe County community members to experience a wide range of co-benefits, such as creating socio-economic opportunities and reducing poverty and inequality, while improving the health of people and the environment.



# 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 in land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and other steps, 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 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;
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.


**Figure 2: ICLEI Climate Mitigation Milestones**

Science-based targets are climate goals calculated in line with the latest climate science, that represent a 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 IPCC states that global emissions must be reduced by 50% by 2030 and net zero by 2050. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations and communities reduce their emissions by more than 50% by 2030.

The outcome of the fifth milestone will determine if adjustments to the strategies in the climate action plan are needed in order to meet the County's emissions reduction target and other climate action goals.

This report represents the County's completion of ICLEI's Climate Mitigation Milestone One, and provides a foundation for future work to reduce greenhouse gas emissions in Santa Fe County.

# Inventory Methodology

## Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from the Santa Fe County community as a whole. The government operations inventory[7] is mostly a subset of the community inventory, as shown in Figure 3. For example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles.

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, which is described in the next section.


**Figure 3: Relationship between Community and Government Operations Inventories**

Three greenhouse gases are included in this inventory: carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$). Many of the charts in this report represent emissions in "carbon dioxide equivalent" ($CO_2e$) values, calculated using the global warming potentials (GWP) for methane and nitrous oxide from the IPCC 5th Assessment Report[8] (Table 1).

**Table 1: Global Warming Potential Values**

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

[7] Santa Fe County. 2021. Santa Fe County Greenhouse Gas Emissions Inventory, Baseline 2005 and Years 2017 and 2018. Retrieved from www.santafecountynm.gov/media/files/Sustain/Santa-Fe-County-GHG-Inventory-Operations-2005-2017-2018.pdf.

[8] IPCC, 2013: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press.

# Community Emissions Protocol

Version 1.2 of the U.S. Community Protocol for Accounting and Reporting GHG Emissions[9] 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 to be in compliance with the U.S. 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

This inventory also includes emissions from the following activities:

- Wastewater processing
- Fugitive emissions from natural gas leakage
- Land use
- Off-road equipment and transportation
- Aviation

# Quantifying Greenhouse Gas Emissions

## *Sources and Activities*

Communities contribute to greenhouse gas 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".

[9] ICLEI. 2019. US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2. Retrieved from https://icleiusa.org/us-community-protocol/.

| Source | Activity |
|---|---|
| Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere (e.g., combustion of gasoline in transportation; combustion of natural gas in electricity generation; methane emissions from a landfill). | The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions either directly (e.g., use of household furnaces and vehicles with internal combustion engines) or indirectly (e.g., use of electricity created through combustion of fossil fuels at a power plant, consumption of goods and services whose production, transport and/or disposal resulted in GHG emissions). |

The distinction between sources and activities can help local governments decide how to group the emissions numbers they might gather for the purpose of reporting. For example, 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. 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.

The sources and activities framework alleviates the need to utilize the "scopes" concept common in other types of organization-focused inventories, such as those developed using the Local Government Operations Protocol.[10] The U.S. Community Protocol does not use scopes as a framework for categorizing emissions in community inventories because the organization-related definitions of scopes for corporate and government operations accounting does not translate to the community scale in a manner that is clear and consistently applicable as an accounting framework.

## *Base Year*

The inventory process requires the selection of a base year with which to compare current and future emissions. Santa Fe County's community greenhouse gas emissions inventory utilizes 2019 as its baseline year, since it is the most recent year for which the necessary data are available during a "normal" year. Emissions calculations are thus based on the best available data in the year 2019. Comparing future emissions to the anomalous pandemic years of 2020 and 2021 would very likely result in a skewed understanding of GHG emissions associated with Santa Fe County.

[10] *Local Government Operations Protocol*, ICLEI USA, California Air Resources Board, California Climate Action Registry, and The Climate Registry.

### *Quantification Methods*

Greenhouse gas emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of greenhouse gas 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 greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see appendix 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 $CO_2$/kWh of electricity). For this inventory, calculations were made using ICLEI's ClearPath tool, a standard GHG inventory and forecasting tool for local governments.[11]

# Community Emissions Inventory Results

The total countywide emissions for the 2019 inventory are shown in Table 2 and Figure 4. Figure 4 shows the contribution of each sector to the total emissions. Transportation and Mobile Sources was the largest contributor, followed by Residential Energy and Commercial Energy. On-road gasoline passenger vehicles are the largest source of emissions, contributing to 29% of inventoried GHG emissions in Santa Fe County.

Figure 5 shows the $CO_2e$ emissions and removals from forests and trees outside of forests. Carbon emissions from land use change (e.g. forest to settlement) and forest disturbances (e.g. wildfires) were included in the emissions inventory in the Agriculture, Forestry, and Other Land Uses sector. Carbon removals were not included in the inventory, since the purpose of this GHG emissions inventory is to quantify total gross emissions, rather than net emissions. However, having an understanding of carbon removals from forests and trees outside of forests is beneficial for carbon sequestration and climate change mitigation planning purposes.

[11] ICLEI USA. 2022. ClearPath. Retrieved from https://icleiusa.org/clearpath/.

**Table 2: Countywide Emissions Inventory**

| Sector | Fuel or Source | 2019 Usage | Usage Unit | 2019 Emissions (MT $CO_2e$) |
|---|---|---|---|---|
| Residential Energy | Electricity | 452,581,440 | kWh | 233,889 |
| | Natural Gas | 38,994,622 | Therms | 207,399 |
| | LPG | 462,252 | MMBtu | 29,386 |
| | Fuel Oil | 11,568 | MMBtu | 861 |
| | | | **Residential Energy Total** | **471,535** |
| Commercial Energy | Electricity | 361,899,780 | kWh | 189,415 |
| | Natural Gas | 21,892,172 | Therms | 116,437 |
| | Propane | 134,970 | MMBtu | 8,376 |
| | Fuel Oil | 122,835 | MMBtu | 9,146 |
| | | | **Commercial Energy Total** | **323,374** |
| Industrial Energy | Electricity | 23,283,250 | kWh | 10,160 |
| | | | **Industrial Energy Total** | **10,160** |
| On-Road Transportation | Gasoline (passenger vehicles) | 1,292,496,980 | VMT | 539,276 |
| | Diesel (passenger and freight vehicles) | 137,889,231 | VMT | 203,660 |
| Transit | All Fuel Types | 1,975,531 | VMT | 725 |
| Aviation | All Fuel Types | 707,210 | MMBtu | 56,003 |
| Off-Road | All Fuel Types | - | - | 60,360 |
| Rail | Diesel | 54,289,028 | Gallons | 3,673 |
| | | | **Transportation Total** | **863,698** |
| Solid Waste | Waste Generated | 163,817 | Tons | 77,576 |
| | Landfill Gas Flaring | 14,192,162 | Cubic Feet/Year | 37 |
| | | | **Solid Waste Total** | **77,612** |
| Water and Wastewater | Potable Water Treatment and Supply Energy | 123,534 | MMBtu | 18,397 |
| | Wastewater Treatment Energy | 39,048 | MMBtu | 4,009 |
| | Fugitive Emissions from Septic Systems | 24,121 | Service Population | 2,931 |
| | Wastewater Treatment Processes | 126,237 | Service Population | 4,811 |
| | | | **Water and Wastewater Total** | **30,148** |
| Agriculture, Forestry, and Other Land Uses | Ranching and Farming | - | - | 20,080 |
| | Agriculture Energy Use | 8,999,096 | kWh | 3,906 |
| | Forest Disturbances and Land Use Change | - | - | 47,499 |
| | | | **Agriculture, Forestry, and Other Land Uses Total** | **71,485** |
| Process and Fugitive Emissions | Fugitive Emissions from Natural Gas Distribution | 61,189,792 | Therms | 10,616 |
| | | | **Process and Fugitive Emissions Total** | **10,616** |
| | | | **Total Countywide Emissions** | **1,858,627** |

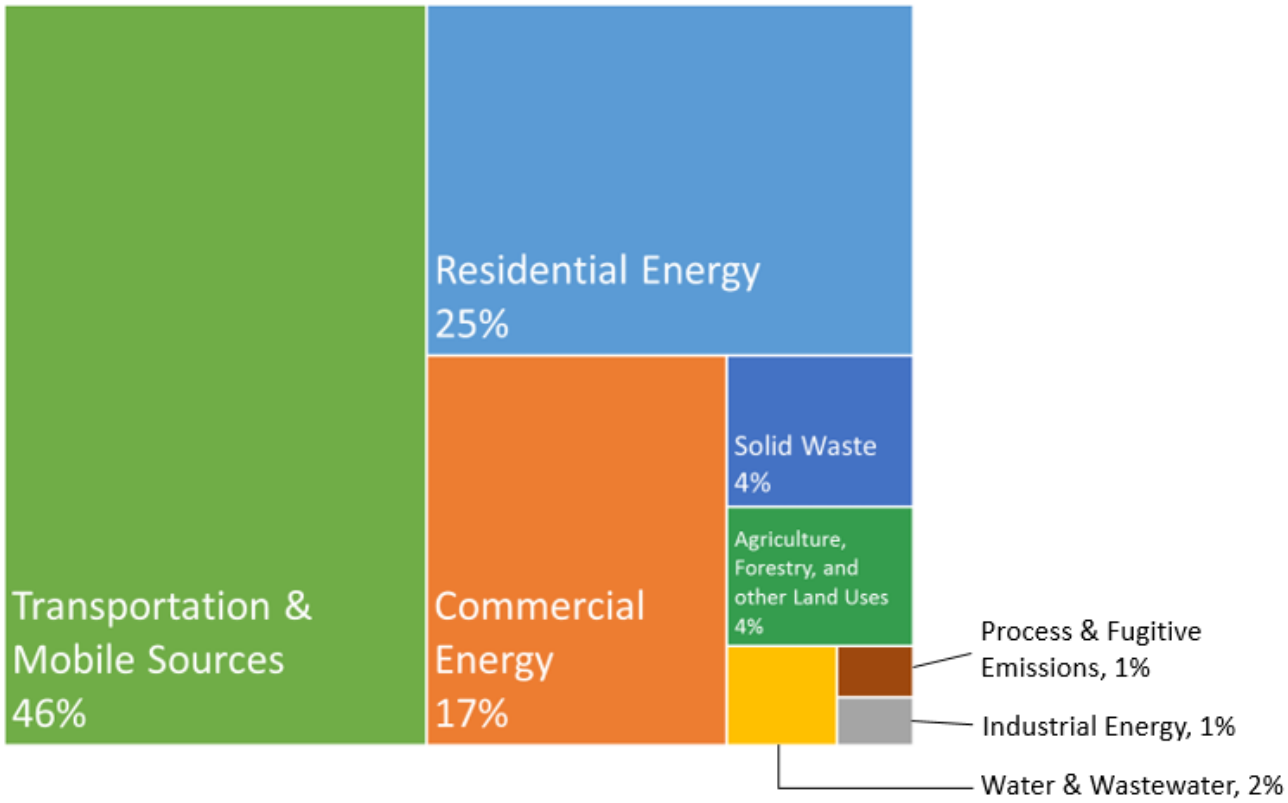



**Figure 4: Countywide Emissions by Sector**

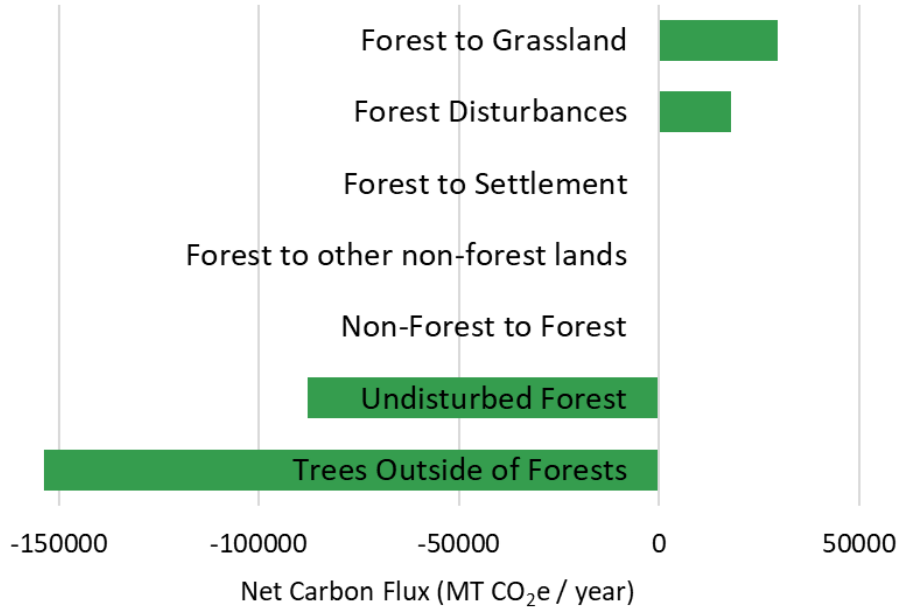



**Figure 5: Emissions and Removals from Forests and Trees Outside of Forests**

## Next Steps

This inventory will be used to focus and prioritize actions to reduce emissions. Based on the inventory results, the following areas have the greatest potential for emission reductions:

- Transportation, especially emissions from passenger vehicles
- Residential energy use
- Commercial energy use

Completion of another GHG inventory in two to five years is recommended in order to assess progress resulting from emission-reducing programs and actions that are implemented. The detailed methodology section of this report, as well as notes and attached data files in the ClearPath tool, will be helpful to complete a future inventory consistent with this one.

# Conclusion

This inventory marks the completion of Milestone One of the Five ICLEI Climate Mitigation Milestones. The next steps are to forecast emissions, set an emissions reduction target, and build upon the existing Santa Fe County sustainability goals with a more robust climate action plan that identifies specific quantifiable strategies to meet the emissions reduction target. Santa Fe County will continue to track key energy use and emissions indicators on an on-going basis. Future GHG emissions inventories will need to be updated 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 over time.

Transportation and buildings are responsible for the largest portion of GHG emissions in Santa Fe County and therefore, reduction actions in transportation and the built environment must be prioritized through significant adjustments and changes in infrastructure, land use planning, and ordinances. The County has set a goal of reducing emissions from the building sector by 60% across County facilities by 2025, and countywide by 2030, and is implementing a number of programs to reach these goals. Similar commitments and targets need to be made in the transportation sector.

According to the 2020 Santa Fe County Housing Study,[12] 38% of workers in Santa Fe County commute from outside of the County, with 22% having a commute that is greater than 50 miles. A quarter of these workers earn $1,230 per month or less, while the median house sale price in Santa Fe County in 2019 was nearly $435,000 and the median rent was $1,030. Addressing transportation emissions presents a challenge that is entangled with the rising cost of living and inaccessibility of affordable housing in the

[12] Reagan, S. 2021. *2020 Santa Fe County Housing Data*. UNM Bureau of Business and Economic Research. Retrieved from http://52.26.4.43/media/publications/SantaFeCountyHousing2020Finalf.pdf.

County. Collaborative land use planning with the County, City of Santa Fe, and Santa Fe Metropolitan Planning Organization is needed to make the drastic changes necessary for workers and residents to reduce vehicle use by creating environments where the community can work and live without using a vehicle. Strategies to achieve this include higher density development, investing in equitable transportation infrastructure for all modes of transportation (including biking, walking, and transit), and addressing the increasing cost of living. These initiatives align with the County's Sustainable Growth Management Plan[13] and Community Development Department's vision of a healthy, affordable, and connected community with equitable access to live, work, and play in Santa Fe County.

The Intergovernmental Panel on Climate Change (IPCC) states that to meet the Paris Agreement commitment of keeping warming below 1.5°C, global emissions must be reduced by 50% by 2030 and reach net zero by 2050. Equitably reducing global emissions by 50% requires that those most responsible, the high-emitting, wealthier nations, reduce their emissions by more than 50% by 2030. 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. To achieve the science-based target, community education, involvement, and partnerships will be instrumental. In addition to equitable land use planning, the County will collaborate with ICLEI staff to identify a science-based target that incorporates a fair share consideration of the County's historic contributions to global GHGs as part of the County's climate action plan.

This inventory shows that communitywide transportation patterns as well as residential and commercial energy are particularly important to focus on in the climate action plan, due to the substantial and positive impact eliminating these emissions can have. Through careful, strategic planning, and the implementation of best practices, Santa Fe County can align actions that achieve the emissions reduction target with wider environmental, economic, social, and health benefits for community members in the decades to come.

[13] Santa Fe County. 2015. *Santa Fe County Sustainable Growth Management Plan.* Retrieved from https://www.santafecountynm.gov/media/files/SustainableGrowthManagementPlanAdoptedbyResolution2015-155.pdf.

# Appendix: Methodology Details

The following tables show each activity, related data sources, and notes and assumptions about the data.

## Energy

**Table 3: Energy Data Sources**

| Activity | Data Source(s) | Data Notes and Assumptions |
|---|---|---|
| **Countywide** | | |
| Residential, commercial, and industrial electricity consumption | Public Service Company of New Mexico (PNM), Jemez Mountains Electric Cooperative (JMEC), Central New Mexico Electrical Cooperative (CNMEC), and Mora-San Miguel Electric Cooperative (MSMEC) | • PNM: Residential meters are billed on residential rates 1A & 1B. Commercial includes multifamily apartment buildings, businesses, large users such as hospitals and universities, institutional/government buildings, wastewater treatment facilities, and transit vehicle energy. Industrial facilities are based on meter type. Electricity used for water supply and wastewater treatment was subtracted from total commercial electricity use, and electricity use from residential domestic wells was subtracted from total residential electricity use to avoid double counting.<br>• JMEC: Residential includes single family dwellings and multifamily apartment buildings. Commercial includes businesses, large users like hospitals, universities, institutional/government buildings, and wastewater treatment facilities. Industrial is based on kVA size (how much power is required to run equipment).<br>• CNMEC: Residential includes single family dwellings or apartments, including farm homes. Commercial includes businesses and institutional/government buildings. Industrial includes electricity consumed by pipeline pumping stations, wind farms, solar farms, etc.<br>• MSMEC: Utility provided data for entire utility service area, which spans four counties. Electricity use of Santa |

| | | |
|---|---|---|
| | | Fe County MSMEC customers was estimated based on ratio of population in entire service area and population in Santa Fe County service area. Residential includes single family dwellings and seasonal residents, and commercial includes small and large businesses. No industrial energy use was reported. |
| Residential, commercial, and industrial natural gas consumption | New Mexico Gas Company (NMGC) and EMW Gas Association (EMW) | • NMGC: Residential includes single-family residential units. Multi-family apartment buildings are classified as residential if each single family unit is individually metered, otherwise they are classified as commercial. Commercial includes small, medium, and large volume primary business activity, including churches, master metered multi-unit residential structures, and institutional/government buildings. Natural gas used in the water and wastewater sector was subtracted from commercial natural gas consumption to avoid double counting. No industrial facilities were reported.<br>• EMW: Natural gas use was estimated by multiplying the average residential and commercial natural gas use per household of NMGC customers by the number of households served by EMW. |
| Residential LPG and Fuel Oil Consumption | U.S. Census | Non-utility fuel consumption was estimated by multiplying the average residential NMGC natural gas use per household by the Santa Fe County household count in the "House Heating Fuel" section of the 2019 U.S. Census ACS 5-Year Estimates Subject Table, *Physical Housing Characteristics for Occupied Housing Units* (https://data.census.gov/cedsci/table?q=S25&g=0500000US35049&tid=ACSST5Y2019.S2504&hidePreview=true). This assumes that if a household is using natural gas for heating, cooking etc., the same amount of energy would be used if a similar household was using propane or another fuel for heating and cooking. In the Census table, the house heating fuel categorized as "Bottled, tank, or LP gas," was assumed to be LPG for entry into ClearPath. Similarly, the house heating fuel categorized as "Fuel oil, kerosene, etc.," was assumed to be Distillate Fuel Oil No. 2 for entry into ClearPath. |
| Commercial Propane Consumption | U.S. Environmental Protection Agency (EPA) FLIGHT and U.S. | • EPA FLIGHT: 2019 propane consumption from Caja Del Rio Landfill was reported to EPA FLIGHT. Recommended by ICLEI to include in commercial energy sector even |

| | | |
|---|---|---|
| | Energy Information Administration (EIA) | though this is a solid waste facility. No other facilities in Santa Fe County were required to report to the EPA in 2019, meaning no single industrial facility besides the landfill emitted more than 25,000 MT $CO_2e$.<br>• EIA: Additional commercial propane consumption was estimated by scaling statewide propane usage from EIA to the population of Santa Fe County. |
| Commercial Fuel Oil Consumption | U.S. Energy Information Administration (EIA) | Commercial fuel oil consumption was estimated by scaling statewide fuel oil usage from EIA to population of Santa Fe County. |

**Table 4: 2019 Emissions Factors for Electricity Consumption**

| Emissions Factor | $CO_2$ (lbs/MWh) | $CH_4$ (lbs/GWh) | $N_2O$ (lbs/GWh) |
|---|---|---|---|
| eGRID[14] | 952.3 | 68.0 | 10.0 |
| PNM | 1,175 | 117.8 | 16.9 |

# Transportation

**Table 5: Transportation Data Sources**

| Activity | Data Source | Data Notes and Assumptions |
|---|---|---|
| **Countywide** | | |
| Vehicle miles traveled | Google Environmental Insights Explorer (EIE), U.S. Energy Information Administration (EIA), U.S. Department of Transportation (DOT), and U.S. Environmental Protection Agency (EPA) | The Travel Demand Model (also known as Origin-Destination Model) was used to account for on-road passenger emissions. This takes into account 100% of in-boundary trips (trips that begin and end inside Santa Fe County) and 50% of transboundary trips (trips that begin outside of Santa Fe County and end outside of Santa Fe County). The 2019 National Default Vehicle Fuel Efficiency and Emission Factors was used for the vehicle mix and emission factors, which sources data from EIA, DOT, and EPA (see Table 6). Vehicle miles traveled (VMT) data was sourced from Google EIE. Note that on-road freight emissions are likely included in this inventory record since Google EIE VMT data accounts for all private on-road transportation. Also note that the energy required for EV |

[14] U.S. Environmental Protection Agency, Emissions & Generation Resource Integrated Database (eGRID).

| | | |
|---|---|---|
| | | charging is captured in the residential and commercial energy sectors. |
| Transit | National Transit Database (NTD) and North Central Regional Transit District (NCRTD) | • Santa Fe Trails: Fuel use (diesel, CNG, and gasoline) was sourced from NTD. Diesel fuel use accounts for buses only, CNG fuel use accounts for demand response vehicles and buses, and gasoline fuel use accounts for demand response vehicles only. Annual vehicle revenue miles (VRM) were sourced from NTD Transit Agency Profile. Total VRM for Santa Fe Trails in 2019 was 1,230,563. ClearPath VRM entries are proportional to gallons of fuel used across the three Santa Fe Trails inventory records for each fuel type.<br>• NCRTD: Both fuel use and VRM (for fiscal year 2019, not calendar year 2019) were received directly from the transit agency. Transit agency provided data for entire service area. Total annual fuel use was 176,332.02 gallons propane, and total VRM was 1,433,335. Total service population was 289,292. Fuel usage and VRM in Santa Fe County was allocated based on population of Santa Fe County (150,358). |
| Aviation | 2019 Albuquerque Sunport Sustainable Airport Master Plan and 2015 GHG Emissions Inventory of the City of Santa Fe and Santa Fe County | • Albuquerque Sunport: Fuel data is from 2013. This is the latest data available as per the 2019 Sustainable Airport Master Plan, available here: https://cabq.legistar.com/LegislationDetail.aspx?ID=3980533&GUID=B64634BD-18CC-4443-A8D2-6F1A62CBE438&Options=ID%7cText%7c&Search=r-19-168 (page 59 in Chapter 4). 10% of fuel consumption was attributed to Santa Fe County. This follows the same methodology as the 2015 GHG Emissions Inventory of the City of Santa Fe and Santa Fe County, available here: https://static1.squarespace.com/static/5c3b5ceb50a54f1affe9404f/t/60b7ef509349e87551654d24/1622667091655/Santa+Fe+2015+GHG+Emissions+Inventory_Mar.9.17.pdf (page 22).<br>• Santa Fe Municipal Airport (SAF): Fuel data is from the 2015 GHG Emissions Inventory of the City of Santa Fe and Santa Fe County, since fixed-based operators were unable to provide data for 2019. 100% of fuel consumption was attributed to Santa Fe County under the assumption that the vast majority of passengers |

| | | |
|---|---|---|
| | | arriving to or departing from SAF are conducting activities in Santa Fe County (e.g. tourism, business).<br>• All fuel purchases were assumed to be associated with domestic passenger flights, not domestic freight. Both airports had no international flights in 2019. |
| Off-Road Vehicles and Non-Road Equipment | National Emissions Inventory (NEI) | Includes non-road engines and equipment, such as lawn and garden equipment, construction equipment, engines used in recreational activities, and portable industrial, commercial, and agricultural engines. Data is from 2017 National Emissions Inventory, the latest data available. The next NEI data release will be for data year 2020. Link to NEI data query page: https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data#dataq. Link to NEI data documentation: https://www.epa.gov/sites/default/files/2021-02/documents/nei2017_tsd_full_jan2021.pdf. |
| Rail | Amtrak Fiscal Year (FY) 2019 and 2020 Annual Reports, 2019 Rail Runner Program Evaluation Report, and National Transit Database (NTD) | Fuel usage was calculated by allocating total network route miles and fuel usage to miles of track in Santa Fe County.<br>• Amtrak: 21,400 route miles in Amtrak's network, of which 39.6 are in Santa Fe County. Amtrak has one stop in Santa Fe County (Lamy). Total route miles was sourced from Amtrak's FY20 annual report, and miles within Santa Fe County was measured using Google Earth. Fuel quantity was sourced from Amtrak's FY19 annual report. Link to Amtrak's annual reports: https://www.amtrak.com/sustainability-reports.<br>• Rail Runner: 97 route miles in Rail Runner's network, of which 25.2 are in Santa Fe County. Total route miles was sourced from 2019 Program Evaluation Report, and miles within Santa Fe County was measured using Google Earth. Fuel quantity was sourced from NTD. Link to Rail Runner's Program Evaluation Report: https://nmlegis.gov/Entity/LFC/Documents/Program_Evaluation_Reports/Cost,%20Effectiveness%20and%20Operations%20of%20the%20New%20Mexico%20Railrunner.pdf. |

For vehicle transportation, average miles per gallon and emissions factors for $CH_4$ and $N_2O$ were applied to each vehicle type. The factors used are shown in Table 6.

