

City of Denton

Greenhouse Gas Inventory: 2016

Summary Report

Sustainability
September 2017



Welcome to the City of Denton's 2016 Greenhouse Gas Inventory.

The City is committed to improving quality of life, protecting the environment, and creating economic opportunities for its citizens, businesses and institutions. Air Quality and Greenhouse Gas Management is a key focus area of Denton's sustainability plan, *Simply Sustainable, A Strategic Plan for Denton's Future*, adopted in February 2012. By working to reduce greenhouse gas emissions, the City can achieve multiple benefits, including saving energy and money, strengthening the local economy, improving local air quality, and preserving quality of life in our community.

In 2005, the City of Denton signed the U.S. Conference of Mayors Climate Protection Agreement and joined other cities nationwide in collecting data and taking steps to identify and reduce greenhouse gas (GHG) emissions.

Tracking greenhouse gas emissions supports policies and actions that can most effectively reduce emissions while also achieving other City goals.

This report presents the GHG emissions inventoried from municipal operations as well as from activities of the community as a whole for fiscal year 2016 (October 2015 – September 2016). The community inventory includes emissions generated from municipal operations. Consistent with recommended protocols, both the municipal and community inventories include Scope 1 (direct emissions from combustion or organic material decomposition) and Scope 2 (indirect emissions over which an entity has direct control, such as electricity consumption). Scope 3 (out of direct control of an entity) emissions are considered optional for reporting. Those Scope 3 emissions included here are for informational purposes, and are excluded from GHG emission totals.

Starting in 2016 the City of Denton committed to completing GHG inventories every year in order to accelerate its ability to support positive results and correct negative trends. Prior to this, reports were completed approximately every five years. Inventory reports for previous years can be found at www.sustainabledenton.com.

Greenhouse Gas Emissions: The Basics

Naturally occurring gases, called greenhouse gases (GHGs), help regulate the temperature of our planet in a phenomenon referred to as "the greenhouse effect." Modern human activities including the burning of fossil fuels, use of aerosols, clearing of land, and generation of solid waste, have increased greenhouse gases in the atmosphere.

"Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer) (USEPA-4)."

Over the past few decades, scientific and political concern has increased about the potential contribution of human-sourced GHG emissions to climate change. Potential outcomes include global warming and the associated environmental, economic, and social impacts. Expected human health impacts from global climate change include increased: heat-related illnesses, dangers from severe weather events, incidence of vector-borne disease, and illness associated with rising concentration of air and water pollutants.

“Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns (USEPA-4).” Climate change and global warming can be caused by natural processes or human activities.

Climate science is highly complex, and the state of knowledge about climate change is constantly evolving. The most widely cited source on the science of climate change is the Intergovernmental Panel on Climate Change (IPCC- <http://www.ipcc.ch/>). This international scientific body comprehensively reviews the scientific literature on climate change and publishes summaries of the latest findings. Due to the scope and complexity of their investigation, reports take six years to publish, with the most recent report (Fifth Assessment Report, AR5) published in 2014.

According to the IPCC:

1. “Warming of the climate system is unequivocal;”¹ and
2. “The IPCC is now 95 % certain that humans are the main cause of current global warming.”²

Additional information on GHG emissions and global climate change, including expected impacts, can be found on the following websites:

- National Oceanic and Atmospheric Administration (NOAA): <http://www.noaa.gov/>; or <http://www.climate.gov/>
- National Research Council of the National Academies, Climate Change and the National Academies: <http://nas-sites.org/americasclimatechoices/>
- Intergovernmental Panel on Climate Change (IPCC): <http://www.ipcc.ch/>

Software for Tracking Greenhouse Gas Emissions: ClearPath

Since 2006, the City has utilized software developed and endorsed by ICLEI Local Governments for Sustainability (ICLEI) and partners including the National Association of Clean Air Agencies (NACAA) and the U.S. Environmental Protection Agency (USEPA). The software has been updated over time to reflect current scientific understanding and to remain consistent with the latest inventory protocols. Since 2011, the City has used ICLEI’s web-based ClearPath software,

¹ IPCC AR5, SPM p 4

² IPCC AR5, SR p v

which allows for efficient protocol updates, technical support, and improved forecasting and planning strategies.

Data pertaining to energy use, fuel consumption, and waste is gathered from City departments, community agencies, and service providers and entered into the software to generate GHG inventories for both municipal operations and for the community activities. The software uses the latest methods and emissions factors to translate this data into equivalent CO₂ emissions. Equivalent CO₂, abbreviated as CO₂e, is the amount of CO₂ that would have the same, or equivalent, global warming potential as the actual mix of GHG emissions produced (e.g. CO₂, CH₄, N₂O, Fluorinated gases, etc.). The software is a tool for tracking GHG emissions; however, ***it is useful to think of the numbers generated as an estimate rather than an exact value.***

Updates for the 2016 Inventory:

Denton uses data and calculations specific to our city where possible, and seeks to apply these methods consistently over time. As the state of knowledge about climate change evolves, so do the protocols and methods for tracking emissions. This report reflects current GHG inventory protocols, as well as any pertinent updates and refinement of internal tracking methods, including:

- Emissions factors for the consumption of electricity were updated to reflect changes in regional energy sources and their associated GHG levels.
- The City began tracking and reporting on the consumption of compressed natural gas in our fleet vehicles.
- With the intention to enhance readability, the charts included in this report have been simplified compared to previous years by grouping similar emissions sources into broader categories. For a more detailed breakdown of emissions sources please refer to the Appendix.

