



Dubuque, Iowa

Inventory of Community Greenhouse Gas Emissions
2014-2018

Produced by the University of Northern Iowa Center for Energy and Environmental Education

With Assistance from ICLEI - Local Governments for Sustainability USA



CREDITS AND ACKNOWLEDGMENTS

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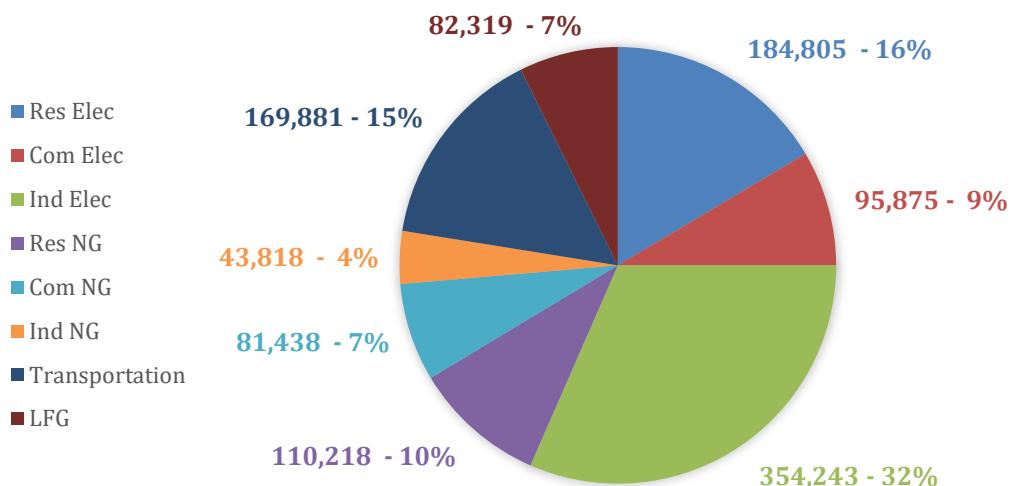
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EXECUTIVE SUMMARY

The City of Dubuque recognizes that greenhouse gas (GHG) emissions from human activity are catalyzing profound climate change, the consequences of which pose substantial risks to the future health, wellbeing, and prosperity of our community. Furthermore, Dubuque has multiple opportunities to benefit by acting quickly to reduce community GHG emissions. With reducing GHG emissions, Dubuque has the opportunity to create green jobs, reduce energy and transportation costs for residents, improve health for residents, and make Dubuque a more attractive place to live and grow a business. This report provides estimates of greenhouse gas emissions resulting from sources and activities in the city of Dubuque and the steps being taken to reduce emissions below the levels of the 2003 baseline year.

2003 Baseline Year Inventory

Fig ES 1: 2003 Baseline GHG Emissions Inventory for Community of Dubuque, IA (MT CO₂e)



Key Findings (ES 2-6)

Fig ES 2: 2014 GHG Inventory for Community of Dubuque, IA (MT CO₂e)