**Table 6: 2019 MPG and Emissions Factors by Vehicle Type**
(Source: U.S. Energy Information Administration)

| Fuel | Vehicle type | MPG | $CH_4$ g/mile | $N_2O$ g/mile |
|---|---|---|---|---|
| Gasoline | Passenger cars & motorcycles | 24.1 | 0.0183 | 0.0083 |
| Gasoline | Light truck | 17.6 | 0.0193 | 0.0148 |
| Gasoline | Heavy truck | 5.37 | 0.0785 | 0.0633 |
| Diesel | Passenger car | 24.1 | 0.0005 | 0.001 |
| Diesel | Light truck | 17.6 | 0.001 | 0.0015 |
| Diesel | Heavy truck | 6.39 | 0.0051 | 0.0048 |

# Wastewater

**Table 7: Wastewater Data Sources**

| Activity | Data Source | Data Notes and Assumptions |
|---|---|---|
| **Countywide Operations** | | |
| Nitrogen Discharge | City of Santa Fe Utilities and Population-based | City of Santa Fe activity data was received directly from the utility. Two additional inventory records (process $N_2O$ emissions from wastewater treatment and nitrogen discharge) were included to account for the population served by the several small wastewater treatment plants in Santa Fe County. The population was assumed to be the same as the population served by community water systems. The wastewater treatment systems were assumed to be predominately anaerobic, with no nitrification-denitrification processes. |
| Digester Gas Combustion/Flaring | | |
| Nitrification-Denitrification | | |
| Process Emissions from Wastewater Treatment Lagoons | Santa Fe County Utilities | Activity data was received directly from the utility. The ClearPath default of 32.5% was used as the fraction of BOD5 removed in primary treatment. The ClearPath default of 1.25 was used as the industrial discharge multiplier. |
| Energy used in wastewater facilities | Santa Fe County Utilities, City of Santa | Activity data was received directly from the respective utilities. Electricity usage of the Quill Wastewater Treatment Plant (Santa Fe County Utilities) was estimated |

| | | |
|---|---|---|
| | Fe Utilities, and Population-based | based on average use in 2018/19. An additional inventory record was included to account for the energy used in the several small community wastewater plants. The population served by these small plants was assumed to be the same as the population served by community water systems. Energy use was estimated by multiplying the population served by small plants by the average energy use per person in the City and County wastewater utility systems. Community wastewater systems were assumed to all be in PNM and NMGC's service areas since those two utilities serve 85% of Santa Fe County residents. |
| Fugitive Emissions from Septic Systems | Population-based | A population-based calculation was used in ClearPath to quantify fugitive emissions from septic system. Population that uses septic systems was inferred by subtracting the total population of Santa Fe County by the number of people served by Santa Fe County's wastewater utility, the City of Santa Fe's wastewater utility, and the population served by other community wastewater systems. |

# Potable Water

**Table 8: Potable Water Data Sources**

| Activity | Data Source | Data Notes and Assumptions |
|---|---|---|
| **Countywide** | | |
| Energy used in the treatment and supply of potable water | Santa Fe County Utilities, City of Santa Fe Utilities, New Mexico Drinking Water Watch | • Santa Fe County and City of Santa Fe Utilities: Activity data was received directly from the respective utilities.<br>• Community Water Systems: Energy use was estimated by multiplying the population served by community water systems by the average energy used per person in the City and County water utility systems. Population of community water systems was sourced from New Mexico Drinking Water Watch: https://dww.water.net.env.nm.gov/NMDWW/index.jsp. Community water systems were assumed to all be in PNM and NMGC's service areas since those two utilities serve 85% of Santa Fe County residents.<br>• Domestic Wells: Population using domestic wells was inferred by subtracting the total population of Santa Fe County by the number of people served by Santa Fe |

| | | |
|---|---|---|
| | | County's water utility, the City of Santa Fe's water utility, and the population served by community water systems. Energy use was estimated by multiplying population using domestic wells by the average electricity use per person in the City and County water utility systems. This method does not take into account residents with multiple wells. All wells were assumed to all be in PNM's service area since PNM serves approximately 85% of Santa Fe County residents. |

## Solid Waste

**Table 9: Solid Waste Data Sources**

| Activity | Data Source | Data Notes and Assumptions |
|---|---|---|
| **Countywide** | | |
| Waste generated | Santa Fe Solid Waste Management Agency (SWMA) and U.S. Environmental Protection Agency (EPA) | Activity data was received directly from SWMA. The Caja del Rio Landfill serves all households in Santa Fe County and all businesses. Waste characterization was assumed to be 100% municipal solid waste (MSW) due to the lack of local or state waste characterization studies. A separate inventory record was created for construction and demolition waste (C&D), since SWMA provided a tonnage amount for that waste category. Both MSW and C&D factor sets used EPA averages.<br>MSW source: https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials. C&D source: https://www.epa.gov/sites/default/files/2020-03/documents/final_cd-eol-management_2015_508.pdf (Table ES-1). Note that solid waste collection and transportation emissions are included in the Transportation & Mobile Sources sector. |
| Landfill gas flaring | Santa Fe Solid Waste Management Agency (SWMA) | Activity data was received directly from SWMA. Flare emissions account for entire landfill tonnage, not just tonnage reported in 2019. |

# Agriculture, Forestry, and Other Land Uses

**Table 10: Agriculture, Forestry, and Other Land Uses Data Sources**

| Activity | Data Source | Data Notes and Assumptions |
|---|---|---|
| **Countywide** | | |
| Ranching and Farming | USDA Census of Agriculture, U.S. National GHG Emissions Inventory, and New Mexico 2018 GHG Emissions Inventory | • Ranching: Livestock headcount data was sourced from 2017 USDA Ag Census: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/New_Mexico/. Emission factors were sourced from IPCC (2006), refined for U.S. National GHG Emissions Inventory.<br>• Farming: Emissions from farming practices were estimated by scaling statewide farming emissions to the cropland area in Santa Fe County. Only Agricultural Soil Management and Urea Fertilization were downscaled to the cropland area of Santa Fe County since Enteric Fermentation and Manure Management were likely covered by ranching emissions. Cropland area for both Santa Fe County and New Mexico were sourced from 2017 USDA Ag Census: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/New_Mexico/. Statewide GHG emissions were sourced from New Mexico 2018 GHG Emissions Inventory: https://cnee.colostate.edu/wp-content/uploads/2020/10/New-Mexico-GHG-Inventory-and-Forecast-Report_2020-10-27_final.pdf. |
| Agriculture Energy Use | Central NM Electric Coop (CNMEC) and Mora-San Miguel Electric Coop (MSMEC) | CNMEC and MSMEC reported electricity use from the agricultural sector. CNMEC included energy use from irrigation wells and livestock wells. MSMEC included energy use from agricultural buildings and irrigation. Electricity usage of MSMEC was estimated based on ratio between the population in MSMEC's total service area and the population of Santa Fe County residents served by MSMEC. |
| Forest Disturbances and Land Use Change | ICLEI Land Emissions and Removals Navigator (LEARN) | Activity data was sourced from LEARN tool: https://icleiusa.org/LEARN/. The most recent data year at time of this inventory was 2016. Forest disturbances include forest area loss and emissions from fire, insect/disease, and harvest/other. |

# Fugitive Emissions

**Table 10: Fugitive Emissions Data Sources**

| Activity | Data Source | Data Notes and Assumptions |
|---|---|---|
| **Countywide** | | |
| Fugitive Emissions from Natural Gas Distribution | New Mexico Gas Company (NMGC) | Includes fugitive emissions from natural gas use in residential, commercial, and water & wastewater sectors. Activity data (total natural gas usage) was received from NMGC. Emissions factors and other inputs (leakage rate, energy density, gas density, % $CH_4$, and % $CO_2$) were ClearPath defaults. |

# Inventory Calculations

The 2019 inventory was calculated following the U.S. Community Protocol and ICLEI's ClearPath software. As discussed in the *Inventory Methodology* section, the IPCC 5th Assessment was used for global warming potential (GWP) values to convert methane and nitrous oxide to $CO_2$ equivalent units. ClearPath's inventory calculators allow for input of the sector activity (e.g. kWh or VMT) and emissions factors to calculate the final $CO_2e$ emissions.

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# Appendix C: Local Government Operations Greenhouse Gas Emissions Inventory

SANTA FE COUNTY

# Greenhouse Gas Emissions Inventory

Baseline 2005
and Years
2017 & 2018

SANTA FE COUNTY

# Contents

# Executive Summary

All emissions are reported in metric tons of carbon dioxide equivalent (MT $CO_2e$). The analysis covers carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), and the groups of high Global Warming Potential (GWP) gases, including hydrofluorocarbons (HFCs).

## Santa Fe County is committed to reducing greenhouse gas emissions.

In 2017, the Santa Fe County Board of County Commissioners adopted a Resolution 2017-68 affirming its commitment to the Paris Agreement and signed onto "We Are Still In." To further its goals, the County contracted Adelante Consulting to develop greenhouse gas (GHG) emissions inventories for calendar years 2005, 2017 and 2018, quantifying emissions from the County's municipal operations only. The inventories include emissions from the following primary sources: stationary energy, transportation, solid waste, and water and wastewater management. Both Scope 1 and 2 emissions are reported.

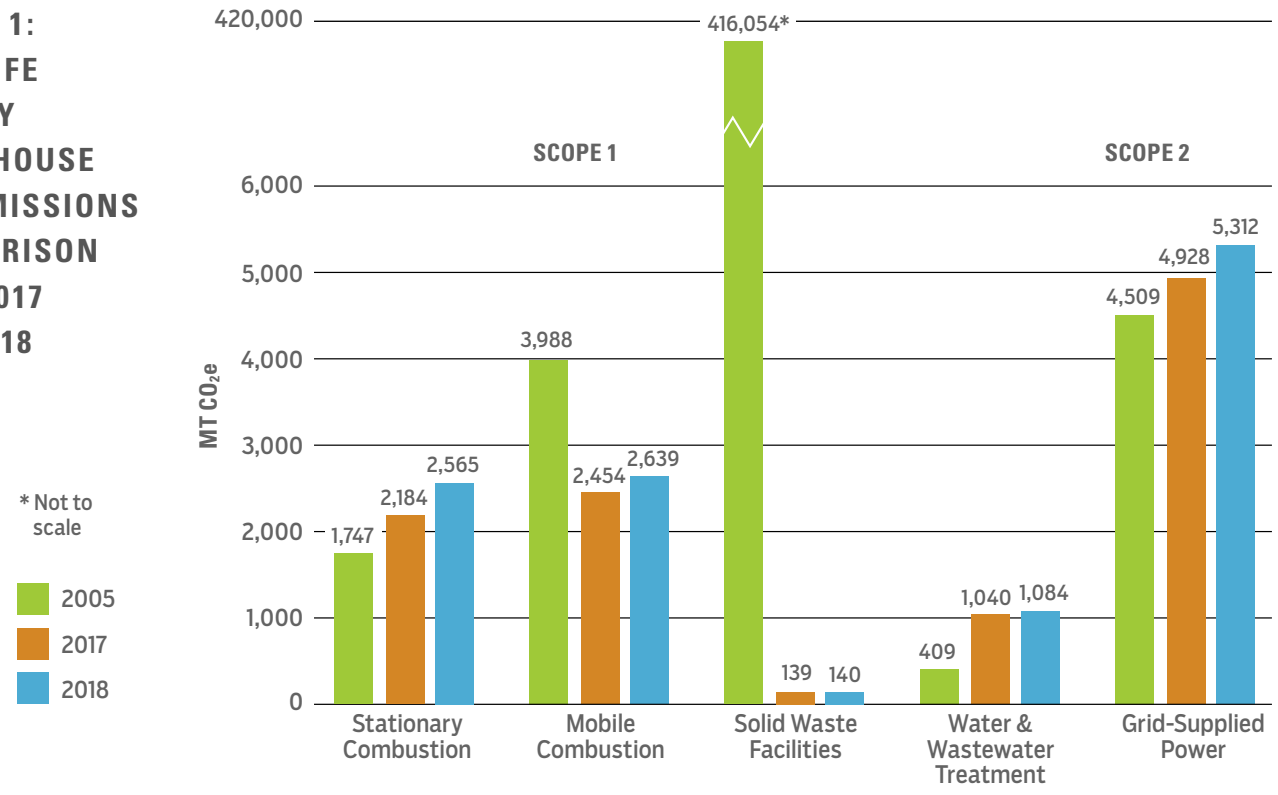
The 2005 inventory serves as a baseline, while data from 2017 and 2018 show trends over time. All GHG emissions sources, as could be determined from available data, from 2005, 2017 and 2018 are included. The data available for 2018 is the most complete of the data sets. Total emissions for County government operations in 2005 were calculated at 426,707 MT $CO_2e$. By contrast, 2017 GHG emissions totaled 10,745 MT $CO_2e$, and 2018 GHG emissions were 11,741 MT $CO_2e$. The dramatic reduction in GHG emissions from 2005 to 2017 was due primarily to a reduction in emissions from solid waste operations caused by the installation of the landfill gas collection system and flare.

Key highlights:

- Total GHG emissions showed a 97.2% decrease from 2005 to 2018; over 99% of this reduction is directly related to the development of a gas collection system at the Caja Del Rio landfill.

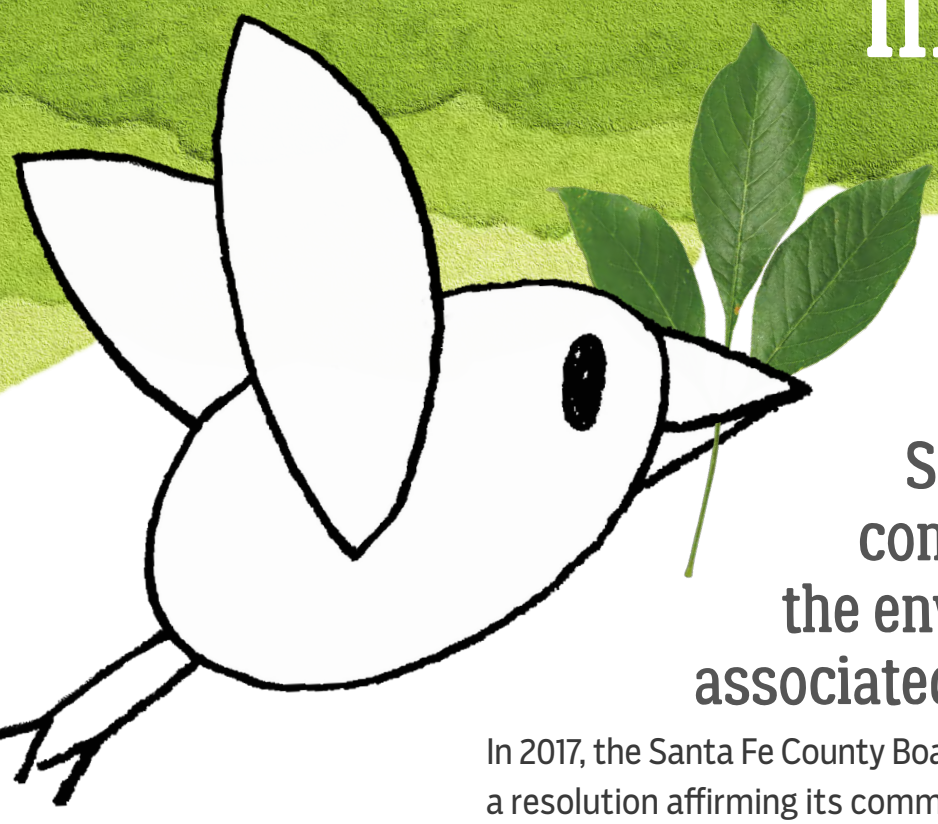
- Scope 1 emissions are calculated at 6,429 MT $CO_2e$ for 2018, a 98% decrease from 2005 to 2018.
- Scope 2 emissions are calculated at 5,312 MT $CO_2e$ for 2018, an 18% increase from 2005 to 2018. This increase is directly related to an 83% increase in County staff between 2005 and 2018, which necessitated an increase in the County's building footprint. However, the County was able to reduce per capita emissions over this time period, most likely by virtue of its solarization program.
- County buildings and facilities accounted for more than half of all GHG emissions in 2017 and 2018.

**FIGURE 1: SANTA FE COUNTY GREENHOUSE GAS EMISSIONS COMPARISON 2005, 2017 AND 2018**




These inventories set the foundation to make informed decisions on how to reduce the GHG emissions of County operations, and are the first step toward preparing a County-wide comprehensive action plan to further reduce emissions and increase resilience in the face of climate change.

# Introduction



## Santa Fe County has a commitment to analyze the environmental impacts associated with its operations.

In 2017, the Santa Fe County Board of County Commissioners adopted a resolution affirming its commitment to the Paris Agreement and signed onto "We Are Still In." The Paris Agreement contains more than a dozen key elements, and two are particularly germane to Santa Fe County's commitment:

1. A commitment to net zero greenhouse gas (GHG) emissions by mid-century.[1]

2. A commitment to assess progress every five years, and to accelerate reduction strategies if not on track to meet the mid-century goal.[2]

1 Paris Agreement to the United Nations Framework Convention on Climate Change, Articles 4 and 5, Dec. 12, 2015, T.I.A.S. No. 16-1104.

2 Ibid, Articles 4 and 7.

Santa Fe County has embraced the following seven climate action strategies, enumerated on the "We Are Still In" website[3]:

- Adopt policies to reduce carbon footprint of new and/or existing buildings;
- Increase energy efficiency of local government operations, such as buildings, street lighting, and water or wastewater plants;
- Promote practices that reduce the carbon footprint of food procurement and consumption and prevent food waste;
- Purchase renewable power or build on-site renewable electricity to run local government needs;
- Quantify, track and publicly report the County's climate action through CDP or carbon Climate Registry;
- Set a goal for emissions reduction equal to or greater than the US goal under the Paris Climate Agreement (26-28% reduction from 2005 levels by 2025);
- Use strategies that build resilience to threats of climate change into zoning, capital improvement, comprehensive planning, and hazard mitigation documents.

**Through the adoption of climate action strategies and actions to quantify and reduce greenhouse gas emissions, the County will realize numerous benefits.**

Through the adoption of climate action strategies and actions to quantify and reduce greenhouse gas emissions, the County will realize numerous benefits related to:

- Improving risk management and increasing resiliency by allowing decision makers to better identify and manage the impacts of climate change.
- Addressing inefficiencies related to resource inputs and waste resulting in improved County services and cost savings.
- Increasing performance of buildings through energy efficiency and integrated design methodology.
- Allowing the County to better prepare for future state and federal GHG emission regulations.
- Using outreach and education to recruit public and stakeholder participation concerning the impact of GHG emissions and the benefits of GHG reduction initiatives.

3 https://www.wearestillin.com/organization/santa-fe-county-nm

The adoption of climate action strategies such as regional air quality improvements and expanded public transportation can help improve public health outcomes.

- Improving public health outcomes through regional air quality improvements and expanded public transportation.
- Creating secure and meaningful jobs in the green economy.

In order to further its goals, the County sought support to develop greenhouse gas emissions inventories for calendar years (CY) 2005, 2017 and 2018, quantifying emissions from the County's municipal operations generated from the following primary sources: stationary energy, transportation, solid waste, and water and wastewater management. The 2005 inventory serves as a baseline, while data from 2017 and 2018 show trends over time.

Appropriate and relevant portions of the Local Government Operations Protocol guidelines (LGOP)[4] were utilized to quantify direct emissions (Scope 1) and indirect emissions (Scope 2) within the boundary of County government operations. The County is a member of Local Governments for Sustainability (ICLEI), therefore ICLEI's software, ClearPath, was utilized to display and document inventory data by sector and to calculate GHG emissions.

The completion of the County GHG emissions inventories is intended to allow County emissions to be recorded and compared across time, identify emissions trends, and support the establishment of County emissions reduction goals and planning for 2025 through 2050 and the adoption of high-impact emission reduction strategies.

4 Local Government Operations Protocol for the quantification and reporting of greenhouse gas emissions inventories, Version 1.1. May 2010, https://ww2.arb.ca.gov/local-government-operations-protocol-greenhouse- gas-assessments.

# Inventory Boundaries

**The inventories that were developed for this report include only GHG emissions generated by County government operations;** they do not include emissions generated by County residents. Inventory boundaries reflect the approach used to consolidate GHG emissions, defining the operations, departments and activities which fall within the scope of emissions resulting from County operations. Following LGOP guidelines, a financial control approach was utilized encompassing not only County-owned properties, vehicles, and activities, but also entities where the County has a financial stake in the emissions of partner organizations. Based on guidance from County staff, a percentage of emissions from the Santa Fe Solid Waste Management Agency (SWMA), which operates the Caja Del Rio landfill pursuant to a Joint Powers Authority (JPA) agreement between the County and City of Santa Fe, and from the Buckman Direct Diversion water treatment facility, which also was formed under a JPA agreement between the County and City, are included within the County's inventory boundary. In addition, a portion of emissions from the North Central Regional Transportation District (NCRTD) was included.

The LGOP was designed to provide a standardized set of guidelines to assist local governments in quantifying and reporting GHG emissions associated with their government operations. The Protocol was developed in partnership by the California Air Resources Board (ARB), California Climate Action Registry (CCAR), and ICLEI, in collaboration with The Climate Registry and dozens of stakeholders.

Through this Protocol, the partners sought to enable local governments to measure and report GHG emissions associated with government operations in a harmonized fashion. The Protocol facilitates the standardized and rigorous accounting of GHG emissions, which can help track emissions reduction progress over time and in comparison to GHG reduction targets.

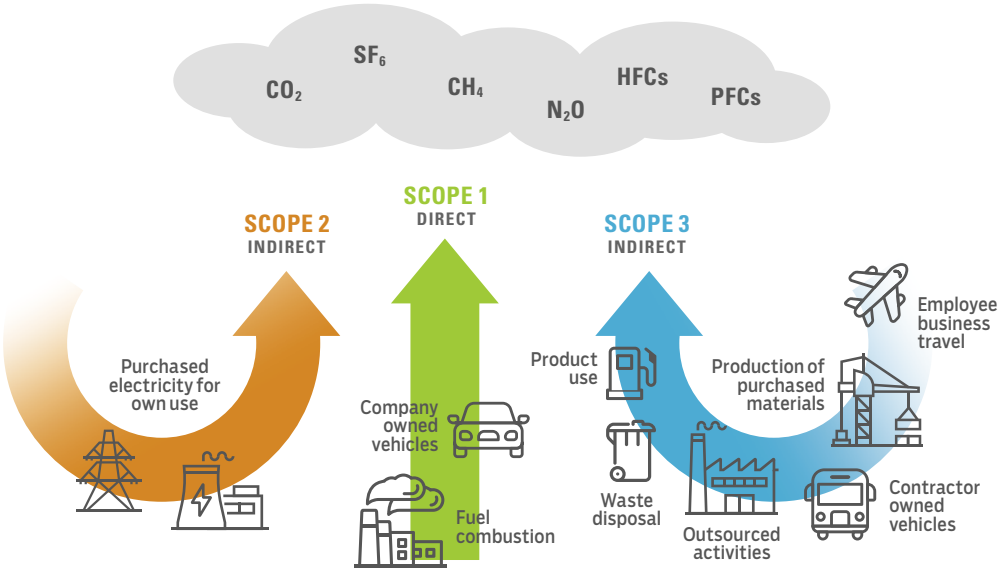
The Protocol provides the principles, approach, methodology, and procedures needed to develop a local government operations GHG emissions inventory. It is designed to support the complete, transparent, and accurate reporting of a local government's GHG emissions. The Protocol guides participants through emissions calculation methodologies and reporting guidance applicable to all U.S. local governments.[5]

Three scopes of emissions are defined in the LGOP. Scope 1 encompasses all direct emissions, including those from the combustion of fossil fuels such as gasoline, natural gas and propane; Scope 2 encompasses indirect emissions from the consumption of purchased grid-supplied energy (electricity); and Scope 3 emissions encompasses other emissions indirectly related to the operations of County government like emissions from business travel and employee commutes, emissions related to supply chain requisition of goods and services, and emissions from contracted services.

With the exception of the County fleet and the NCRTD, all sectors within the inventory report both Scope 1 and Scope 2 emissions. Figure 2, below, illustrates the sources of GHG emissions commonly included in Scopes 1, 2 and 3.

**FIGURE 2: GREENHOUSE GAS EMISSIONS SCOPES**

Source: Local Government Operations Protocol, Version 1.1, Page 23



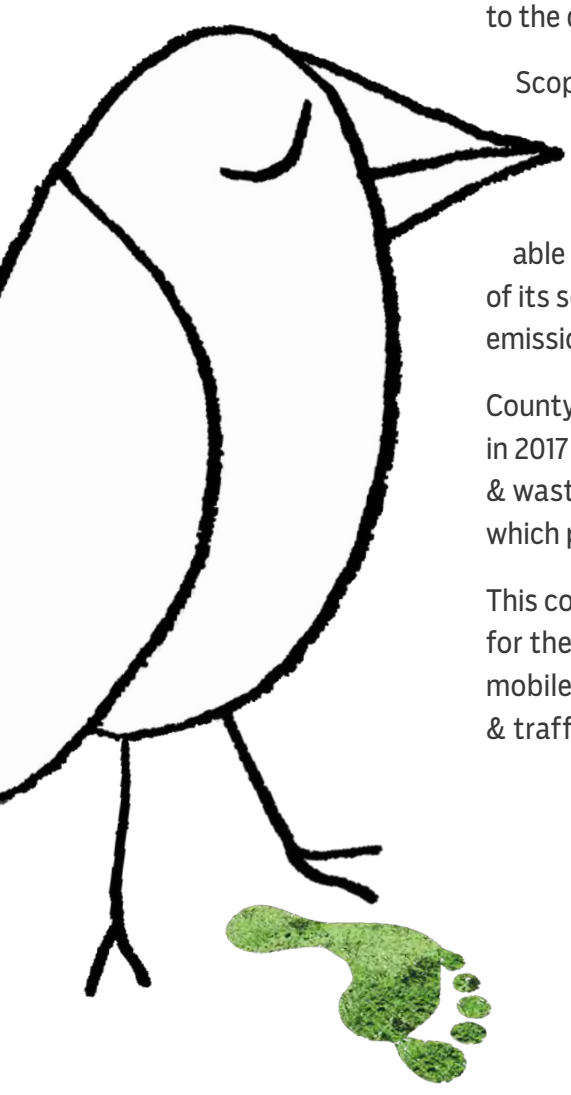

Scope 3 emissions are not addressed in this report because of a lack of necessary data. As the County builds upon this initial inventory effort, the County may wish to add Scope 3 inventory detail capturing emissions from a variety of other sources such as employee commutes, business travel, and supply chain analyses.

5 Ibid, pg. 11.

# Inventory Results

## Overall County operation emissions show a 97% drop from 426,707 MT $CO_2e$ in 2005 to 11,741 MT $CO_2e$ in 2018.

Scope 1 emissions are calculated at 6,429 MT $CO_2e$ for 2018, a 98% decrease from 2005 to 2018 (Table 1). Over 99% of this reduction in emissions is directly related to the development of a gas collection system at the Caja Del Rio landfill.



Scope 2 emissions are calculated at 5,312 MT $CO_2e$ for 2018, an 18% increase from 2005 to 2018 (Table 1). This increase is directly related to an 83% increase in County staff between 2005 and 2018, which necessitated an increase in the County's building footprint. However, the County was able to reduce per capita emissions over this time period, most likely by virtue of its solarization program. See Figure 1 for a summary of Scope 1 and Scope 2 emissions across each inventory year.

County buildings and facilities accounted for more than half of all GHG emissions in 2017 and 2018. The next highest emissions are from mobile combustion, water & wastewater treatment, solid waste, and finally street lights & traffic signals, which produced the lowest amount of emissions (Figures 4 and 5).

This contrasts to inventory year 2005, when solid waste operations accounted for the bulk of GHG emissions (Figure 3), followed by buildings & facilities, mobile combustion, water & wastewater treatment, and finally, street lights & traffic signals.

