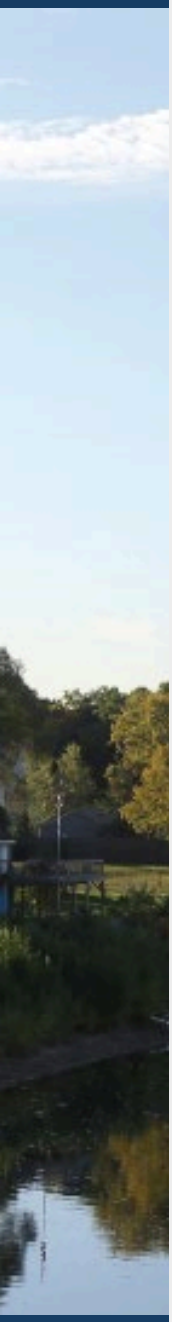
Hennepin County Greenhouse Gas Emissions Inventory and Analysis

2006-2020



Prepared by:
Becky Alexander, LHB
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Background

In 2007 the Hennepin County Board of Commissioners adopted the Cool Counties Initiative, pledging to inventory the county's greenhouse gas (GHG) emissions, commit to reduction goals, and take climate action. To support this, the county developed an inventory of GHG emissions from county residents, businesses, and organizations for the years 2006 through 2012. In 2020, this inventory was updated to include additional years and was used to inform Hennepin County's Climate Action Plan (May 2021) and revised GHG reduction goals. Since then, 2020 data has also been collected. This report provides a high-level overview of GHG emissions trends since 2006, including an analysis of the key drivers of change across this time period.

Greenhouse Gas Emissions Summary

Countywide GHG emissions for 2006 through 2020 have been calculated in accordance with the *U.S. Community Protocol* developed by ICLEI.[1] They include electricity and natural gas use, vehicle travel, and waste and wastewater generated within county boundaries. In 2020, 64% of countywide emissions was from building energy use, 33% from travel, and 3% from waste and wastewater management (Figure 1).

Figure 1. Hennepin County 2020 GHG breakdown by activity, fuel type, and sector.

Hennepin County's emissions decreased 13% from 2006 to 2019 and an additional 19% from 2019 to 2020 (Figure 2). The Drivers of Change section below quantifies the reasons for this decrease. Due to the impacts of the COVID-19 pandemic, data from 2020 is considered an anomaly that is discussed separately from 2006-2019 trends.

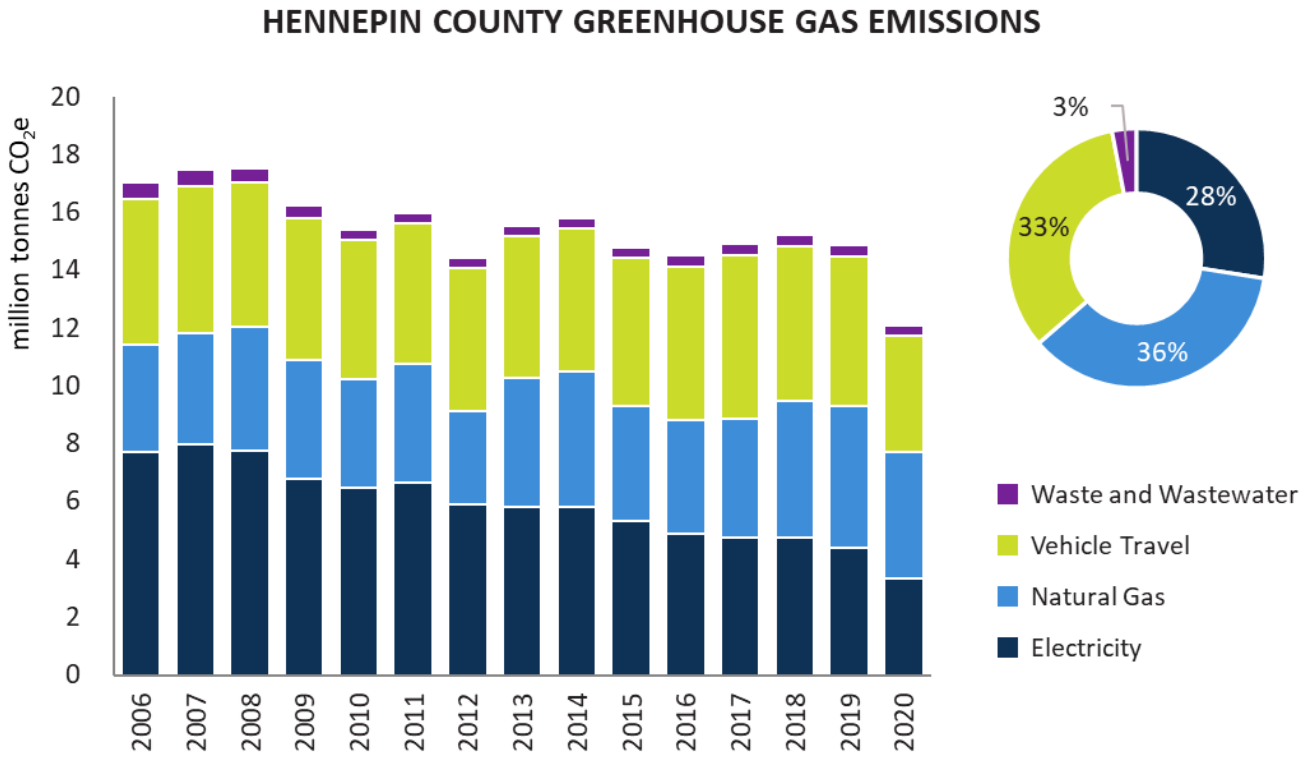

Figure 2. Hennepin County greenhouse gas emissions by activity from 2006-2020 (left) and 2020 breakdown by activity (right).

ENERGY

Buildings generate GHG emissions by using electricity and natural gas. Electricity accounted for 27% and natural gas accounted for 36% of the community's emissions in 2020 (Figure 1).

