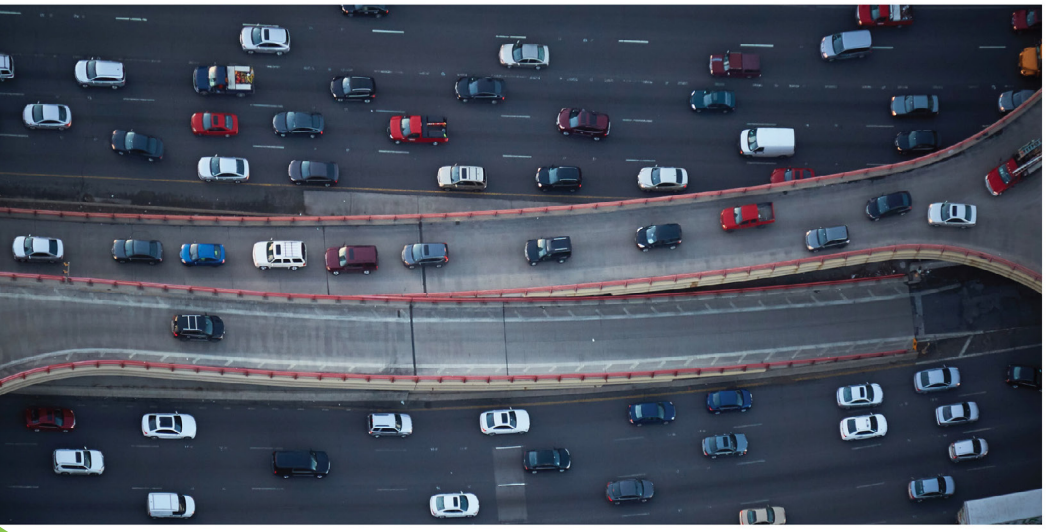


Regional greenhouse gas emissions inventory

Updated with 2019 data

Chicago Metropolitan Agency for Planning

ICF

Contents

Acknowledgments

The regional greenhouse gas emissions inventory was prepared by ICF for the Chicago Metropolitan Agency for Planning (CMAP). ICF and CMAP would like to thank everyone who provided data to support this effort, including the following organizations: Metropolitan Water Reclamation District, Commonwealth Edison, Nicor Gas, People's Gas, and Oak Ridge National Laboratory.

Introduction

Northeastern Illinois is working to reduce greenhouse gas (GHG) emissions and build resilient communities. ON TO 2050, the region's long-range comprehensive plan, recognizes the threat posed by climate change and includes climate resilience and emissions reduction goals to ensure the region remains a great place to live.

This inventory is an important part of that work. The regional inventory and accompanying local emissions summaries provide a snapshot of emissions in 2019 and serve as a foundation for developing emissions reduction plans and tracking progress towards long-term goals.

Inventory scope

This report provides a summary of GHG emissions for the seven-county region, which consists of Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will counties. The report also presents emissions separately for the City of Chicago, which is located almost entirely within Cook County.[1]

This report includes newly developed emission estimates for 2019 and updated emission estimates for 2010 and 2015 for the following three sectors: stationary energy, transportation, and waste. Emissions are presented for 2019 because they are more representative than 2020 of long-term trends in the region due to the COVID-19 pandemic. This inventory reflects emissions from the three most common human-generated GHG pollutants: carbon dioxide, methane, and nitrous oxide.

Emissions sources covered by this inventory report

Stationary energy

Emissions from grid-supplied electricity and the combustion of fuels such as natural gas in:

- residential buildings
- commercial and institutional buildings
- manufacturing industries
- energy industries (e.g., power plants and refineries)
- wastewater treatment plants

Fugitive emissions from:

- oil and natural gas systems

Transportation

Emissions from the combustion of fuels and grid-supplied electricity consumed by:

- on-road vehicles (e.g., passenger cars and trucks)
- railways
- intra-regional waterborne navigation
- aviation
- off-road vehicles including construction equipment

Waste

Emissions from the decomposition of waste that is generated in the region, including:

- disposal of solid waste in landfills
- biological treatment of waste (composting)
- wastewater treatment

[1] While a portion of O'Hare International Airport is located within DuPage County, for the purposes of this report, all landing and takeoff emissions associated with O'Hare are assumed to occur within Cook County.

Methodology overview

ICF developed this inventory for CMAP in compliance with the Global Protocol for Community-Scale Greenhouse Gas Inventories BASIC level requirements. The estimates were developed using the best available data and latest guidance for developing GHG inventories. Refer to the 2019 inventory methodology for more information about the methodology and data sources used to prepare the inventory.

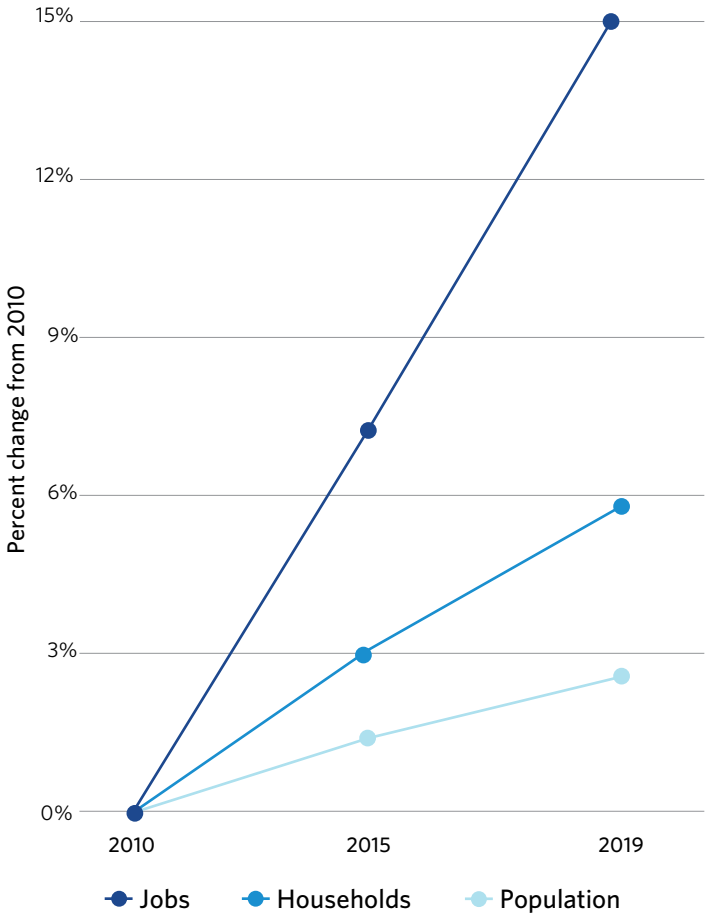
Note on the data

This inventory report uses data from 2019 instead of 2020. Due to dramatic changes in transportation emissions from the COVID-19 pandemic, 2019 data are more representative of long-term tends than 2020.

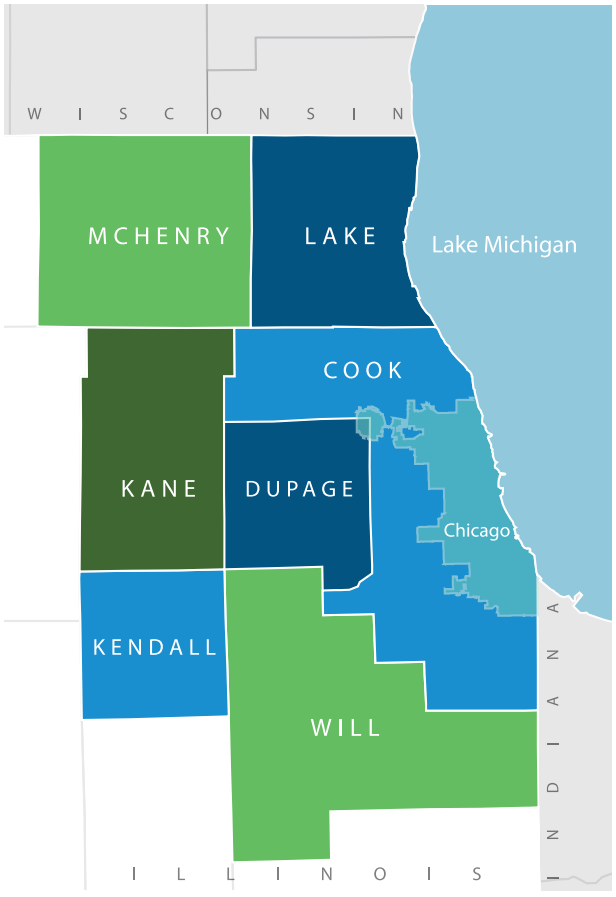
Regional overview

Northeastern Illinois has a land area of over 3,900 square miles and is divided into seven counties and 284 municipalities. Over half of the 8.6 million people that live in the region reside in Cook County, with almost a third residing in the City of Chicago. Between 2010 and 2019, the population in the region increased by about 2 percent. Over the same period, the number of households increased by 6 percent while the number of jobs increased by 15 percent. An increase in population and economic activity typically results in a greater demand for energy, which makes it harder to reduce emissions.