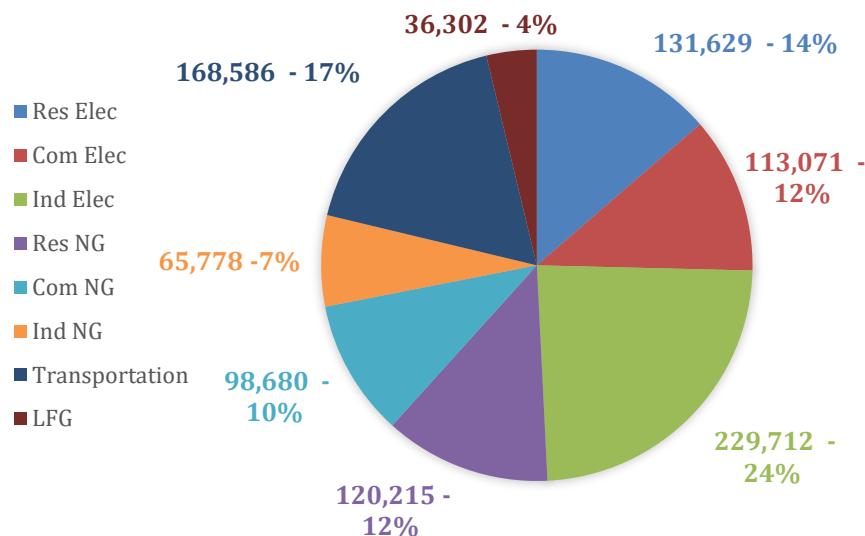


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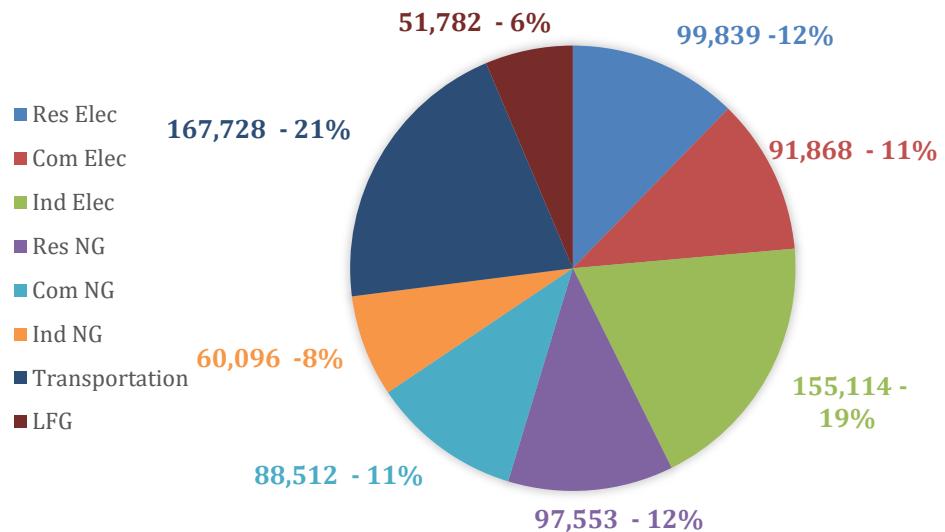


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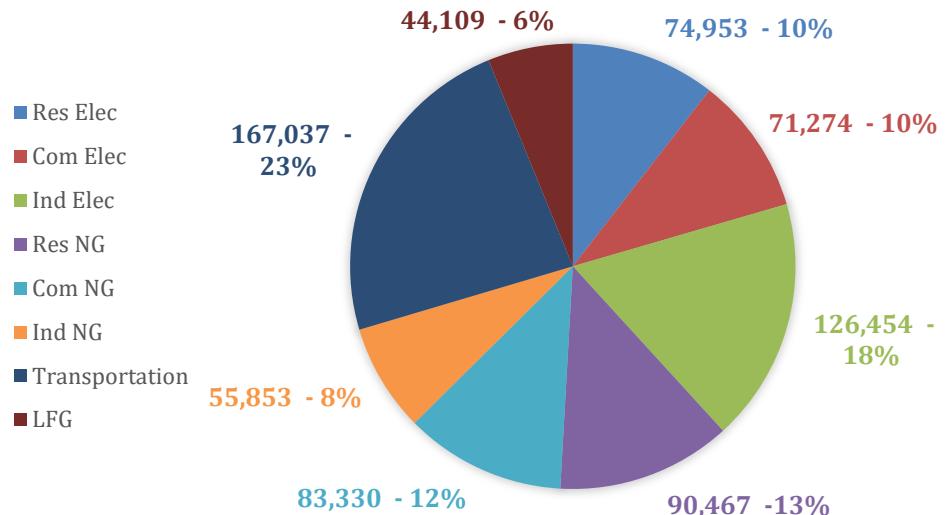