Electricity is commonly used to power lighting, air conditioning, appliances, and water heating. Countywide electric usage data was collected from the county's two largest utility providers, Xcel Energy and Wright-Hennepin, broken down between residential and commercial/industrial users.[2] Each utility also provided annual emissions factors (tonnes of CO2e per kilowatt-hour of electricity), which account for the different sources of energy used to generate electricity.[3]

Despite significant growth in both population and economic activity, **overall electricity use** decreased 15% from 2006 to 2020, with even steeper reductions occurring in the commercial/industrial sector (Figure 3). Much of this drop is due to energy efficiency, with utility conservation programs recording significant savings.[4] With cleaner electricity provided by the electric utilities, **electricity emissions** decreased 57% from 2006 to 2020 (Figure 4).[5]

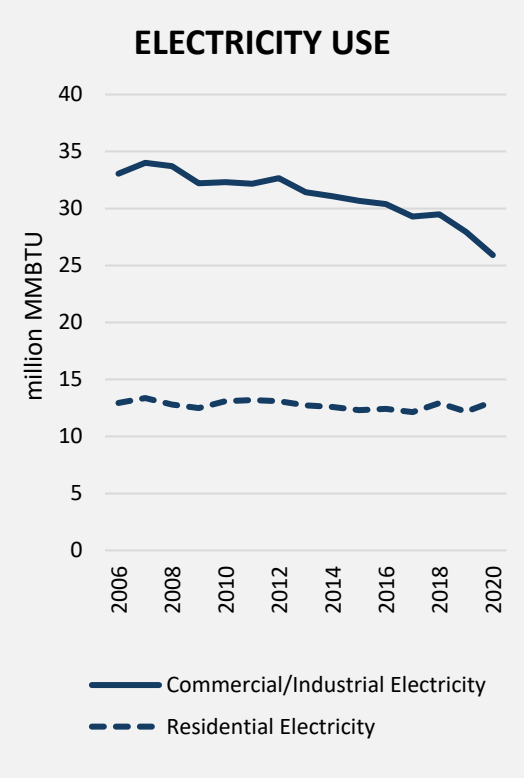

Figure 3. Hennepin County electricity use by sector for 2006-2020. Commercial/industrial electricity use decreased 22% from 2006 to 2020, while residential electricity use increased 1%.

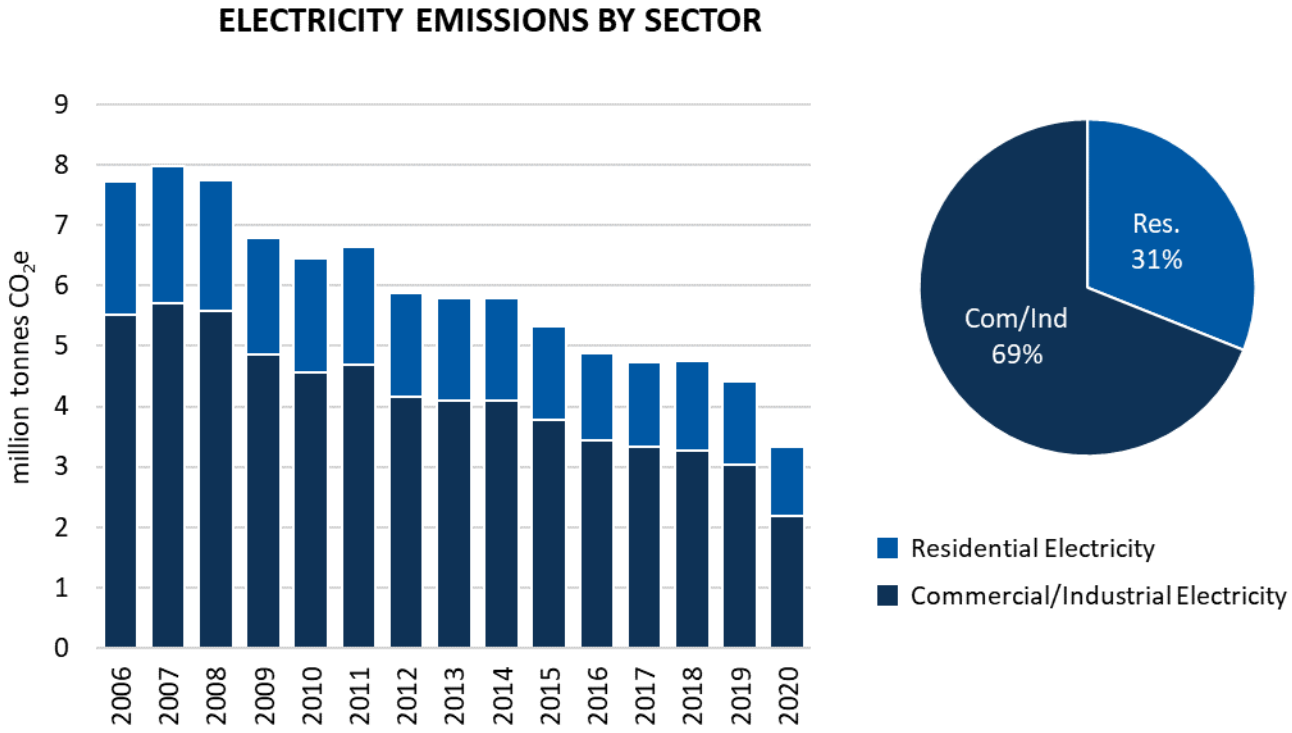

Figure 4. Hennepin County electricity emissions by sector for 2006-2020 (left) and 2020 breakdown by sector (right).

Natural gas is commonly used for space heating, water heating, and cooking appliances, as well as for some types of commercial equipment. Usage data was provided by the county's natural gas utility provider, CenterPoint Energy.

About 2% of Hennepin County's homes use propane or fuel oil for space heating – estimates for these fuels are included in the totals shown here.[6] The use of these types of fuels in commercial and industrial buildings and processes has been determined to have a minimal impact on the countywide total and has been excluded from this analysis.[7] Unlike electricity, natural gas and other stationary fuel emissions factors do not change over time.