Northeastern Illinois socioeconomic trends



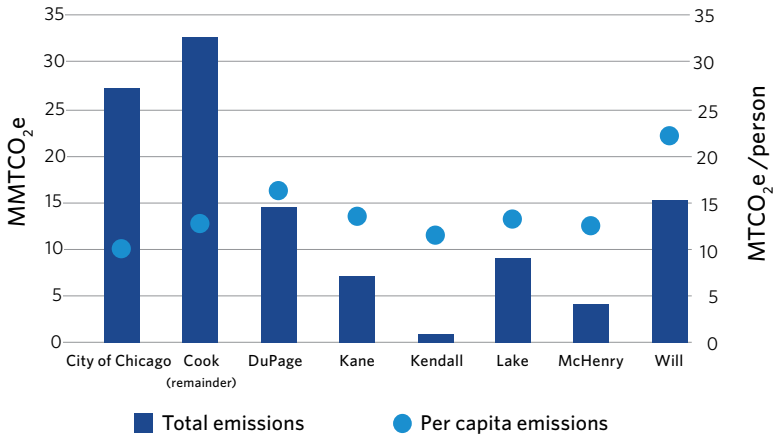
Map of northeastern Illinois



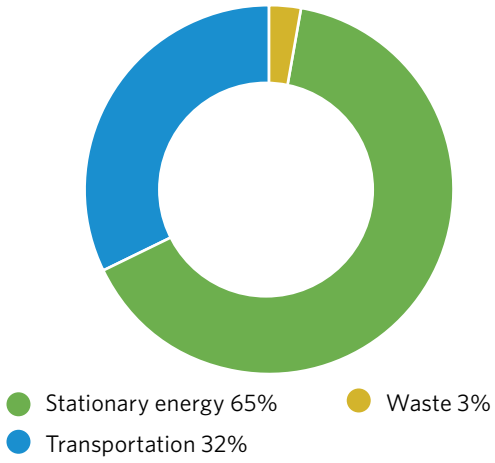
2019 emissions overview

In 2019, northeastern Illinois produced roughly 112 $MMTCO_2e$ of GHG emissions or 13.10 $MTCO_2e$ per person. Cook County, including the City of Chicago, accounted for more than half of the region's emissions, followed by Will County. Will County had the highest emissions per capita of any county while Kendall County had the lowest emissions per capita. Emissions from the stationary energy sector accounted for the largest portion of emissions from the region, followed by transportation and waste.

2019 emissions by county: total and per capita

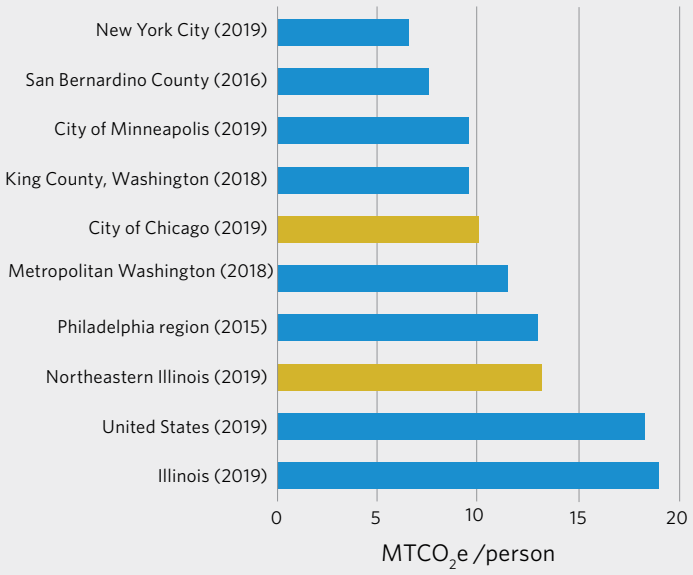


2019 regional emissions by sector

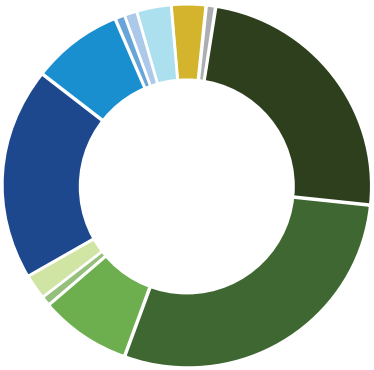


Emissions in context

Per capita emissions for other jurisdictions are provided for the purposes of comparison.



2019 regional emissions by subsector



- Residential buildings 24%
- Commercial & industrial buildings 29%
- Manufacturing 8%
- Energy industries 1%
- Fugitive emissions 2%
- On-road passenger 19%
- On-road commercial 8%
- Aviation 1%
- Railways 1%
- Off-road 3%
- Solid waste 3%
- Other 1%

Units and global warming potentials

Emissions in this report are presented in million metric tons of carbon dioxide equivalent ($MMTCO_2e$) that were calculated based on global warming potentials from the Intergovernmental Panel on Climate Change's Fifth Assessment Report.