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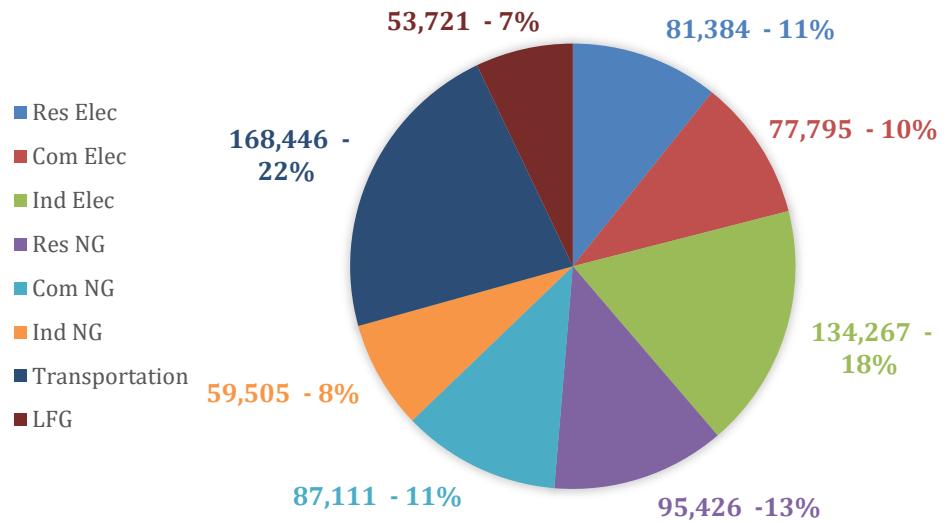
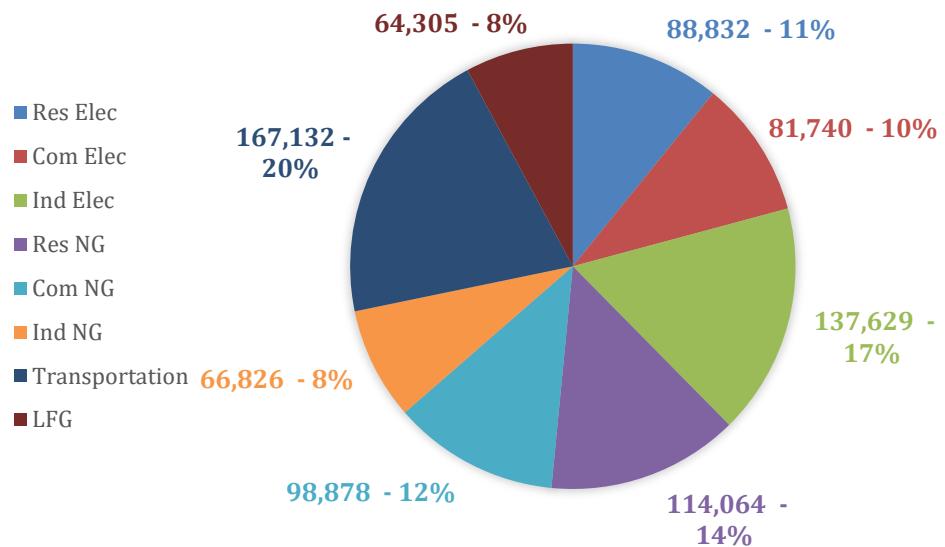


Fig ES 6: 2018 GHG Inventory for Community of Dubuque, IA (MT CO2e)



BACKGROUND

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. Dubuque has the potential to be impacted by increased air pollution, more severe flooding, and other environmental concerns. To address the root cause of this threat, in 2013 Dubuque created a Community Climate Action and Resiliency Plan that has a goal of reducing Dubuque's community wide greenhouse gas emissions by 50% below the baseline year of 2003 (Fig ES 6 & Table 1) by the year 2030. The City of Dubuque also signed on to the Global Covenant of Mayors for Climate and Energy to formally and publicly express its commitment to reducing Dubuque's contribution to the cause of climate change.

Fig. 1: 2003 Baseline GHG Inventory for community of Dubuque, IA (MT CO₂e)