Natural gas use and emissions varied over the study period but are generally increasing (Figure 5). In 2020, natural gas use and emissions were 18% higher than in 2006 (Figure 6). While short-term variations are strongly correlated with weather trends, the gradual increase over time reflects countywide population and economic growth.[8] Unlike with electricity, there is not evidence of significant natural gas reductions being achieved through energy efficiency efforts.

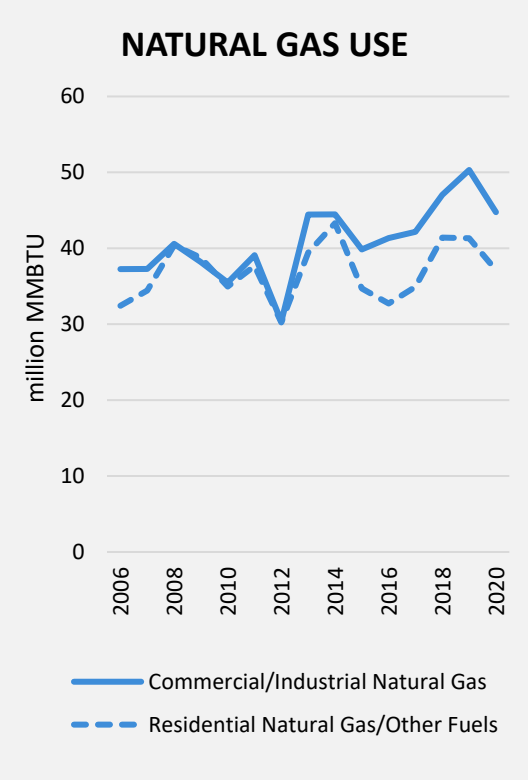

Figure 5. Hennepin County natural gas use by sector for 2006-2020.

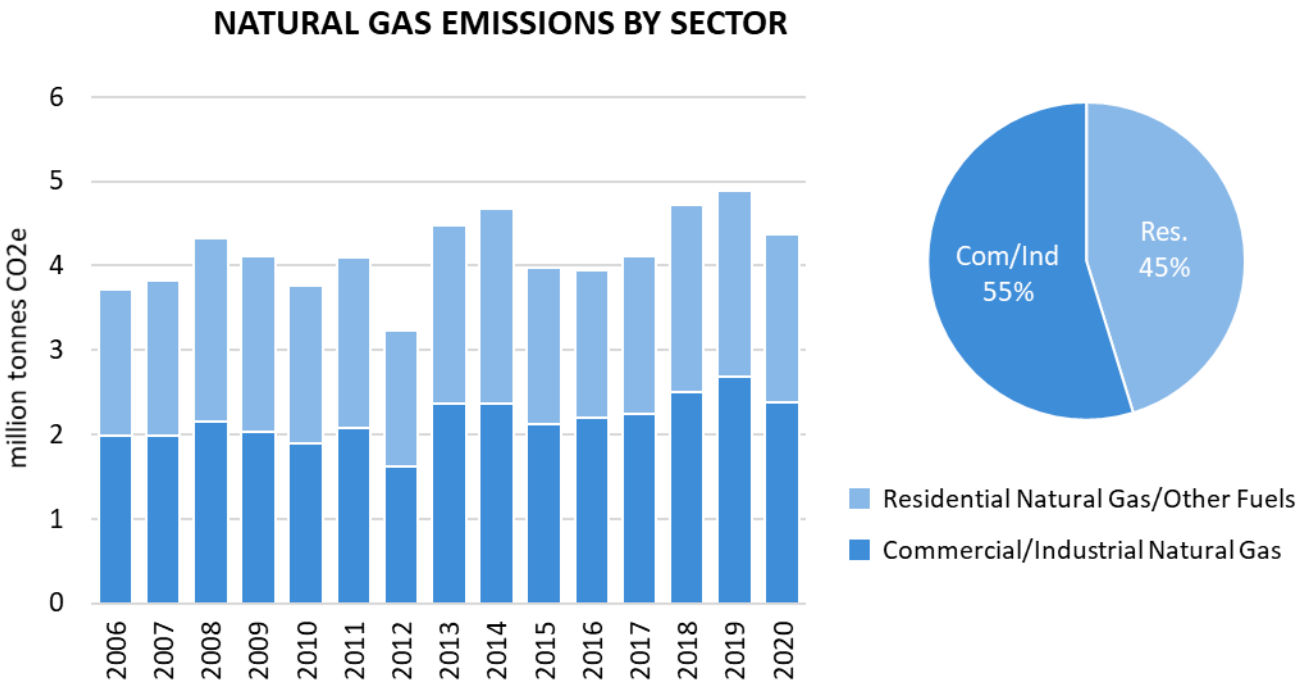

Figure 6. Hennepin County natural gas emissions by sector for 2006-2020 (left) and 2020 breakdown by sector (right).

Emissions from building energy use can also be broken out between residential and commercial/industrial uses. Residential users include single-family homes, townhomes, and duplexes. Commercial/industrial includes non-residential energy users, such as businesses, industries, and institutions.[9] Commercial and industrial buildings accounted for 38% of 2020 emissions, while residential buildings were responsible for 26% (Figure 1).

Due primarily to an increase in economic activity as well as weather changes, **commercial/industrial energy use** increased by 11% from 2006 to 2019. It dropped 10% in 2020, likely due to a combination of a warmer winter and the impacts of the COVID-19 pandemic. With increasingly cleaner electricity generation, **commercial/industrial emissions** decreased 39% from 2006 to 2020.

Due primarily to population growth and weather changes, **residential energy use** increased 11% from 2006 to 2020. **Residential emissions** decreased 20% from 2006 to 2020, again due to cleaner electricity generation.