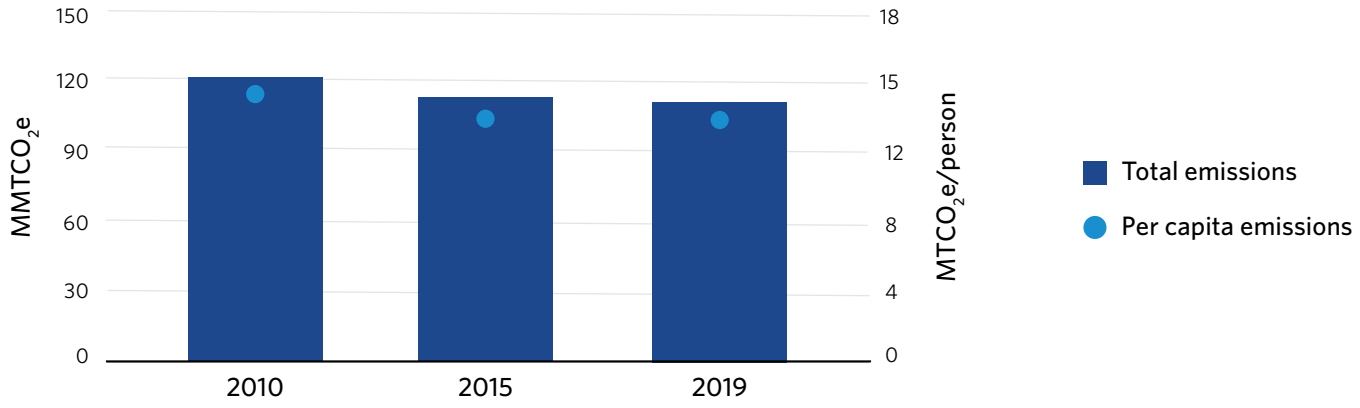
Emissions trends

Regional trends

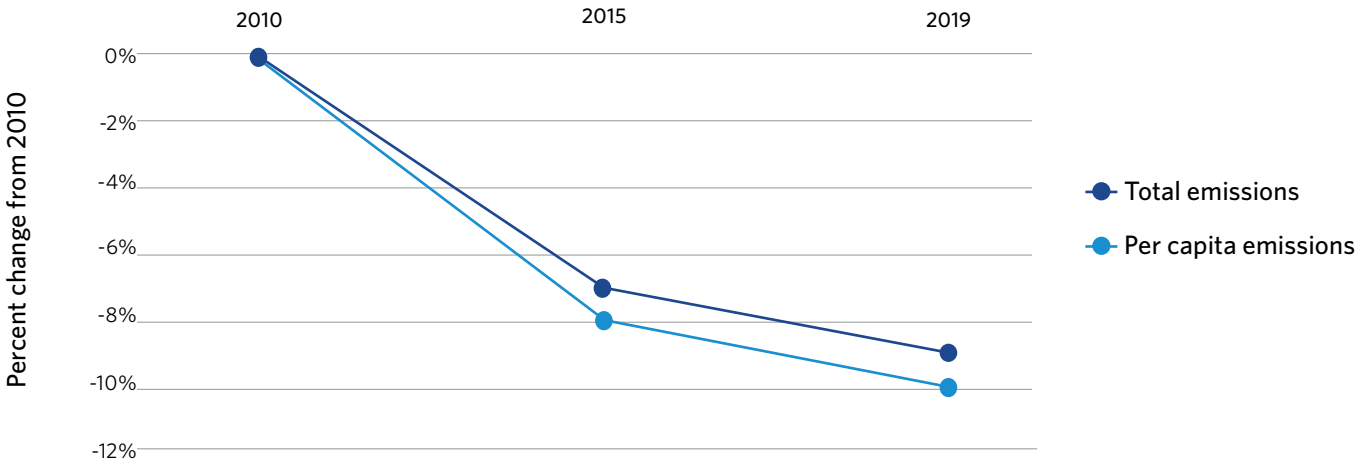
Between 2010 and 2019, regional emissions decreased by roughly 11 $MMTCO_2e$, or about 9 percent. During this period, per capita emissions also fell by nearly 10 percent. Both total emissions and per capita emissions decreased more significantly between 2010 and 2015 than 2015 and 2019, with total emissions and per capita emissions falling only 2 percent between 2015 and 2019.

The decrease in emissions between 2010 and 2019 was driven by a decrease in emissions from the stationary energy and waste sectors, which fell by 11 percent and 38 percent, respectively. These reductions were primarily due to a transition away from coal and an increase in methane capture at landfills. In contrast, emissions from the transportation sector increased by 2 percent between 2010 and 2019, due primarily to an increase in driving, both overall and per person.

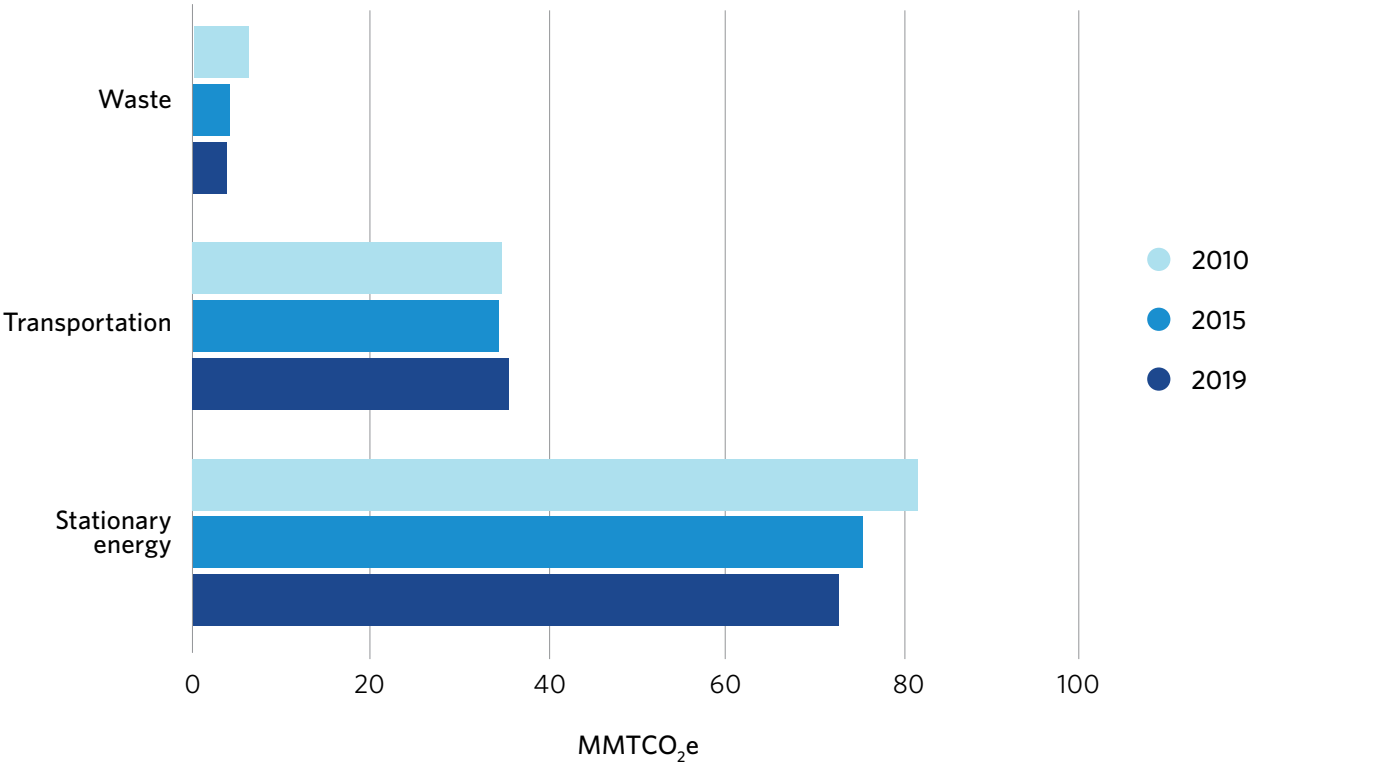
Regional emissions by year: total and per capita