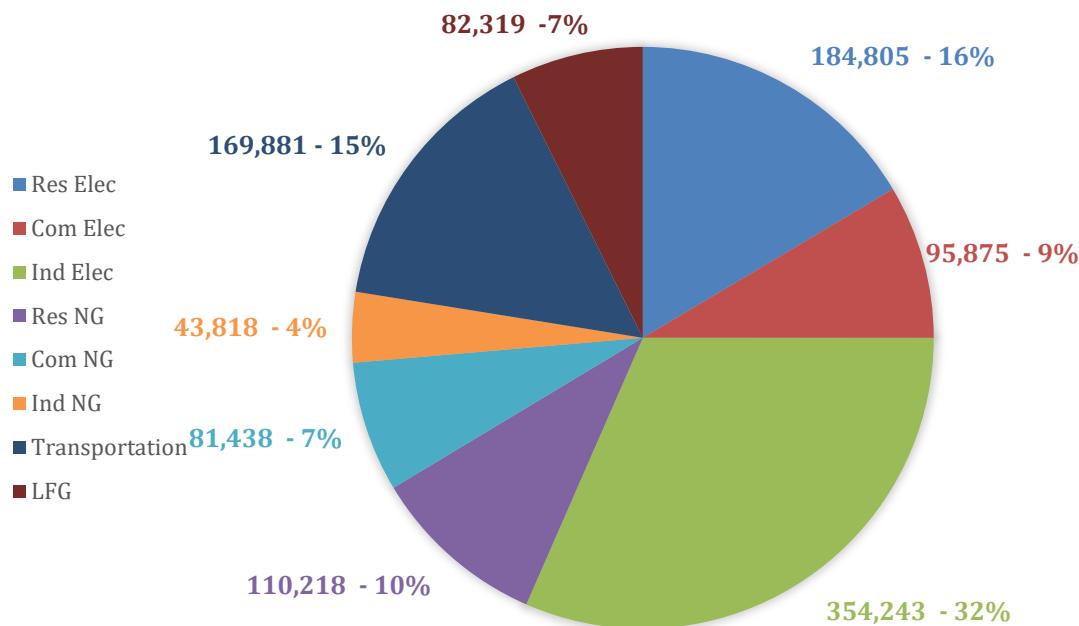


Table 1: 2003 Baseline Community-Wide GHG Emissions by Source/Activity

Source/Activity	Source/Activity Data Quantity and Unit	Emissions (MT CO2e)
Residential Use of Electricity	200,817,098 kWh	184,805
Commercial Use of Electricity	104,182,052 kWh	95,875
Industrial Use of Electricity	384,935,560 kWh	354,243
Residential Natural Gas	20,827,931 Therms	110,218
Commercial Natural Gas	15,389,306 Therms	81,438
Industrial Natural Gas	8,725,384 Therms	43,818
On-road Vehicle Travel	354,610,505 VMT	169,881
Landfill Gas	2,940 MT CH ₄	82,319
Total GHG Emissions		1,122,597

METHODOLOGY

Community Emissions Protocol

The Community Protocol was released by ICLEI in October 2012, 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. UNI CEEE utilized this protocol to complete Dubuque's inventory.

SUSTAINABILITY & CLIMATE CHANGE MITIGATION ACTIVITIES IN DUBUQUE

After serving 10 years on the City Council, Roy D. Buol ran for the office of Mayor in 2005. His platform was based upon “engaging citizens as partners,” and what he heard from thousands of citizens was a consistent theme surrounding water quality, recycling, green space, public transit, cultural vitality, accessibility and downtown revitalization. During the 2006 City Council goal-setting process, Mayor Buol proposed and received full support from his council colleagues to focus on sustainability as a City top priority, stating “cities that get out in front on sustainability will have competitive economic advantages in the future.” What soon became known as Sustainable Dubuque is a City Council adopted, community-created, and citizen-led initiative whose story officially begins in 2006. A City Council priority each year since, we are continually working to expand awareness, create partnerships, and encourage initiatives involving all sectors of our community. Dubuque became an early leader on the sustainability front.

Dubuque has already implemented programs that have or will lead to ancillary benefits in the form of energy conservation and greenhouse gas mitigation. The initiatives that Dubuque currently has in place include:

- **Sustainable Dubuque Task Force**

The City Council moved to create a city-wide citizen task force, supported by City Staff, to develop a comprehensive definition of what sustainability meant to our community. Aptly named the “Sustainable Dubuque Task Force,” the representation included individuals who brought diverse backgrounds and interests to the process, including local government, schools, utility companies, religious organizations, neighborhood associations, youth organizations, non-profits, environmental organizations and business stakeholders. The group met over the next two years, collecting community-wide input to develop a vision. The process also included presentations to community organizations and businesses to discuss targeted visions and ideas. Additionally, nearly 900 community surveys were completed. The results of these efforts, along with other data collected by the task force, were used to develop the Sustainable Dubuque vision and model which focuses on a balanced approach to life quality and includes “economic prosperity, environmental integrity, and social/cultural vibrancy.” The collective desire of our citizens to create value and a legacy of life quality through sustainable practices and programs was defined.

- **U.S. Conference of Mayors’ Climate Protection Agreement**

In 2006 Dubuque Mayor, Roy D. Buol signed the U.S. Conference of Mayors’ Climate Protection Agreement in support of the Kyoto Protocol. This signifies that Dubuque is striving to be a replicable sustainability model for all communities, especially those with populations under 200,000 where 40% of the United States lives.