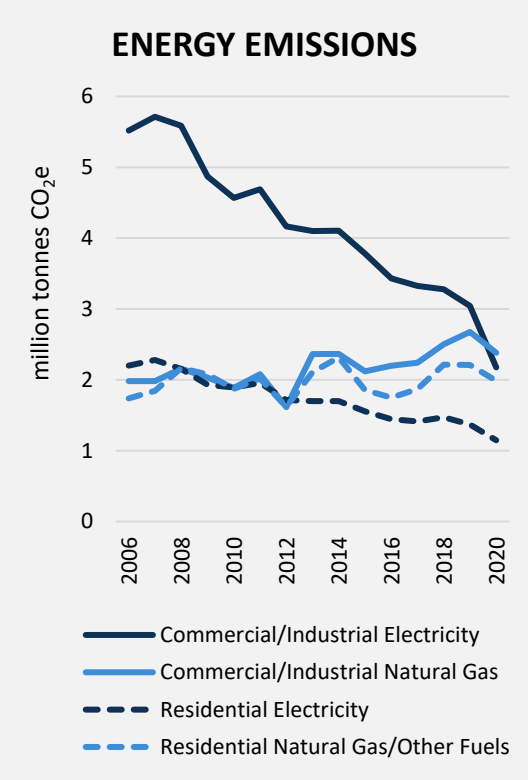

Figure 7. Hennepin County building energy emissions by sector and fuel type for 2006-2020.

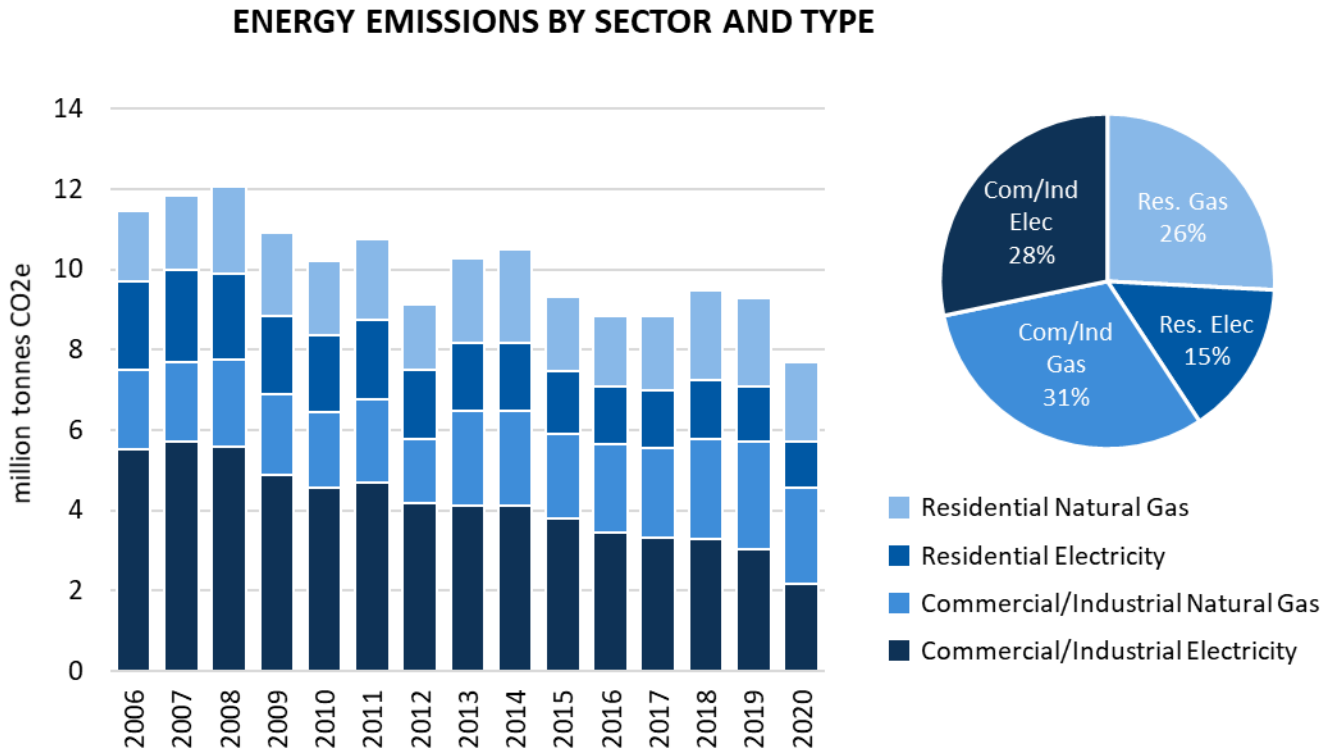

Figure 8. Hennepin County building energy emissions by sector/fuel type for 2006-2020 (left) and 2020 breakdown by sector/fuel type (right).

TRAVEL

Hennepin County's travel emissions account for vehicle miles traveled (VMT) within county boundaries, regardless of where each trip started or ended. Travel accounted for 33% of countywide emissions in 2020 (Figure 1).

Vehicles with internal combustion engines emit GHGs from their tailpipes while in use. Electric vehicles indirectly emit GHGs through the generation of electricity used to charge their batteries. Vehicle emissions depend on miles driven, fuel type, and fuel efficiency. County VMT data is available from MnDOT.[10] Emissions are estimated using statewide or national averages from ICLEI and the U.S. Federal Highway Administration for vehicle type breakdown, fuel breakdown, fuel economy, and emissions factors by fuel type.

While there was an 11% growth in population from 2006 to 2019, **VMT** only increased by 7%, meaning that there has been a reduction in travel per capita. VMT dropped by 19% in 2020 due to job loss, remote work/school, and other business and lifestyle changes caused by the pandemic (Figure 10). **Travel emissions** increased by 3% from 2006 to 2019, with some of the added emissions from increased VMT offset by better fuel economy. Emissions dropped 22% from 2019 to 2020 (Figure 9).