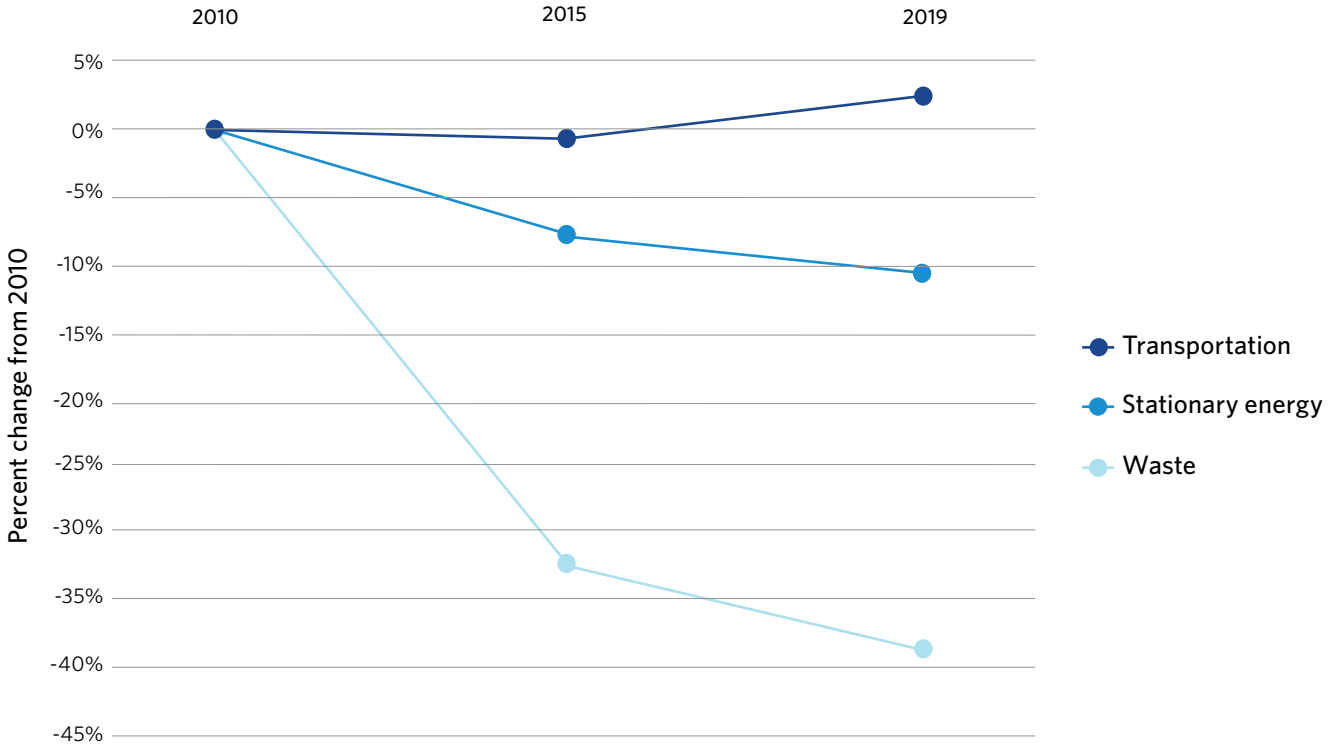
Change in regional emissions



Regional emissions by year and sector



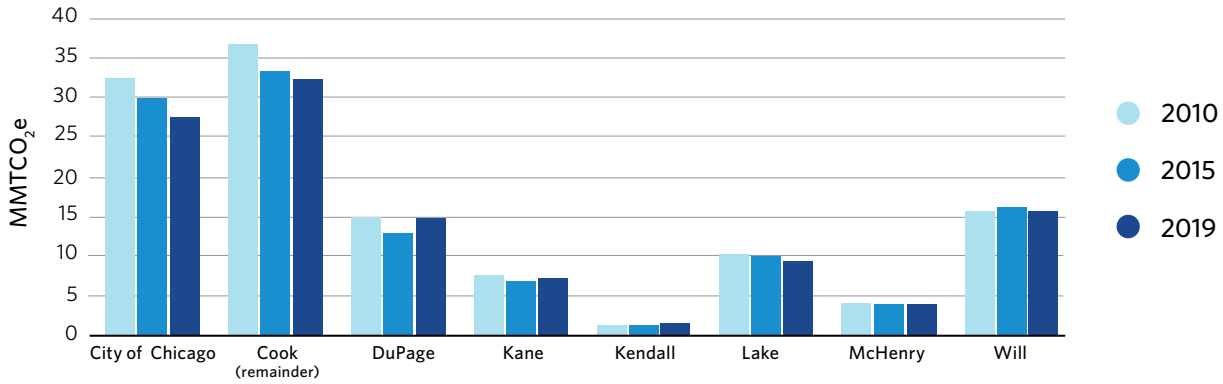
Change in regional emissions by sector



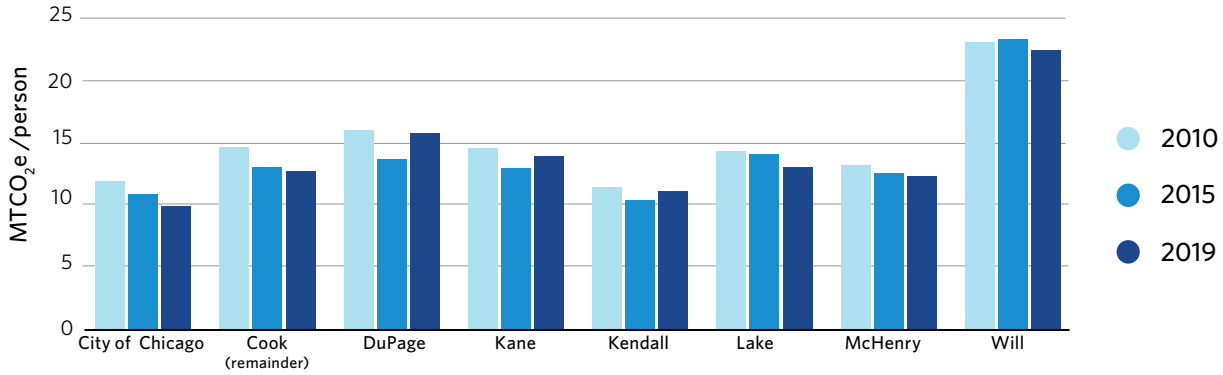
County trends

Consistent with the regional trend, emissions in Cook, Lake, and McHenry counties decreased between 2010 and 2015 and between 2015 and 2019. Emissions from DuPage, Kane, and Kendall counties decreased between 2010 and 2015 but increased between 2015 and 2019. In Kendall County, this resulted in a net increase in emissions between 2010 and 2019. Will County, in contrast, experienced an increase in emissions between 2010 and 2015 followed by a reduction in emissions between 2015 and 2019, resulting in a net zero change in emissions between 2010 and 2019.

Total emissions by year and county



Per capita emissions by year and county



Change in county emissions

County	2010-2015	2015-2019	2010-2019
City of Chicago	-8% ↓	-8% ↓	-15% ↓
Cook (remainder)	-9% ↓	-3% ↓	-12% ↓
DuPage	-13% ↓	15% ↑	-0.4% ↓
Kane	-8% ↓	4% ↑	-5% ↓
Kendall	-2% ↓	14% ↑	12% ↑
Lake	-2% ↓	-5% ↓	-7% ↓
McHenry	-5% ↓	-1% ↓	-6% ↓
Will	3% ↑	-3% ↓	0% –

Percentages are calculated from a specific base value. Two percentages that have different base values cannot be directly combined by addition. Therefore, percent changes for a portion of the time period (2010-2015 and 2015-2019) may not sum to equal the percent change for the entire time period (2010-2019).

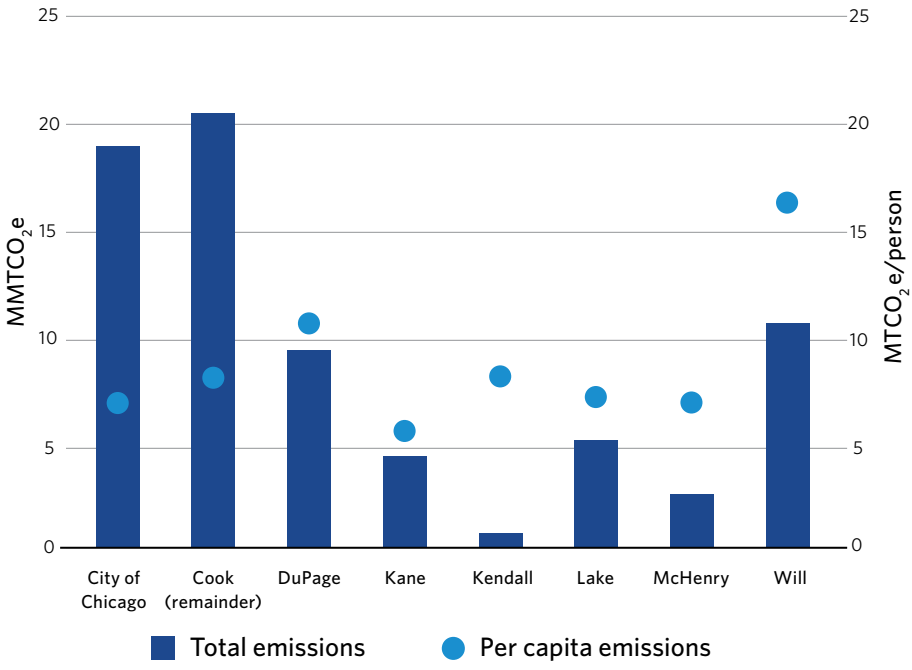
Stationary energy sector

2019 stationary energy sector emissions

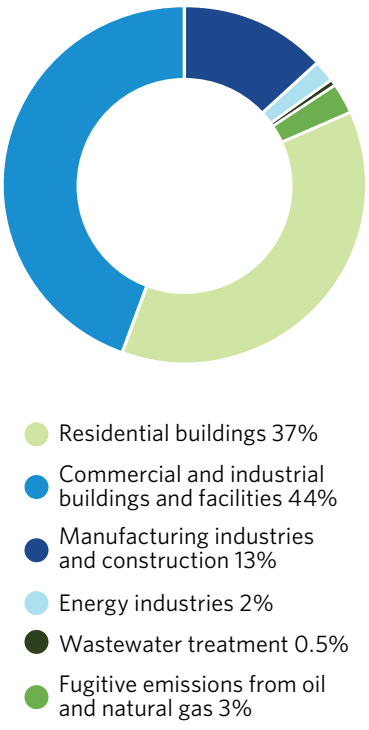
The stationary energy sector includes emissions from the combustion of fuel in buildings and power plants, as well as fugitive emissions that occur during the extraction, transformation, and transportation of fossil fuels. The sector is broken out into the following six subsectors:

- **Residential buildings:** Emissions from electricity and natural gas used in residential buildings.
- **Commercial and institutional buildings and facilities:** Emissions from electricity, natural gas, and other fuels used in commercial and institutional buildings such as schools, businesses, hospitals, government buildings, and other public facilities (excluding wastewater treatment plants).
- **Manufacturing industries and construction:** Emissions from electricity, natural gas, and other fuels used in industrial and construction facilities.
- **Energy industries:** Emissions from energy produced and used on site by power plants and refineries (excluding emissions from electricity generation for utility consumers).
- **Wastewater treatment:** Emissions from electricity, natural gas, and other fuels such as biogas used at wastewater treatment plants.
- **Fugitive emissions from oil and natural gas systems:** Emissions from leaks, venting, flaring, and other accidental releases at refineries and natural gas transmission and distribution facilities.