**TABLE 1: GREENHOUSE GAS EMISSIONS SUMMARY FOR YEARS 2005, 2017 AND 2018 (MT $CO_2E$)**

| Scope & Sector | 2005 | 2017 | 2018 | % Change 2005-2018 | % Change 2017-2018 |
|---|---|---|---|---|---|
| **SCOPE 1 TOTALS** | **422,198** | **6,255** | **6,429** | **-98%** | **3%** |
| Buildings & Facilities | 1,747 | 2,184 | 2,565 | 47% | 17% |
| Solid Waste | 416,054 | 139 | 140 | -100% | 1% |
| Water & Wastewater Treatment | 409 | 1,040 | 1,084 | 165% | 4% |
| Mobile Combustion | 3,988 | 2,454 | 2,639 | -34% | 8% |
| **SCOPE 2 TOTALS** | **4,509** | **4,928** | **5,312** | **18%** | **8%** |
| Buildings & Facilities | 2,905 | 3,638 | 3,862 | 33% | 6% |
| Street Lights & Traffic Signals | 44 | 81 | 83 | 89% | 2% |
| Solid Waste | 85 | 63 | 65 | -24% | 3% |
| Water & Wastewater Treatment | 1,475 | 1,146 | 1,302 | -12% | 14% |
| **TOTALS, SCOPES 1 & 2** | **426,707** | **10,745** | **11,741** | **-97%** | **9%** |

**FIGURE 1: SANTA FE COUNTY GREENHOUSE GAS EMISSIONS COMPARISON 2005, 2017 AND 2018**

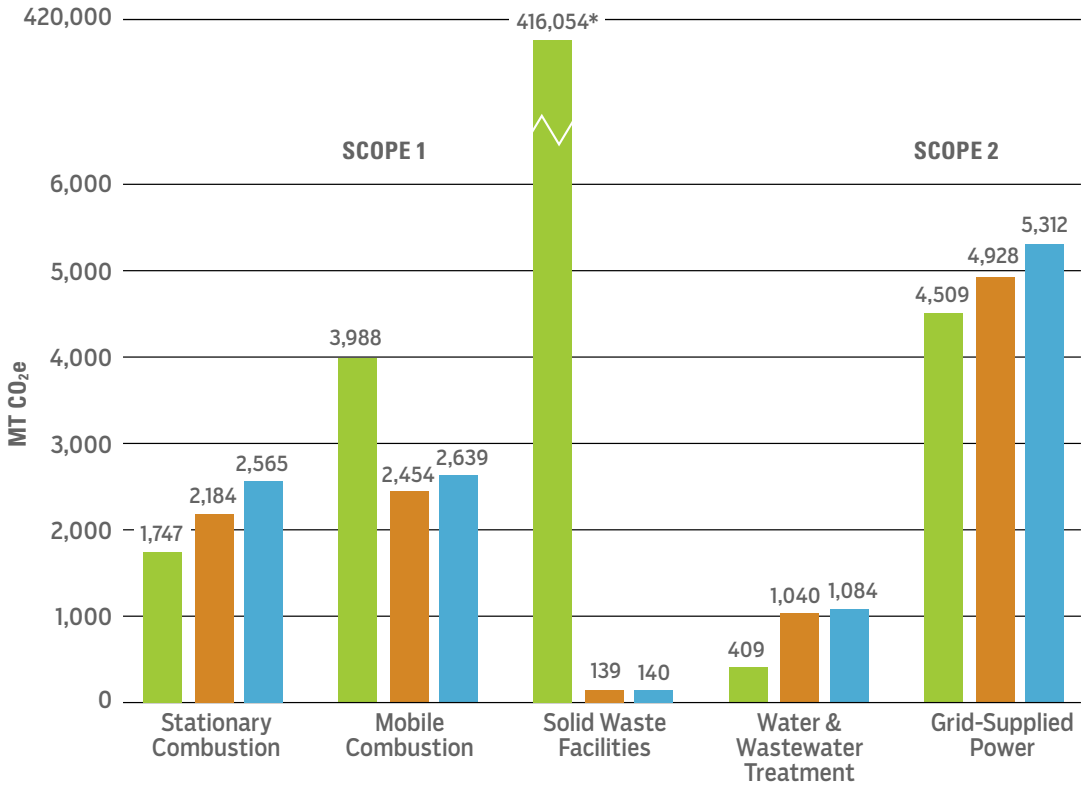


**FIGURE 3:**

## 2005

**SCOPE 1 AND SCOPE 2 GREENHOUSE GAS EMISSIONS BY SECTOR (MT $CO_2E$)**

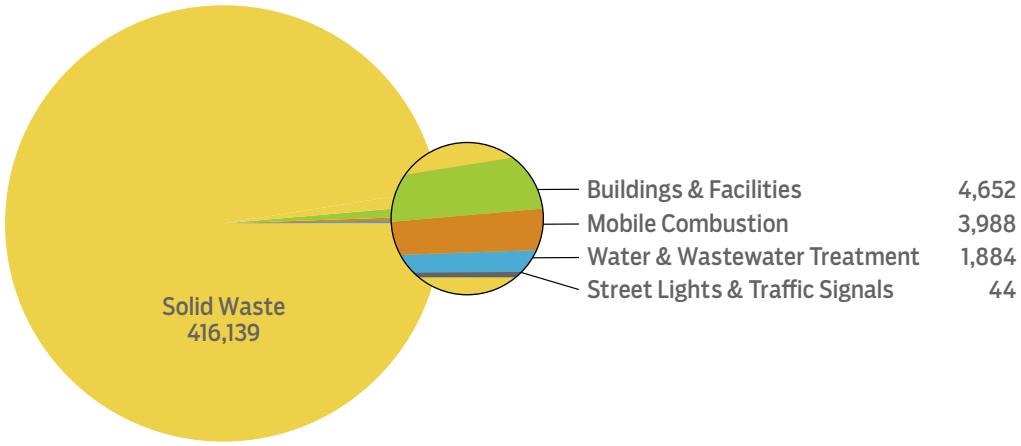



**FIGURE 4:**

## 2017

**SCOPE 1 AND SCOPE 2 GREENHOUSE GAS EMISSIONS BY SECTOR (MT $CO_2E$)**

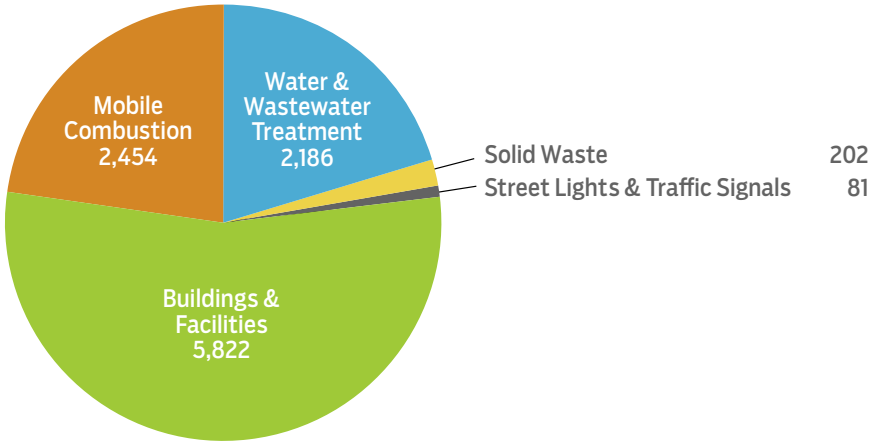
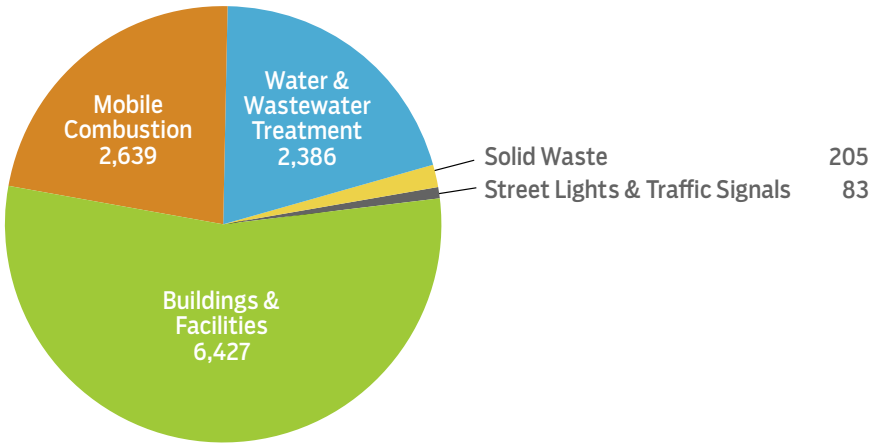



**FIGURE 5:**

## 2018

**SCOPE 1 AND SCOPE 2 GREENHOUSE GAS EMISSIONS BY SECTOR (MT $CO_2E$)**



Factors for the changes in emissions include:

Facilities represent a significant source of emissions. Buildings that have not been updated for energy efficiency provide opportunities for reducing emissions considerably.

## SOLID WASTE

Responsible for the largest portion of reductions, emissions from solid waste decreased with the installation of a landfill gas capture system at Caja Del Rio. This system captures the emissions from the landfill and destroys the resulting gas by flaring with a 99% destruction rate. In addition, there has been a concerted effort to improve recycling and increase diversion of garbage from the landfill.

## STATIONARY COMBUSTION

Scope 1 emissions from buildings and facilities increased by 47% from 2005 to 2018. This is likely due to the near doubling of County employees, from 563.5 full-time equivalent employees (FTE) in 2005, according to the County's budget for fiscal year 2005, to 1,032 FTEs in 2018, according to the County's Comprehensive Audited Financial Report for fiscal year 2018.

The number of the County's FTEs increased from 999 in 2017 to 1,032 in 2018, a 3.3% increase, while Scope 1 emissions increased by 17%. The increase in emissions resulted from a 17% increase in natural gas and propane use from 2017 to 2018. In 2018, the Heating Degree Days (HDDs) increased by approximately 9% from the 2017 HDDs, which required an increase of heating fuel usage of approximately 9% in 2018 in order to provide the same level of comfort as in 2017. Scope 1 emission increases between 2017 and 2018 are assumed to be the result of increases in FTEs, HDD changes and suboptimal building energy efficiency. Facilities represent a significant source of emissions, therefore, buildings that have not been updated for energy efficiency provide opportunities for reducing emissions considerably.

In addition to the expanded heating fuel use and increases in FTEs between 2017 and 2018, these data are partially influenced by the inclusion of propane use for road maintenance in the Buildings and Facilities calculation. Road maintenance propane usage increased 25% from 2,258 to 2,824 gallons from 2017 to 2018, contributing nearly 16 MT $CO_2e$. Overall, road maintenance comprises 5-6% of total propane use over the 2017-2018 period.

## MOBILE COMBUSTION

Although in 2018 there were nearly twice the number of vehicles in the County fleet from 2005 levels, vehicle fuel emissions decreased. The decrease is likely partially due to strategic fleet vehicle replacement which increased the average fuel efficiency of the fleet. Additionally, departments have implemented fleet management policies such as idle reduction mandates to reduce fuel use.

However, data regarding the County's fleet was limited, which limits the reliability of any conclusions. For example, out of approximately 700 vehicles in the County's fleet in 2018, only 289 have fuel use data (42% of fleet), and 260 have no data (37%). 204 have $CO_2e$ reports (29%), and fuel use in some cases, but $CO_2e$ reports cannot be entered into ClearPath. Instead, ClearPath requires vehicle miles traveled (VMT), type of fuel used, vehicle information (heavy or light duty, year of model), and then calculates the $CO_2e$ from that information. Additionally, the $CO_2e$ reports are by driver rather than vehicle, further limiting their utility in calculating GHG emissions from the fleet and in reaching conclusions about fleet management. $CO_2e$ reports were modified to support limited modeling within ClearPath.

Therefore, while the decrease is likely due in part to improvements in vehicle fuel efficiency (MPG) and in fleet management practices, the data is insufficient to support definitive conclusions.

The installation of solar panels at County facilities helped offset electricity emissions from other sources.

## ELECTRICITY

Electricity emissions in buildings increased 6.2% from 2017 to 2018, largely due to greater use due to growth in the number of County FTEs and the corresponding increase in necessary building square footage in which to house them. In addition, the number of Cooling Degree Days (CDDs) increased in 2018; however, cooling accounts for only approximately 14% of electricity use. It is expected that the total impact from increased CDDs is fairly minor[6].

The installation of solar panels at 10-15% of County facilities, lighting upgrades to LED lights, and building systems improvements and occupant engagement, along with increasing amounts of renewably produced electricity in the electrical utility grid, helped to counter the effect of increased emissions due to increased CDDs and FTEs.

6 "Use of Energy Explained: Energy use in commercial buildings," U.S. Energy Information Administration, accessed August 24, 2020, https://www.eia.gov/energyexplained/use-of-energy/commercial-buildings.php

# Data Sources and Methods

## Inventory data related to building energy, building operations, transportation, solid waste, and water and wastewater management

was compiled based on records provided by the County, the City of Santa Fe, and the New Mexico Environment Department; interviews with County departments and partner organizations; utility record data hosted online by utility providers and the County; and payment receipts available through the County Sunshine Public Information Portal (Sunshine Portal). The inventory for CY 2018 is supported by the most complete set of quantitative data and therefore is the most accurate; the CY 2017 data was almost as complete as that for CY 2018. CY 2005 data was lacking in many respects and therefore is more speculative and less reliable.

Where records were incomplete or missing, a range of estimation methods were employed following ICLEI's LGOP estimation procedures. Additional County reports and documents were used to confirm facility locations and conditions and to append utility cost data to corresponding facilities. An overview of inventory data sources and methods by sector is outlined below.

### BUILDING ENERGY/BUILDING OPERATIONS

A list of County-owned properties provided by the County was used as the foundation of the buildings and facilities inventory. Properties with no related emissions, such as open space areas and trails were excluded, and each remaining facility was given a unique Asset Identification Number (AID) to track facilities, as names or addresses sometimes changed across time. For the existing facilities, this AID corresponds to the identifier used by the County.

The 2014/2015 Santa Fe County Facilities Condition Assessment Report was utilized to confirm facility construction dates, utilities present, and any energy savings present where applicable; however, the report did not include information about all County facilities.


The majority of CY 2017 and 2018 facility records for electricity and natural gas were complete as provided by the County. For facilities with incomplete records, data was estimated based on information from a range of other sources.

The majority of CY 2017 and 2018 facility records for electricity and natural gas were complete as provided by the County. This information was added directly into ClearPath. Additional utility records were obtained from NM Gas Company and PNM utility portals if present. For facilities with partial 2018 use where only half of the year was enumerated, the presented total was doubled to estimate total year use.

For facilities with no data, financial records were obtained from the Sunshine Portal. These data provided the years of interest, specific vendors, and amount paid, and were delineated based on the Chart of Accounts available on the portal. Virtually all propane data was compiled in this manner.

Propane payments to Kings Butane for the year 2017, as an example, were downloaded from the Sunshine Portal. The government management and budgetary accounting numbers (GMBA numbers), assigned by the County Finance Department, were matched to six groups of eligible facilities using this vendor. Five of these were fire stations (e.g., Stanley Fire) and the propane costs were assigned to the facility using size of the facility versus size of expenditure to determine to which facility to assign the incurred expense. A standard price per unit of $2.00/gallon was assumed, and usage was calculated in this manner. There are shortcomings to this method, but the ease and accuracy of capturing all billing for propane vastly improved previous attempts to quantify this particular data set.

For facilities that could not be matched to a corresponding account number (some GMBA groupings were too large to be useful, such as Fire Operations), usage data was estimated using a reference facility of similar use and age and adjusted for building size. For facilities where CY 2018 data was present and CY 2017 data was missing, LGOP Alternative Activity Guideline Equations 6.8 and 6.13[7] were utilized to estimate missing values using CY 2018 as the proxy year. This data was then normalized for heating and cooling days as specified in the Protocol. Where LGOP estimates were used, this is noted in the specific ClearPath record.

CY 2005 utility data was not provided due to inaccessibility and financial records were also not present on the Sunshine Portal. Facilities constructed after 2005 were excluded from the CY 2005 inventory.

7 Local Governmental Operations Protocol for the quantification and reporting of greenhouse gas emissions inventories, Version 1.1. May 2010, Page 36.

2018 usage values were reduced by 9% to account for reduced use in 2005. The 9% value reflects changes in energy intensity between 2005 and 2018, as outlined by the Energy Information Administration[8].

Usage data for the Valle Vista, Santa Cruz and Jacobo Housing Complexes was estimated using 2018 per unit average consumption values provided by the Santa Fe County Housing Authority. LGOP Alternative Activity Guideline Equations 6.8 and 6.13 were utilized to estimate CY 2017 usage.

See Tables 2 and 3 in the Appendix for a summary of fuel usage by sector and costs across each inventory year.

Inventory data for this report was compiled and organized by sector: building energy, building operations, transportation, solid waste, and water and wastewater management.

## TRANSPORTATION

A list of County-owned vehicles was used as the foundation for the transportation inventory; however, the list was not comprehensive. For vehicles with GPS enabled, County monthly carbon emission summary reports were compiled and individual vehicles were grouped by department and entered into ClearPath. For vehicles where mileage data was not available, fuel economy was estimated based on vehicle model and year using EPA fuel economy standards[9]. For these records $NO_2$ and $CH_4$ values were not identified, and $CO_2$ was used as a stand-in for $CO_2e$, resulting in marginally reduced emissions values. Emissions were calculated outside of ClearPath and vehicles were grouped by department. In many instances, vehicle weight and fuel type were estimated.

Vehicle records for SWMA were obtained during meetings with SWMA officials. Because 42% of total waste is estimated to originate within the County, 42% of emissions were recorded as County emissions.

NCRTD transit fleet data was not provided. Vehicle miles traveled and fuel use were estimated from 2018 NCRTD Budget Documents and 2014 vehicle lists outlined in the 2014 NCRTD Transit Service Plan Update, which was used because it contained the most complete information available about NCRTD vehicles. Miles per gallon for identified vehicles were compiled from EPA combined fuel ratings[10]. Gross receipts tax collected in the County provided approximately 12% of NCRTD's budgets in CY 2017 and 2018; therefore, 12% of total fuel use, VMT, and passenger boardings were attributed to the County in the inventories for 2017 and 2018.

8 "AEO2020 Data," U.S. Energy Information Administration, accessed August 24, 2020, https://www.eia.gov/outlooks/aeo/consumption/sub-topic-03.php
9 "Fuel Economy Guide," U.S. Environmental Protection Agency, accessed August 24, 2020, https://www.fueleconomy.gov/feg/printGuides.shtml
10 Ibid.

58% of total waste processed by SWMA is expected to have originated from outside the County. As a result, only 42% of total solid waste emissions were recorded within the County inventory for this report.

## SOLID WASTE

Based on guidance from partners at the City of Santa Fe, 42% of total waste processed by SWMA is expected to have originated from within the County. As a result, 42% of total solid waste emissions were recorded within the County inventory. CY 2017 and CY 2018 landfill gas flare, fleet and facility data was obtained during meetings with SWMA agency officials. Facility utility records were obtained from SWMA, the County and the City of Santa Fe. CY 2005 and CY 2017 facility records were incomplete and were estimated using waste placement totals reported to the EPA. It is assumed that facility use and corresponding emissions respond to total waste placement occurring at SWMA. As a result, waste placement totals were used as an indicator of facility use. SWMA waste placement in CY 2017 was 1.5% lower than CY 2018; therefore, CY 2018 facility utility records were reduced by 1.5% for CY 2017. In CY 2005, SWMA waste placement values were 18.7% greater than CY 2018, so CY 2018 facility utility records were increased by 18.7% for CY 2005.

In 2005 SWMA did not have a landfill gas collection system. Waste placement tonnage was derived from historic EPA landfill reporting. Waste in Place is a cumulative number based on the landfill opening in 1997. The reported value of all waste landfilled through 2005 is 1,331,912 MT. $CH_4$ data was estimated using a landfill emissions tool that the California Air Resources Board developed[11]. The spreadsheet-based tool implements a mathematically exact first-order decay model of the 2006 IPCC guidelines. This tool is designed to estimate the fugitive emissions of a landfill that does not have a landfill gas collection system. The file and data used are available for download from the ClearPath inventory record created for the County. In 2005, 50% of waste tonnage is presumed to have originated from within the County with the other 50% coming from the City of Santa Fe; as a result, 50% of landfill gas emissions for CY 2005 were included in the County's emissions inventory.

Solid waste processed at the seven County-owned Solid Waste Convenience Centers was transferred to SWMA and related emissions are included within the SWMA Solid Waste inventory. Facility-specific emissions are included within the Buildings and Facilities sector, while emissions related to the transport of solid waste are included within the Transportation sector.

Information about waste generated by County employees directly from County operations was not available.

11 https://ww2.arb.ca.gov/resources/documents/landfill-methane-emissions-tool

## WATER

Utility data from the Buckman Direct Diversion (BDD) and associated water lift stations were obtained from the City of Santa Fe, and 30% of total emissions were recorded in these inventories, which corresponds to the percentage of BDD water utilized by County water utility customers. 2005 data was not available, so City of Santa Fe water use was used as an indicator of facility use and emissions.

Per City of Santa Fe and US Census Bureau reporting, water usage decreased by 8.13% from 2005 to 2018. Therefore, 2005 water use and lift station use was assumed to be 8.13% greater than 2018 values.

## WASTEWATER

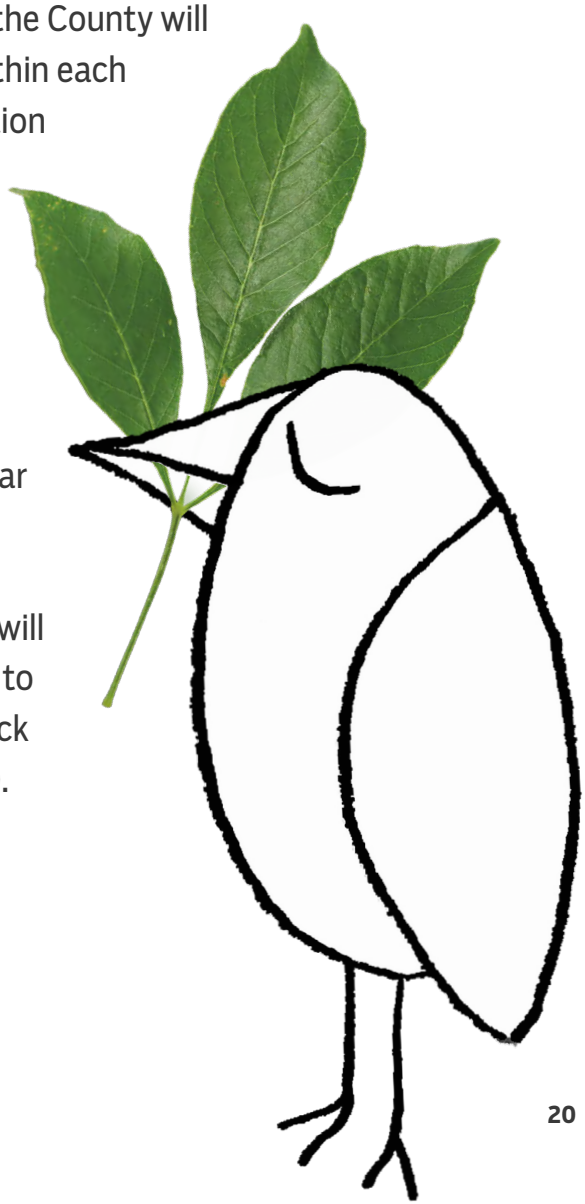
Wastewater data was obtained from the County including information about County-owned lift stations and the Quill Wastewater Treatment facility. Quill lagoon emissions and emissions from onsite disposal systems (OSDS), when data indicated the presence of such systems at various facilities, were derived from the estimated County population during the inventory year.

# Next Steps

## These GHG emissions inventories are the first step toward preparing a comprehensive action plan to further reduce emissions and increase resilience in the face of climate change.

High impact strategies within each sector will help achieve emission reduction targets that align with the Paris Agreement.

In the next phase of this project, the County will specify high impact strategies within each sector to achieve emission reduction targets that are in alignment with the Paris Agreement: a 26-28% or more reduction from 2005 levels by 2025, and net-zero GHG emissions by 2050. A comprehensive GHG reduction plan by sector in five year increments will be made available to the public and implemented by the County in mid-2021. Progress will then be assessed every five years to ensure the County remains on track to meet the net-zero goal by 2050.



# Appendix

## 1.1 Fuel Usage by Sector

### TABLE 2: SECTOR-SPECIFIC ENERGY USAGE TOTALS

| Fuel Type | Sector | 2005 Use | 2017 Use | 2018 Use |
|---|---|---|---|---|
| **ELECTRICITY (kWh)** | Buildings & Facilities | 4,932,811 | 7,893,742 | 8,380,463 |
| | Streetlights | 73,494 | 174,928 | 179,096 |
| | Solid Waste | 95,840 | 87,319 | 87,157 |
| | Water & Wastewater | 2,480,639 | 2,470,303 | 2,808,079 |
| | **TOTAL** | **7,582,784** | **10,626,292** | **11,454,795** |
| **NATURAL GAS (therms)** | Buildings & Facilities | 290,028 | 345,177 | 437,239 |
| | Water & Wastewater | 25,555 | 23,633 | 24,760 |
| | **TOTAL** | **315,583** | **368,810** | **461,999** |
| **PROPANE (gallons)** | Buildings & Facilities | 37,262 | 39,663 | 43,746 |
| | Solid Waste | 4,168 | 3,512 | 3,512 |
| | **TOTAL** | **41,430** | **43,175** | **47,258** |
| **GASOLINE (gallons)** | Vehicle Fleet | 286,045 | 69,401 | 72,328 |
| **DIESEL (gallons)** | Vehicle Fleet | 112,500 | 40,569 | 42,152 |

# 1.2 Fuel Usage and Costs

### TABLE 3: FUEL USAGE AND COST ESTIMATES[12]

| | 2005 | | 2017 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|
| Fuel Type | Usage | Usage (GGE)* | Usage | Usage (GGE) | Cost | Usage | Usage (GGE) | Cost |
| ELECTRICITY (kWh) | 7,582,784 | 225,008 | 10,626,292 | 315,320 | $778,608 | 11,454,795 | 339,905 | $913,365 |
| NATURAL GAS (therms) | 315,583 | 276,827 | 368,810 | 323,518 | $67,431 | 461,999 | 405,262 | $222,601 |
| PROPANE (gallons) | 41,430 | 54,657 | 43,175 | 56,959 | $61,240 | 47,258 | 62,346 | $65,123 |
| DIESEL (gallons) | 112,500 | 127,841 | 40,569 | 46,101 | $110,023 | 42,152 | 47,900 | $135,814 |
| GASOLINE (gallons) | 286,045 | 286,045 | 69,401 | 69,401 | $173,364 | 72,328 | 72,328 | $207,364 |
| TOTAL (GGE, USD) | | 970,379 | | 811,299 | $1,190,666 | | 927,741 | $1,544,267 |

12 Gasoline and diesel cost estimates are limited by the lack of complete fleet data, discussed above, and estimates are lower than actual County gasoline and diesel expenditures. Per gallon cost estimates are based on data obtained from https://www.eia.gov/dnav/pet/PET_PRI_GND_DCUS_R40_A.htm. 2005 costs were not estimated because of the lack of data available from that year and the resulting inherent inaccuracy in any estimations.

* (GGE): Gallons of Gasoline Equivalent

# 1.3 Glossary

**Carbon Dioxide Equivalent ($CO_2e$):** The common unit used to measure the six greenhouse gases regulated under the Kyoto Protocol. Since each gas contributes a different level of atmospheric warming, $CO_2e$ is calculated by multiplying each gas by its global warming potential.

**Cooling Degree Day (CDD):** The equivalent number of days needed to cool a building by 1 degree to accommodate the cooling requirement. For example, if on one day the temperature is 75ºF, that day is worth 10 Cooling Degree Days because it is 10 degrees above 65ºF, which is the standard temperature used in the United States. CDD is calculated in this way for each day of the year and summed up to get the total annual CDD.

**Climate Change:** A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

**Fossil Fuel:** A general term for organic materials formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years.

**Global Warming Potential (GWP):** Global Warming Potential factors represent the heat-trapping ability of each greenhouse gas relative to that of carbon dioxide.

**Government Management and Budgetary Accounting (GMBA):** A numerical coding system whereby the data presented in budget requests and reflected in appropriations are consistently coded within the accounting system. This compatibility facilitates comparisons between actual expenditures across previous fiscal periods and even across other governmental bodies. In the case of the County, all expenditures are coded with an established, defined Chart of Accounts or COA, which lists the GMBA number and the relevant associated data like "Tesuque Fire". These codes are available for download from the County Sunshine Portal, checkbook register.

**Greenhouse Gas (GHG):** A gas that absorbs radiation at specific wavelengths within the spectrum of radiation (infrared radiation) emitted by the Earth's surface and by clouds. The gas in turn emits infrared radiation from a level where the temperature is colder than the surface. The net effect is a local trapping of part of the absorbed energy and a tendency to warm the planetary surface. Carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), sulfur hexafluoride ($SF_6$), Hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) are the six primary greenhouse gases.

**Heating Degree Day (HDD):** The equivalent number of days needed to heat a building by 1 degree to accommodate the heating requirement. For example, if on one day the temperature is 55ºF, that day is worth 10 Heating Degree Days because it is 10 degrees below 65ºF, which is the standard temperature used in the United States. HDD is calculated in this way for each day of the year and

summed up to get the total annual HDD. A number of organizations use HDD data as provided by the U.S. Energy Information Administration (https://www.eia.gov/energyexplained/units-and-calculators/degree-days.php).

**Kilowatt hour (kWh):** A derived unit of energy equal to 3.6 megajoules. Electrical energy is sold in kilowatt hours. If the energy is being used at a constant rate (power) over a period of time, the total energy in kilowatt hours is the product of the power in kilowatts and the time in hours.

**Light-emitting diode (LED):** A light-emitting diode is a two-lead semiconductor light source. LEDs have many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching.

**Metric Ton (MT):** Common international measurement for the quantity of greenhouse gas emissions. A metric ton is equal to 2205 pounds or 1.1 short tons.

**Onsite Disposal System (OSDS):** Commonly known as septic systems, these wastewater treatment systems are designed to treat and dispose of effluent on the same property that produced the wastewater typically in anaerobic environments. OSDSs are known sources of $NO_2$ and $CH_4$ emissions depending on the specifics of the system in use.