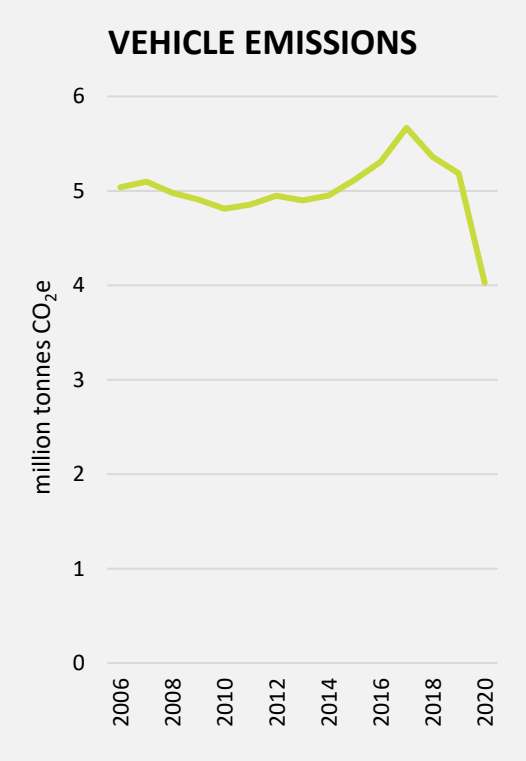

Figure 9. Hennepin County emissions from vehicle travel for 2006-2020.

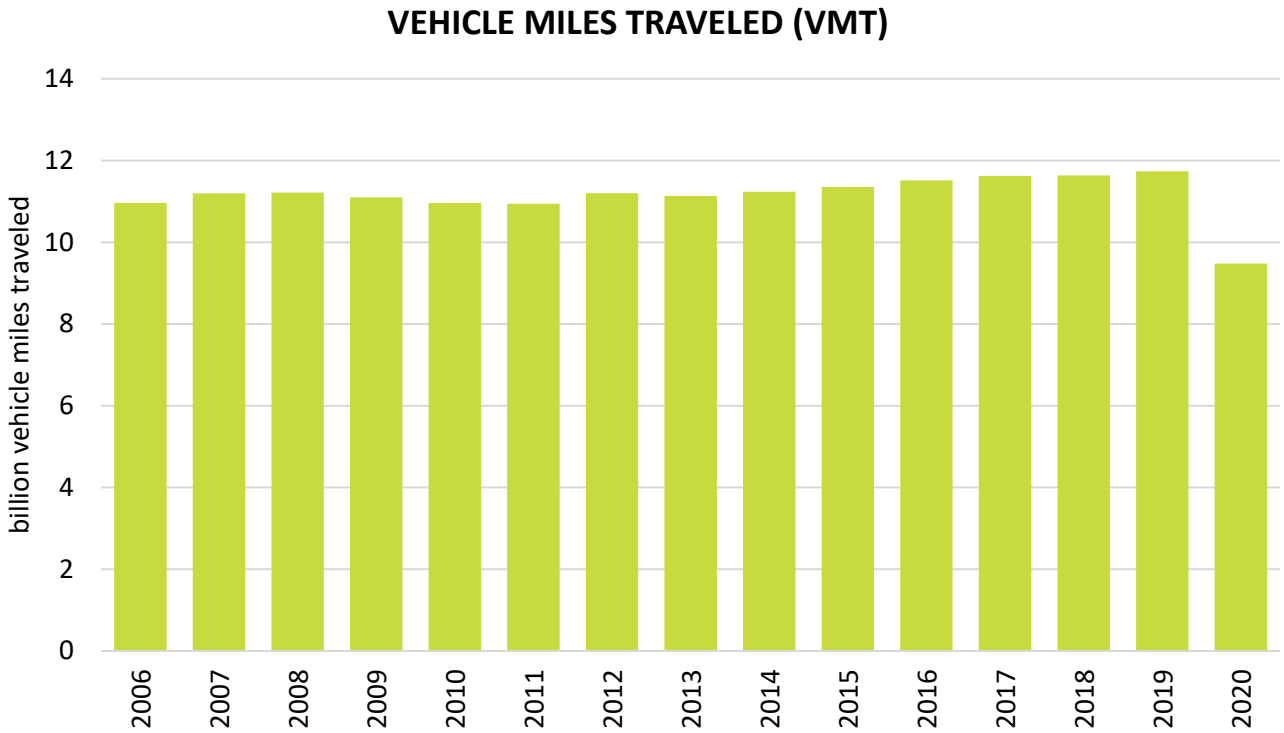

Figure 10. Hennepin County vehicle miles traveled for 2006-2020.

WASTE & WASTEWATER

The management of solid waste and wastewater generated in Hennepin County accounted for 3% of total emissions in 2020 (Figure 1).[11]

The amount of countywide **solid waste** sent to landfills and waste-to-energy facilities decreased 28% from 2006 to 2020 (Figure 12). The increase in recycling shown in Figure 12 is mostly due to reporting changes that allowed yard waste to be counted as recycling.

Waste and wastewater emissions decreased 32% from 2006 to 2020 (Figure 11). These changes are the result of how solid waste is managed – including variation in the amount of waste sent to out-of-state landfills without methane recovery – as well as system-wide reductions in emissions per gallon of wastewater treated by Metropolitan Council Environmental Services. In line with the U.S. Community Protocol, the waste emissions shown here do not account for offsets based on energy generated (e.g., steam and electricity from waste incineration or landfill gas recovery) and do not include biogenic emissions.

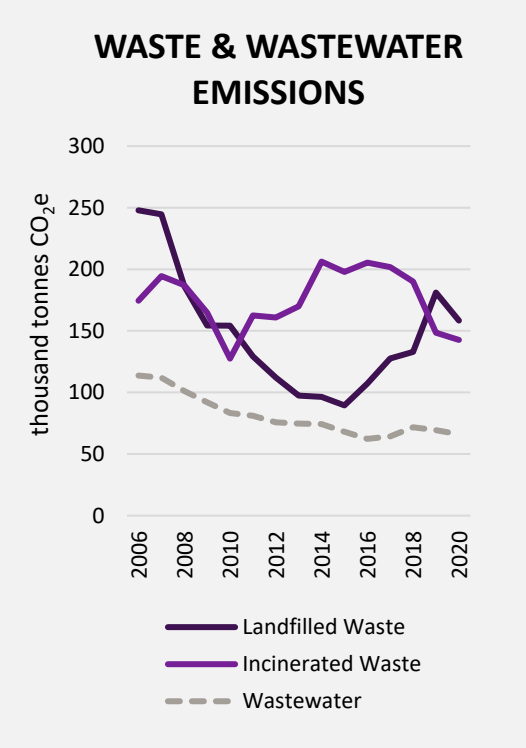

Figure 11. Hennepin County municipal solid waste and wastewater emissions for 2006-2020.