2019 stationary energy emissions by county: total and per capita



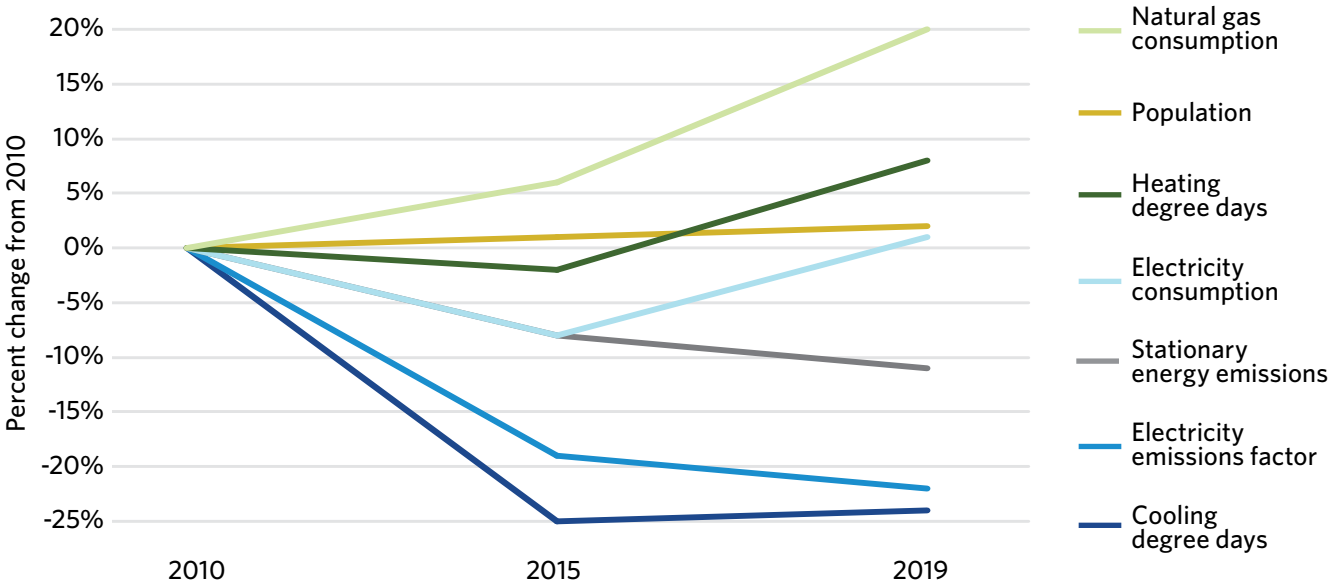
2019 stationary energy emissions by subsector



Stationary energy sector trends

Regional emissions from the stationary energy sector decreased by roughly 9 $MMTCO_2e$, or 11 percent, between 2010 and 2019. This decrease was driven by a decrease in the electricity grid emissions factor, which reflects a transition away from more carbon-intensive fuel sources, such as coal, to less carbon-intensive fuel sources, such as natural gas, solar, and wind. Over the same period, both electricity and natural gas consumption increased, driven in part by population growth as well as annual variability in weather patterns (e.g., cooling degree days and heating degree days).

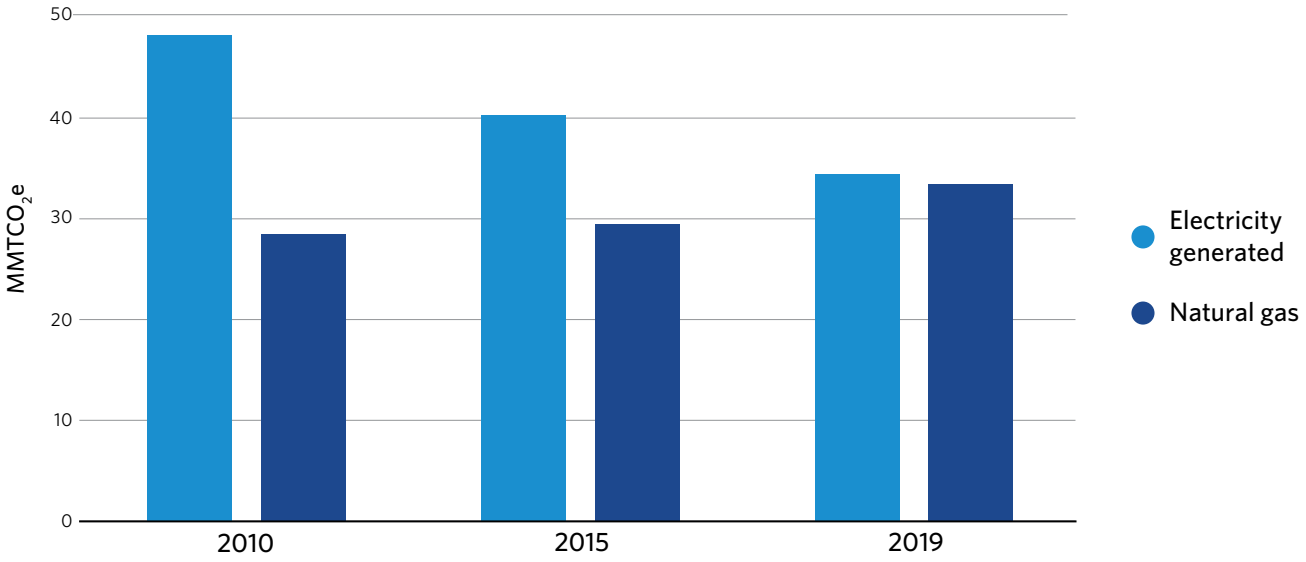
Change in stationary energy sector characteristics



Cooling and heating degree days

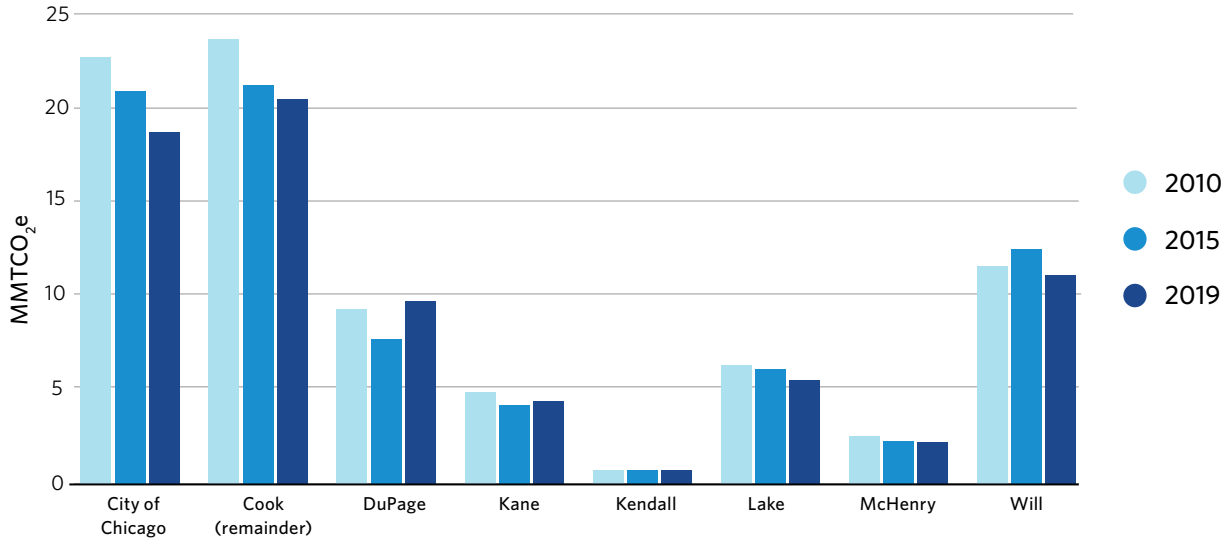
Cooling degree days (CDD) and heating degree days (HDD) are defined as the number of degrees by which the average daily temperature is higher than 65° Fahrenheit (CDD) or lower than 65° Fahrenheit (HDD), respectively. For example, if the average daily temperature is 78° Fahrenheit, then 13 CDDs are accounted for that day. An increase in CCDs indicates a greater need for air conditioning and in turn higher electricity consumption while an increase in HDDs mean a greater need for furnace use and in turn higher natural gas consumption.