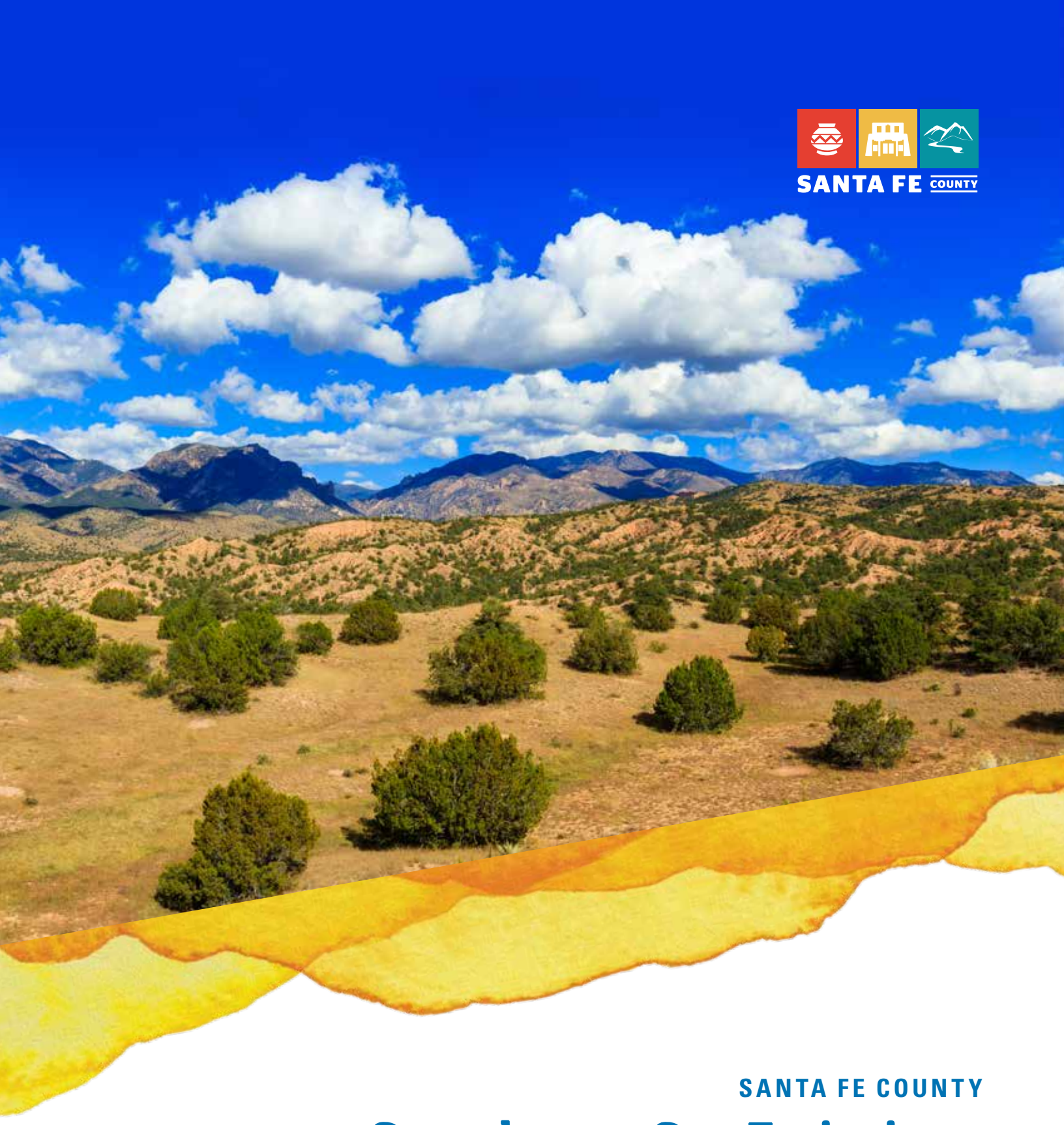
**Scopes 1, 2 and 3:** The World Resource Institute and World Business Council on Sustainable Development developed a classification system for different types of GHG emissions for GHG accounting purposes. Scope 1 emissions come directly from owned equipment and buildings. Scopes 2 and 3 are indirect emissions from sources shared by the reporting institution with other entities.

**Therms:** The therm is a unit of heat energy equal to 100,000 British thermal units (BTU). It is approximately the energy equivalent of burning 100 cubic feet (often referred to as 1 CCF) of natural gas. Since natural gas meters measure volume and not energy content, a therm factor is used by natural gas companies to convert the volume of gas used to its heat equivalent, and thus calculate the actual energy use.

Content and data prepared by Adelante Consulting, Inc.
Report designed by Firestik Studio

SANTA FE COUNTY

# Appendix D: Greenhouse Gas Emissions Reduction Plan: Local Government Operations



SANTA FE COUNTY

# Greenhouse Gas Emissions Reduction Plan

Roadmap to Net Zero by 2050: Government Operations

# Contents



# Santa Fe County is committed to net zero emissions by 2050.

In April 2021, the County joined the "Race to Zero", a global coalition of cities, regions, businesses, and investors committed to achieving carbon neutrality by 2050, at the latest. This Greenhouse Gas Emissions Reduction Plan (GHGERP) is a detailed roadmap to achieve greenhouse gas (GHG) emission reductions in County operations across four sectors:

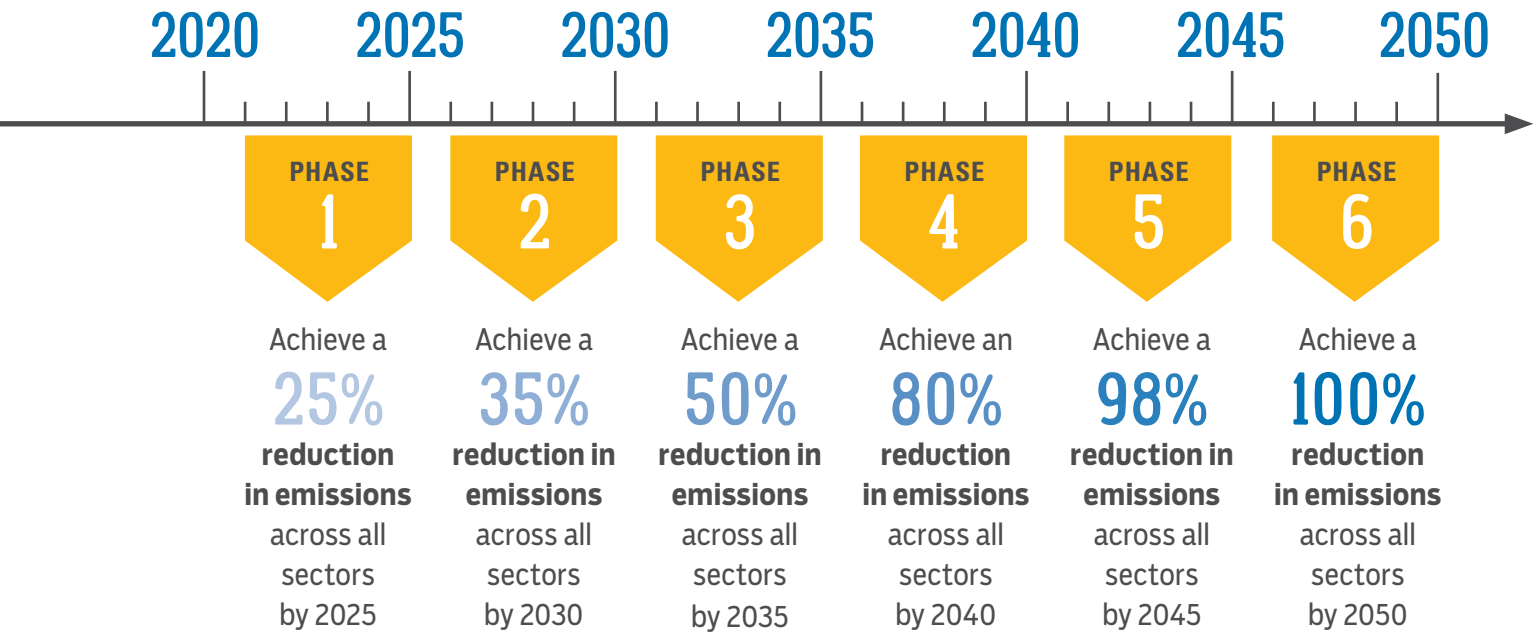
- Buildings and facilities
- Fleet
- Water and wastewater
- Solid waste

To learn more about the Race to Zero coalition, visit unfccc.int/climate-action/race-to-zero-campaign

The reduction plan is composed of six phases, each in five-year increments, from 2021 to 2050. Detailed actions are presented for the first two phases, from 2021 to 2030, with preliminary guidance provided for the final two decades. It will be necessary to revisit this long-range guidance for all phases on a periodic basis as the plan is implemented and conditions are reassessed.

Emission reduction strategies were informed by GHG inventories of County operations produced by Adelante Consulting for the calendar years 2005, 2017, and 2018. The inventories included both Scope 1 (direct emissions, e.g. from vehicles and the combustion of fuel) and Scope 2 (indirect emissions, e.g. from purchased electricity) emissions, as well as emissions from operational areas in which the County has a financial stake (e.g. North Central Regional Transit District, Buckman Direct Diversion Water Treatment Plant, and Santa Fe Solid Waste Management Agency).

With an understanding of the County's historical GHG emissions, informed targets can now be set to guide the County to achieve net zero emissions. Using 2018 as a baseline, the reduction targets and timelines of each phase are as follows:




In 2018, County buildings and facilities produced more than half of the GHG emissions of County operations. 1.8 MW of solar have been installed on County facilities from 2011 to 2021 to help offset emissions from facilities. These installations reduce approximately 2,100 tons of GHG each year. Yet, more needs

to be done to reach the County's net zero goal beyond on-site renewable energy generation. As recommended by the consultant, in order to meet the County's targets, the following operational improvements need to be made:

- Implementing energy efficiency measures in buildings
- Sourcing all electricity from renewable energy
- Electrifying buildings and fleet
- Decreasing methane emissions from solid waste and wastewater treatment operations

Eighty-six percent (86%) of the Phase 1 target can be achieved by implementing four high-impact projects, which have all been initiated or are nearing completion as of November 2021:

1. Complete Quill Wastewater Treatment Facility improvements including conversion from open lagoon to membrane filtration system.
2. Use electricity from the PNM Solar Direct program to offset 50% of the County's electricity from PNM that is generated by non-renewable energy sources.
3. Implement facility improvement measures recommended by the 2020 investment grade audit at 13 identified facilities.
4. Install 200 kW DC of behind-the-meter photovoltaic systems at County facilities.

The remaining 14% of the Phase 1 target can be met through various smaller projects. In subsequent phases, emerging reduction strategies that have yet to be identified, perhaps due to new technologies and changes in state and national policy, will play an important role in shaping reduction actions. Thus, it is key to allow for flexibility in the GHGERP. Reduction targets may need to be adjusted as County emissions are measured following the end of each Phase, or if the global scientific consensus on the timeline and magnitude of necessary emission reductions is amended. Given this fluid landscape, it is key for County stakeholders to collaboratively identify appropriate GHG emissions reduction strategies.

At the end of each reduction phase, the County will need to conduct a thorough review and provide a report on the successes, challenges, and limitations, as well as propose alternative pathways to adjusted strategies, which will guide actions needed to meet the 2050 net zero goal. This review, along with GHG emissions

**86%**

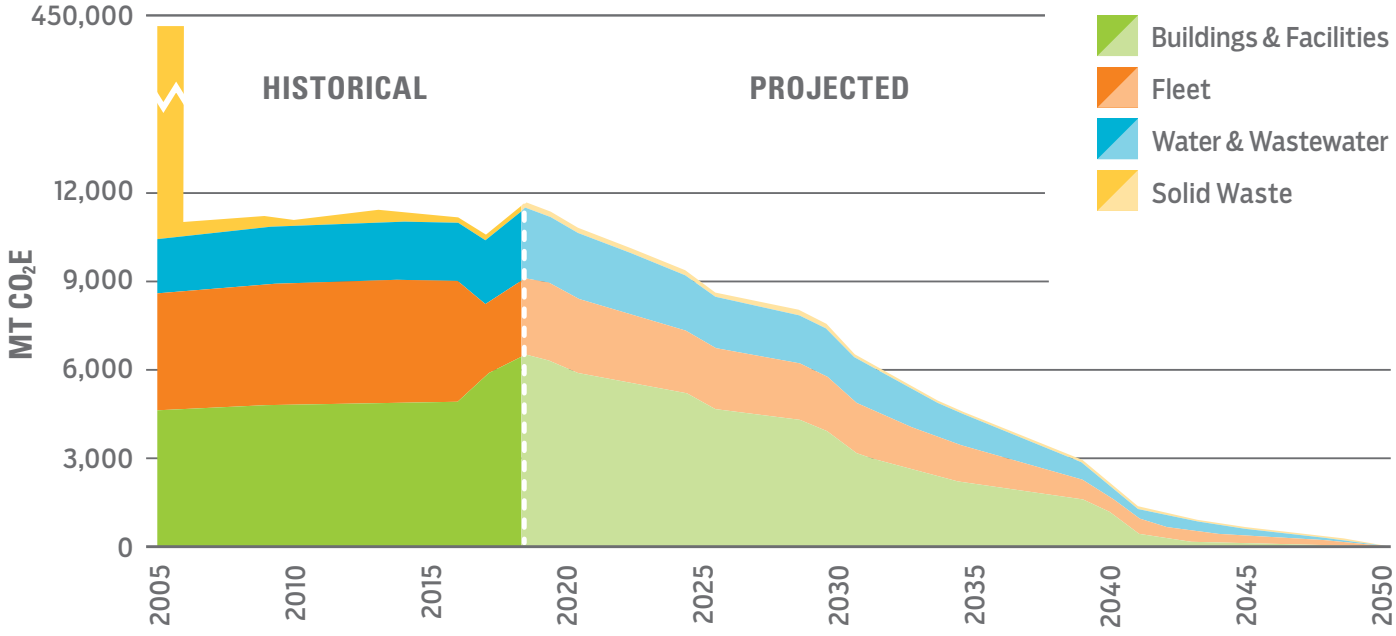
**of the Phase 1 reduction target can be achieved by implementing four high-impact projects, which have all been initiated or are nearing completion as of late 2021.**

inventories conducted every five years, will provide the trail markers needed to fine-tune and accelerate meeting the County's operational net zero goal. Once the GHGERP is in operation, the next step is to develop a climate action plan, which is a comprehensive, community-wide strategy to further reduce emissions and increase resilience in the face of climate change throughout Santa Fe County.

It is of utmost importance throughout the GHG emissions reduction process that the County prioritizes community safety, continuity, and proper functioning of government operations and services in the face of an ever-changing, and increasingly unpredictable climate-altered world. This plan is an affirmative, positive guide for the County to address these complex climate issues within the bounds of its immediate capabilities and with a vision for additional actions that can be implemented for the benefit of current and future generations. Santa Fe County welcomes input on best practices and will work with any interested parties to improve and adjust the plan as needed.

## Santa Fe County's Roadmap to Net-Zero Greenhouse Gas Emissions

The County's historical emissions are shown on the left, and projected emission reductions on the right that are in alignment with the reduction targets of each phase.




Source: Adelante Consulting, Inc., 2021

Greenhouse gases, such as carbon dioxide, methane, and nitrous oxide, trap heat in the Earth's atmosphere that would otherwise escape into space, allowing for a livable planet. This is called

# the greenhouse gas effect.

The increase in the concentration of greenhouse gases in our atmosphere, primarily from the burning of fossil fuels, as well as the emissions of synthetic fluorinated gases from industrial processes, is resulting in extra trapped heat and consequently higher global temperatures.[1] The global climate is increasing in temperature each year at an accelerated rate.

The planet's average surface temperature has risen more than **2.1°F** since the late 19th century.

The planet's average surface temperature has risen about 2.14°F (1.19°C) since the late 19th century.[2] This change has been largely driven by increased carbon dioxide emissions into the atmosphere from the burning of fossil fuels and other human activities.[3] The global community must rapidly reduce GHG emissions to avoid predicted catastrophic climate change impacts if no actions are taken.[4] To limit the rise in global mean temperatures to 1.5 degrees Celsius above pre-industrial levels, countries signed the Paris Agreement in 2015, committing to net zero GHG emissions by 2050. Net zero means that any residual emissions, such as emissions in hard-to-decarbonize sectors, are offset by actions that take emissions out of the atmosphere, either through technology or land-based carbon sequestration techniques.

# net zero

**means that any residual emissions are offset by actions that take emissions out of the atmosphere, either through technology or land-based carbon sequestration techniques.**

In 2013 Santa Fe County passed Resolution 2013-7 committing the County to lead by example in several key areas, including sustainability. In 2017, the County passed Resolution 2017-68 to support and adopt the goals of the Paris Agreement and apply them to significantly reduce GHG emissions in the operation of County facilities and services.

In accordance with the Paris Agreement, this Greenhouse Gas Emissions Reduction Plan (GHGERP) details the actions needed to achieve net zero GHG emissions from County government operations by 2050, and establishes interim GHG emissions reduction goals in five year increments from 2021 to 2050. GHG emission reduction actions address the following categories:

**Buildings and facilities** > energy use of County facilities

**Water and wastewater** > emissions associated with water & wastewater treatment

**Fleet** > vehicle emissions of County fleet, also referred to as “mobile combustion”

**Solid waste** > emissions from solid waste operations

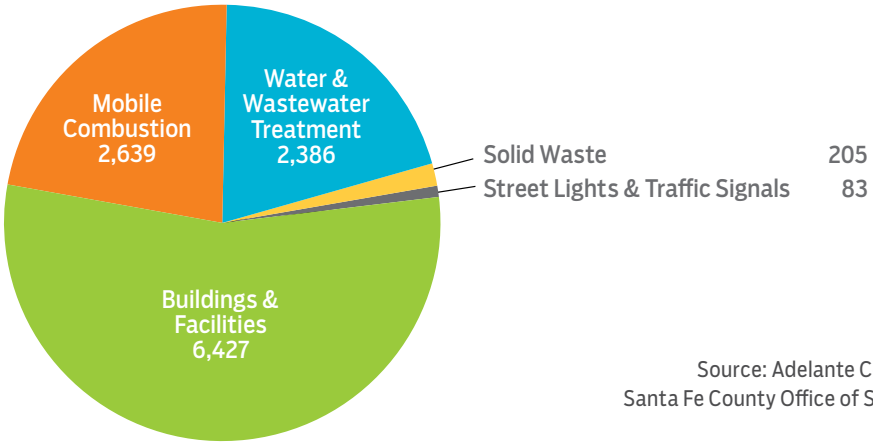
The emission reduction strategies across these four categories are informed by the County’s 2018 GHG emissions inventory,[5] which measured the emissions associated with each of these sectors. A fifth category, “Carbon Offsets”, relates to strategies the County can take to offset carbon emissions to achieve net zero emissions by 2050.

# 2018 GHG Emissions Inventory

In 2018, Santa Fe County's total GHG emissions from County operations were 11,741 metric tons of carbon dioxide equivalent (MT $CO_2e$).[6] County buildings and facilities accounted for more than half of all GHG emissions in 2018, with mobile combustion from the vehicle fleet and water and wastewater treatment processes also producing significant emissions (Figure 1). The 2018 inventory sets the baseline for the County's reduction plan and allows the County to make informed decisions to reduce emissions across each sector.

FIGURE 1

## Scope 1 and 2 GHG emissions by sector in 2018 (MT $CO_2e$)




Source: Adelante Consulting, Inc. and Santa Fe County Office of Sustainability, 2021

# Goals and Interim Targets

The roadmap to net zero by 2050 is based on six emission reduction phases, indicating which emission reduction actions should be taken, and when, using 2018 as the baseline reduction year:[7]

**Phase 1**
2021 to 2025
Achieve a 25% reduction in emissions across all sectors by 2025.

**Phase 2**
2026 to 2030
Achieve a 35% reduction in emissions across all sectors by 2030.

**Phase 3**
2031 to 2035
Achieve a 50% reduction in emissions across all sectors by 2035.

**Phase 4**
2036 to 2040
Achieve an 80% reduction in emissions across all sectors by 2040.

**Phase 5**
2041 to 2045
Achieve a 98% reduction in emissions across all sectors by 2045.

**Phase 6**
2046 to 2050
Achieve a 100% reduction in emissions across all sectors by 2050.

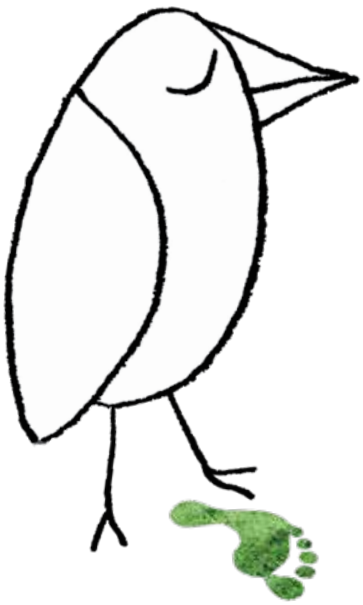
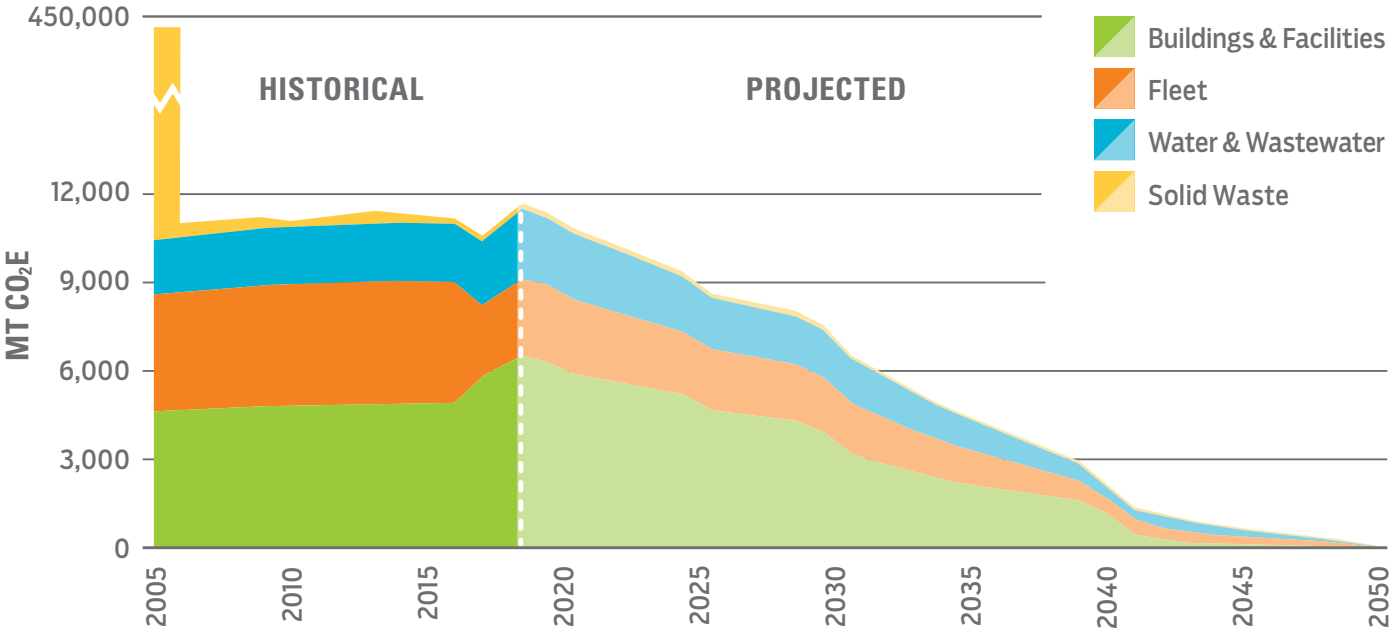


FIGURE 2

## Santa Fe County historical (left) and projected (right) GHG emissions

across four sectors (Buildings and Facilities, Fleet, Water and Wastewater, and Solid Waste) from 2005 to 2050




Source: Adelante Consulting, Inc., 2021

This document details the actions that are needed to achieve the GHG emission reduction targets in the next ten years (Phases 1 and 2). The focus of Phase 1 is planning for future actions and identifying funding sources to pay for this work, while implementing reduction actions that can easily be achieved given available funding and technology. Reduction strategies also include actions to reduce emissions from operational areas in which the County has a financial stake: the North Central Regional Transit District (NCRTD), the Buckman Direct Diversion Water Treatment Plant (BDD), and the Santa Fe Solid Waste Management Agency (SWMA). As the County does not have operational control over these entities, the County will work in conjunction with other joint powers to collaboratively identify and implement emission reduction strategies with these organizations.

Many of the reduction actions listed in Phase 1 are currently in progress and producing positive results. This document serves to formalize these actions as elements within the GHG emission reduction framework.

Emission reduction amounts were calculated for select high-impact actions that are tied to concrete projects (Figure 3). Completing the four high-impact reduction actions (Figures 3-7), all of which are in progress as of November 2021, will achieve 86% of the Phase 1 reduction target, while the remaining 14% can be met through various smaller projects.

The actions that are planned in Phase 1 will be implemented in Phase 2, and a detailed planning process will be conducted to identify appropriate proposed emission reduction actions in Phases 3 to 4, with consideration of anticipated new technologies, changes to climate data and policy, as well as new funding sources as they become available at the local, state, and federal levels. Emission reduction actions for Phases 5 and 6 will be determined in Phase 4, again giving consideration to new technologies, climate policies, and funding sources. Reduction targets will be updated as GHG emission inventories are completed at the end of each five-year phase to ensure the County remains on track to meet the net zero goal by 2050.

TABLE 1

## GHG emission reduction targets for each phase and the reduction amount needed to meet these targets, using 2018 as a baseline

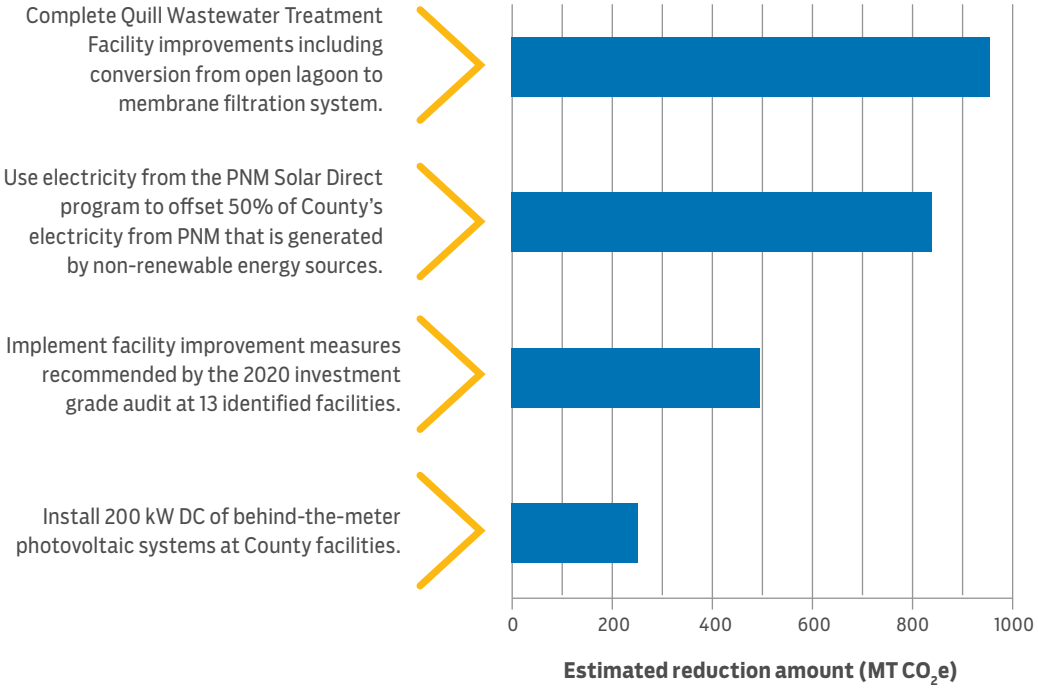
| PHASE | YEAR | EMISSIONS REDUCTION TARGET (%) | REDUCTION AMOUNT (MT $CO_2e$) | TOTAL EMISSIONS (MT $CO_2e$) |
|---|---|---|---|---|
| **Baseline** | 2018 | n/a | n/a | 11,741 |
| **1** | 2025 | 25% | 2,935 | 8,806 |
| **2** | 2030 | 35% | 1,174 | 7,632 |
| **3** | 2035 | 50% | 1,761 | 5,871 |
| **4** | 2040 | 80% | 3,522 | 2,348 |
| **5** | 2045 | 98% | 2,113 | 235 |
| **6** | 2050 | 100% | 235 | 0 |

Source: Santa Fe County Office of Sustainability and Adelante Consulting, Inc., 2021

FIGURE 3

## High-impact GHG emission reduction actions identified in Phase 1.

Completing these four projects will achieve 86% of the Phase 1 reduction target.




Source: Santa Fe County Office of Sustainability and Adelante Consulting, Inc., 2021

FIGURE 4

## Upgraded Quill Wastewater Treatment Plant

Photo courtesy of LeRoy Alvarado, 2021

FIGURE 5

## September 2021 construction update of PNM Solar Direct project,

expected to be completed in first quarter of 2022. PNM Solar Direct is a 50 MW solar array located on Jicarilla Apache Nation. Santa Fe County has subscribed to 2.6% of the generation capacity of this array. The 1.3 MW of solar energy from this subscription will power half of the electricity that PNM supplies to Santa Fe County facilities with renewable energy.