Municipal Operations

Figure 1 summarizes the total annual GHG emissions in metric tons of Carbon Dioxide equivalents (CO₂e) from City of Denton municipal operations for each of our recorded inventory years. We report values using IPCC's 5th Assessment guidelines.

Figure 2 shows how these emissions from municipal operations break down as a metric of Denton's population so we can compare against other cities with similar serviceability. Considering the high rate of population growth in North Texas, a per capita metric is also important to incorporate into our internal comparative analysis to see how we are performing as a percentage of our resident base.

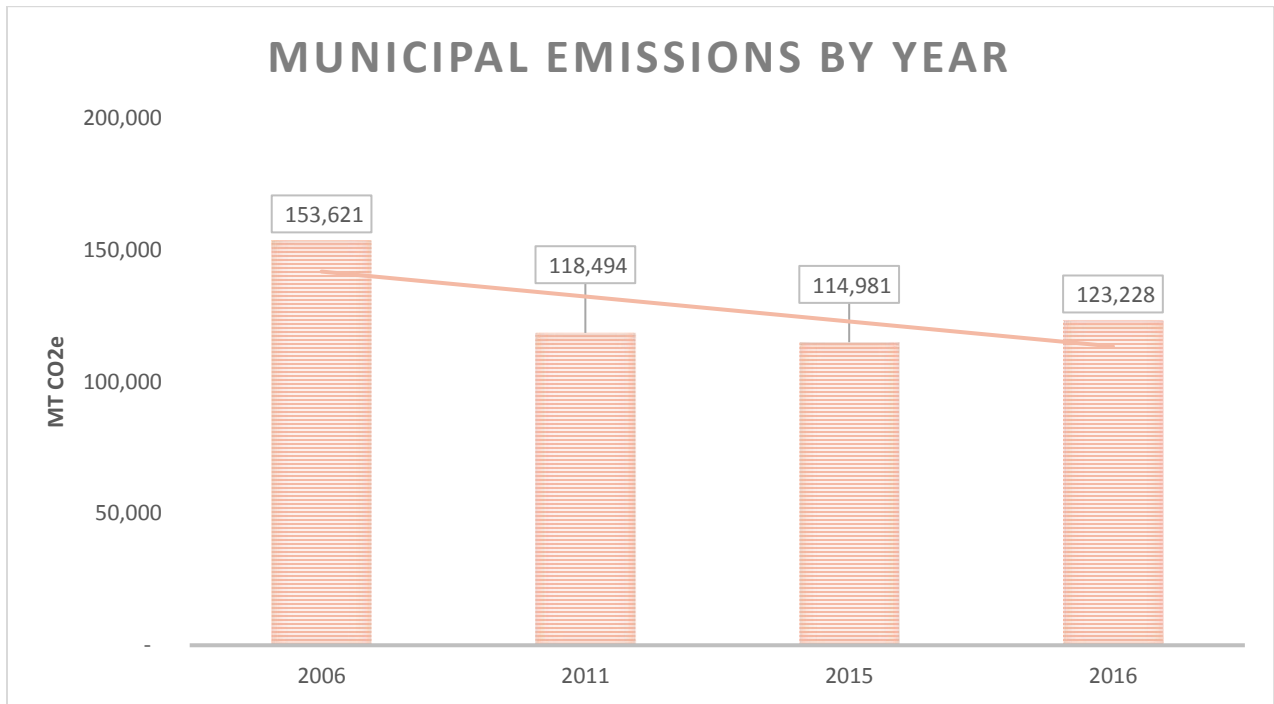


Figure 1

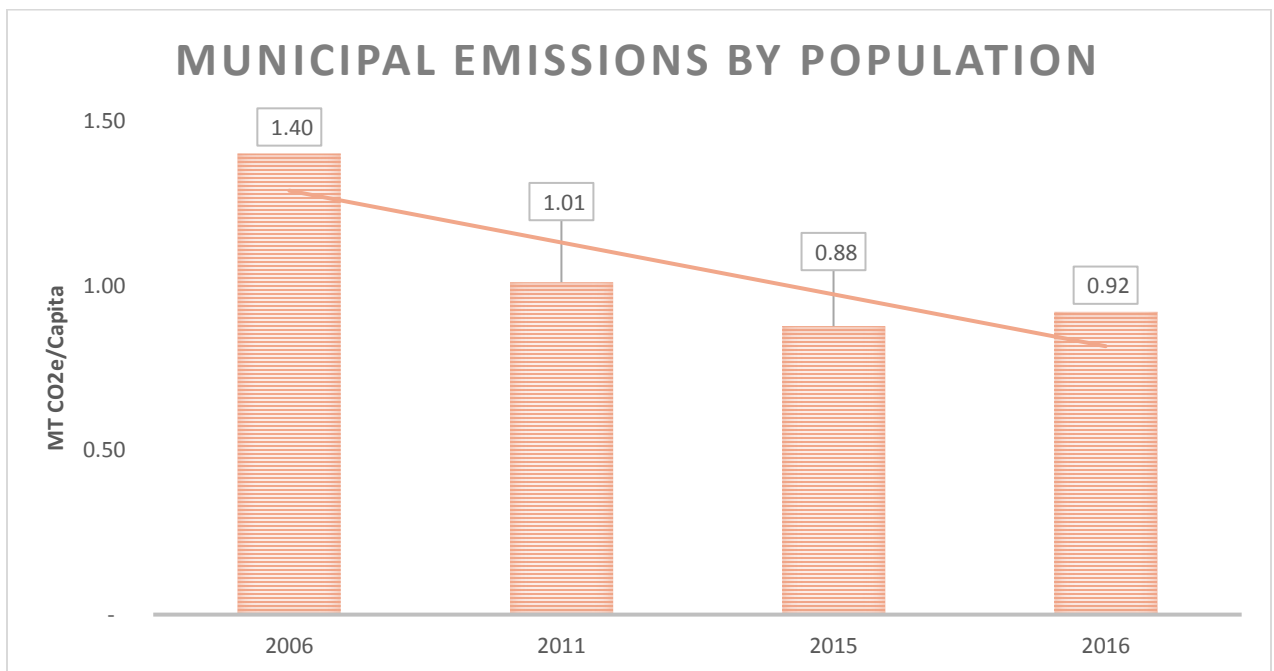


Figure 2

Figure 3 shows how emissions from municipal operations are distributed by source type. These sources include methane emissions from solid and liquid waste decomposition, electricity and natural gas emissions