Stationary energy: electricity generated and natural gas emissions



At the county level, emissions from the stationary energy sector decreased from 2010 and 2019 across all counties except for DuPage County and Kendall County. The increase in stationary energy emissions in DuPage County during this period was driven by a 50 percent increase in non-residential electricity consumption. Kendall County, where emissions remained flat, similarly experienced a 25 percent increase in electricity consumption from both residential and non-residential sources during this period.

Stationary energy emissions by year and county



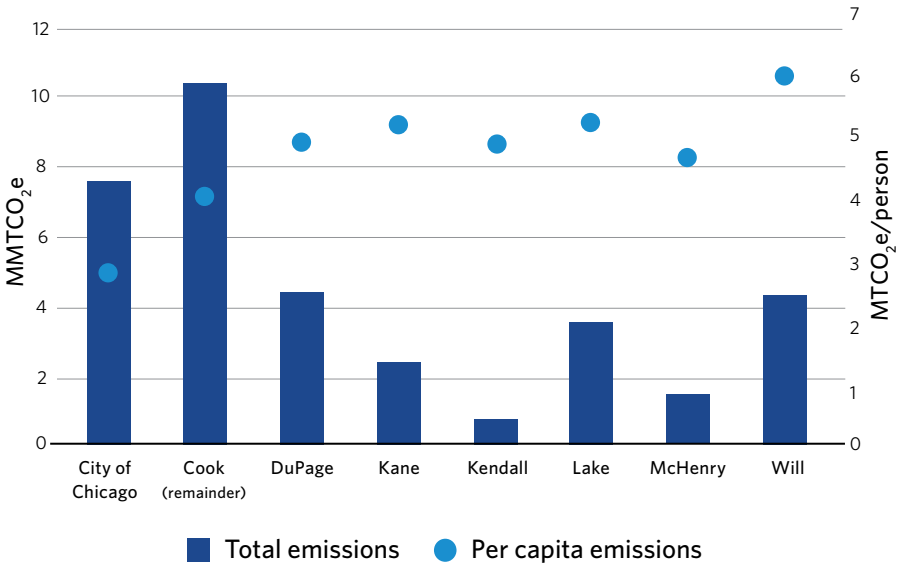
Transportation sector

2019 transportation sector emissions

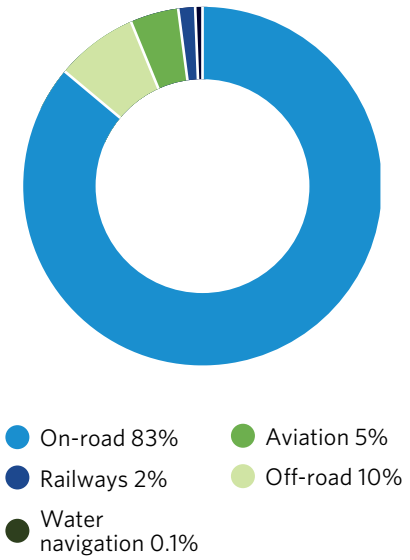
The transportation sector includes emissions from all transportation occurring within the region's geographical boundary. The sector is broken out into the following five subsectors:

- **On-road:** Emissions from combustion engine and electric vehicles for miles traveled on the road network in the region.
- **Railways:** Emissions from passenger trains and freight trains for miles traveled in the region.
- **Waterborne navigation:** Emissions from recreational (e.g., small yachts and fishing boats) and commercial (e.g., ferries and tour boats) boat trips that both originate and end within the region.
- **Aviation:** Emissions from helicopters and small aircraft used for medical transport, local broadcasting, sightseeing, and training flights that start and end within the region. It also includes emissions from aircrafts during takeoff and landing at the area's two major airports, O'Hare and Midway.
- **Off-road:** Emissions from off-road equipment and vehicles (e.g., agriculture, construction, lawn and garden) that operate within the region.

2019 transportation emissions by county: total and per capita



2019 transportation emissions by subsector

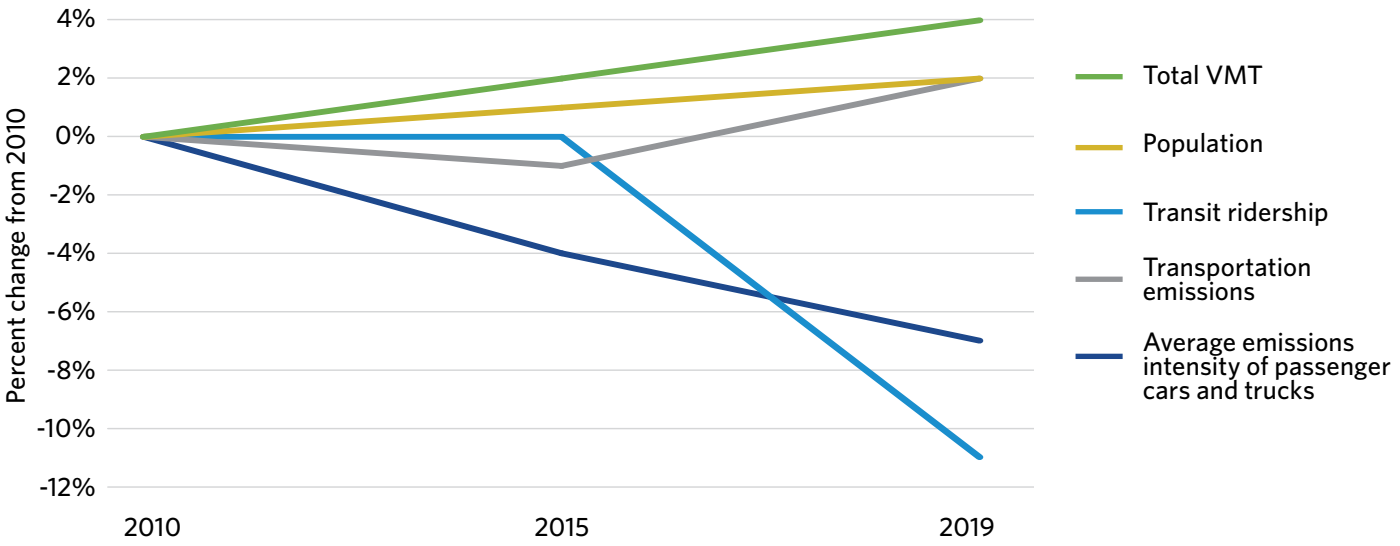


Transportation sector trends

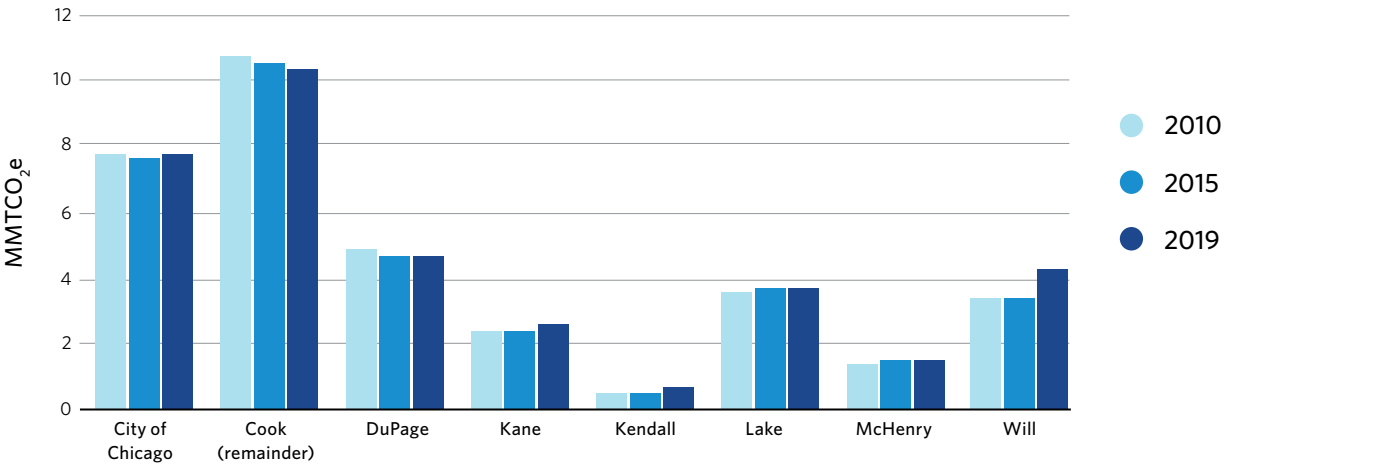
Regional emissions from the transportation sector increased by almost 1 $MMTCO_2e$, or 2 percent, between 2010 and 2019. This increase is driven by an increase in both absolute and per capita vehicle miles traveled (VMT) across the region. These changes in activity more than offset fuel efficiency improvements of on-road vehicles during this period and the corresponding reductions in vehicle emissions intensity. Miles driven annually by electric vehicles increased from less than 1 million miles in 2010 to roughly 245 million miles in 2019. Even so, electric vehicles still represented less than 1 percent of annual VMT in 2019.