Photo courtesy of PNM, 2021

FIGURE 6

## Facility improvement measures at 13 County facilities will include upgrades

to building envelopes to mitigate air leakages such as this one at Hondo Fire Station 2, as well as installation of LED lighting, onsite renewable energy, and high-efficiency low-voltage transformers, upgrades to HVAC equipment and controls, and implementation of water conservation measures. The County facilities and associated improvement measures were identified and recommended by an energy service company through an investment grade audit certified by the New Mexico Department of Energy, Minerals, and Natural Resources, and implemented through a guaranteed utility savings contract. County facilities with the highest energy use and/or highest community impact were prioritized for energy efficiency upgrades. Implementation of these improvements will be coordinated by the Santa Fe County Public Works facilities team and Office of Sustainability.

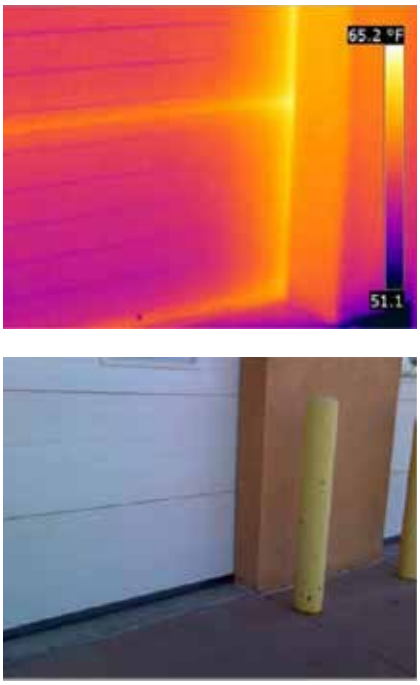



Photo courtesy of Yearout Energy, 2020

FIGURE 7

135 kW DC photovoltaic system installed September 2021 at the Santa Fe County Public Safety complex

Photo courtesy of Sol Luna Solar, 2021

# Methodology

The emission reduction amounts were modeled by the consultants using ClearPath, an online software used in best practice protocols to conduct GHG inventories, emission forecasting, and emission monitoring at community-wide or government-operational scales. The consultant created an assigned identification (AID) number for each County facility (Appendix 1) to ensure clarity since some facilities are referred to by multiple names. These AIDs are included next to each facility name in the reduction actions listed in this plan.

County population growth projections were included as an input in ClearPath's models as an indicator for expected new sources of emissions associated with increases in the scope of County government operations between 2020 and 2050, such as new County buildings and fleet, and increased water and wastewater treatment operations to accommodate the County's growing population.[8]

County GHG emissions monitoring will be conducted in ClearPath every five years, during the first year ofeach new GHG emission reduction phase, to track progress in each phase towards County GHG emission reduction goals across all sectors. GHG inventory reports from each phase will be presented to the Board of County Commissioners (BCC) and will be available for comment from stakeholders County-wide.

# Stakeholders

Initial reduction strategies for Phases 1 and 2 were identified in collaboration with the consultant and Santa Fe County's Sustainability Office. Stakeholder input from all departments and building tenants is key to the success of Santa Fe County's GHG emission reduction plan, and will play an integral role in developing and refining this plan. County-wide stakeholders and staff will continue to work together to determine what the next phases of emission reductions should encompass based upon the results of report findings in each phase of the GHGERP's implementation.

# Action Framework

In summary, each phase is a five-year cycle with six steps (Figure 8):

1. Conduct an inventory of County operational GHG emissions;
2. Evaluate the outcomes of the GHG emissions inventory and review progress towards the reduction targets;
3. Create a detailed five-year work plan with County stakeholders to meet reduction targets and select projects for implementation;
4. Identify and obtain financial resources to implement the work plan and projects;
5. Implement the work plan and projects; and
6. Monitor and track effectiveness and progress of the work plan with annual progress reports.

This iterative process will inform and improve the operationalization of subsequent phases.

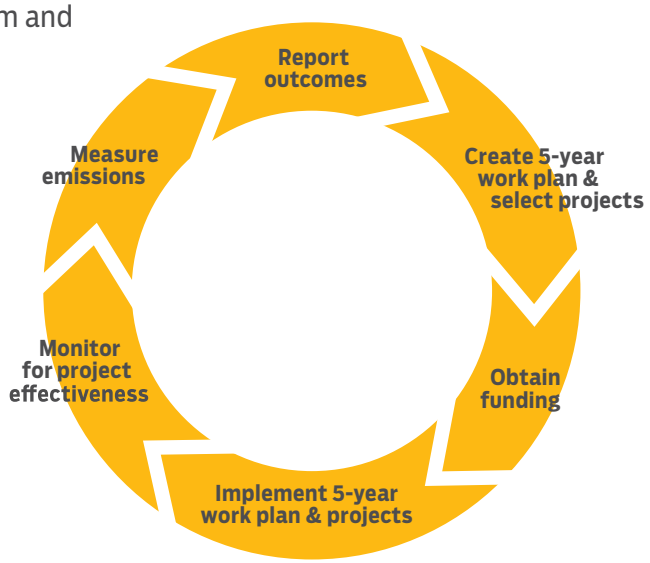



FIGURE 8

General framework for implementing the GHGERP for each five-year cycle of GHG emission reduction and reporting.

# Phase 1 Reduction Actions: 2021–2025

**Reduction Target:**

**25%**

**2,935 MT $CO_2e$**

## 1.1. FACILITIES

### 1.1.1. Accurately track and quantify facility energy use and emissions

- Contract a utility management service firm to assist the County in creating a means to accurately track and measure energy consumption as recorded in all County facility utility bills.
- Benchmark and report total natural gas, electric, propane and water use for buildings that use over 1,000 MMBtus per year.
- Conduct triple-bottom-line (TBL) analyses, an accounting methodology that assesses economic, social and environmental benefits, for planned upgrades to high use County buildings and facilities, and create prioritized plan for projects with the greatest TBL benefit.[9]

### 1.1.2. Increase energy efficiency of County facilities

- Implement facility improvement measures recommended by the 2020 investment grade audit conducted by Yearout Energy at the following facilities (see Figures 3 and 6 in "Background and Planning" section): [10]
  - Adult Detention Facility (AID 135)
  - Agua Fria Fire Station #1 (AID 55)
  - Bennie Chavez Community Center (AID 26)
  - Arroyo Seco Teen Center (AID 19)
  - Edgewood Fire Station #1 (AID 475)
  - Eldorado Community Center Complex (AID 137)
  - Hondo Fire Station #2 (AID 40)
  - La Cienega Community Center (AID 10)
  - La Cienega Fire Station #1 (AID 188)
  - Pojoaque Fire Station #1 (AID 32)
  - Public Safety Complex (AID 41)
  - State Health Center (AID 70)
  - Vista Grande Library (AID 9)
- Install lighting sensors that automatically turn off lights when the room is unoccupied within the two facilities with the highest energy use per square

Energy efficiency retrofits to County facilities are an essential step towards the 2050 net zero emissions goal.

foot: Eldorado Community Center Complex (AID 137) and Public Safety Complex (AID 41).

- Initiate a second investment grade audit project for 20 additional County facilities following the completion of the facility improvement measures currently being implemented.
- Create energy efficiency work plan for facilities with the highest energy use per square foot to prioritize energy efficiency retrofits, including ranking facility inefficiency using industry best practices.
- Implement and budget for integrated design standards with the capital projects and planning teams that include a healthy building checklist[11] and energy efficiency guidelines for all new buildings and major facility improvements, including a net zero energy standard for new facilities.
- Install energy management devices, as appropriate, at all County facilities to minimize the energy consumption of devices such as vending machines, copiers, and other appliances.
- Install smart, programmable thermostats in all County facilities, where feasible.

### 1.1.3. Reduce the use of propane and natural gas within all County facilities

- Create a plan to convert all facilities that use propane and/or natural gas to electric heat pumps and other electrical appliances, as applicable, prioritized by highest usage and feasibility, with cost estimates and proposed timelines for capital funding requests.[12]
- Design and budget all new County facilities to utilize electric heating and cooling systems and other electric appliances instead of propane or natural gas.

### 1.1.4. Increase renewable energy use

- Solarize five or more County buildings or facilities per year by either installing onsite solar generation or subscribing the facility to a community or utility-scale solar array.[13]
- Update analysis of implementing solar power systems at County facilities to prioritize facility installations and create detailed funding request.[14]
- Use electricity from the PNM Solar Direct program to offset 50% of the County's electricity from PNM that is generated by non-renewable energy

Phase 1 actions include using the PNM Solar Direct program to offset

**50%**

of the County's electricity that is generated by non-renewable energy sources.

sources (see Figures 3 and 5 in "Background and Planning" section).

- Install at least 200 kW DC of behind-the-meter photovoltaic (PV) systems at County facilities, including the Public Works Complex (AID 155) and Adult Detention Facility (AID 135) (see Figures 3 and 7 in "Background and Planning" section).
- Install photovoltaic (PV) systems at off-grid solid waste convenience centers that are not yet equipped with a PV system, and increase the capacity of existing off-grid PV systems at convenience centers to meet current electricity, heating, and cooling needs.

## 1.2. VEHICLE FLEET

Santa Fe County's Fleet Management Policies and Procedures, established in 2019, and its associated Vehicle Utilization Review Board (VURB), were created to ensure a safe, healthy and sustainable community by expanding vehicle efficiency, conserving resources, and upholding transparency in resource use. Fleet policies implemented through the VURB will lead to a transition to low-emission vehicles County-wide.

### 1.2.1. Increase efficiency of County fleet

- Increase average efficiency of County passenger vehicles and light-duty trucks by 2 or more miles/gallon each year through the purchase of fuel efficient and alternative fuel vehicles.[15]
- Identify and retire under-utilized and/or redundant vehicles from the County fleet.
- Hire an energy specialist consultant to conduct a comprehensive analysis of the County's light-duty fleet to maximize fleet efficiency, including delivery vans and other high use vehicles, the replacement to either EVs or high efficiency vehicles where EVs are currently not feasible, and the capacity and education needs of fleet staff to manage maintenance of any new vehicles.

### 1.2.2. Reduce County vehicle usage and vehicle miles traveled (VMT)

- Operationalize Fleet Management Policies and Procedures County-wide, excluding emergency services.[16]
- Incentivize County employee ride-sharing and alternative transportation.[17]
- Acquire bicycles and E-bikes for County staff to use for nearby travel at appropriate campus sites.

- Utilize centrally located fuel depot closer to the County's campus sites (e.g. downtown, Public Safety) to save on vehicle wear and fuel consumption from traveling to the fuel depot at the Public Works campus.
- Ensure all vehicles are equipped with GPS and track to identify opportunities to reduce VMT.

Reducing overall vehicle usage and transitioning to low-emission vehicles County-wide will have a significant impact on emissions.

### 1.2.3. Transition County light duty vehicles to electric vehicles (EVs)

- Ensure all new light-duty vehicles purchased are EVs. Where EV adoption is not feasible due to use or daily vehicle miles traveled (VMT) limitations, prioritize purchasing high efficiency, low-emission vehicles.
- Replace 4 or more internal combustion engine vehicles on the County fleet with EVs each year, as feasible and viable.[18]
- Expand County EV or low-emission vehicle motor pool to include at least 5 vehicles per campus, as appropriate, based on the motor pool vehicle need at each campus.
- Increase employee access to EVs by making EVs available for staff use in a shared motor pool and provide training opportunities for employees to familiarize themselves with EVs.

### 1.2.4. Expand County electric vehicle charging infrastructure

- Analyze usage and needsof current EV charging infrastructure network.
- Install 5 or more electric vehicle charging stations at County buildings each year, as appropriate for fleet and/or public use, and as feasible and viable based on the analysis of usage and needs.[19]

### 1.2.5. Reduce emissions of fleet in agencies within which the County has a financial stake

- Work with Santa Fe Solid Waste Management Agency (SWMA) to identify operational EV infrastructure requirements and identify high impact vehicles for EV replacement, or operation of heavy-duty fleet on low carbon liquid fuels such as renewable compressed natural gas or renewable diesel, as appropriate.
- Work with SWMA to develop light-duty vehicle replacement plan for vehicles nearing the end of their useful life with EVs, as appropriate.
- Work with North Central Regional Transit District (NCRTD) to support efforts in the electrification of buses or operation on low carbon liquid fuels such as renewable compressed natural gas or renewable diesel, as appropriate.
- Collaborate with the Buckman Direct Diversion (BDD) Board to study the potential of electric vehicle use at the BDD facilities, as appropriate.

Increasing water conservation at County facilities and among County water utility customers is another component of the emissions reduction plan.

## 1.3.WATER & WASTEWATER

### 1.3.1. Reduce emissions at the Quill Wastewater Treatment Facility

- Complete and monitor Quill Wastewater Treatment Facility improvements including conversion from open lagoon system to membrane filtration system, with removal of open lagoon (see Figures 3 and 4 in "Background and Planning" section).
- Offset 50% or more of electricity use at Quill Wastewater Treatment Facility with renewable power (either on-site or off-site), as viable.
- Analyze the suitability of composting or land application measures to utilize wastewater treatment byproducts.

### 1.3.2. Reduce the use of natural gas and electricity at BDD and City of Santa Fe facilities within which the County has a financial stake

- Work with partners at City of Santa Fe to identify and implement measures to reduce natural gas use at facilities under joint powers agreements, including but not limited to lift stations, as appropriate.
- Develop a work plan at BDD to implement measures to reduce natural gas use at water treatment facility, as appropriate. This may include options for the conversion of natural gas heating systems to electric heat pumps.
- Collaborate with City of Santa Fe to implement PV systems at BDD Raw Water Lift Station and BDD Booster Station 1A (AID 1005), as appropriate.

### 1.3.3. Increase water conservation at County facilities and among County water utility users

- Implement water conservation facility improvement measures recommended by the 2020 investment grade audit (conducted by Yearout Energy) at the following facilities:
  - Adult Detention Facility (AID 135)
  - Eldorado Community Center Complex (AID 137)
  - La Cienega Fire Station 1 (AID 188)
  - Public Safety Complex (AID 41)
  - State Health Center (AID 70)
  - Vista Grande Library (AID 9)
- Work with the County Utilities Division to create a plan for water conservation within County facilities and the County water utility service

Increasing the County-wide recycling rate from 17% to

**30%**

will help reduce emissions by reducing the County's overall waste tonnage.

area with strategies that include, but are not limited to, leak detection, providing rebates for water efficient toilets, appliances, and irrigation equipment to low-income utility customers, and incentivizing water capture.

- Create and disseminate educational materials about water conservation, water capture, and the water-energy nexus to County staff and County water utility customers.
- Increase City/County water conservation outreach efforts through collaborative planning, programming, and partnering with relevant stakeholders and committees.

## 1.4. SOLID WASTE

### 1.4.1. Reduce the use of propane within County-owned and SWMA solid waste facilities

- Convert heating systems at County convenience centers from propane to electric heat pumps, as appropriate and viable.
- Work with SWMA to convert propane heating to electric heat pumps within SWMA facilities, as appropriate and viable.

### 1.4.2. Reduce flare emissions from SWMA landfill

- Work with SWMA to examine viable alternative uses for landfill flare gas including the production of combined heat and power.

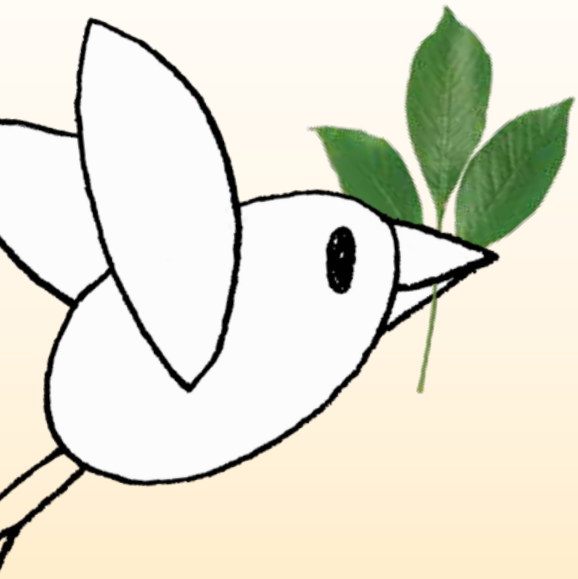
### 1.4.3. Reduce County and SWMA waste tonnage

- Work with SWMA to develop viable waste diversion measures aimed at separating construction wood waste and concrete from construction and demolition (C&D) materials.
- Work with SWMA to expand composting efforts, as appropriate and viable.
- Develop policies and implementation plan to expand waste diversion and recycling efforts within County facilities, including diverting food waste.
- Install composting collections at all County buildings that generate food waste for either on-site composting or collection by a third party, as appropriate and viable based on the implementation plan.
- Expand County's backyard composting program by 50 systems or more each year.
- Create and disseminate educational materials about waste reduction to County staff and County solid waste convenience center users.

- Work to encourage County residents to increase the County-wide recycling rate from 17% to 30%.
- Work with communities to develop a plan and implement re-use centers managed by community volunteers.
- Create incentivizing programs for businesses and production companies to recycle and reduce waste, including expanding local markets for recycling materials such as construction wood waste and concrete, as viable.

### 1.5. CARBON OFFSETS

- Research methods available to offset the County's carbon emissions, including carbon sequestration in soils and tree planting.
- Develop a plan to implement identified carbon offset strategies, as appropriate and viable.



# Phase 2 Reduction Actions: 2026–2030

## Reduction Target:

## 35%

## 1,174 MT $CO_2e$

The following is a tentative list of potential actions for the period between 2026 and 2030. These proposed actions and the plan itself will be reviewed and refined by staff and presented to the BCC prior to implementation of Phase 2. This will allow for adjustments based on the best available data and analyses at that time, along with lessons learned from the implementation of Phase 1. This deployment strategy will provide a more accurate roadmap for making the plan as practical and effective as possible for the specified time period. In doing so, all of the proposed actions will be dependent on available resources in real time (fiscal and human), ensuring that the actions are still appropriate and viable during Phase 2.

### 2.1. FACILITIES

**2.1.1. Increase energy efficiency of County facilities**

- Ensure all new County facilities are designed to meet Energy Star or higher level certification requirements and that new facilities are designed to perform 65% more efficiently than national averages for commercial buildings.
- Ensure all new County facilities are either fully equipped with or electric-ready for electric heating, cooling, cooking, and vehicle charging.
- Implement facility improvement measures at the 20 facilities identified in the 2025 investment grade audit.
- Conduct energy efficiency retrofits at the Public Works Complex (AID 155) and Judge Steve Herrera Judicial Complex (AID 172), and any other facilities prioritized in the energy efficiency work plan conducted in Phase 1.
- Install lighting sensors within the next seven facilities with the highest energy use per square foot:
  - Public Works Complex (AID 155)
  - Judge Steve Herrera Judicial Complex (AID 172)
  - Santa Fe Mountain Center (AID 424)
  - County Administration Building (AID 67)
  - Chimayo Senior and Community Center (AID 26)
  - Chimayo Substation and Sheriff Satellite Center (AID 25)
  - Community Services Building #A-#D (AID 71)

- Implement energy efficiency measures identified in Phase 1 for all new County facilities.
- Implement prioritized plan derived from triple-bottom-line cost benefit analysis in Phase 1.

Ongoing conversion of County facilities to energy efficient electric heating and cooling systems will contribute to emissions reduction in Phase 2.

### 2.1.2. Reduce the use of propane and natural gas within all County facilities

- Convert the next six facilities with the highest propane use to energy efficient electric heating and cooling systems, such as heat pumps:
  - Fairgrounds Small Animal Barn (AID 497)
  - Rio En Medio Senior and Community Center (AID 12)
  - Chimayo Senior and Community Center (AID 26)
  - Esperanza Administration (AID 409)
  - Road Department (AID 1014)
  - Chimayo Fire Station #2 (AID 18)
- Convert at least five additional facilities identified in the prioritized plan created in Phase 1 from propane to energy efficient electric heating and cooling systems, such as heat pumps.
- Convert the Adult Detention Center (AID 135) and Judge Steve Herrera Judicial Complex (AID 172) from natural gas to electric heating and cooling systems and other electrical appliances, as appropriate.
- Convert the next 15 facilities with the highest natural gas use to electric heating and cooling systems and other electrical appliances, as appropriate:
  - Public Works Complex (AID 155)
  - Juvenile Development Detention Facility (AID 122)
  - Stanley Fire Station #3 (AID 432)
  - Fairgrounds Extension Building (AID 73)
  - State Health Center (AID 70)
  - La Cienega Fire Station #1 (AID 188)
  - Fairgrounds Exhibition Hall #1 (AID 499)
  - Public Safety Complex (AID 41)
  - Edgewood Senior Center (AID 51)
  - Glorieta Fire Station #1 (AID 39)
  - Pojoaque Fire Station #2 (AID 31)
  - El Rancho Community Center (AID 15)
  - Pojoaque Fire Station #1 (AID 32)

- Youth Shelter and Family Services (AID 127)
- County Administration Building (AID 67)

- Continue designing all new County facilities to utilize electric heating and cooling systems instead of propane or natural gas.

Providing County staff with alternative transportation, such as bicycles and E-bikes, can help limit emissions by reducing vehicle usage for nearby travel.

### 2.1.3. Increase renewable energy use

- Solarize four County buildings or facilities per year or subscribe the facilities to community solar or utility-scale solar arrays.[20]
- Install behind-the-meter PV systems at 10 additional facilities identified in the solar analysis conducted in Phase 1.
- Continue to use electricity from the PNM Solar Direct program to offset the remainder of the County's electricity from PNM that is generated by non-renewable energy sources, and explore opportunities for community and/or utility-scale solar arrays in Santa Fe County, including on tribal and State lands, to offset the County's electricity that is generated by non-renewable energy sources outside of PNM's service area.
- Revisit solar analysis conducted in Phase 1 and reassess prioritization of facilities to be solarized, taking into account the County's renewable energy goals and the changing energy landscape of electric utilities. If solar installations are still needed to achieve the County's net zero GHG emissions target, update the solar analysis to determine new priorities, sizes, and estimated costs of solar installations at County facilities.

## 2.2. VEHICLE FLEET

### 2.2.1. Increase efficiency of County fleet

- Continue to increase average efficiency of County passenger vehicles and light-duty trucks by 2 or more miles/gallon each year.[21]
- Identify County vehicles that are under-utilized and continue removing redundancies from the County fleet.
- Continue to implement the recommendations of the analysis by energy specialist consultant conducted in Phase 1.

### 2.2.2. Reduce County vehicle usage and vehicle miles traveled (VMT)

- Assess success of County employee ride-sharing and alternative transportation incentive program created in Phase 1 and make any changes to program, if needed.

By the end of Phase 2, at least

**20%**

of the County's light-duty fleet will be electric.

- Acquire additional bicycles and E-bikes for County staff to use for travel and transit from the workplace, as appropriate for nearby travel.

**2.2.3. Transition County light duty vehicles electric vehicles (EVs)**

- Continue to ensure all new light-duty vehicles purchased are EVs. Where EV adoption is not feasible due to use or daily vehicle miles traveled (VMT) limitations, prioritize purchasing high efficiency, low-emission vehicles.
- Continue and accelerate the replacement of internal combustion engine vehicles on the County fleet with electric vehicles each year.[22]
- Ensure that over 20% or more of the County's light-duty fleet is electric.
- Continue expanding County motor pool(s) with EVs.
- Continue to make EVs available for staff use and provide training opportunities for employees to familiarize themselves with EVs.

**2.2.4. Transition County medium and heavy-duty vehicles to alternative fuels and EVs where applicable**

- Identify medium and heavy-duty vehicles which can be readily replaced by EVs or other available technologies.
- Identify sources of low carbon intensity (CI) alternative fuels and develop procedures to source low CI fuels for current and future County alternative fuel vehicles.
- If needed, determine alternative fuel infrastructure and sourcing requirements and develop procedures to ensure fuels are available in sufficient quantities during all phases.
- If feasible, continue to replace delivery vehicles with EV vans based on analysis conducted in Phase 1.

**2.2.5. Expand County electric vehicle charging infrastructure**

- Continue to install 5 or more electric vehicle charging stations at County buildings each year.[23]
- Implement EV infrastructure improvements based upon needs identified in Phase 1.
- Reevaluate usage and needs of EV charging infrastructure network and quantify the charging infrastructure investment needed to support County EV adoption goals.

During Phase 2, the County will implement water conservation improvement measures at

**20**

additional facilities.

**2.2.6. Reduce emissions of fleet in agencies within which the County has a financial stake**

- Continue to propose and work with SWMA to replace all light-duty vehicles nearing their useful life with EVs.
- Continue to work with SWMA and NCRTD and replace medium and heavy-duty vehicles nearing their useful life with alternative fuel vehicles or EVs where applicable, using the results from the analysis conducted in Phase 1.
- Work with SWMA and NCRTD to identify medium and heavy-duty vehicles which can be readily converted to low carbon alternative fuels using available technologies.
- Implement the results of the study conducted in Phase 1 with City of Santa Fe to electrify the vehicles used at the BDD.

## 2.3. WATER & WASTEWATER

**2.3.1. Reduce emissions at the Quill Wastewater Treatment Facility**

- Analyze additional measures needed to reduce process emissions at Quill Wastewater Treatment Facility.
- If suitable, implement composting or land application measures to utilize wastewater treatment byproducts based on analysis conducted in Phase 1.

**2.3.2. Reduce the use of natural gas and electricity at BDD and City of Santa Fe facilities within which the County has a financial stake**

- Support City of Santa Fe with implementation of measures identified in Phase 1 to reduce natural gas use at City-owned lift stations.
- Propose and work with BDD to convert natural gas heaters to electric heat pumps or other appropriate electric systems.

**2.3.3. Increase water conservation at County facilities and among County water utility users**

- Implement water conservation facility improvement measures at the 20 facilities identified in the 2025 investment grade audit.
- Continue to disseminate educational materials about water conservation, water capture, and the water-energy nexus to County staff and County water utility customers.
- Increase outreach efforts through a joint water conservation coalition with City of Santa Fe.

Phase 2 will continue efforts to reduce waste tonnage by improving composting and recycling programs and implementing new waste diversion measures.

## 2.4. SOLID WASTE

### 2.4.1. Reduce the use of propane within County-owned and SWMA solid waste facilities

- Work with SWMA to convert all remaining facilities from propane heating to electric heating and cooling systems.

### 2.4.2. Reduce flare emissions from SWMA landfill

- If applicable, support efforts at SWMA to implement alternative uses for landfill flare gas.

### 2.4.3. Reduce County and SWMA waste tonnage

- Work with SWMA to implement waste diversion measures aimed at separating construction wood waste from C&D materials.
- If feasible, support efforts at SWMA to supply wood waste materials to wood products manufacturers.
- If feasible, support efforts at SWMA to expand composting efforts to include food waste.
- Continue to install composting collections at County buildings that generate food waste for either on-site composting or collection by a third party, focusing on the Adult Detention Facility (AID 135) and senior centers if these facilities were not included in Phase 1.
- Continue expanding the County's backyard composting program and support the City of Santa Fe to adopt a similar program.
- Reduce landfill tonnage coming out of convenience centers by 10%.
- Continue to work with residents to increase County-wide recycling rate to 50%.

## 2.5. CARBON OFFSETS

- Implement carbon offsetting pilot project using one or more of the methods identified in Phase 1.

# Phases 3–6 Reduction Actions: 2031–2050

**Reduction Target:**

**100%**

**by 2050**

The work plans, actions and experience learned by implementing Phases 1 and 2 will inform the actions developed for Phases 3 to 6 with the explicit goal of bringing the County to net zero emissions by 2050. It is key to allow for flexibility in this emission reduction plan. To ensure the County remains on track to meet the net zero goal by 2050, reduction targets may need to be updated as GHG emissions are measured at the end of each phase. In addition, targets will need to be updated if the global scientific consensus on the timeline and magnitude of necessary emission reductions changes.

Emerging reduction strategies that have yet to be identified, perhaps due to new technologies and changes in state and national policy, will also play an important role in shaping future reduction actions. For example, the New Mexico Energy Transition Act mandates the state's electricity be powered by renewable energy sources by 2045. These policies should be taken into account and prepared for accordingly. One such opportunity could be found by focusing efforts away from producing renewable energy (e.g. installing solar panels) as the electric utility grid approaches the 2045 goal, and work instead towards the electrification of County facilities to reduce emissions associated with energy produced by propane and natural gas. It is key for all County stakeholders to collaboratively identify appropriate GHG emission reduction strategies as the energy, technology, and policy landscapes change.