from direct consumption, transportation emissions, and transmission & distribution losses from our municipal utility operations. Understanding where GHG emissions are coming from helps the City determine areas to focus future policy and improvement projects to achieve long term GHG reduction goals.

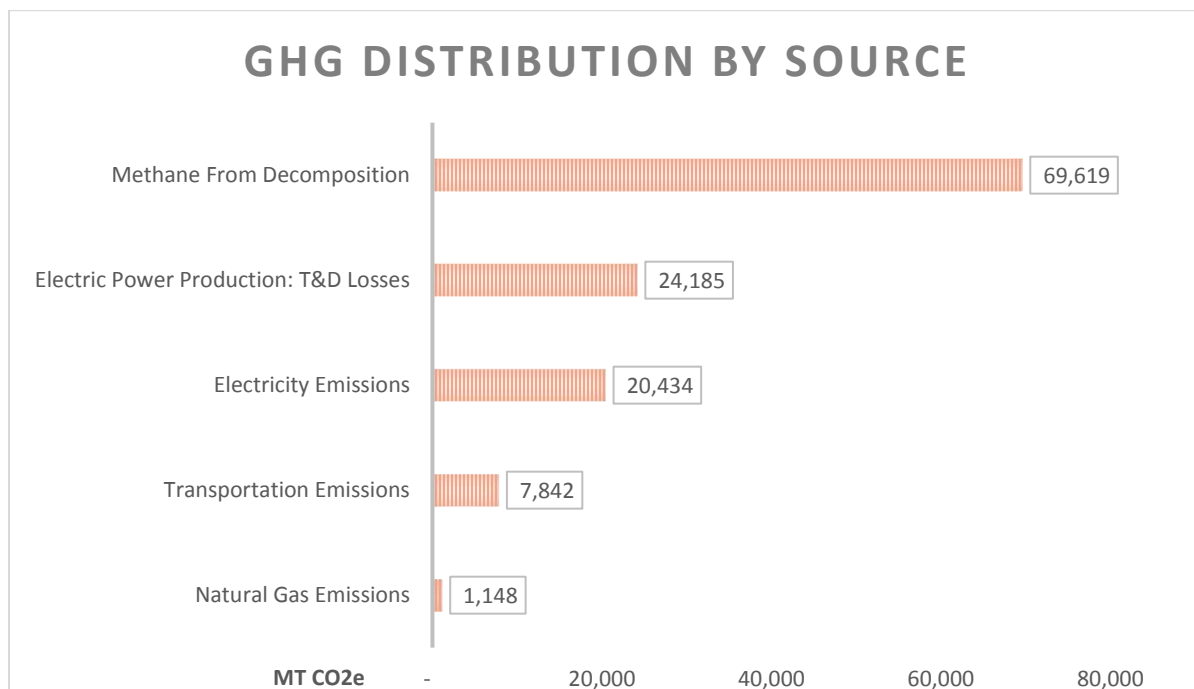


Figure 3 (for a more detailed breakdown of sources, please refer to the Appendix)

Observing long term trends in each of these source categories is an important component of our ongoing reporting and tracking efforts. The City continues to implement new programs and procedures that are helping to reduce our carbon footprint, so it is valuable to see how those efforts translate into tangible GHG reductions. To get a better sense of how each emission source is trending since our baseline year of 2006, **Figure 4** breaks down these changes year over year, while **Figure 5** shows the percentage changes over the base year.