At the county level, transportation sector emissions from Cook and DuPage counties decreased from 2010 to 2019 while all other counties experienced an increase in emissions during this period, driven by an increase in emissions from on-road transportation.

Change in transportation sector characteristics



Transportation emissions by year and county



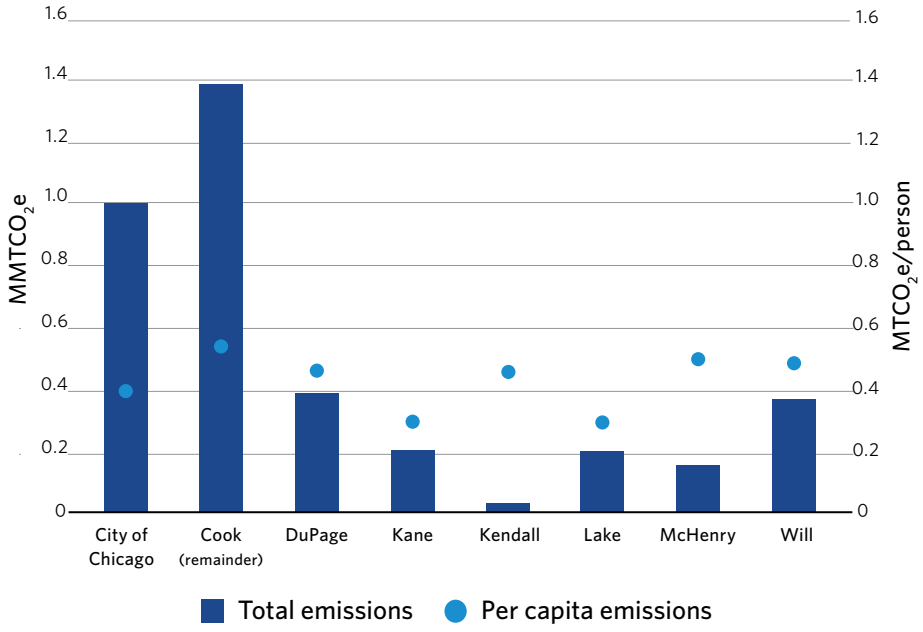
Waste sector

2019 waste sector emissions

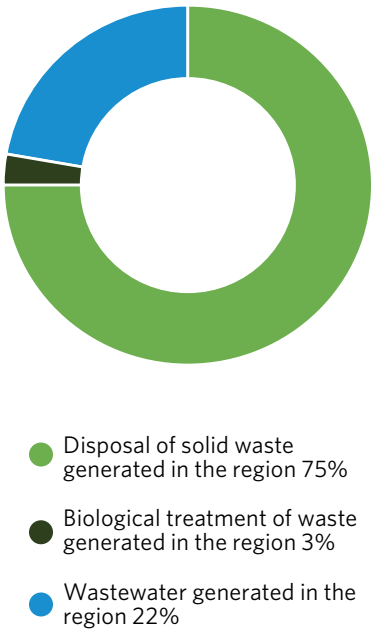
Waste sector emissions include emissions generated during the management and treatment of solid waste and wastewater. The sector is broken out into the following three subsectors:

- **Disposal of solid waste generated in the region:** Emissions from waste sent to landfills located both within and outside the region.
- **Biological treatment of waste generated in the region:** Emissions from composting and the anaerobic digestion of organic waste including food waste, yard waste, sludge, and other organic sources.
- **Wastewater generated in the region:** Emissions from water that is anaerobically treated.

2019 waste emissions by county: total and per capita



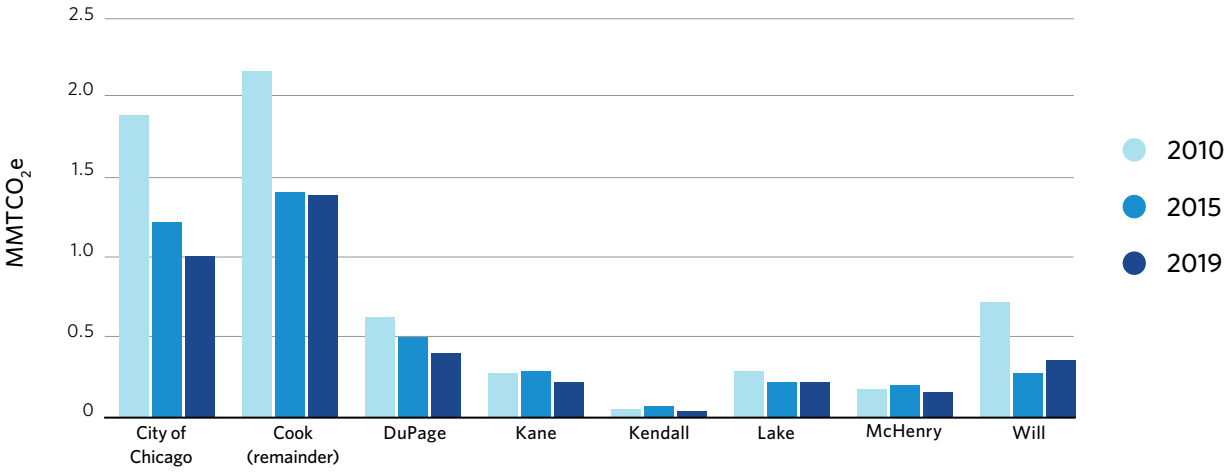
2019 waste emissions by subsector



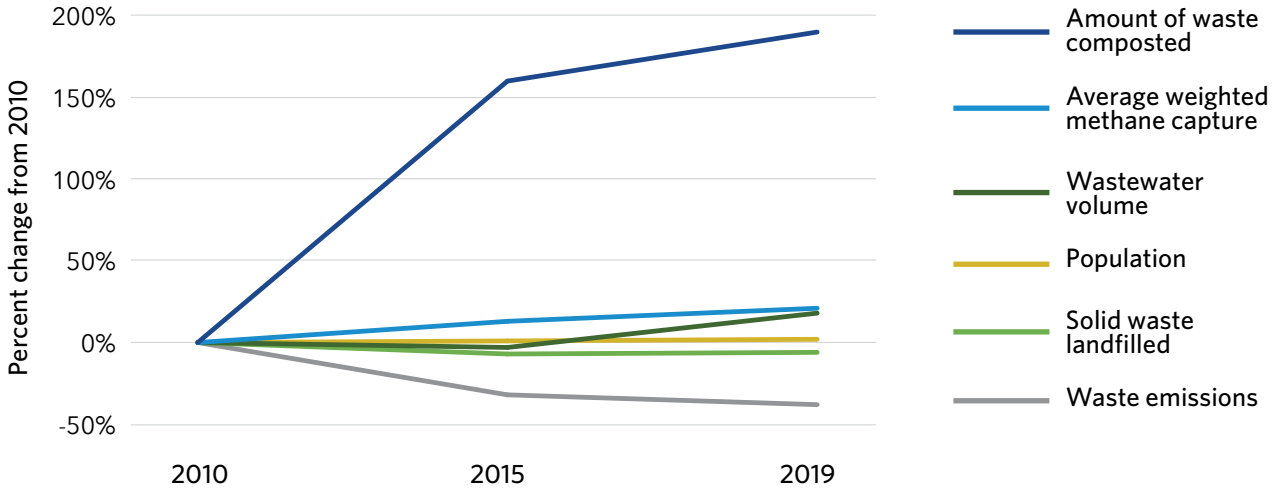
Waste sector trends

Regional emissions from the waste sector decreased by roughly 2 $MMTCO_2e$, or 38 percent, between 2010 and 2019. This decrease is driven by an increase in methane capture at landfills as well as a reduction in the amount of waste sent to landfills, which more than offset an increase in emissions from composting and wastewater treatment during the period. All counties achieved a reduction in emissions from the waste sectors between 2010 and 2019.