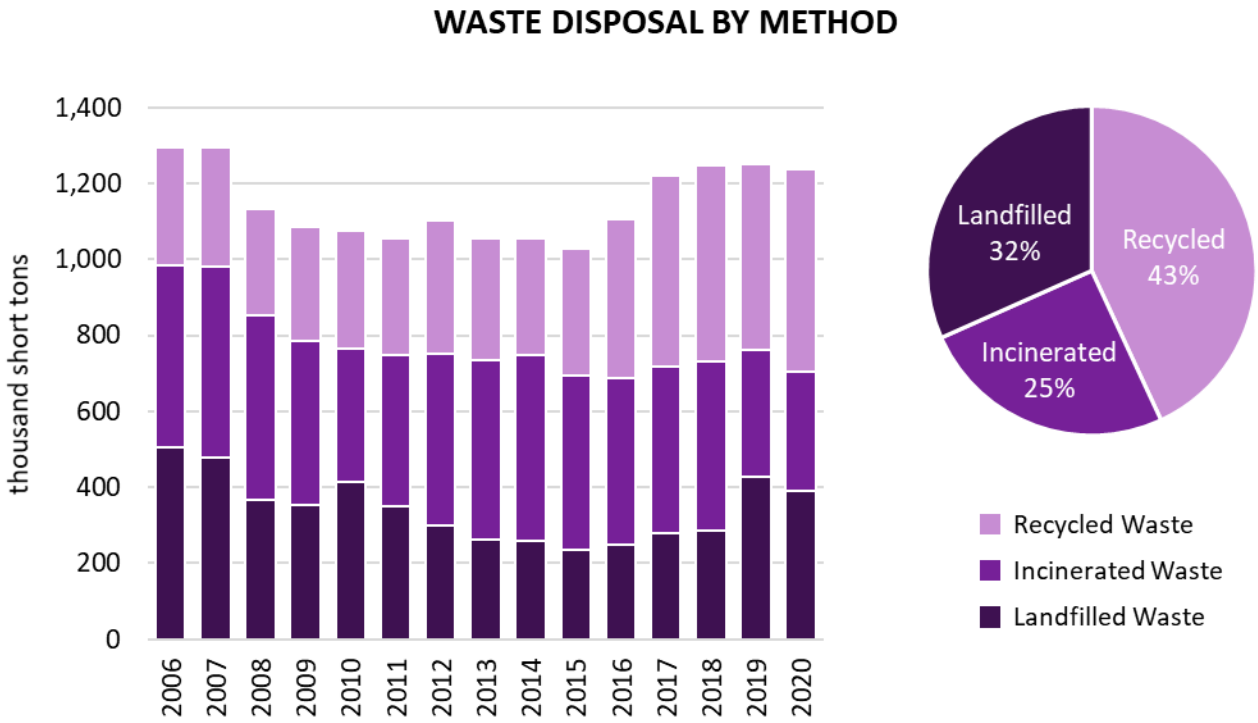

Figure 12. Hennepin County municipal solid waste generation by disposal method for 2006-2020 (left) and 2020 breakdown of total waste by disposal method (right). The reporting methodology has changed over time, making year-to-year comparisons more difficult. For example, in 2016 the MPCA changed requirements related to yard waste, recycling estimates, and hauler reporting.

Drivers of Change

Many factors impact countywide emissions, from growth and weather to emissions reduction programs. This analysis determines the biggest drivers of change from the baseline year of 2007 to the year 2019 using the "Greenhouse Gas Contribution Analysis" toolkit developed through the U.S. Department of Energy's Cities Leading through Energy Analysis and Planning (Cities-LEAP) program.[12]

Figure 13 shows the top reasons for increases and the top reasons for decreases in countywide greenhouse gas emissions. The primary reasons for increases are city growth and weather, while the primary reasons for decreases reflect policies, programs, cleaner electricity, and action at the federal, regional, and local scale.

While this analysis compares two specific years – 2007 and 2019 – many of the findings also hold true for other years. For example, population has steadily increased across the study period, and electricity efficiency and clean electricity have consistently driven down emissions. However, weather variations from year-to-year result in a less predictable pattern of natural gas use and associated emissions.

Top three reasons for increases:

1. Population growth increased residential energy use, vehicle travel, and waste.
2. Job growth increased commercial/industrial energy use.
3. A colder winter increased natural gas use across sectors.

Top three reasons for reductions:

1. Cleaner electricity supplied by Xcel Energy.
2. Electricity efficiency and conservation in commercial/ industrial buildings.
3. Less travel per person.