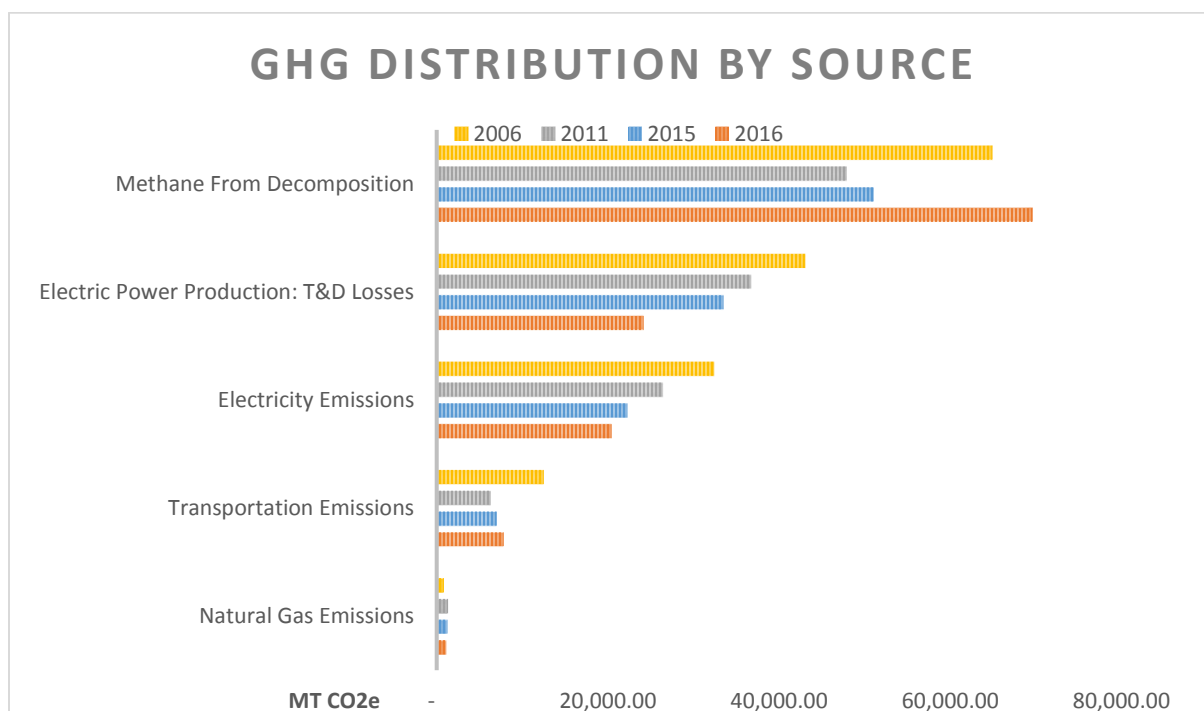


Figure 4

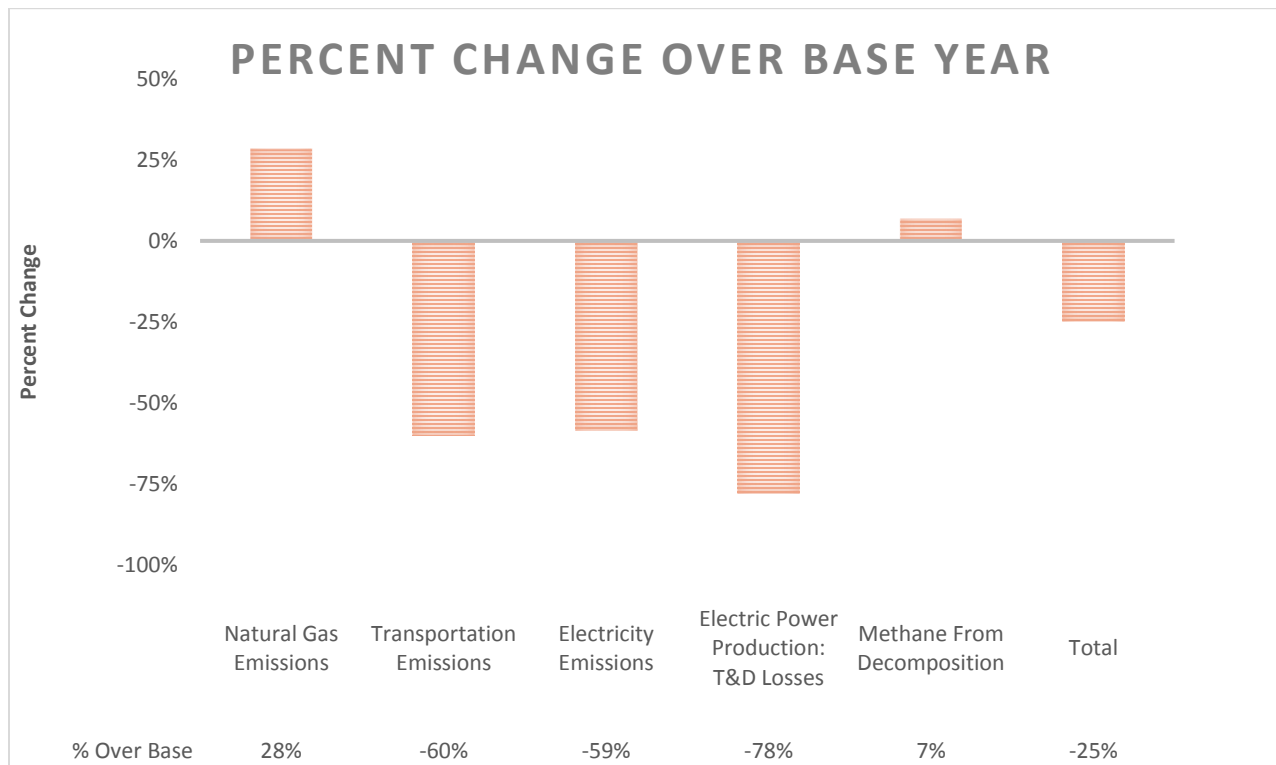


Figure 5

Highlights from Municipal Inventory:

The following highlights represent any major changes or trends in Denton's municipal scale GHG inventory for the year:

- Overall, the City of Denton has successfully decreased our total GHG emissions by 25% since 2006, the base year of reporting. During that same time, we have also decreased total GHG emissions per capita by 52%;
- Denton Municipal Electric is already recognized as a national leader in transmission and distribution efficiency. Their continued T&D efficiency efforts resulted in a net reduction of MWh losses by ~25% compared to 2015;
- Between the addition of 94 new fleet vehicles and the incorporation of compressed natural gas consumption into our inventory data, transportation emissions increased over 2015. Efforts however, to educate staff on efficient driving behaviors and fuel economy priority purchasing policies, have led to the decrease of emissions per vehicle by nearly 80% since 2006; and
- The amount of solid waste landfilled in Denton increased by 7% over last year due to a combination of population growth and higher rates of dumping from sources outside City limits. Simultaneously, we observed a 19% increase in landfill gas (LFG) volume. The combination of these additional sources resulted in a total emissions increase of 27% over 2015. The surge in LFG is not easily designated, but is likely the result of some ongoing management practices designed to expedite the decomposition process; including, but

not limited to, increased vacuum pressure, running the flair concurrently with the gas-to-electricity engine, and the integration of high nutrient liquids.