- **4-STAR Certified Community**

The STAR Community Rating System is a national certification which measures a community’s environmental, economic, and social efforts to achieve sustainability. Dubuque scored a total of 468 of 720 points, a significant achievement.

- **Green Vision Education**

The Dubuque Metropolitan Area Solid Waste Agency has organized the Green Vision Education program to recognize area schools for their sustainability efforts. This program assess the schools on Energy Efficiency, Resource Management, Pollution Prevention, Sustainable Purchasing, and Eco-Literacy. These sustainability practices are then incorporated into their curriculum.

- **Community Climate Action and Resiliency Plan**

The Dubuque Community Greenhouse Gas Reduction Task Force agreed upon the target of reducing community-wide greenhouse gas emissions by 50% below the 2003 level by 2030. This target was adopted by the City Council in 2013.

- **Petal Project**

The East Central Intergovernmental Association created the Petal Project to help businesses reduce their natural resource use in five categories: Waste Reduction, Energy Conservation, Pollution Prevention, Staff Education, and Water Conservation.

- **Historic Millwork District**

Over one million square feet of historic warehouse space is being redeveloped. Private building owners are renovating the warehouses using sustainable best practices. Furthermore, the public sector is creating a \$200 million livable neighbor for diverse housing, entrepreneurial businesses, a thriving arts and culture scene, open spaces, and the historic preservation and energy-efficient technologies.

- **Water and Resource Recovery Center**

In 2013 the City's wastewater treatment plant underwent a \$70 million upgrade. The facility now uses anaerobic digestion, converting wastewater sludge to 12.5 tons of fertilizer a day. Methane gas is now being captured from the digestion process. It is cleaned and burned to power turbines that generate electricity for the facility.

Excess biogas is also being injected into the natural gas pipeline for others to use.

- **The Jule**

The City's public transportation program underwent a complete transformation of routes and vehicles. This included the introduction of new programs like the **Rack and Ride**, which allows passengers to use the bicycle racks free of charge with the purchase of a regular bus fare ticket. Something worth noting is that the City has seen a 16% increase in public transit ridership over the last 5 years.

- **Smarter City**

- Smarter Water

A community-wide water meter replacement project took place over a 12-month period with over 300 households. This project provided the participants with near real-time personalized information about their consumption habits, including usage in gallons, cost, or carbon footprint. They saw a 6.6% decrease in water utilization, 8-fold increase in leak detection and response, and a 61% participant change in the way they use water.

- Smarter Electricity

Alliant Energy installed nearly 1,000 Advanced Metering Infrastructure meters in volunteer homes. The volunteers were able to compare use to their own history or other households most "like them", set goals for use reduction, and compete in community challenges. They saw that 26% of Dubuque's average household use is from appliances not in use, usage reductions from participants from 3% to 11%, and 45% of participants saying they found ways to reduce their own personal use.

- Smarter Travel

1,000 Dubuque volunteers were recruited to install a Smarter Travel application on their smartphone, as well as, another 500 public transit users to carry radio frequency identification tags. The study collected anonymous data on how, when, and where the participants traveled within the community to identify opportunities to reduce vehicle miles traveled. The data can be used to educate the volunteers, implement policy, build infrastructure, and shape public transit routes.

- Smarter Discards

Over 300 households volunteered to allow their weekly trash, recycling, and food scraps/yard debris setout weights to be collected in anonymized form. A personalized portal provided diversion tips for beneficial use, household goal challenges, insights into household discard patterns, and analytics that compare discard generation with other households with similar profiles. The volunteers increased their diversion by 5% and reported changed consumption habits.

COMMUNITY EMISSIONS INVENTORY RESULTS

COMMUNITY PROFILE

To put emissions inventory data in context, basic information about the community such as population and number of households is needed. This information is provided in Table 1.

Table 2: Dubuque Community Indicators

	2014	2015	2016	2017
Population*	58,086	58,409	58,535	58,410
Households*	13,916	13,964	14,265	14,239

*Data source: American Community Survey 5-year estimates. 2018 data will not be available until November of 2019.