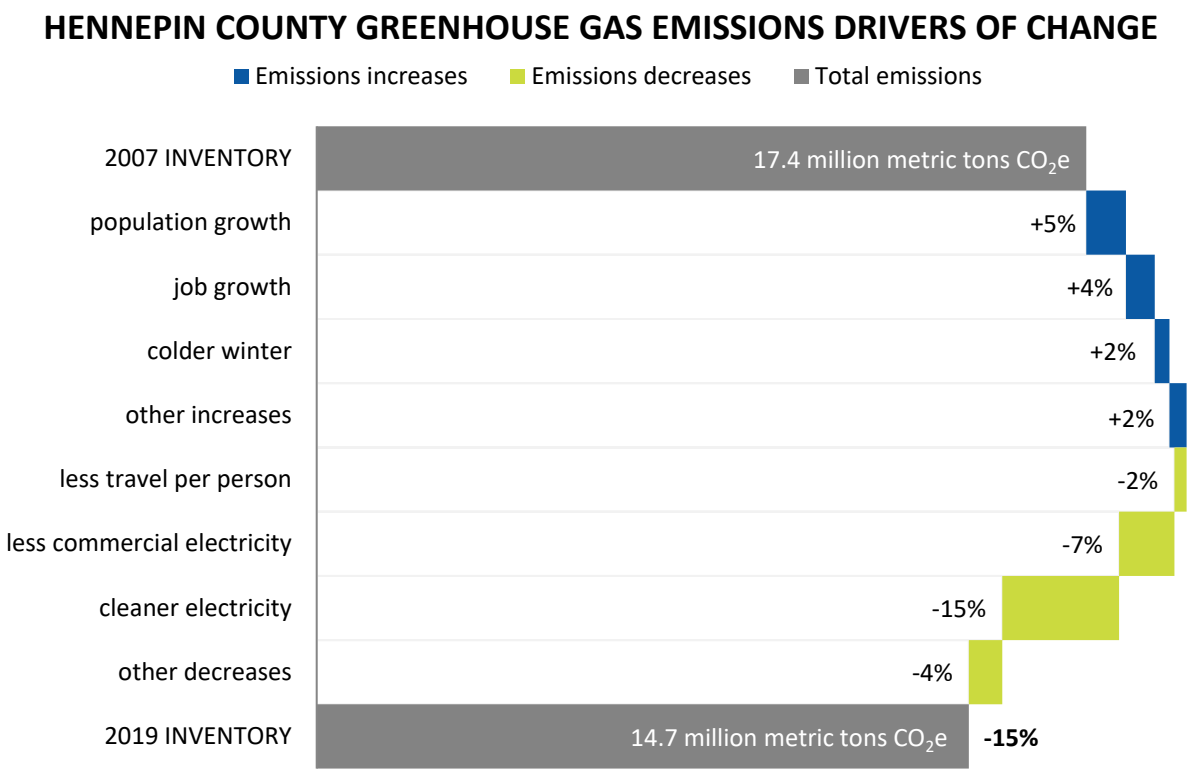

Figure 13. The biggest drivers of change in countywide emissions from 2007 to 2019 for Hennepin County.

Pathway to Net Zero Emissions

To align with the latest global scientific consensus, in 2021 the Hennepin County Board of Commissioners updated the county's GHG goals, now calling for a 45% reduction from 2010 levels by 2030 and to achieve net zero emissions by 2050. Previously – through its participation in the Cool Counties Initiative – the county was pursuing emissions reduction goals that aligned with Minnesota's Next Generation Energy Act of 2007, with targeted reductions of 15% by 2015, 30% by 2025, and 80% by 2050 from a 2005 baseline (Figure 14).

Hennepin County's Climate Action Plan (May 2021) identifies a pathway to meeting these goals through strategies including improving energy efficiency, transitioning to carbon-free energy sources, reducing embodied carbon in building materials, reducing vehicle travel, promoting electric vehicles, advancing zero waste goals, and sequestering carbon in public and private properties within the county.

Table 1. Hennepin County GHG Emissions Baseline and Goals (in million tonnes CO2e)

2010	2030	2050
15.4	8.5	0

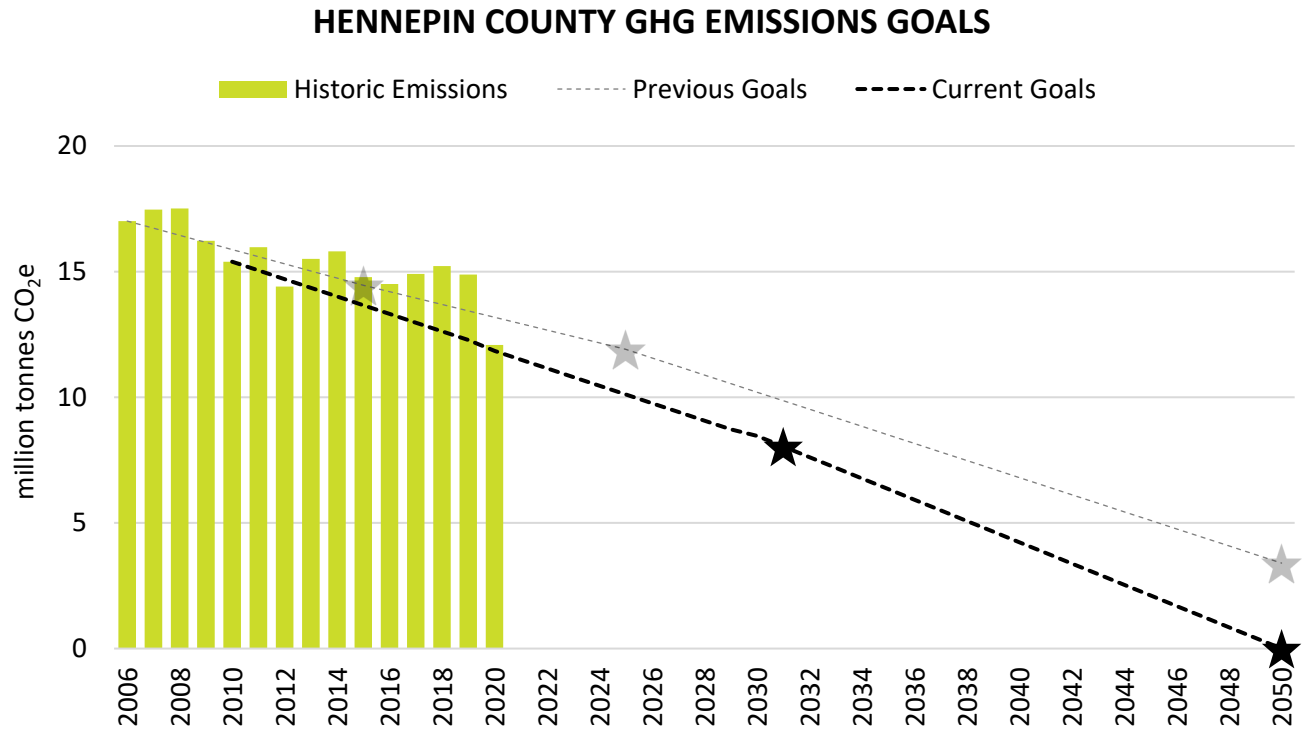

Figure 14. Hennepin County's 2006-2020 GHG emissions as compared to the county's previous and current GHG reduction goals.