# The following steps are needed to implement the GHGERP:

Finalize the practical and feasible reduction strategies for Phases 1 and 2 along with estimates of the actual cost and timeframes of each action.

Identify and secure financial mechanisms to implement these strategies.

Request BCC authorization for County or other funds to implement these steps and each project as funding sources are available and actions are implementable.

Upon implementation of the GHGERP, a yearly progress report will be presented to the BCC.

Each end cycle of the reduction phases will require a thorough review and report of successes, challenges, limitations, and alternative pathways to meet the 2050 net zero goal. This review, along with GHG emission inventories conducted every five years at the end of each phase, will inform the work plan for the next phase, and provide the benchmarks needed to fine-tune and accelerate meeting the County's operational net zero goal.

It is of utmost importance throughout the GHG emissions reduction process that the County prioritizes community safety, continuity, and proper functioning of government operations and services in the face of an ever changing, and increasingly unpredictable climate-altered world. Once the GHGERP is in operation, the next step will be to develop a climate action plan: a comprehensive, community-wide plan to further reduce emissions and increase resilience in the face of climate change throughout Santa Fe County.

# APPENDIX 1

List of Santa Fe County owned, leased, and joint powers authority facilities and their assigned identification number (AID).

| AID | FACILITY NAME | OPERATIONAL SECTOR |
|---|---|---|
| 1 | Stanley Fire Station #2 | Building/Facility |
| 4 | Stanley Fire Station #1 | Building/Facility |
| 5 | Galisteo Fire Station #1 | Building/Facility |
| 9 | Vista Grande Public Library | Building/Facility |
| 10 | La Cienega Fire Station #2 & La Cienega Community Center | Building/Facility |
| 11 | Romero Park | Building/Facility |
| 12 | Rio en Medio/Chupadero Community Center | Building/Facility |
| 13 | Chimayo Head Start | Building/Facility |
| 14 | Abedon Lopez Senior Center (Santa Cruz) | Building/Facility |
| 15 | El Rancho Senior & Community Center | Building/Facility |
| 18 | Chimayo Fire Station #2 & Cundiyo Community Center | Building/Facility |
| 19 | Arroyo Seco Teen Center | Building/Facility |
| 24 | Caja Del Rio Landfill | Building/Facility |
| 25 | Chimayo Substation & Sheriff Satellite Center | Building/Facility |
| 26 | Bennie J. Chavez Senior & Community Center (Chimayo) | Building/Facility |
| 28 | La Puebla Fire Station #1 | Building/Facility |
| 29 | Chimayo Fire Station #1 | Building/Facility |
| 30 | La Puebla Fire Station #2 | Building/Facility |
| 31 | Pojoaque Fire Station #2 & Substation | Building/Facility |
| 32 | Pojoaque Fire Station #1 | Building/Facility |
| 33 | Tesuque Fire Station #2 | Building/Facility |
| 34 | Tesuque Fire Station #3 | Building/Facility |
| 35 | Tesuque Fire Station #1 | Building/Facility |
| 36 | Agua Fria Fire Station #2 (La Tierra) | Building/Facility |
| 37 | Hondo Fire Station #1 | Building/Facility |
| 38 | Fire Prevention | Building/Facility |
| 39 | Glorieta Fire Station #1 | Building/Facility |
| 40 | Hondo Fire Station #2 | Building/Facility |
| 41 | Public Safety Complex | Building/Facility |
| 42 | Eldorado Fire Station #2 | Building/Facility |
| 43 | Eldorado Fire Station #3 | Building/Facility |
| 44 | Turquoise Trail Fire Station #1 | Building/Facility |
| 45 | Turquoise Trail Fire Station #2 | Building/Facility |
| 46 | Turquoise Trail Fire Station #3 | Building/Facility |
| 47 | Madrid Fire Station #1 | Building/Facility |
| 48 | Edgewood Fire Station #3 | Building/Facility |
| 49 | Edgewood Fire Station #2 | Building/Facility |
| 50 | Edgewood Fire Station #4 (Thunder Mountain) | Building/Facility |
| 51 | Edgewood Senior Center | Building/Facility |
| 53 | Edgewood Community Center | Building/Facility |
| 54 | Eldorado Fire Station #1 | Building/Facility |
| 55 | Agua Fria Fire Station #1 | Building/Facility |
| 58 | Old Agua Fria Landfill | Solid Waste |
| 60 | Nambe Convenience Center | Solid Waste |
| 61 | Jacona Convenience Center | Solid Waste |
| 62 | La Cienega Convenience Center | Solid Waste |
| 63 | Eldorado Convenience Center | Solid Waste |
| 64 | San Marcos Convenience Center | Solid Waste |
| 66 | Old Jacona Landfill | Solid Waste |
| 67 | County Administration Building | Building/Facility |
| 68 | District Attorney Office Complex | Building/Facility |
| 70 | State Health Office | Building/Facility |
| 71 | Community Services Building #A-#D | Building/Facility |
| 72 | County Administrative Office | Building/Facility |
| 73 | Fairgrounds Extension Building | Building/Facility |
| 97 | Fairgrounds Arena | Building/Facility |
| 122 | Old Youth Detention Facility | Building/Facility |
| 123 | Old Public Works Building & Yard | Building/Facility |
| 127 | Youth Shelter & Family Services | Building/Facility |
| 135 | Adult Detention Center | Building/Facility |
| 137 | Ken and Patty Adam Senior Center & Max Coll Corridor Community Center | Building/Facility |
| 139 | Nancy Rodriguez Community Center | Building/Facility |
| 153 | Southwest Care | Building/Facility |
| 154 | Old Human Resources Office | Building/Facility |
| 155 | Public Works Complex & Pumphouse | Building/Facility |

| AID | FACILITY NAME | OPERATIONAL SECTOR |
|---|---|---|
| 163 | La Familia Medical Center | Building/Facility |
| 168 | Caja Del Rio Landfill Shop | Solid Waste |
| 169 | Caja Del Rio Landfill Maintenance | Solid Waste |
| 170 | Caja Del Rio Landfill Admin | Solid Waste |
| 171 | Caja Del Rio Landfill Transfer Ops | Solid Waste |
| 172 | Judge Steve Herrera Judicial Complex | Building/Facility |
| 173 | Pojoaque Recreation Complex | Building/Facility |
| 188 | La Cienega Fire Station #1 | Building/Facility |
| 192 | Nambe Senior & Community Center | Building/Facility |
| 193 | Santa Fe Recovery Center | Building/Facility |
| 211 | Santa Cruz Storage | Building/Facility |
| 218 | Santa Cruz Boys & Girls Club | Building/Facility |
| 241 | Valle Vista Housing Complex | Building/Facility |
| 256 | Valle Vista Boys & Girls | Building/Facility |
| 318 | Jacobo Housing Authority Office | Building/Facility |
| 344 | Jacobo Housing Maintenance Office | Building/Facility |
| 345 | Jacobo Boys And Girls Club | Building/Facility |
| 407 | Pojoaque Satellite Office | Building/Facility |
| 409 | Esperanza Shelter Administration | Building/Facility |
| 411 | Stanley Convenience Center | Solid Waste |
| 413 | Life Link Clubhouse | Building/Facility |
| 418 | Bokum Building | Building/Facility |
| 422 | Clerk's Storage Unit | Building/Facility |
| 423 | Stanley Cyclone Center | Building/Facility |
| 424 | Santa Fe Mountain Center | Building/Facility |
| 432 | Stanley Fire Station #3 & Training Center | Building/Facility |
| 439 | Abajo Lift Station | Water/Wastewater Treatment |
| 441 | Valle Vista Lift Station | Water/Wastewater Treatment |
| 443 | Romero Park Caretaker Building | Building/Facility |
| 447 | Quill Wastewater Treatment Plant | Water/Wastewater Treatment |
| 458 | District Attorney Office Parking | Building/Facility |
| 459 | Judge Steve Herrera Judicial Complex Parking | Building/Facility |
| 474 | Glorieta Fire Station #2 | Building/Facility |
| 475 | Edgewood Fire Station #1 | Building/Facility |
| 497 | Fairgrounds Small Animal Barn | Building/Facility |
| 499 | Fairgrounds Exhibition Hall #1 | Building/Facility |
| 529 | Vista Aurora Lift Station | Water/Wastewater Treatment |
| 1001 | Jacobo Housing Complex | Building/Facility |
| 1002 | Fairgrounds Exhibition Hall #2 | Building/Facility |
| 1003 | Buckman Direct Diversion Wastewater Reclamation Facility | Water/Wastewater Treatment |
| 1005 | Buckman Direct Diversion Booster Station 1A | Water/Wastewater Treatment |
| 1006 | Buckman Direct Diversion Booster Station 2A | Water/Wastewater Treatment |
| 1009 | Wellness Center | Building/Facility |
| 1010 | Santa Cruz Housing Complex | Building/Facility |
| 1011 | Arena Sprinkler Well | Building/Facility |
| 1012 | Public Works Maintenance Yard | Building/Facility |
| 1014 | Road Department | Building/Facility |
| 1015 | Caja Del Rio Water System Pump & Tank | Solid Waste |
| 1016 | Rancho Viejo Lift Station | Water/Wastewater Treatment |

# ENDNOTES


1 U.S. Environmental Protection Agency, "Overview of Greenhouse Gases," Overviews and Factsheets, December 23, 2015, https://www.epa.gov/ghgemissions/overview-greenhouse-gases.

2 Rebecca Lindsey and LuAnn Dahlman, "Climate Change: Global Temperature," NOAA Climate.gov, March 15, 2021, https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature.

3 U.S. Global Change Research Program, "Fourth National Climate Assessment" (U.S. Global Change Research Program, Washington, DC, 2018), https://nca2018.globalchange.gov https://nca2018.globalchange.gov/chapter/1.

4 Valérie Masson-Delmotte et al., eds., "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 (Cambridge University Press, 2021), https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf.

5 Adelante Consulting, Inc. and Santa Fe County Office of Sustainability, "Santa Fe County Greenhouse Gas Emissions Inventory, Baseline 2005 and Years 2017 & 2018," 2021, https://www.santafecountynm.gov/media/files/Sustain/Santa-Fe-County-GHG-Inventory-Operations-2005-2017-2018.pdf.

6 Adelante Consulting, Inc. and Santa Fe County Office of Sustainability, "Santa Fe County Greenhouse Gas Emissions Inventory, Baseline 2005 and Years 2017 & 2018," 2021, https://www.santafecountynm.gov/media/files/Sustain/Santa-Fe-County-GHG-Inventory-Operations-2005-2017-2018.pdf.

7 Although the United States' nationally determined contributions to the Paris Agreement designated 2005 as the baseline reduction year, County data for this GHG inventory year is unreliable. The County's 2018 GHG inventory is the most robust.

8 Population growth projections from: Alfred M Pitts, "Regional Population and Housing Projections, Santa Fe County, 2000-2050," June 15, 2009, https://www.santafecountynm.gov/userfiles/Project_Projections(1)(2).pdf; U.S. Census Bureau, Population Division, "Table CO-EST2001-12-35 - Time Series of New Mexico Intercensal Population Estimates by County: April 1, 1990 to April 1, 2000," April 17, 2002, https://www2.census.gov/programs-surveys/popest/tables/1990-2000/intercensal/st-co/co-est2001-12-35.pdf; and U.S. Census Bureau, Population Division, "Table 1. Intercensal Estimates of the Resident Population for Counties of New Mexico: April 1, 2000 to July 1, 2010 (CO-EST00INT-01-35)," September 2011, https://www.census.gov/data/tables/time-series/demo/popest/intercensal-2000-2010-counties.html. Note: A new Population and Housing Study was released in 2021. In Phase 2, updated population projections from this study (or any subsequent update), as well as the rate of new building acquisitions, will be used to reevaluate the growth in the scope of County operations, and reduction targets will be amended as needed.

9 Santa Fe County Strategic Plan 2018, Strategy 2.2.2.

10 Santa Fe County Strategic Plan 2018, Strategy 2.2.2.

11 https://www.santafecountynm.gov/media/files/Sustain/SFCo-Sustainable-and-Healthy-Buildings-Master-Checklist-09-2021.pdf (Note: this is a working document subject to periodic updates).

12 Conversion of all facilities would reduce GHG emissions by 240 metric tons of carbon dioxide equivalent (MT CO2e) (Adelante Consulting, Inc., 2021). The two facilities with the highest propane use are Hondo Fire Station #1 (AID 37) and Galisteo Fire Station #1 (AID 5), and the two facilities with the highest natural gas use are the Adult Detention Facility (AID 135) and Judge Steve Herrera Judicial Complex (AID 172).

13 Santa Fe County Strategic Plan 2018, Performance Measure 2.2.2.4.

14 Santa Fe County Strategic Plan 2018, Strategy 2.2.2.

15 Santa Fe County Strategic Plan 2018, Performance Measure 2.2.2.1.

16 Santa Fe County Resolution 2019-142.

17 Santa Fe County Strategic Plan 2018, Strategy 2.2.2.

18 Santa Fe County Strategic Plan 2018, Performance Measure 2.2.2.2.

19 Santa Fe County Strategic Plan 2018, Performance Measure 2.2.2.3.

20 Santa Fe County Strategic Plan 2018, Performance Measure 2.2.2.4.

21 Santa Fe County Strategic Plan 2018, Performance Measure 2.2.2.1.

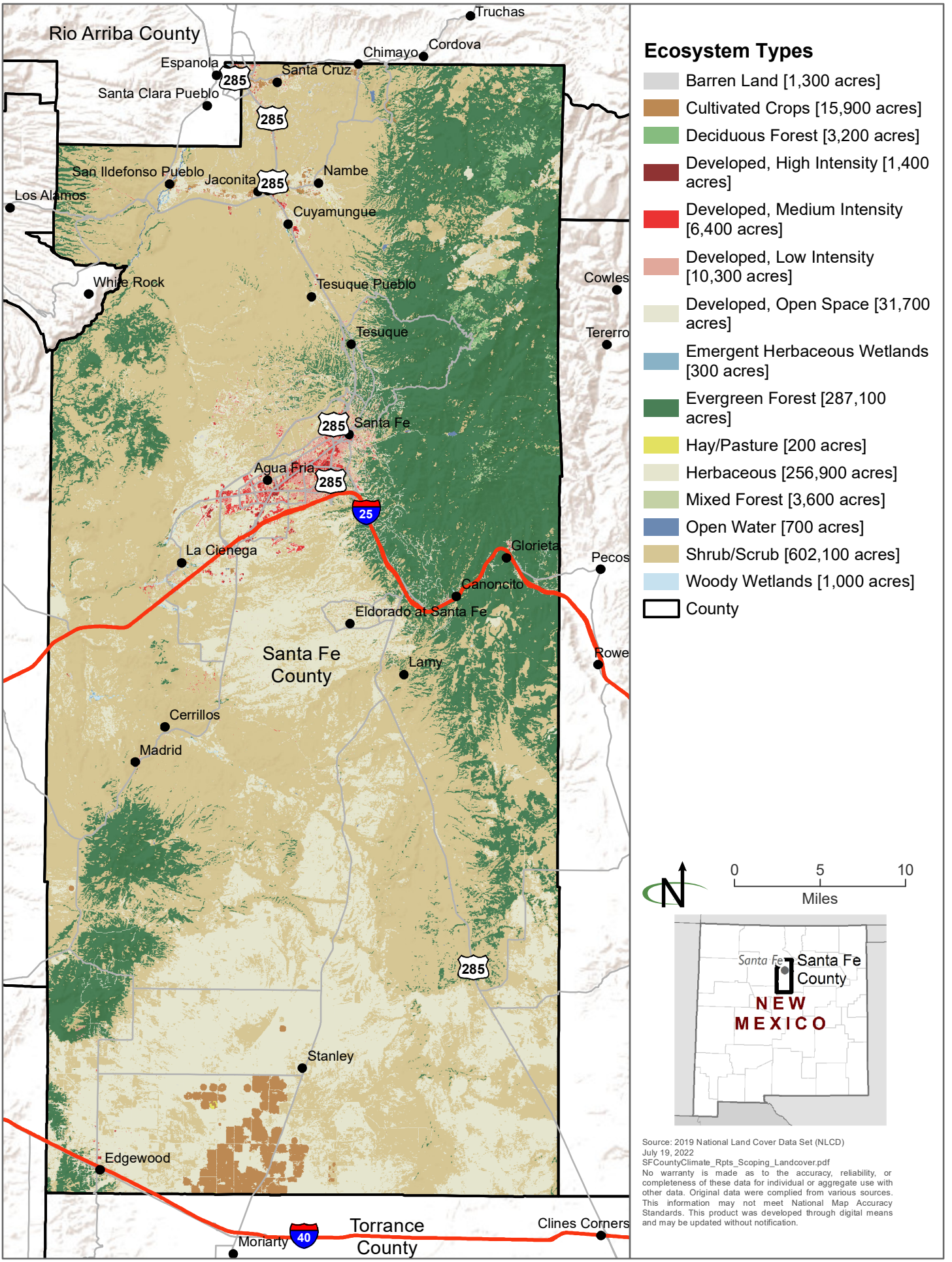
22 Santa Fe County Strategic Plan 2018, Performance Measure 2.2.2.2.

23 Santa Fe County Strategic Plan 2018, Performance Measure 2.2.2.3.


Content and data prepared by Adelante Consulting, Inc.
Report designed by Firestik Studio

SANTA FE COUNTY

# Appendix E: Ecosystem Types




Source: 2019 National Land Cover Data Set (NLCD)
July 19, 2022
SFCountyClimate_Rpts_Scoping_Landcover.pdf

No warranty is made as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were complied from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

# Appendix F: Scoping Report Overview

# Santa Fe County
# New Mexico

Scoping Report Overview

July 26, 2022

# Introduction

**Overview of County Plans:** How do County plans, programs, and resolutions incorporate Nature-based climate solutions and promote sustainability and equity across County departments?

**Ecosystem Types and Services:** What **Ecosystem Types** are found in the County and what **Ecosystem Services** do they provide?

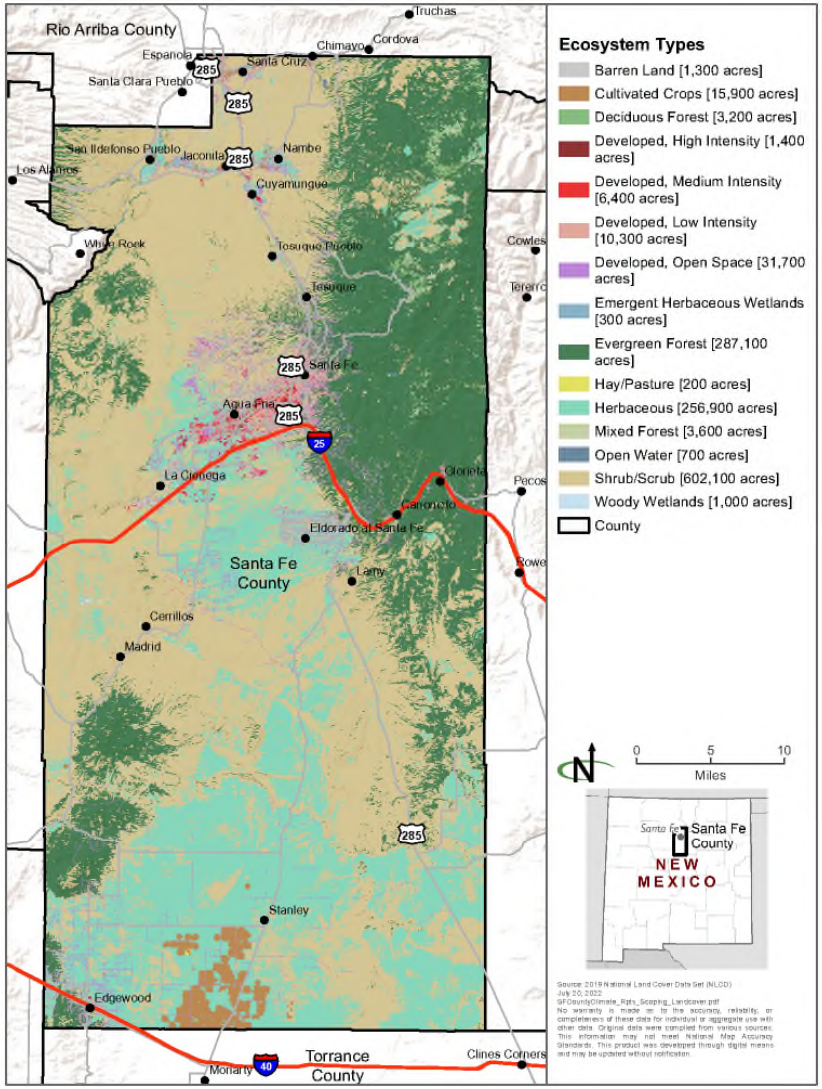
**Climate Changes and Implications:** How is climate changing and what are the implications for the natural and human environment?

**Equity:** What populations in the County have climate and social vulnerabilities?

# Santa Fe County
# New Mexico

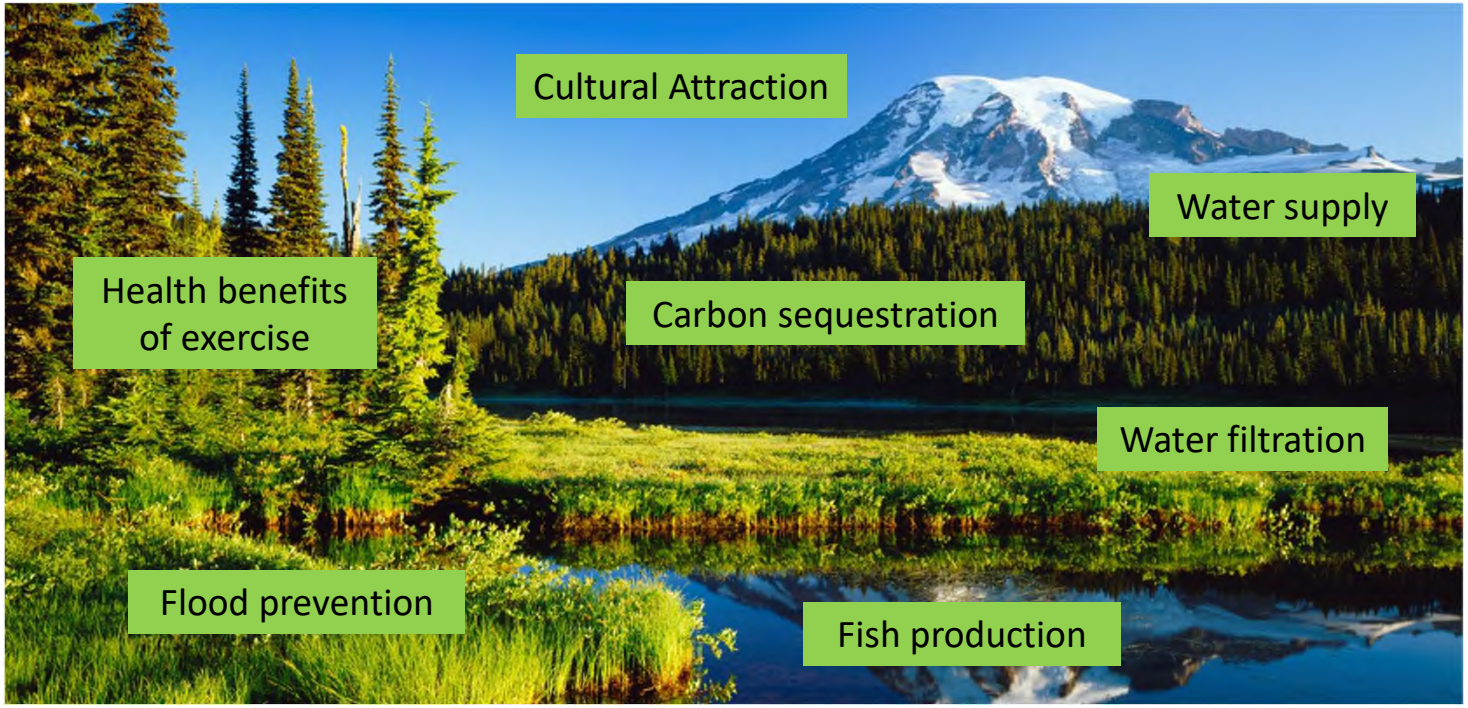
## Ecosystem Types and Services Overview

# Ecosystem Types in Santa Fe County



# What Are Ecosystem Services?

Ecosystem services are commonly defined as the benefits people obtain from ecosystems. This include aspects of nature that contribute directly or indirectly to human health, wealth, and wellbeing.



# What Are Ecosystem Services?

The Millennium Ecosystem Assessment classification includes four categories of Ecosystem Services:

**Provisioning Services:** energy, fuel, forage, fiber and minerals, etc.

**Regulating Services:** long-term storage of carbon; climate regulation; water filtration, purification and storage; soil stabilization; flood control; and disease regulation, etc.

**Supporting Services:** pollination, seed dispersal, soil formation, and nutrient cycling, etc.

**Cultural Services:** educational, aesthetic, spiritual, and cultural heritage values, recreational experiences and tourism opportunities, etc.

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# Why Ecosystem Services?

- Serve as a common language to characterize how resources generate benefits and impact people's wellbeing
- Increase our ability to recognize and communicate potential tradeoffs and values when comparing alternative approaches for management
- Clarify how outside stakeholders and landowners contribute to benefits within the broader landscape
- Aid in the identification of equity concerns related to unequal benefits

# Ecosystem Services in Santa Fe County

| Ecosystem Service | Relevant Ecosystem Type(s) |
|---|---|
| Water supplies for domestic use | All in watershed |
| Water supplies for agricultural use | All in watershed |
| Microclimate stabilization (i.e., urban cooling) | Developed medium and low intensity and open space |
| Noise control | Vegetated areas in developed medium and low intensity and open space |
| Flood prevention and mitigation | All in watershed for flood prevention, all in natural floodplains for flood mitigation, particularly in riparian areas |
| Water filtration/ purification | All in watershed |
| Pollinator support | All vegetated, particularly herbaceous, developed medium intensity, developed low intensity, developed open space |
| Visual aesthetics and passive use | All undeveloped, cultivated crops, hay/pasture |
| Food Supply | Cultivated crops, hay/pasture |
| Climate regulation | Shrub/scrub, evergreen forest, mixed forest |

| Ecosystem Service | Relevant Ecosystem Type(s) |
|---|---|
| Soil health | All |
| Forest/woodland products with commercial or personal use value | Shrub/scrub, evergreen forest, mixed forest |
| Air quality | Shrub/scrub, evergreen forest, mixed forest, developed medium intensity, developed low intensity, developed open space |
| Recreation opportunities | Shrub/scrub, evergreen forest, mixed forest, developed open space |
| Fisheries | Open water |
| Plant and animal species with subsistence values and/or traditional cultural importance | Herbaceous, shrub/scrub, evergreen forest, mixed forest |
| Plant and animal species with non-use value | Herbaceous, shrub/scrub, evergreen forest, mixed forest |
| Erosion and sedimentation control | All in watershed |
| Flow regulation | All in watershed |
| Waste Treatment | Emergent wetlands, woody wetlands |

EMPSi

# Ecosystem Services in Santa Fe County

| Ecosystem Service | Example Value(s) |
|---|---|
| Water supplies for domestic use | $112-$271/ household/ year |
| Water supplies for agricultural use | $349/acre/year |
| Microclimate stabilization (urban cooling) | $12-$15/tree/year |
| Noise control | $358/acre/year |
| Flood prevention and mitigation | $2-$20/ acre/year |
| Water filtration/ purification | $6-$1,509/ acre-foot water/year |
| Pollinator support | Varies by crop or habitat supported |
| Visual aesthetics and passive use | $22-$494/ household/ year |
| Food Supply | Varies based on product and market conditions |
| Climate regulation | $56/acre/year |

| Ecosystem Service | Example Value(s) |
|---|---|
| Soil health | $15-$1,255/ acre/year |
| Forest/woodland products with commercial or personal use value | $212/acre/ year |
| Air purification | $20-$22/ tree/year |
| Recreation opportunities | $41/person/ day |
| Fisheries | $138/person/ day |
| Plant and animal species with subsistence values and/or traditional cultural importance | Varies by species of interest |
| Plant and animal species with non-use value | Varies by species of interest |
| Erosion and sedimentation control | $21-$62/ acre/year |
| Flow regulation | $133-$152/ household/ year |
| Waste treatment | $48-$129/acre /year |

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# Equity and Ecosystem Services

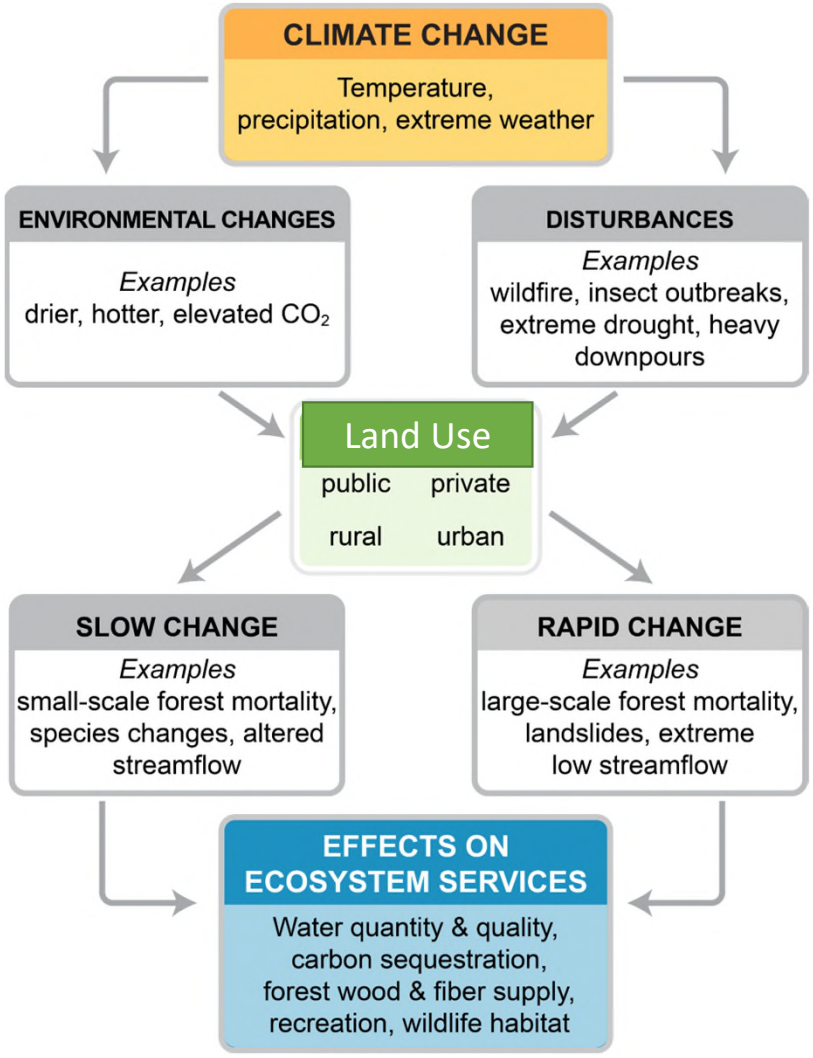
Who benefits from current ecosystem services provided by County lands?