Moving Forward:

The following strategies will maximize our work to reduce GHG emissions from municipal operations:

- Continued increase of renewable energy resources in DME's fuel mix;
- Prioritizing energy tracking and targeted efficiency projects, including retrofits and new construction, at municipal buildings and water and wastewater operations;
- Continued efforts to promote community recycling and reduce organics disposal at the landfill; and
- Continued improvement of fleet efficiency, including increased percentage of low/no emissions vehicles.

Community Activities

Figure 6 summarizes the total annual GHG emissions in metric tons of Carbon Dioxide equivalents (CO₂e) for the entire Denton community, including municipal operations, over reporting years. **Figure 7** highlights how the Denton community compares to the national average when observing GHG emissions on a per capita basis.

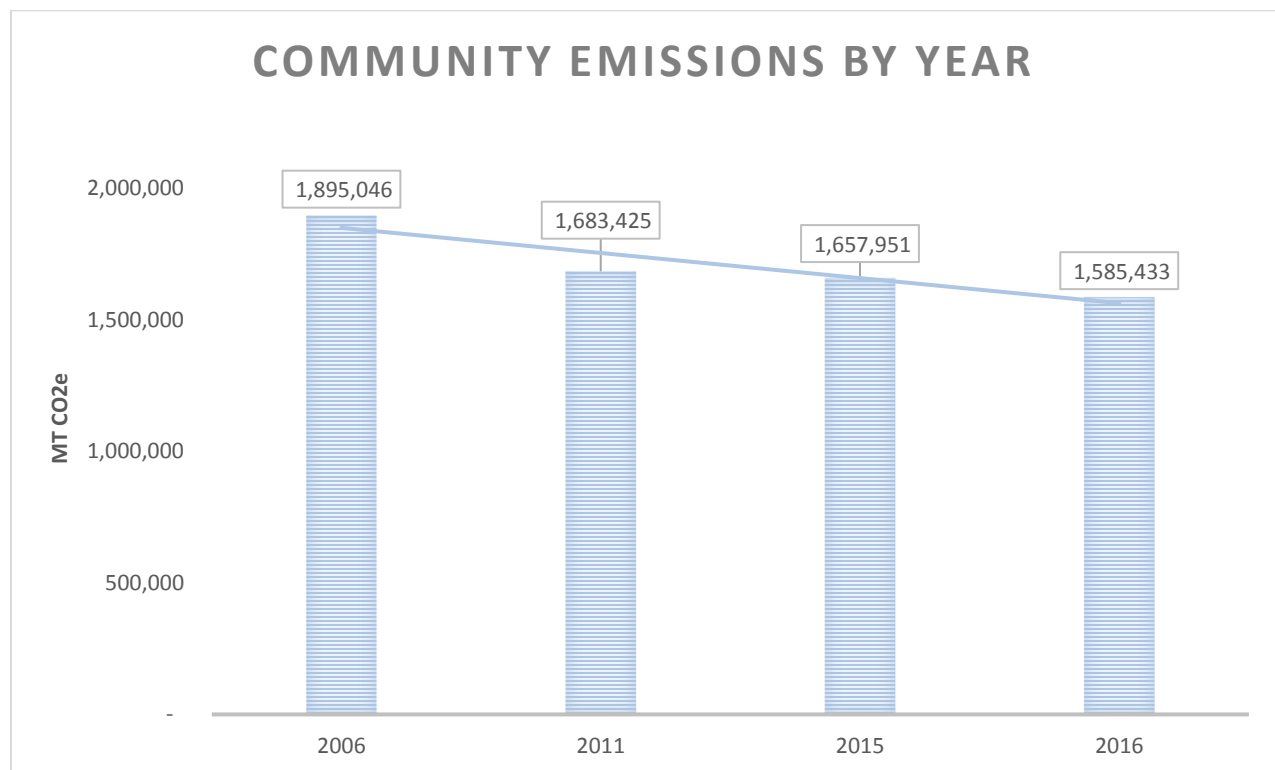


Figure 6

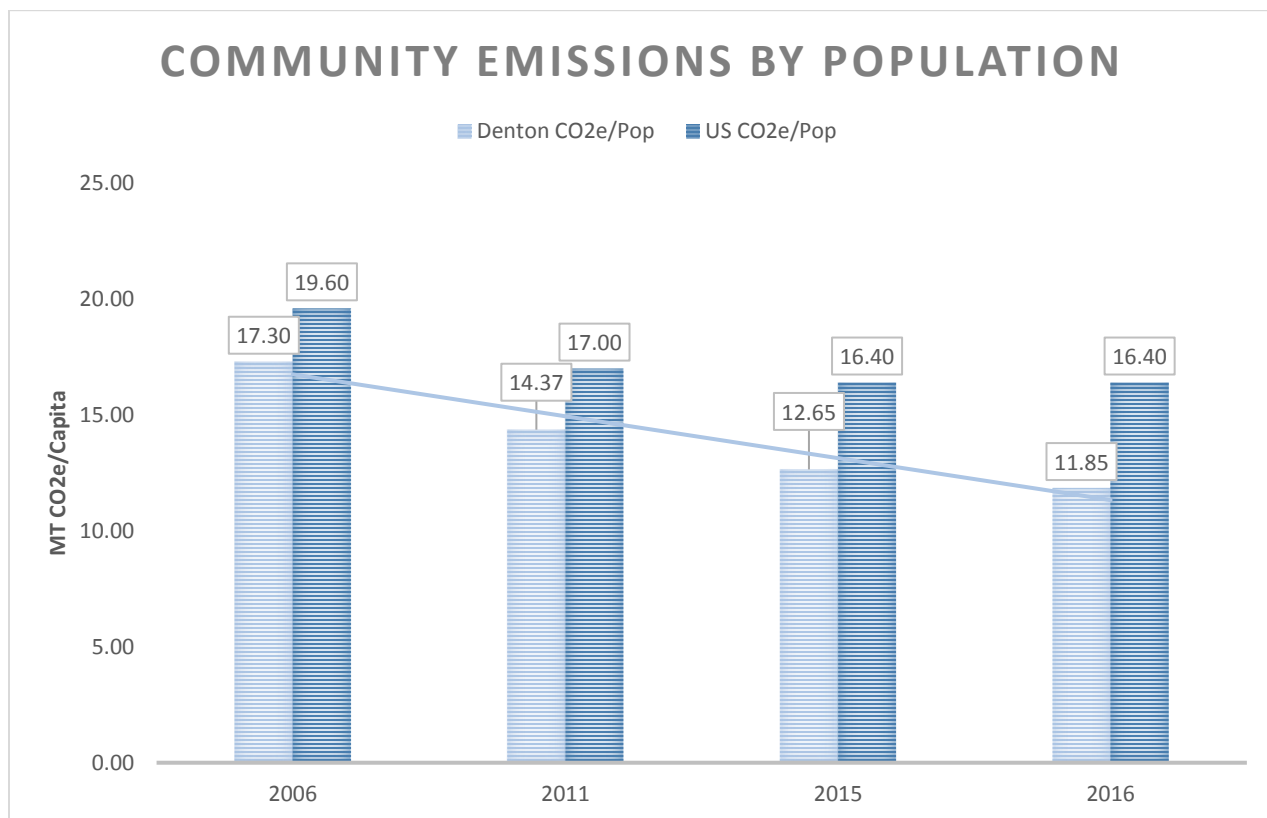


Figure 7

As we take a closer look at the numbers for this reporting year, **Figure 8** shows us how emissions from community activities are distributed by source type. These include transportation emissions, electricity and natural gas emissions from direct consumption, and methane emissions from decomposition. Understanding where GHG emissions in the community are coming from helps the City determine areas to focus future policy and improvement projects for long term GHG reduction goals.

Observing trends in each of these source categories is an important component of our ongoing reporting and tracking efforts. The City continues to implement new educational and outreach programs that are helping to reduce the community's carbon footprint, it is valuable to see how those efforts translate into tangible GHG reductions. To get a better sense of how each emission source is trending since our baseline year of 2006, **Figure 9** breaks down these changes year over year, while **Figure 10** shows the percentage changes over the base year.