Waste emissions by year and county



Change in waste sector characteristics



Composting

The amount of compost increased between 2010 and 2019 due to efforts to divert waste from landfills. This contributed to the decrease in emissions from landfills during this period but also caused emissions from the biological treatment of waste to increase. Despite this increase, the shift towards composting is a net benefit for the region's emissions. While the percent increase is relatively high, the total amount of waste composted was still only about 0.7 million metric tons in 2019 compared to over 7.5 million metric tons of waste that was sent to a landfill.

Regional and county emissions overview

Sector	City of Chicago	Cook (remainder)	DuPage	Kane	Kendall	Lake	McHenry	Will	Regional total
Stationary energy	18.72	20.52	9.73	4.40	0.74	5.51	2.20	11.05	**72.88**
Residential buildings	6.55	8.61	3.01	1.84	0.38	2.59	1.21	2.90	**27.10**
Commercial and institutional buildings and facilities	10.45	8.54	5.74	1.82	0.20	1.98	0.58	3.01	**32.33**
Manufacturing industries and construction	1.38	3.22	0.80	0.72	0.12	0.86	0.36	2.04	**9.50**
Energy industries	0	+	+	0	0.03	0.05	0.04	1.42	**1.54**
Wastewater treatment	0.15	0.14	0.02	0.01	+	0.02	0.01	0.02	**0.38**
Fugitive emissions from oil and natural gas systems	0.20	0	0.16	0	0.01	0	+	1.66	**2.02**
Transportation	7.76	10.43	4.67	2.59	0.70	3.71	1.49	4.31	**35.66**
On-road	5.11	9.12	4.09	2.22	0.62	3.23	1.26	3.87	**29.51**
Railways	0.46	0.17	0.07	0.03	0.01	0.07	0.02	0.05	**0.87**
Waterborne navigation	0.01	0.02	+	+	+	0.02	+	+	**0.05**
Aviation	1.62	+	NE	NE	NE	NE	NE	NE	**1.62**
Off-road	0.57	1.12	0.52	0.34	0.08	0.39	0.21	0.39	**3.63**
Waste	1.01	1.39	0.40	0.22	0.04	0.22	0.16	0.36	**3.82**
Disposal of solid waste generated in the region	0.68	1.05	0.35	0.19	0.03	0.16	0.11	0.31	**2.87**
Biological treatment of waste generated in the region	+	0.04	0.01	0.01	+	0.02	0.04	0.01	**0.12**
Wastewater generated in the region	0.33	0.31	0.05	0.03	0.01	0.04	0.01	0.05	**0.83**
Total	**27.49**	**32.33**	**14.81**	**7.22**	**1.48**	**9.43**	**3.86**	**15.73**	**112.35**

+ Does not exceed 0.005 $MMTCO_2e$ NE (emissions are not estimated due to a lack of data availability)

Northeastern Illinois socioeconomic characteristics (2019)

County	Population	Households	Employment
Chicago	2,746,388	1,142,725	1,313,527
Cook (remainder)	2,529,153	944,215	1,352,744
DuPage	932,877	348,216	640,104
Kane	516,522	180,374	218,068
Kendall	131,869	43,534	28,366
Lake	714,342	253,386	334,367
McHenry	310,229	114,282	93,794
Will	696,355	240,009	260,023
Regional total	**8,577,735**	**3,266,741**	**4,240,993**

Emission projections

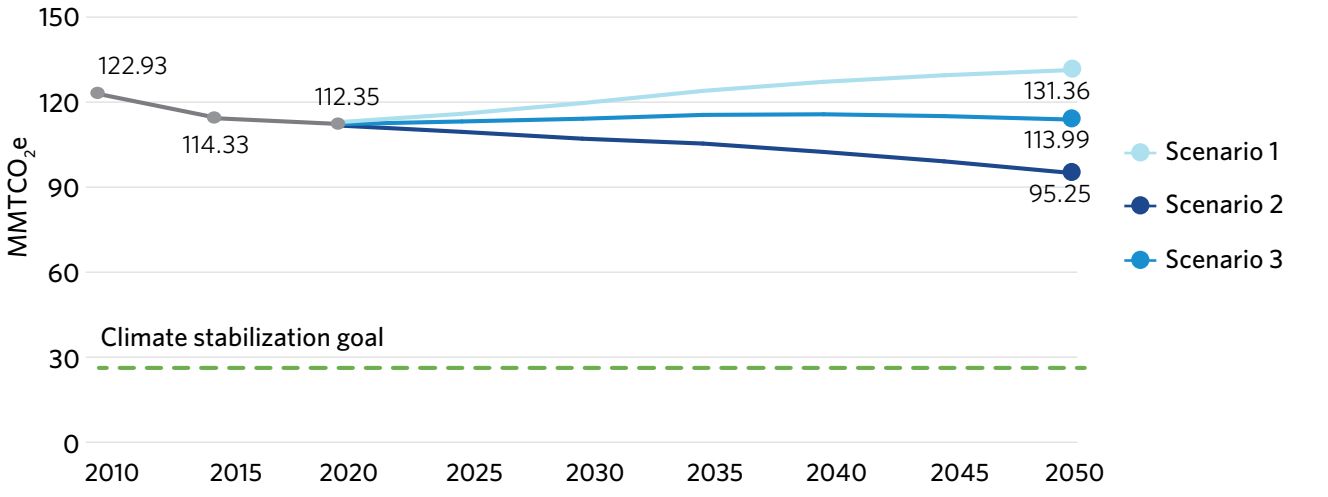
ICF used three business-as-usual scenarios to generate future emissions projections for northeastern Illinois. These scenarios are based on historical trends, and do not consider future impacts of state and federal policies such as the Climate and Equitable Jobs Act, Infrastructure Investment and Jobs Act, and Inflation Reduction Act.

- **Scenario 1:** Assumes no change in emissions per capita from 2019 through 2050. Under this scenario, emissions increase at the same rate as population growth in the region.[2]
- **Scenario 2:** Assumes future per capita emissions decrease at the same rate every five years as the rate between 2015 and 2019. Per capita emissions decreased by roughly 2.3 percent between 2015 and 2019, so this scenario assumes that per capita emissions will decrease by 2.3 percent every five years. Projected population growth is likely to offset these reductions, resulting in a 1.5 percent increase in emissions by 2050.
- **Scenario 3:** Assumes future per capita emissions decrease at the same rate every ten years as the rate between 2010 and 2019. Per capita emissions decreased by roughly 10 percent between 2010 and 2019, so this scenario assumes that per capita emissions will decrease by roughly 10 percent every 10 years. This rate of reduction is more than enough to offset projected population growth, and results in a total reduction of 15.2 percent.

Climate stabilization pathway

The stabilization pathway is an emissions pathway designed to limit global warming to 2° Celsius. This target is the outcome of extensive climate modeling conducted by researchers and is consistent with GHG reduction targets of many cities worldwide.

2050 emissions under projection scenarios



[2] Population growth in the region was estimated using CMAP's ON TO 2050 socioeconomic forecast.

The dotted line in the figure above shows ON TO 2050's GHG reduction target — an 80 percent reduction in GHG emissions, relative to 2005 levels, by 2050. Achieving this target will require an annual average GHG emissions reduction of 5 percent.

Conclusion

Between 2010 and 2019, northeastern Illinois reduced its greenhouse gas emissions by roughly 9 percent. This is progress, but achieving CMAP's emissions reduction target, and avoiding the most severe impacts of climate change, will require intensified action across all emissions sectors.

ON TO 2050, the region's long-range comprehensive plan, contains several recommendations for how to reduce emissions and build more resilient communities. The plan serves as a guide for the region, and includes actions local governments, transit agencies, and other organizations can take to reduce emissions, such as:

- Supporting the electrification of the region's transportation system
- Encouraging active transportation
- Promoting renewable energy in zoning, building, design guidelines, and energy codes

This inventory and the accompanying local emissions summaries are intended to provide community members and decisions makers with the information they need to begin reducing their greenhouse gas emissions. All of the data included in the inventory is available for download on CMAP's website, and will be periodically updated to reflect current conditions and recent trends.

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The Chicago Metropolitan Agency for Planning (CMAP) is the region's comprehensive planning organization. The agency and its partners developed and are now implementing ON TO 2050, a long-range plan to help the seven counties and 284 communities of northeastern Illinois implement strategies that address transportation, housing, economic development, open space, the environment, and other quality-of-life issues.

See **cmap.illinois.gov** for more information.

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