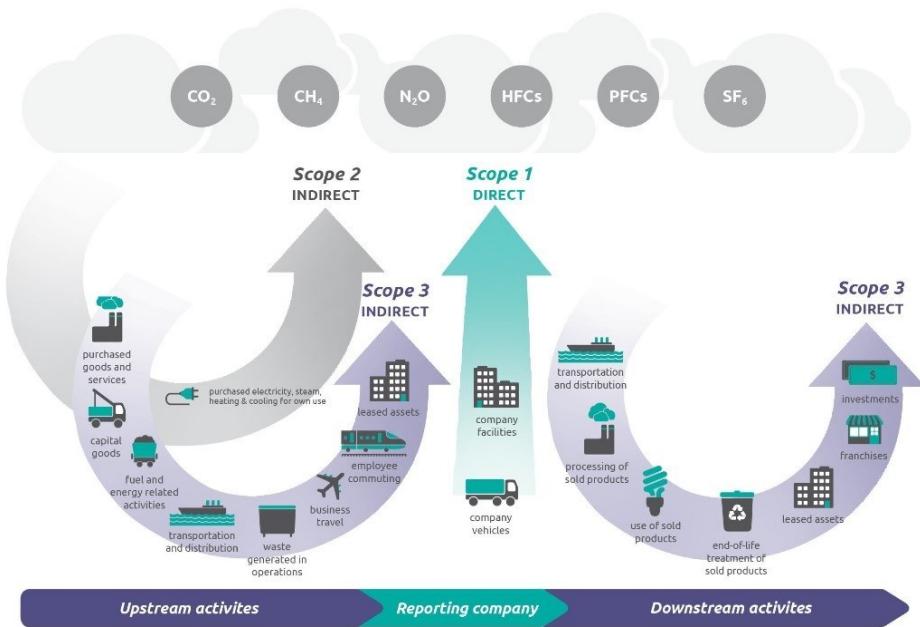
COMMUNITY-WIDE SOURCES AND ACTIVITIES FRAME

The community-wide sources and activities frame includes direct emissions from the Dubuque Metropolitan Area Landfill (an emissions source) and emissions that result from use of energy by all members of the community. This frame includes the following four Basic Emissions Generating Sources and Activities:

- Use of electricity by the community
- Use of natural gas in residential, commercial, and industrial stationary combustion equipment
- On-road passenger and freight motor vehicle travel
- Landfill gas emitted from the Dubuque Metropolitan Area Landfill

The use of electricity by the community is an activity that results in emissions. The use of natural gas in stationary combustion equipment and the combustion of diesel and gasoline in motor vehicles are both sources of emissions and activities that results in emissions. The City of Dubuque may have significant influence over some of these emissions, but it may also have little influence over others.

The graphic below illustrates the scope of these sources and activities.



When used for comparison across communities, this framework is helpful in illustrating relative urban efficiencies. Tables 3 through 7 and Figures 2 through 6 summarize emissions from community-wide sources and activities for the years 2014 through 2018, respectively.

Table 3: 2014 Community-Wide GHG Emissions by Source/Activity

Source/Activity	Source/Activity Data Quantity and Unit	Emissions (MT CO2e)
Residential Use of Electricity	205,760,247 kWh	131,629
Commercial Use of Electricity	176,750,498 kWh	113,071
Industrial Use of Electricity	359,083,104 kWh	229,712
Residential Natural Gas	22,717,086 Therms	120,215
Commercial Natural Gas	18,647,626 Therms	98,680
Industrial Natural Gas	14,745,186 Therms	65,778
On-road Vehicle Travel	367,124,000 VMT	168,586
Landfill Gas	1,296.5 MT CH ₄	36,302
Total GHG Emissions		963,973

Fig. 2: 2014 GHG Inventory for community of Dubuque, IA (MT CO2e)