Notes

[1] The *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* serves as a national standard to define which emissions sources and activities should be included in a community-wide inventory and provides methodologies to account for these emissions. This protocol reflects the sources and activities that local governments are best able to influence, including emissions that occur within the community's geographic boundaries (also known as Scope 1 emissions) as well as emissions occurring outside the community (also known as Scope 2 and Scope 3 emissions). The U.S. Community Protocol accounts for the six internationally recognized GHGs that directly impact the climate (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride). While these gases have different levels of heat-trapping potential, they are assessed using the common metric of carbon dioxide equivalents (CO2e).

Although 2005 is the baseline year referenced in Hennepin County's original GHG reduction goals (in alignment with the Cool Counties Initiative and Minnesota's Next Generation Energy Act), 2006 was chosen as the baseline for Hennepin County because data on the County's electricity and natural gas use were not consistently available for 2005.

[2] There are five electric utilities operating in Hennepin County: Xcel Energy, Wright-Hennepin Cooperative Electric Association, Connexus Energy, Minnesota Valley Electric Cooperative, and Anoka Municipal Utility. Xcel Energy provides over 95% of the electricity used in the county. Wright-Hennepin serves customers in western Hennepin County, accounting for approximately 4% of the county's total electricity. Anoka Municipal Utility, Connexus Energy, and Minnesota Valley Electric Cooperative each have small service areas within Hennepin County; Anoka in Champlin and Dayton, Connexus in Dayton and Maple Grove, and Minnesota Valley Electric Cooperative around Eden Prairie. Since all three utilities have small service areas within Hennepin County, the electricity provided by these utilities has been calculated to be a de minimis source of emissions - adding up to less than 1% of total electricity - and is therefore not included in this inventory.

[3] Per the U.S. Community Protocol, the electricity emissions factors used for these inventories exclude CO2 from biomass generation. Great River Energy (GRE) provides electricity to Wright-Hennepin Cooperative Electric Association. Though there is some variability in the electricity emissions factors of GRE's member distribution cooperatives due to renewable energy purchases and programs, GRE's system average is used here.

For Xcel Energy, 2019 and 2020 emissions factors are currently undergoing third-party verification and are subject to change when the verification is complete. As with GRE, these factors are system-wide averages that do not account for community-level differences in local renewable electricity generation or purchase through programs such as WindSource or Renewable*Connect. However, Hennepin County's current participation in these programs is low enough (ranging from 0.5% to 1.7% of total electricity use) that they would not make a noticeable difference in the results shown here. As these programs grow, a methodology may be needed to account for their impact while accurately reflecting renewable energy credit (REC) ownership (which is transferred to the consumer for some programs, but not others) and avoiding double-counting savings (as they are already accounted for in Xcel's system-wide average). Following the ICLEI Protocol, other market-based solutions such as REC purchases are also excluded from these inventories.

[4] The COVID-19 pandemic likely contributed to a small shift from the commercial to the residential sector in 2020 due to the transition to remote work.

[5] Xcel Energy reported a 51% drop and Great River Energy reported a 33% drop in emissions per kilowatt-hour of electricity over this time period. This includes a small impact from local investment in renewable electricity through utility programs; see Note 3 for more information about how these impacts are accounted for.

[6] U.S. Census Bureau, American Community Survey, "Hennepin County House Heating Fuel".

[7] Large users of on-site combustion fuels (e.g. propane, fuel oil, wood) are required to report their usage to the Minnesota Pollution Control Agency. An analysis of these users within Hennepin County from 2011-2020 show that they comprise 1%

or less of total commercial/industrial energy use and can therefore be considered *de minimis* and excluded from the inventory. Data from small users of these fuels is not reported, but is also assumed to be *de minimis* in Hennepin County.

[8] Around three-quarters of Hennepin County's residential natural gas and 60% of its commercial natural gas is estimated to be used for space heating.

[9] Energy used in multi-family residential buildings can fall into either category (residential or commercial), depending on whether there are energy meters for each unit (residential) or for the entire building (commercial). In practice, electricity is typically accounted for within the residential sector while natural gas is typically accounted for in the commercial sector.

[10] VMT data is not available for 2015 due to MnDOT migrating to a new tracking system. VMT was estimated for this year using the average VMT per capita from 2014 and 2016. Emissions were estimated using the average emissions per mile from 2014 and 2016.

[11] Emissions from managing municipal solid waste generated within county boundaries are determined based on the quantity of waste, waste composition (e.g. organics, plastics), and the method of disposal (e.g. landfill, incineration, recycling). In Minnesota, municipal solid waste data is tracked at the county level and reported annually to the Minnesota Pollution Control Agency. Emissions from waste incineration are reported by the Hennepin Energy Recovery Center. Landfill emissions are estimated and based on statewide averages for landfill composition and methane recovery rates. Per the U.S. Community Protocol, recycled waste is assigned zero emissions.

Emissions from metro area wastewater treatment are provided by Metropolitan Council Environmental Services. This includes emissions from building and process electricity use, wastewater effluent discharge, stationary fossil fuel combustion, process nitrification/denitrification, biosolids incineration, mobile fossil fuel combustion, and biogas combustion and leaks. Though both anthropogenic and biogenic emissions are calculated by MCES, only anthropogenic emissions are included here per the ICLEI U.S. Community Protocol. In order to best represent its regional approach to providing wastewater services, MCES does not allocate wastewater emissions to communities based on flows to specific treatment plants (which have varying levels of emissions per gallon treated), but rather uses a consistent emissions factor for the entire system.

[12] ICLEI's Contribution Analysis tool accounts for changes in population, employment, emissions factors, weather, and per capita GDP (for solid waste only). Due to data limitations, the impact of economic cycles on energy use and travel are not included. The weather analysis uses monthly energy data from Hennepin County from 2017-2019 to determine how weather-dependent the community's building stock is likely to be. This data is limited by the billing cycles of the utility companies, which don't align with calendar months. This may cause some imprecision in the weather normalization.

2007 was used as the baseline year rather than 2006 since natural gas data is not available for 2006 (the inventory estimates 2006 natural gas use based on weather, number of households, and GDP).