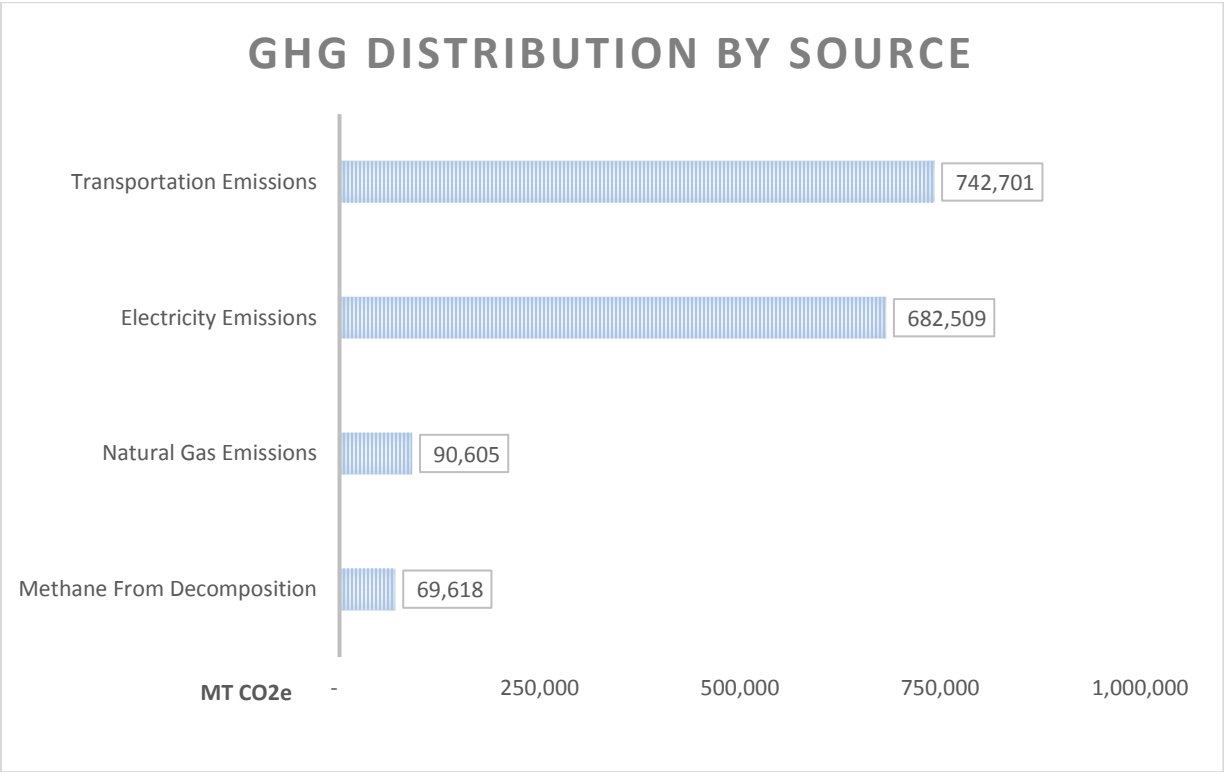


Figure 8

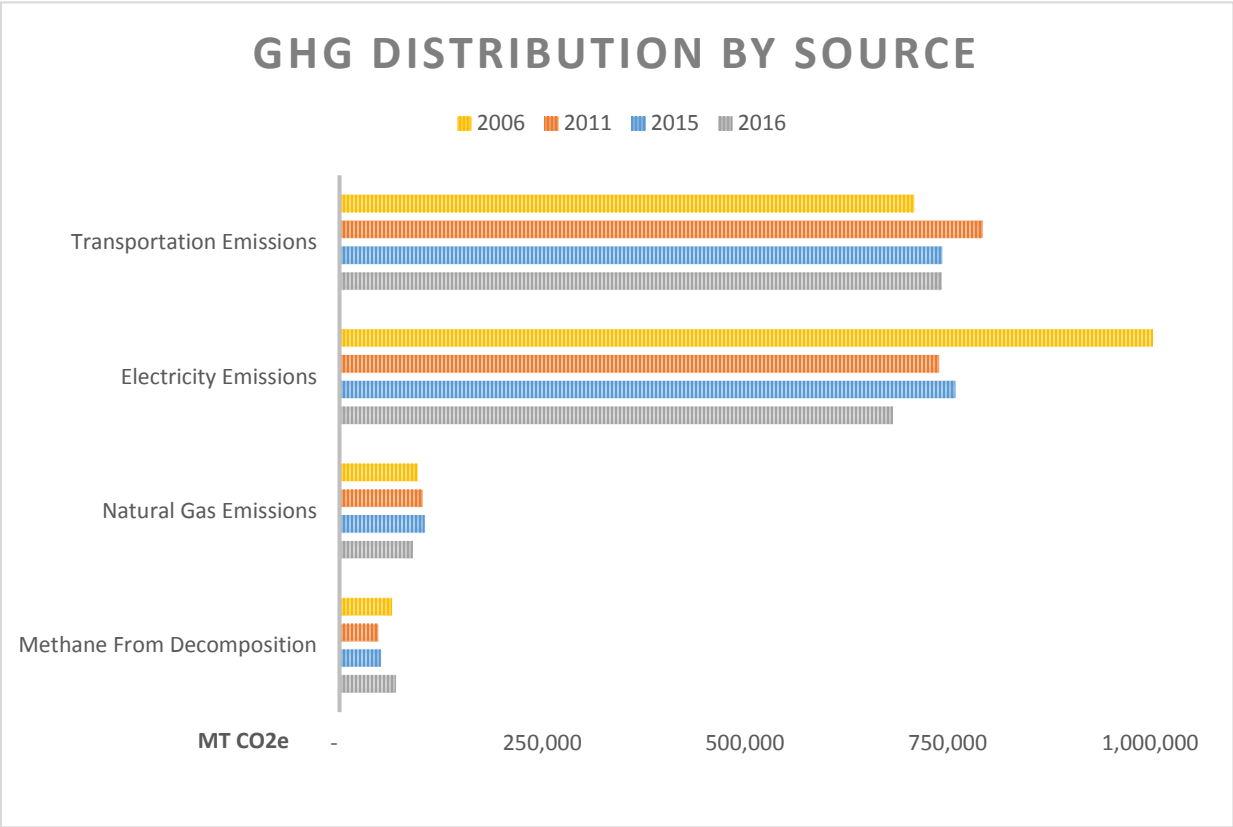


Figure 9

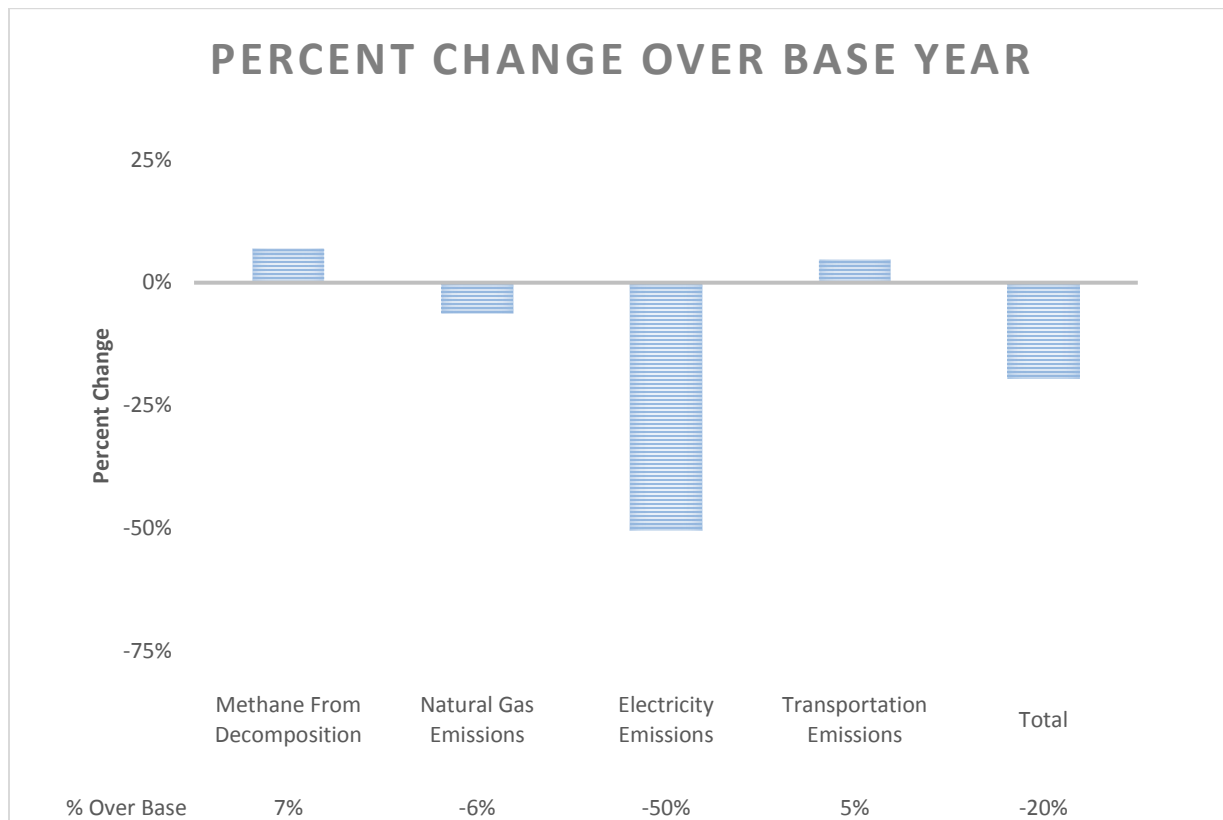


Figure 10

Highlights from Community Inventory:

The following highlights represent any major changes or trends in Denton's community scale GHG inventory for the year:

- Overall, the Denton community has successfully decreased our total GHG emissions by nearly 20% since 2006, the base year of reporting. During that same time, we have also decreased total GHG emissions per capita by 46%;
- Despite increasing availability of natural gas in North Texas and our ongoing population growth in Denton, the community successfully decreased associated emissions by nearly 16% over 2015. Supporting energy efficiency efforts through the Energy Code, DME's GreenSense Incentive Program and our Learn to Conserve workshop series are contributing forces to these positive results; and
- Emissions from the direct consumption of electricity continue to be the major driver for GHG reduction on the community level. Not only did Denton grow by an estimated 2.1%, but it managed to slightly reduce its total consumption of electricity over last year. Additionally, Denton Municipal Electric's (DME) commitment to transitioning to renewable energy and cleaner burning resources of generation led to the community's total electricity emissions being decreased by its largest percentage (11%) since DME made its major switch to purchasing 40% of its energy from wind sources.

Moving Forward:

The following strategies will maximize our work to reduce Community GHG emissions:

- Continued community education about ways to conserve energy, reduce waste and increase recycling, drive less, and choose efficient transportation options;
- Continued increase of renewable energy resources in DME's fuel mix;
- Continued support of energy audit and rebate program;
- Continued adoption of most recent energy efficiency codes;
- Continued development of alternative transportation options;
- Continued support of alternative fuel vehicle deployment; and
- Continued participation with State and regional partners on energy efficiency measures.

2016 GHG Inventory Summary

Though the City did observe its first increase in total GHG emissions on the municipal scale since our base reporting year, community activities continued to see steady decreases in its carbon footprint. To offer expanded clarification on some of the reasons for these increases, please consider the following summaries of key municipal and community sectors;