Are there certain services that are disproportionately distributed to different geographic populations?

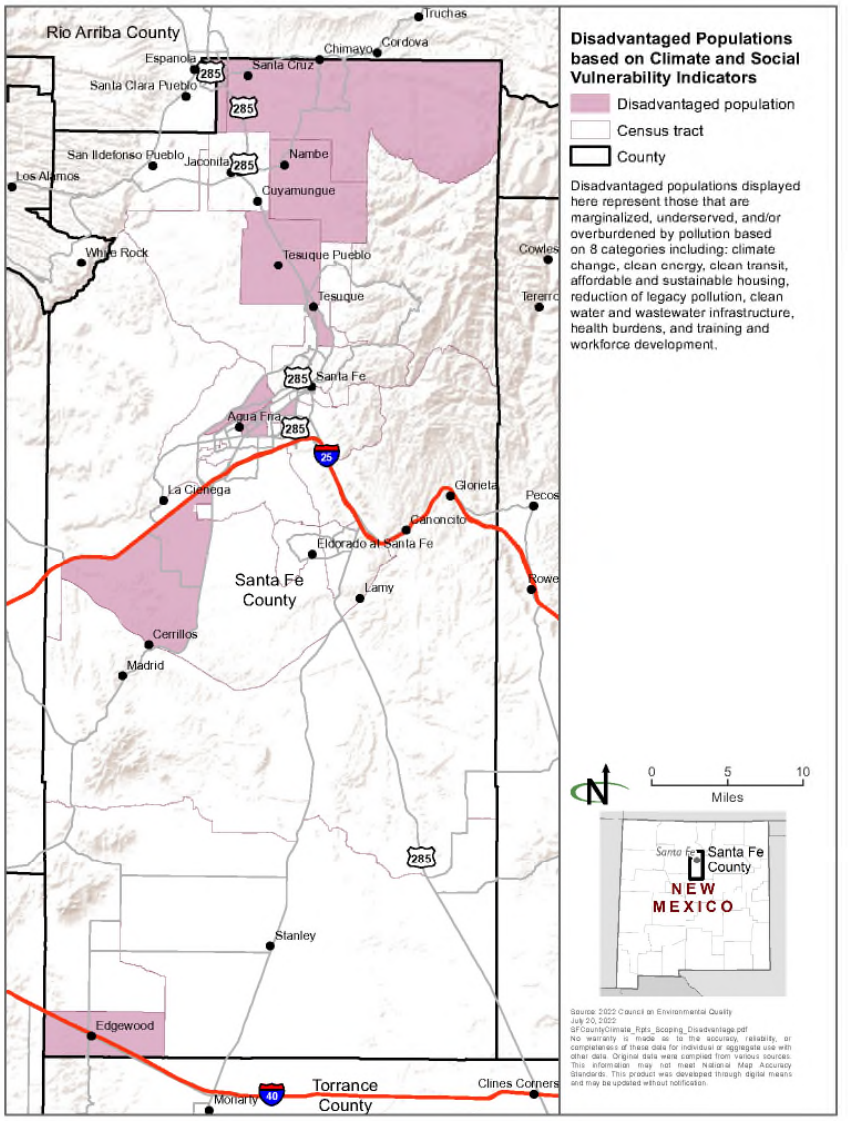
Are there certain communities of interest that have unique ties to certain ecosystem services?

*See **Table 5** of the scoping report for a discussion of equity considerations by ecosystem service type

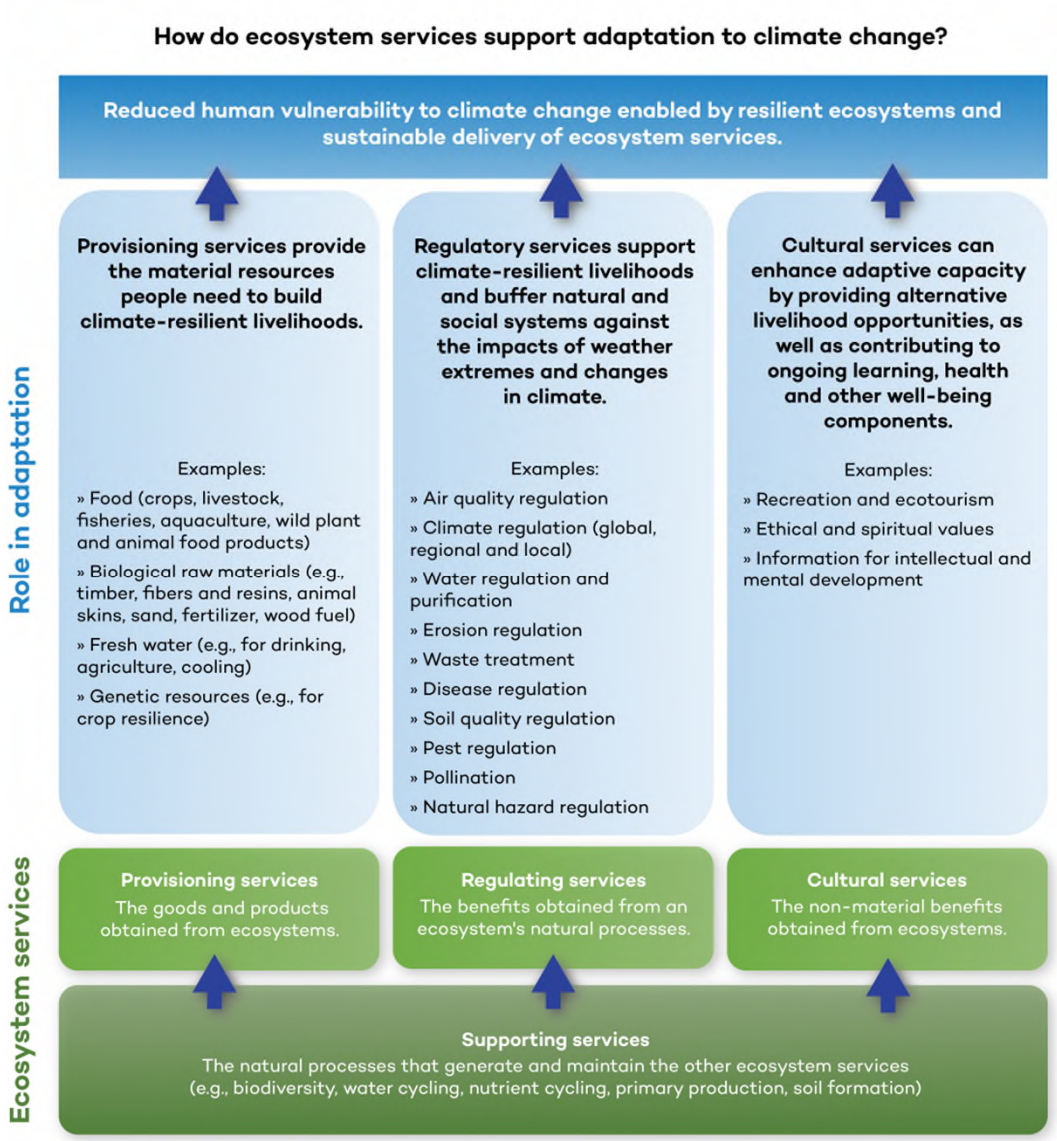
# Ecosystem Services and Climate Change



# Equity and Ecosystem Services



# Ecosystem Services and Climate Change



# Santa Fe County
# New Mexico

Overview of County Plans

# Plans, Programs, and Resolutions Evaluated

| Plan, Program, or Resolution |
|---|
| Adopt-a-Road Program |
| Affordable Housing Plan |
| Agriculture and Ranching Implementation Plan |
| AgriGate |
| Backyard composting program |
| Capital Improvements Planning |
| Community Climate Action Plan* |
| Community Plans |
| Community-wide Greenhouse Gas Inventory |
| Domestic wells pilot project* |
| Economic Development Plan* |
| Greenhouse Gas Emissions Reduction Plan for County Operations |
| Housing Authority planning |
| Leading by Example Resolution 2013-7 |
| Master Naturalist Program |
| Open Space Management Plans |
| Open Space, Trails, and Parks Strategic Management Plan |

| Plan, Program, or Resolution |
|---|
| Race to Zero Pledge |
| Santa Fe Basin Study |
| Santa Fe County Greenhouse Gas Emissions Inventory |
| Santa Fe County Resolution 2022-004 |
| Santa Fe County Resolution No. 2022-036 |
| Santa Fe County Resolution No. 2022-049 |
| Santa Fe County Strategic Plan* |
| Stormwater Management Plan* |
| Supporting Paris Agreement Resolution 2017-68 |
| Supporting the 30x30 Resolution 2020-93 |
| Sustainable Growth Management Plan |
| Sustainable Land Development Code |
| Thorton Ranch Master Plan |
| Water Resources Plan |
| Wildfire Protection Plan |

*Plan is currently under revision or in development

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# Plan Review Findings

- Cross-departmental plans all contain elements of **climate mitigation, ecosystem adaptation and resilience,** and **equity**
  - **Climate Mitigation:** Efforts to curb emissions (for example, efforts to inventory and curb emissions from County municipal sources, improve opportunities for equitable public transportation options, and divert green waste)
  - **Ecosystem Adaptation and Resilience:** Efforts to reduce fire risk, reduce drought risk, identify methods for heat management, and improve air and water quality
  - **Equity:** Efforts to address equitable distribution of ecosystem services and create equity-based solutions through a variety of means, including sustainable land development initiatives as well as affordable housing efforts
- Existing elements **already contain the building blocks** for improving natural systems and ecosystem services in the County

# Nature-based Solutions in County Plans, Programs, and Resolutions

| Climate Mitigation | Ecosystem Adaptation and Resilience | Equity |
|---|---|---|
| **Community-wide Greenhouse Gas Emissions Inventory and Greenhouse Gas Emissions Reduction Plan**<br>Promotes climate mitigation through greenhouse gas reductions:<br>• Diverts waste from the landfill via composting (reduces methane)<br>• Increases the energy efficiency of County buildings | **Sustainable Land Development Code**<br>Promotes adaptation and resilience:<br>• Provides for native landscaping (reduces water usage needs)<br>• Provides for water conservation<br>• Reduces heat island effect by preserving vegetation and requiring trees for shading in parking areas | **Resolution 2017-68 (in Support of the Paris Agreement)**<br>• Resolves to maximize economic and social co-benefits of greenhouse gas reduction |
| **Sustainable Land Development Code**<br>• Reduces emissions through green building practices and renewable energy standards<br>• Maintains and expands natural open spaces (promotes carbon sequestration) | **Open Space, Trails, and Parks Strategic Management Plan**<br>• Conserves and increases diversity of native flora and fauna to help with erosion control<br>• Implements forest prescriptions to improve open space fire resiliency | **Resolution 2022-36 (Complete Streets)**<br>• Promotes equitable transportation improvements, which reduces greenhouse gas and air pollutant emissions and improves safety |
| **Open Space, Trails, and Parks Strategic Management Plan**<br>• Researches carbon sequestration projects and opportunities for land restoration | **Wildfire Protection Plan**<br>• Manages wildfire risk through landscape resilience<br>• Reduces air quality degradation | **Sustainable Land Development Code**<br>• Provides benefits by reducing heat island effect |

# Appendix G: Recommendations for Implementing Nature-Based Solutions Using an Iterative Planning Approach

# Recommendations for Implementing Nature-Based Climate Solutions Using an Iterative Planning Approach
# Santa Fe County, New Mexico

**Prepared for:**
**Santa Fe County, NM**
**Sustainability Office**

**Prepared by:**
**Environmental Management and Planning Solutions, Inc.**

**February 2023**

The established goals of Santa Fe County are to:

- Provide a safe community
- Promote a sustainable community
- Support a healthy community
- Be a proficient, transparent, and accessible government.

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# TABLES

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# Executive Summary

Santa Fe County is preparing a community-wide Climate Action Plan. The Climate Action Plan will serve as a roadmap to reduce County-wide emissions and increase the community's resilience to the effects of climate change.

*Nature-based solutions are defined by the International Union for Conservation of Nature as, "Actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits."*

Climate data show that Santa Fe County, along with the rest of the state, has already begun experiencing the effects of climate change. Changes in temperature and precipitation are resulting in increased heat exposure, prolonged drought, decreased water availability, and more frequent and intense wildfires. Nature-based solutions are expected to play a key role in climate mitigation and adaptation in the County and worldwide.

Through a series of internal workshops and follow-on discussions with internal and consultant staff, the County evaluated nature-based solutions already present within the County's plans, programs, and resolutions, identified three preliminary themes around which to center future nature-based solution approaches, and developed a framework for further developing, analyzing, prioritizing, and ultimately implementing and monitoring these nature-based solutions.

This framework is intended to be implemented within the context of the larger climate action planning effort. A key component is the development of a working group of County staff with knowledge of natural systems and vulnerable communities, experts who can share knowledge of local natural resources and nature-based solutions, and external partners and stakeholders comprised of other land management agencies and jurisdictions in the County, conservation organizations, and equity-based organizations to help identify and implement solutions.

This collaborative-based approach is intended to identify opportunities and partnerships for nature-based solutions that can be implemented by both the County and its partners to maintain and enhance natural systems and build climate resiliency and center equity for all County residents.

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# Chapter 1. Introduction

**Nature-Based Solutions**

Nature-based solutions are actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature.

Santa Fe County is preparing a community-wide Climate Action Plan. The Climate Action Plan will serve as a roadmap to reduce County-wide emissions and increase the community's resilience to the effects of climate change. Nature-based solutions are expected to play a key role in climate mitigation and adaptation in the County and worldwide. Nature-based solutions are defined by the International Union for Conservation of Nature as, "Actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits." Nature-based solutions include actions such as preserving natural ecosystems, restoring degraded ecosystems, and sustainably managing working lands.

Projects like planting trees to cool communities, installing green stormwater infrastructure to manage runoff, and maintaining healthy landscapes to sequester carbon are all examples of nature-based solutions. Research has shown that implementing nature-based solutions could mitigate a substantial portion (37 percent) of the necessary carbon dioxide equivalent ($CO_{2e}$) emissions[1] by 2030 (Griscom et al. 2017).

The County participated in a cohort of local governments working with graduate students at the University of Colorado Boulder and staff at Nature-Based Climate Solutions (NCS) to engage stakeholders and community members to identify opportunities to implement nature-based solutions.

The County followed the "Managing Urban Landscapes for Climate Action" guide (NCS 2023) to:

1. Determine how nature-based solutions align with existing County plans and goals across departments
2. Convene internal stakeholders to identify shared nature-based solutions objectives and opportunities for collaboration
3. Work with internal stakeholders to identify and begin to prioritize opportunities for nature-based solutions that address climate mitigation, adaptation, and equity

The County contracted Environmental Management and Planning Solutions, Inc. (EMPSi) to provide technical expertise and advise on next steps to incorporate nature-based solutions into the climate action planning process.

EMPSi produced an internal stakeholder scoping report as the first work product. This report provided baseline information to County staff in support of the three steps identified above (EMPSi 2022). The scoping report identified synergies of current County plans with climate action planning, ecosystem types

[1] A carbon dioxide equivalent is a metric 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. For example, the GWP for methane is 25 and for nitrous oxide 298. This means that emissions of 1 million metric tons of methane and nitrous oxide respectively is equivalent to emissions of 25 and 298 million metric tons of carbon dioxide.

and services, projected climate-related changes and risks, and potentially vulnerable communities. EMPSi presented an overview of that report during the first of three days of workshops led by NCS. Materials for and the results of these workshops are documented in the Nature-Based Climate Solutions Engagement Workshops Report (NCS 2022a). Following the workshops, County, NCS, and EMPSi staff worked to distill and refine the information gathered through the workshops, resulting in NCS's Key Findings report (NCS 2022b).

This report incorporates the information obtained through the workshops by reference and builds off the Key Findings report to provide recommendations of next steps for integrating nature-based solutions into the County's Climate Action Plan through an iterative planning process.

# Chapter 2. Recommendations

Santa Fe County's Climate Action Plan seeks to provide goals and strategies to reduce greenhouse gas emissions to work towards climate stabilization and livability; incorporate adaptation measures to increase community resilience to irreversible climate impacts; and center equity to ensure vulnerable communities are protected. This section provides recommendations for an iterative process through which to identify, evaluate, and incorporate nature-based solutions into the Climate Action Plan, building off of the work that has occurred to date.

## 2.1 Preliminary Focus Areas and Nature-Based Solutions

Using the information gathered during the internal workshops, EMPSi, NCS, and County Sustainability staff identified three preliminary focus areas for nature-based solutions for potential inclusion in the Climate Action Plan. These focus areas are defined in the callout box to the right and described in the subsections below. The preliminary focus areas are intended to be refined through further internal and external stakeholder engagement during the climate action planning process.

**Preliminary Focus Areas**

Focus areas express the main goals through which nature-based solutions may be categorized. The preliminarily identified focus areas are:

- Protect and Restore Biodiversity: *Under this goal, the County will aim to protect and restore biodiversity in its local ecosystems*
- Capture and Infiltrate Runoff: *Under this goal, the County will aim to reimagine how runoff is managed to increase water security and address pollution*
- Build Healthy Soils: *Under this goal, the County will support the implementation and innovative development of regenerative practices toward building soil health, local food production, and supporting local farmers*

Using the information collected during the workshops and subsequent discussions with NCS and EMPSi, County staff developed a matrix of potential nature-based solution strategies for each focus area. Within the matrix County staff described the proposed strategy, how it supports the focus area(s) and addresses climate vulnerabilities, its relationship to existing plans and projects, current and potential resource needs, and potential outcomes.

The matrix is included as Appendix A. Like the focus areas, these are preliminary strategies that are intended to be expanded on and refined through the climate action planning process.

### 2.1.1 Protect and Restore Biodiversity

Biodiversity is the variety of life found within an ecosystem and, more broadly, on Earth. Protecting biodiversity is essential to maintaining ecosystem function and ecosystem services, including providing cultural value, clean air, healthy food, clean water, and carbon sequestration (**Table 1**). In addition, sustainable and biodiverse landscapes have been shown to be more resilient overall to wildfire, drought, and flooding, all of which are projected to increase in the coming decades (IPCC 2022).

Threats to biodiversity include land and sea use change, direct exploitation of organisms, climate change, pollution, and invasive species (IPBES 2019). Global species loss is occurring at an unprecedented rate; approximately 25 percent of species in studied plant and animal groups are threatened with extinction.

| Table 1. Ecosystem Services Supported by the Protect and Restore Biodiversity Goal |
|---|
| **Climate regulation** – Carbon sequestration and storage by biomass |
| **Air quality** – Vegetation traps particulate matter, improving air quality |
| **Water filtration/purification** – Vegetation influences the quantity of available water |
| **Pollinator support** – Flowering vegetation provides support for pollinators for both agricultural production and habitat for native species |
| **Microclimate stabilization** – Urban trees moderate local temperatures by providing humidity and shade |
| **Visual aesthetics and passive use** – Open space provides value for those viewing the space |
| **Plant and animal species** – Collection of plant material or hunting can have subsistence or cultural importance for certain communities and value for those who do not directly use them |

Vulnerable populations are often exposed to an uneven environmental burden. Restoring, increasing, and protecting the County's biodiverse ecosystems would benefit vulnerable communities by promoting sustainable and clean transit and reducing legacy pollution in the soil, air, and waterways. The County's vulnerable populations would benefit from protection and restoration of biodiversity, through improvement of environmental and climate factors.

Nature-based solutions that contribute to biodiversity include removing invasive plant species, planting fire- and drought-tolerant native species, increasing tree canopy cover to reduce heat islands, protecting open spaces and wildlife corridors, improving pollinator habitat, and restoring wetlands habitats and disturbed areas. Many existing County plans, programs, and resolutions already include components to promote biodiversity, and others were identified through the nature-based solutions internal stakeholder workshops. Some of these include:

- The Open Space, Trails, and Parks Strategic Management Plan conserves and increases diversity of native flora and fauna to help with erosion control, implements forest prescriptions to improve open space fire resiliency, and researches carbon sequestration projects and opportunities for land restoration
- Resolution 2020-93 supports the 30x30 initiative to protect 30 percent of land and water by 2030 and to continue to develop strategies for preserving habitats within the County, protecting important plant and wildlife habitat that contributes to maintaining and improving biodiversity on these lands and waters
- The Santa Fe County Open Space Division has been working to restore beaver habitat in the Los Potreros Open Space. Beaver dams slow water and create wetland habitat that in turn provides habitat for other plants and animals, recharges groundwater, serves as natural fire breaks, and stores carbon

Appendix A provides a working matrix of ongoing initiatives and potential projects and programs that could support the Protect and Restore Biodiversity focus area.

### 2.1.2 Capture and Infiltrate Runoff

Infiltration is the process by which water, usually in the form of precipitation or snowmelt, enters the soil and recharges streams, lakes, rivers, and underground aquifers. Infiltration is important because it promotes both the quality and availability of water in an ecosystem.

Runoff occurs when there is more water than the land can absorb. Runoff can come from natural processes, such as from storms and snowmelt moving water over the landscape, and from human activity, such as the development of impervious surfaces that prevent water from entering soils. In addition, precipitation that runs across impervious surfaces such as roads and parking lots can transport oils, bacteria, litter, and other pollutants into waterways. Capturing and infiltrating runoff is essential to maintaining ecosystem function and ecosystem services, including improving water quality and moderating the effects of flood (**Table 2**).

| Table 2. Ecosystem Services Supported by the Capture and Infiltrate Runoff Goal |
|---|
| **Water supplies** – Watershed conditions support water quality and quantity for domestic and agricultural use |
| **Flood prevention and mitigation** – Healthy watersheds can increase water retention, and undeveloped floodplains and riparian systems can reduce flood risk during high flow |
| **Water filtration/purification** – Vegetation influences the quantity of available water |
| **Erosion and sedimentation control** – Vegetation cover reduces sediment runoff |
| **Flow regulation** – Vegetation cover supports moderated timing of runoff during high flow events |
| **Waste treatment** – Effluent filtering and nutrient fixation by wetlands |

Capturing and infiltrating runoff using cisterns, rain gardens, and other strategies can also help to sustain landscapes in periods of drought. By 2050, environmentally critical streamflow is projected to be affected in 42 to 79 percent of the world's watersheds, causing negative impacts on freshwater ecosystem services (IPCC 2022). Within the Upper Rio Grande Basin, a decrease in overall water availability by one-quarter to one-third is projected by the end of the 21st century (Llewellyn and Vaddey 2013). Improving the methods of capturing and infiltrating runoff can hedge against the negative impacts of prolonged drought.

Regions and populations with higher exposure and vulnerability to water security, including the American Southwest, are likely to face greater risks of climate change than others. Measures such as infiltrating rainwater into green infrastructure would provide a variety of ecosystem services to help protect vulnerable populations. Between 1900-2022, Santa Fe County received an average of 14.5 inches of precipitation per year (NOAA 2023); A 1,000 square foot roof could collect more than 9,000 gallons of water from this amount of precipitation annually (University of Arizona 2023).

Nature-based solutions that that could contribute to the capture and infiltration of runoff include creating green stormwater infrastructure, adopting low-impact development strategies, promoting native plant and natural water harvesting landscapes, and promoting plantings that encourage sustainable landscapes. The County has ongoing initiatives that would support the capture and infiltration of runoff, and others were identified through the nature-based solutions internal stakeholder workshops. Some of these include:

- The County is exploring the possibility of making code updates to promote the use of green stormwater infrastructure in new construction. Green stormwater infrastructure mimics natural processes to absorb and treat stormwater in place. Rainwater-harvesting landscapes can also support vegetation that create a cooling effect on the surrounding area with minimal supplemental irrigation.
- The County is exploring developing a low-impact development and maintenance guide for contractors, County staff, and the general public. Low-impact development mimics natural

processes to absorb and treat stormwater runoff, which helps to prevent stormwater pollution. This would help the County meet its federal municipal separate storm sewer system requirements.

- The County hosts educational programs and events to promote sustainable development and landscaping practices. Events such as the County's annual Earth Day celebration and programs such as the Master Naturalist Program promote stewardship of the environment.

Appendix A provides a working matrix of ongoing initiatives and potential projects and programs that could support the Capture and Infiltrate Runoff focus area.

### 2.1.3 Build Healthy Soils

Soils are formed by the interaction of parent material, climate, biota (flora, fauna, and humans), topography, and time. The interaction of these five factors create complex and diverse soil patterns across the landscape that influence soil use and management. Soils are living dynamic systems that are the interface between agriculture, rangelands, forests, and ecosystems. They provide important ecosystem services such supporting agriculture and food supplies and carbon sequestration (**Table 3**).

**Table 3. Ecosystem Services Supported by the Build Healthy Soils Goal**

| |
|---|
| **Food supplies** – Crops and livestock provide food source |
| **Soil health** – Healthy soil supports nutrient cycling to improve agricultural output and support other services |
| **Climate regulation** – Carbon sequestration and storage by soils |

Soils can be naturally susceptible to erosion because of factors such as topography, vegetation type and density, ground cover, and soil moisture regimes. Climate change impacts can exacerbate erosion susceptibility of soils. These impacts include reductions in vegetation cover that exposes bare soils, increased and more severe wildfires that burn soils and cause soil crusting, drought that reduces soil moisture availability, and higher-intensity precipitation events that reduce the infiltration capacity of soils (Edwards et al. 2019).

Poor soil health can impact vulnerable populations through poor runoff capture and infiltration, susceptibility to flood and landslide events, and reducing agricultural outputs. Promoting soil conservation through nature-based solutions would restore and protect soil health, benefitting vulnerable communities. For instance, producing biochar from green waste and adding it to soil can help to enhance nutrient availability, water-holding capacity, increase crop yields, and can reduce or remove contaminants from soils (Joseph et al. 2021; Qiu et al. 2022). Also, producing biochar from green waste may also help to sequester carbon and reduce emissions that would otherwise be created by landfilling compostable material.