- **Landfill Emissions** – The City's landfill has often been recognized nationally as a leader for its innovative solutions in solid waste management. Many of these associated practices have intentionally been designed to increase the methane production of the landfill, thus resulting in greater GHG emissions included in this report. It's important to understand that in the solid waste industry, higher amounts of methane production is considered a good thing because it typically correlates with materials in the landfill breaking down more rapidly. Methane at the landfill is captured and then either turned into energy for the electric grid or flared so the methane is destroyed and less powerful greenhouse gases are emitted.
- **Transportation Emissions** – Denton's increasing population means that the City has had to expand its civil services, namely Fire and Police. The fleet department made some significant investments in additional fleet vehicles in 2016 to respond to these changes and prepare for future demand. In addition to this increase in our total fleet size, the City expanded its use of compressed natural gas among its Solid Waste inventory due to purchases of these alternative fuel vehicles in previous years.

As a full-service municipality, many operational efficiencies and emissions reductions achieved through projects such as municipal energy efficiency retrofits, purchase of wind energy, and the landfill methane-to-energy project, translate into community-wide savings.

The City continues to track municipally generated emissions and has identified key areas to further reduce locally generated emissions, promoting several overlapping city goals for health, livability, environment, and economic development. These goals and plans will be further outlined in the City's Air Quality and GHG Action Plan, under development.

Residents seeking to reduce their carbon footprint can visit the City's Sustainability website, www.sustainabledenton.com, for a variety of resources. Energy audits and rebates provided by the City to its customers are an ideal tool to improve energy efficiency in homes and business. Public and alternative transportation information can also be found through this site.

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