Regenerating the capacity of soil to function as a living ecosystem to regulate and retain water, provide physical stability and support for plants, sequester carbon, and sustain productive plants is the foundation of productive and sustainable landscapes. Projects that include minimum tillage practices, use crop cover and crop rotations, and use organic matter, biochar, and fertilizer amendments can reduce soil erosion and improve nutrient availability, moisture retention, and carbon storage (Idowu and Flynn 2013; Idowu and Brewer 2018; NRCS 2018). Existing County plans, programs, and resolutions already include components to promote healthy soils, and others were identified through the nature-based climate solutions internal stakeholder workshops. Some of these include:

- The County offers free green waste days to promote composting or chipping of green waste, rather than burning, to improve soil health while also reducing the greenhouse gas emissions associated with landfilling. In addition, Santa Fe County's backyard composting program and outreach provides free composting systems and education resources to County residents. Future expansion may include increasing access to the program within underserved communities. These composting programs and education efforts support the zero-waste goal in the Sustainable Growth Management Plan.

- The Santa Fe County Sustainable Land Development Code establishes revegetation requirements following clearing or construction (SLDC 7.17.7). These requirements help to prevent soil loss due to erosion..

Appendix A provides a working matrix of ongoing initiatives and potential projects and programs that could support the Build Healthy Soils focus area.

## 2.2 APPROACH

This section provides a proposed approach for further refining and incorporating nature-based solutions into the climate action planning process. While the internal stakeholder workshops have begun to identify opportunities for nature-based solutions, the approach below provides a strategy that includes continuation of the NCS process within the context of the larger climate action planning effort. This approach envisions that nature-based solutions will be one track of the climate action planning process, with the potential for incorporating nature-based solutions into the broader goals of the Climate Action Plan and/or potentially becoming focus area campaigns that could be implemented inside or outside of the Climate Action Plan. This process is meant to be iterative (steps repeated and information refined). The graphic below outlines steps in the process.

### 2.2.1 Review and Refine Baseline Data

A review of current information available to the County provides a starting point for assessing baseline conditions of the natural, built, and human environments the County is tasked with managing, and identifying where additional data may be needed to develop, implement, and evaluate the effectiveness of nature-based solutions. The review of information should be focused to the issues the County seeks to resolve in the Climate Action Plan so as not to be overly broad. **Table 4** presents example baseline data needs to support current or future County initiatives.

Because nature-based solutions focus on measures to protect, conserve, and restore natural systems, a more refined inventory of the condition of the County's natural systems may be needed to identify and implement nature-based strategies. The role each natural system plays in terms of ecosystem services should also be identified. Identifying the services each system provides is helpful for communicating their importance to stakeholders. The condition of each system where it is known is helpful for informing opportunities for conservation or restoration.

**Table 4. Example Baseline Data Needs**

- **Carbon sequestration potential** – Inventory of the amount of carbon potentially stored in the County's soils and biomass
- **Tree mapping** – Baseline data to inform tree canopy initiatives might include use of tree mapping databases such as the Landsat Tree Cover Database or community tree counts using applications such as OpenTreeMap
- **Conservation area inventory** – Inventory and map conservation areas to support tracking of the 30x30 initiative
- **Climate change vulnerability** – Identify communities and infrastructure that are most vulnerable to climate impacts

Nature-based solutions are valuable tools in building resilience to climate vulnerabilities such as flood risk due to extreme precipitation events or wildfire risk due to extreme heat and drought. If not already inventoried, identifying climate vulnerabilities for natural and built systems that the County manages would help inform the development and prioritization of nature-based solutions and climate action projects. Understanding what systems are vulnerable, the mechanisms by which they are vulnerable, when they are vulnerable (times of year or near term/long term), and the people affected (particularly vulnerable communities) are key elements in this development and prioritization process. Identifying vulnerabilities also allows for consideration of how current land uses, land use practices, or existing policies may be contributing to these vulnerabilities.

Many aspects of climate resiliency, such as floodplain restoration, wetland protection and restoration, and land conservation, are best addressed at a landscape-level scale. Identifying where nature-based solutions are being used or explored in surrounding jurisdictions can provide real-world examples for internal and external stakeholders, vest County staff by showing proven solutions to common problems, and serve as a model for inclusion in the County's climate action plan. For example, the Santa Fe National Forest land use plan (USDA Forest Service 2022) identifies annual goals for eradication or suppression of nonnative invasive plant species. This goal supports climate resiliency in that landscapes free of invasive species tend to be more resilient and have a greater capacity to survive natural disturbances in the face of stressors such as climate change. It also directs the Forest Service to work with local government agencies, such as the County, and other partners on projects to maintain and improve watershed conditions and wildlife habitat and connectivity, which supports biodiversity and climate resiliency.

Sources of data may be available internally, from other state and federal land management agencies in the County, from local universities and research groups, or from other external stakeholders (see Section

2.2.2). A preliminary list of research needs has been identified in Appendix A, along with the focus area(s) that each research need supports.

### 2.2.2 Identify and Coordinate with Potential Nature-Based Climate Solution Partners

Developing and implementing a nature-based solutions approach will be most effective if it includes a diverse array of partners. Partners will be important for both identifying existing and future opportunities for nature-based solutions and for providing expertise and resources to implement and monitor these programs. An example of a partnership for a similar effort includes the City of Boulder's Cool Boulder Campaign, which was launched in partnership with academic institutions, nonprofit organizations, local businesses, and other community groups. More locally, the New Mexico Forestry Division worked with partners to create a Forest Action Plan that provides a vision for collaboration between organizations to address issues in forest and watershed management, rather than guiding the actions of the Forestry Division alone (New Mexico EMNRD 2020).

Potential partners include:

- Internal staff across County departments with knowledge of natural systems and vulnerable communities. The internal stakeholder workshops identified potential candidates who have a deep interest and understanding of the natural resources within the County as well as the natural and human vulnerabilities being faced.
- Experts who can provide technical assistance and share knowledge of local natural resources and nature-based solutions, including from academia.
- External partners and stakeholders such as other land management agencies and jurisdictions in the County (for example, City of Santa Fe, New Mexico State Lands Department, US Forest Service, and the Bureau of Land Management), conservation organizations, and equity-based organizations to help identify and implement solutions.

A list of potential external partners is provided in **Table 5**.

**Table 5. Potential Partners**

- New Mexico State Trust Lands
- Audubon Southwest
- Bureau of Land Management
- City of Santa Fe
- Defenders of Wildlife
- Forest Stewards Guild
- Institute of Applied Ecology
- Santa Fe County Extension Office
- Quivira Coalition
- Reunity Resources
- Rio Grande Return
- YouthWorks
- Santa Fe Botanical Garden
- Santa Fe Community College
- Santa Fe Conservation Trust
- Santa Fe Watershed Association
- The Nature Conservancy
- The New Mexico Acequia Association
- US Forest Service
- Xerces Society

A nature-based solutions working group is recommended to be established within the climate action planning process, with a charter developed to direct the actions and outcomes of the working group. Potential working group members should be provided information on the following:

- The County's purpose and goals
- A presentation of nature-based solutions, with examples of strategies and how they can address climate-related vulnerabilities
- The three preliminary focus areas and the internal strategies developed (Appendix A) to date
- The duties and high-level overview of the desired outcomes of the working group

Through this working group process, suggestions for additional strategies and identification of future partnerships should be identified. The outcomes of the working group can be included in the public outreach portion of the climate action planning process, from which additional input and ideas can be generated and additional partners with an interest in assisting in implementing nature-based solution strategies identified. The work product of this effort could be an expansion of the nature-based solutions matrix (Appendix A) that includes a comprehensive accounting of both internal and external nature-based solution strategies to address the County's purpose and goals.

### 2.2.3 Assessment and Ranking of Strategies for Nature-Based Climate Solutions

After developing a more comprehensive list of potential nature-based solutions, County Sustainability staff and the stakeholder working group will need to determine a method to assess strategies to carry forward into the Climate Action Plan. Potential assessment criteria may include:

- Identifying how the solution will address the vulnerability (reduce risk or enhance the ecosystem)
- Identifying trade-offs (benefits versus unintended consequences)
- Evaluating equity
- Estimating cost
- Identifying funding/implementation details and any potential barriers to implementation
- Identifying potential partners (if not already identified)

The County should consider use of a ranking system of strategies based on these or other assessment criteria. The outcome of this process would be a proposal for which strategies would be carried forward in the Draft Climate Action Plan as well as those that may be pursued outside of the plan.

### 2.2.4 Develop the Climate Action Plan

Based on the work done as described in the sections above, the County should incorporate proposed nature-based solutions into the Draft Climate Action Plan for public review. Based on feedback during public review, the steps above should be repeated to refine, assess, and rank any additional strategies identified by the public.

### 2.2.5 Implementation, Monitoring, and Adaptive Management

Part of the climate action planning process should be the identification of an implementation, monitoring, and adaptive management strategy for nature-based solutions that are part of the Climate Action Plan, including:

- Identifying current conditions to serve as a baseline against which to measure progress
- Developing near-term and long-term milestones
- Developing monitoring intervals and indicators for success, including indicators to measure equity impacts
- Performing periodic reviews of indicators based on the selected monitoring intervals

- Where criteria are not being met, reconvening stakeholders to evaluated adjustments needed to achieve progress

## 2.3 SUMMARY

This final report presents the outcomes of a collaborative process among County staff, NCS, and EMPSi to identify current and potential nature-based solutions, preliminary nature-based solution focus areas, and a framework for engaging external partners in the refinement, selection, and implementation of a nature-based solution approach to improving climate resiliency within the County. The development of preliminary focus areas and a nature-based solution strategy matrix provides a foundation upon which to engage external partners and stakeholders to further identify, evaluate, and implement a nature-based solutions approach both within and external to the climate action planning process.

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# Appendix A
# Preliminary Nature-Based Solution Strategy Matrix

Appendix A provides a matrix of current and potential nature-based solution strategies developed to date. These are preliminary strategies that are intended to be expanded on and refined through the climate action planning process. The living matrix is found at this link.

Each strategy indicates the focus area or areas it would support; therefore, an explanation of the focus areas are provided below for reference.

| Focus Area | Explanation |
|---|---|
| Protect and restore biodiversity | Biodiversity is the variety of life found within an ecosystem and, more broadly, on Earth. Biodiversity plays a role in maintaining the ecosystem services that our community relies on, including clean air, healthy food, and clean water. However, biodiversity is being lost at an unprecedented rate. Under this focus area, the County will aim to protect and restore biodiversity in its local ecosystems |
| Capture and infiltrate runoff (stormwater) | Scientists expect more frequent and intense floods and droughts with less predictable spring snowmelt in the Upper Rio Grande Basin. Precipitation that runs across impervious surfaces, such as roads and parking lots, can transport oils, bacteria, litter, and other pollutants into waterways. Capturing and infiltrating this runoff, using cisterns, rain gardens, and other strategies, can help to address water quality issues and sustain landscapes in periods of drought. Under this focus area, the County will reimagine how runoff is managed to increase water security and address pollution. |
| Build healthy soils | Healthy soils are the foundation of productive and sustainable landscapes. Healthy soil can help to store water, prevent erosion, absorb carbon, and support local food production. However, unsustainable land use practices can affect soil health in numerous ways, including by accelerating erosion, compacting soils, contaminating soils, and altering soil chemistry. Through this focus area, the County will support the development and implementation of regenerative practices to build soil health. |

**Nature Based Climate Solutions in Santa Fe County**

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| No. | Focus Area(s) Addressed | | | Strategy Category | Proposed Strategy | How it supports the focus area and addresses climate vulnerabilities | Existing Resources and Relationship to Existing Plans | Resource Needs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| | *Biodiversity* | *Stormwater* | *Healthy Soils* | | | | | | |
| 1 | x | x | x | Research Need | Conduct an internal review to ensure the County has the necessary policies, procedures, and staffing in place to protect natural resources and ecosystem services. This should include a review of:<br>- staff and procedures to review environmental permits submitted by developers (e.g., for septic systems, stormwater management)<br>-staffing and procedures to carry out inspections and take enforcement action, if necessary, to ensure developers comply with environmental laws and policies; and<br>-staffing and procedures to ensure County projects and operations comply with environmental laws and policies. | The County must have robust systems in place to ensure the protection of natural resources and ecosystem services. The internal review of County policies, procedures, and staffing will help to identify any areas where additional resources are needed for environmental protection. | This review would support numerous County environmental initiatives, including the County's compliance with federal municipal separate storm sewer system (MS4) requirements and environmental reviews of development permits.<br><br>The County is currently conducting a review of MS4 policies and procedures, but a more comprehensive environmental review is also needed. | External consultant to complete review and staff time to manage contract. | Completed review with recommendations on any areas for improvement |
| 2 | x | x | x | Research Need | Quantify climate change vulnerabilities in Santa Fe County to inform selection and prioritization of specific nature-based solutions and climate action projects. | Identification of the communities and infrastructure that are most vulnerable to climate impacts will help to evaluate and prioritize nature-based solutions and climate action projects generally. | This review would inform the County's future Community-wide Climate Action Plan<br><br>The New Mexico Department of Energy, Minerals, and Natural Resources Climate Risk Map may be relevant to this project. | Staff time and external consultant support will be needed for study | Completed vulnerability assessment and map. |
| 3 | x | | | Research Need | Conduct a study to identify the carbon sequestration potential of natural and agricultural lands within Santa Fe County and map existing conservation areas to inform future conservation and management strategies. | Identifying carbon sequestration potential of County landscapes will help to inform local management strategies. | Supports County 30x30 resolution (2020-93) and supports strategy 1.5 in County greenhouse gas reduction plan. | Carbon sequestration data is needed. USGS Protected Areas Database may aid in mapping conservation areas.<br><br>Staff time and consultant support are required. | Completed study |
| 4 | x | | | Research Need | Assess tree equity score and access to green space in Santa Fe County to identify potential target areas for tree giveaways or planting projects. | The right tree in the right place can help to cool communities, improve air quality, and filter stormwater runoff. However, disadvantaged communities often have less canopy coverage than other communities. Identifying inequities in canopy cover and creating a list of climate-resilient trees for Santa Fe County will help to inform future tree planting activities and policies. | The City of Albuquerque has prepared a list of climate-ready trees that may serve as a model for Santa Fe County. | Data on local tree equity scores is needed.<br><br>Staff time and consultant support needed. | Completed tree equity and greenspace study with identification of potential projects. |

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|---|---|---|---|---|---|---|---|---|---|
| | *Biodiversity* | *Stormwater* | *Healthy Soils* | | | | | | |
| 5 | | | x | Research Need | Explore feasibility and impact of commercial compost pick up at County facilities that serve food | Composting provides a pathway to improve soil health while also reducing the green house gas emissions associated with landfilling food. | Supports zero waste goal (goal 27) in the Sustainable Growth Management Plan and action item 1.4.3 in the greenhouse gas reduction plan.<br><br>Staff are currently working on a USDA grant, which will yield case studies to help inform this work; however, a County specific plan is needed. | Study of cost-benefit analyses for compost pick up and emissions reduction potential from these activities. | Feasibility study and County policies for composting in facilities serving food where feasible. |
| 6 | | | x | Research Need | Explore feasibility and impact of using green waste at County convenience centers to produce biochar | Biochar is produced by decomposing plant material at high temperatures to create a carbon-rich soil amendment. Adding biochar to soil can help to enhance nutrient availability and water-holding capacity. Producing biochar from green waste may also help to sequester carbon. | Supports zero waste goal (goal 27) in the Sustainable Growth Management Plan | Data on green waste collection and potential emission reductions is needed. Staff time and possibly consultant support are needed to assess feasibility. | Feasibility study and potential biochar pilot program |
| 7 | x | x | x | Ongoing Initiative | Continue to support County Master Naturalist Program | The Master Naturalist Program trains individuals to become stewards of New Mexico's natural environment, resources, and heritage. Participants attend several weeks of classroom and field instruction. They then volunteer with one of the Program's partner agencies (Santa Fe County, Audubon Southwest, Santa Fe Botanical Garden) on a variety of environmental stewardship projects. | Master Naturalist is an existing program that supports existing County Open Space projects.<br><br>Funding is allocated to the program annually | None at this time. | Continuation of the program |
| 8 | x | | x | Ongoing Initiative | Continue research projects to develop effective land management strategies, projects include the Ortiz Mountains forest enhancement work to research forest thinning strategies that optimally reduce wildlife fuels, sequester carbon, and benefit wildlife. | Promotes biodiversity conservation, reduces wildfire intensity (thus reducing GHG emissions), sequesters carbon, increases forest resiliency | Staff time and funding allocated to this project. In alignment with Ortiz Mountains Open Space Management Plan and OSTP Strategic Plan. | Staff time and funds | Experimental thinning project completed with results communicated to stakeholders (e.g. USFS) and methods integrated into external agency(ies) forest thinning plans if successful |

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|---|---|---|---|---|---|---|---|---|---|
| | *Biodiversity* | *Stormwater* | *Healthy Soils* | | | | | | |
| 9 | x | | | Ongoing Initiative | Continue to support habitat restoration projects such as the beaver habitat project on the Los Potreros Open Space | Biodiversity can directly and indirectly affect the ecosystem services our community relies on. Well-designed habitat restoration projects play a key role in enhancing or maintaining biodiversity. For example, the Santa Fe County Open Space Division has been working to restore beaver habitat in the Los Potreros Open Space. Beavers construct dams, which slow water and create wetland habitat. These wetlands can provide habitat for other plants and animals, recharge groundwater, serve as natural fire breaks, and store carbon. | Beaver Management Plan, OSTP Strategic Plan | Staff time and funds | Ongoing habitat restoration projects |
| 10 | | | x | Ongoing Initiative | Continue to offer free green waste days to promote composting or chipping of green waste rather than burning | Composting provides a pathway to improve soil health while also reducing the green house gas emissions associated with landfilling food. | Supports zero waste goal (goal 27) in the Sustainable Growth Management Plan<br><br>County has successfully offered free green waste days in the past. | Ongoing staff time and funds will be needed to continue free green waste programs. | Ongoing free green waste program. |
| 11 | | x | | Ongoing Initiative | Explore creating an incentive program for installing green stormwater infrastructure (GSI) in existing development and update County codes to promote use of GSI in new development. | GSI mimics natural processes to absorb and treat stormwater runoff in place, which helps to prevent stormwater pollution. Rainwater harvesting landscapes can also support vegetation to help cool communities with minimal supplemental irrigation. | Supports the County in meeting federal municipal separate storm sewer system (MS4) requirements.<br><br>County has procured consultant services to assist with the code review portion of this strategy as part of its MS4 work. | None at this time. | Report on potential GSI incentive program and revised County code to promote GSI, particularly within priority stormwater management areas. |
| 12 | | x | | Ongoing Initiative | Develop a low impact design and maintenance guide for contractors, County staff, and the public. | Low impact development (LID) mimics natural processes to absorb and treat stormwater runoff, which helps to prevent stormwater pollution. Rainwater harvesting landscapes can also support vegetation to shade and cool communities with minimal supplemental irrigation.<br><br>A LID design and maintenance guide will help the County, developers, and the public implement these techniques. | Supports County in meeting federal municipal separate storm sewer system (MS4) requirements.<br><br>This strategy is proposed for inclusion in the County's revised stormwater management program. | Staff time and consultant support to create guide. | Completed guide |
| 13 | x | x | x | Ongoing Initiative | Host annual County Earth Day events to educate the public on sustainable landscaping practices. Purchase educational signage for demonstration gardens. | Public education can help to increase awareness and adoption of sustainable landscaping practices to protect and enhance ecosystem services. | The County Sustainability Office currently hosts annual Earth Day events. These events can be leveraged to help promote nature-based solutions. | Ongoing funding is needed for consultant support. | Ongoing annual Earth Day events |

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| No. | Focus Area(s) Addressed | | | Strategy Category | Proposed Strategy | How it supports the focus area and addresses climate vulnerabilities | Existing Resources and Relationship to Existing Plans | Resource Needs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| | *Biodiversity* | *Stormwater* | *Healthy Soils* | | | | | | |
| 14 | | | | Ongoing Initiative | Ramp up the Transfer of Development Rights (TDR) program on privately-owned lands to preserve agriculture; rural open space and character; scenic vistas; natural features; areas of special character or special historic, cultural or aesthetic interest or value; and environmental resources for the benefit of the residents of Santa Fe County. | TDRs are a market-based tool to conserve private land, reduce rural sprawl, and direct growth to areas with adequate levels of public services. | Staff time already committed to this project. Project aligns with Sustainable Land Development Code (Section 12. 14). | More staff time and funding | Functioning TDR bank |
| 15 | x | | | Ongoing Initiative | Support local outdoor education initiatives both Countywide and on Santa Fe County open space properties | Outdoor education can help to promote environmental stewardship and inspire the next generation of environmental professionals needed to carry out nature-based climate solutions. | Supports education, training, and lifelong learning policy (policy 13.3) in the Sustainable Growth Management Plan.<br><br>There are already a number of outdoor education initiatives in New Mexico through organizations such as the Santa Fe Watershed Association, Santa Fe Botanical Garden, Audubon) | Support from existing organizations. Staff time & funding. | Ongoing outdoor education |
| 16 | x | | | Ongoing Initiative | Expand invasive species removal on County properties through local partnerships | Invasive species are one of the biggest causes of biodiversity loss. Climate change is expected to further facilitate the spread of invasive species and reduce the resilience of ecosystems to invasive species. | Invasive Species Management Plant, 2019 OSTP Strategic Plan | Staff time, community partnerships, and funding | Ongoing invasive species removal where appropriate. |
| 17 | | | x | Ongoing Initiative | Continue to support and expand Santa Fe County's backyard composting program. Expand outreach activities to engage with underserved communities. | In the United States, food waste accounted for over 24% of the material sent to the landfill in 2018. Composting can improve soil health and reduce the greenhouse gas emissions associated with landfilling food. Santa Fe County's backyard composting program provides free composting systems and educational resources to County residents to help divert food waste from County convenience centers. | Supports the County's existing backyard composting program | Ongoing funding and consultant support for installing composting systems and promoting the program. | Expanded backyard composting in Santa Fe County |
| 18 | | | x | Ongoing Initiative | Expand AgriGate website to include resources on compost production and application | In the United States, food waste accounted for over 24% of the material sent to the landfill in 2018. Composting can improve soil health and reduce the greenhouse gas emissions associated with landfilling food. | Supports AgriGate, which is an existing County platform | Staff time and funding to add content to website. Grant funding to develop case studies and cost-benefit analyses for composting programs in different contexts. Staff are currently collaborating on a USDA grant for this. | Online resources |

**Nature Based Climate Solutions in Santa Fe County**

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| No. | Focus Area(s) Addressed | | | Strategy Category | Proposed Strategy | How it supports the focus area and addresses climate vulnerabilities | Existing Resources and Relationship to Existing Plans | Resource Needs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| | *Biodiversity* | *Stormwater* | *Healthy Soils* | | | | | | |
| 19 | x | | x | Potential Project/ Program | Create a Parks and Recreation Division and an Open Space Division to increase capacity to manage open spaces, greenways, and riparian areas. | Healthy parks and open spaces help to sequester carbon and provide other ecosystem services to the community; however, management needs to differ between parks and conservation areas/open spaces. Currently, the County has one team of 13 staff responsible for 6,610 acres of open lands, 18 parks, and 60 miles of trail. Creating two separate teams, with one dedicated to parks and the other dedicated to open space management will help to enhance stewardship of these areas. | None currently | Funding for added staff | One Parks and Recreation Division and one Open Space Maintenance Division |
| 20 | x | x | x | Potential Project/ Program | Create a sustainable landscape management plan for County properties that promote the use of native and pollinator-friendly plants, encourage the use of compost in lieu of synthetic fertilizers, and employ rainwater harvesting techniques where feasible. Prepare a list of climate-ready trees that are recommended for Santa Fe County that can be incorporated into this plan and shared with the public. | The County manages over 100 facilities and 18 parks. Creating a sustainable landscape management plan that promotes the use of native plants and rainwater harvesting techniques where feasible will help to create low maintenance landscapes that promote biodiversity, infiltrate stormwater runoff, and build healthy soils. These landscapes will also serve as important demonstration areas for the community. | Supports Santa Fe County 30x30 resolution (2020-93), pollinator protection resolution (2020-51), and federal MS4 requirements to manage stormwater pollution.<br><br>Albuquerque currently has a list of climate-ready trees that may serve as a model. | Staff time and consultant support to conduct site visits, review current landscaping procedures, and develop new protocols as needed. Community science initiatives may help to compare/contrast different landscape management strategies. | Completed landscape management plan |
| 21 | x | x | x | Potential Project/ Program | Provide professional development opportunities to County staff in sustainable landscaping practices | Professional development in tree care, installation and maintenance of rainwater harvesting landscapes, and plant selection will be needed for County staff to implement sustainable landscaping practices that will help to treat stormwater runoff and support vegetation to cool communities. | Supports Santa Fe County 30x30 resolution (2020-93), pollinator protection resolution (2020-51), and federal MS4 requirements to manage stormwater pollution. | Staff time and funding for professional development | Staff routinely participating in training |
| 22 | x | x | x | Potential Project/ Program | Support community education courses and workforce development programs on composting, sustainable landscaping, and resource management. | Implementing nature-based climate solutions in Santa Fe County will require a trained workforce that is prepared to apply best practices in landscaping, resource management, and solid waste. | Supports education, training, and lifelong learning policy (policy 13.3) in the Sustainable Growth Management Plan.<br><br>Santa Fe County currently sponsors other technical education through the Protec program at the Santa Fe Community College. | Staff time and education partnerships | Ongoing community education programs |
| 23 | x | | | Potential Project/ Program | Leverage existing backyard habitat resources and support education programs to promote fire-resilient, sustainable landscaping practices (e.g., proper tree care, native plant selection, wildlife conservation) on private lands. | Approximately 730,600 acres in Santa Fe County are privately owned. Supporting private landowners in implementing sustainable landscaping practices will help to conserve biodiversity. Example projects include supporting a pilot program to encourage landowners to conserve pinon pines in their yard and assist with tree seed collection from those trees to restore habitat for the pinyon jay. | Supports County 30x30 resolution (2020-93) | Habitat and listed species data may help to inform focus areas for this project.<br><br>Staff time and consultant support needed. | Partnerships in support of backyard habitats |

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| No. | Focus Area(s) Addressed | | | Strategy Category | Proposed Strategy | How it supports the focus area and addresses climate vulnerabilities | Existing Resources and Relationship to Existing Plans | Resource Needs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| | *Biodiversity* | *Stormwater* | *Healthy Soils* | | | | | | |
| 24 | x | x | x | Potential Project/ Program | Support policies at the state and federal level that will help to facilitate financing for nature-based climate solutions | Funding and financing mechanisms will be needed to support expanded implementation of nature-based climate solutions. | Santa Fe County prepares a resolution with legislative priorities for sustainability each legislative session. The County is a member of the Coalition of Sustainable Communities in New Mexico, which provides updates on bills. | Ongoing staff time and coalition membership | Ongoing tracking and support |
| 25 | x | | | Potential Project/ Program | Participate in and support existing native plant and climate resilient tree giveaway events. | Approximately 730,600 acres in Santa Fe County are privately owned. Supporting private landowners in implementing sustainable landscaping practices using native species will help to maintain healthy ecosystems. | There area a number of existing plant giveaway events the County might help to promote or become more involved with. These include the Xerces Pollinator Kits and the State Forestry Division's Conservation Seedling Program. | Community partnerships. | Participation or support of annual native plant giveaways |
| 26 | x | x | x | Potential Project/ Program | Support paid youth natural resource and sustainability internships, particularly for students who are underrepresented in the environmental profession. | Diverse ideas and perspectives are needed now and in the future to identify and implement innovative nature-based climate solutions (NbCS).<br><br>A youth internship program can help to support the longevity of NbCS work in the County by empowering the next generation of environmental professionals. To enhance equity, the County should partner with schools and community organizations to engage students who are underrepresented in the environmental profession. | Supports education, training, and lifelong learning policy (policy 13.3) in the Sustainable Growth Management Plan | Staff time and funding for internships. Community partnerships for recruitment. | Successful internship program informed by participant feedback collected via anonymous surveys |
| 27 | | | x | Potential Project/ Program | Support community compost pilot programs | Composting provides a pathway to improve soil health while also reducing the green house gas emissions associated with landfilling food. Community compost sites can help to increase composting and access to composting by serving as hubs where community members may drop off food scraps and pick up compost. | Supports zero waste goal (goal 27) in the Sustainable Growth Management Plan<br><br>Local organizations are currently piloting community compost programs in Santa Fe County.<br><br>AgriGate may serve as a potential platform to promote community compost sites. Staff are currently assisting with a collaborative funding proposal to USDA to assist with this. | None at this time. | Promotion of community compost sites. |