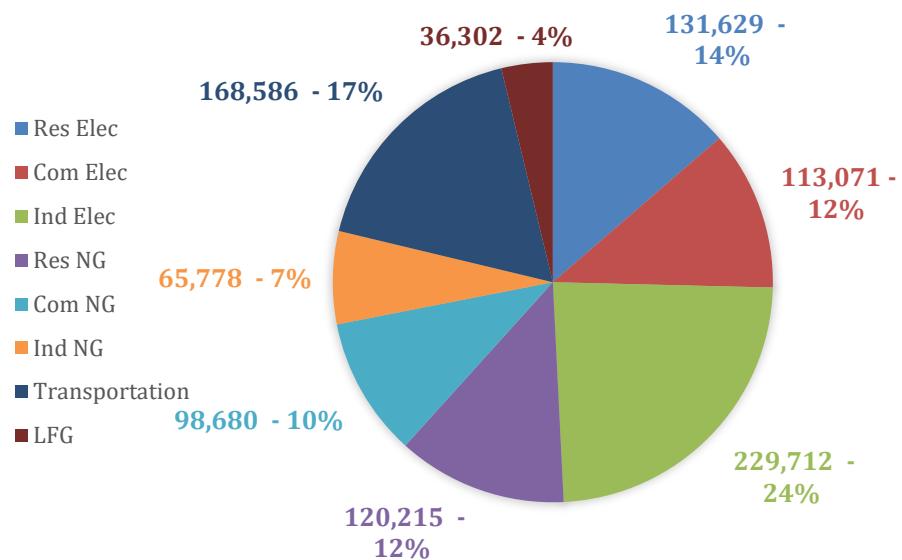


Table 4: 2015 Community-Wide GHG Emissions by Source/Activity

Source/Activity	Source/Activity Data Quantity and Unit	Emissions (MT CO2e)
Residential Use of Electricity	182,341,680 kWh	99,839
Commercial Use of Electricity	167,783,347 kWh	91,868
Industrial Use of Electricity	283,291,479 kWh	155,114
Residential Natural Gas	18,434,566 Therms	97,553
Commercial Natural Gas	16,726,091 Therms	88,512
Industrial Natural Gas	11,551,593 Therms	60,096
On-road Vehicle Travel	373,289,000 VMT	167,728
Landfill Gas	1,849.4 MT CH ₄	51,782
Total GHG Emissions		812,492

Fig. 3: 2015 GHG Inventory for community of Dubuque, IA (MT CO2e)

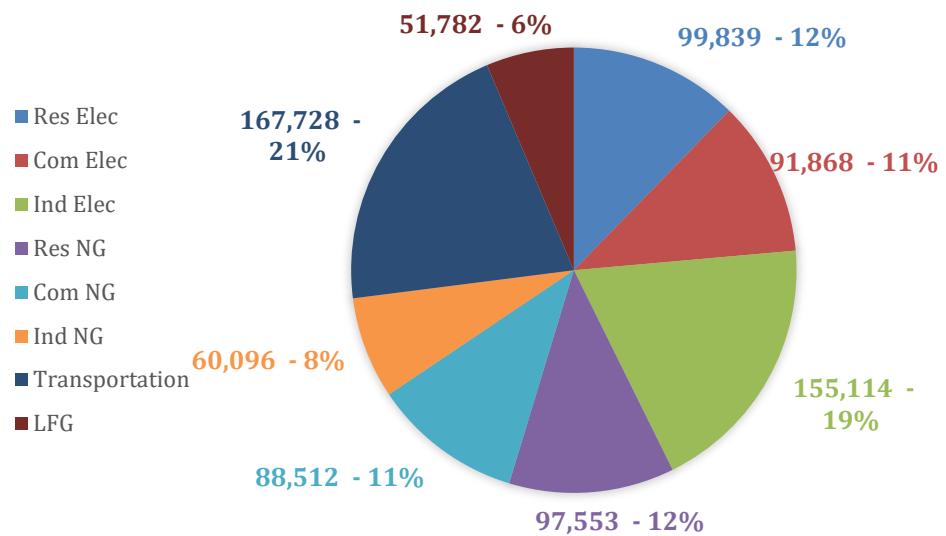


Table 5: 2016 Community-Wide GHG Emissions by Source/Activity

Source/Activity	Source/Activity Data Quantity and Unit	Emissions (MT CO2e)
Residential Use of Electricity	164,600,505 kWh	74,953
Commercial Use of Electricity	156,521,679 kWh	71,274
Industrial Use of Electricity	277,700,553 kWh	126,454
Residential Natural Gas	17,095,678 Therms	90,467
Commercial Natural Gas	15,746,976 Therms	83,330
Industrial Natural Gas	12,180,868 Therms	55,853
On-road Vehicle Travel	372,921,000 VMT	167,037
Landfill Gas	1,575.3 MT CH ₄	44,109
Total GHG Emissions		713,477

Fig. 4: 2016 GHG Inventory for community of Dubuque, IA (MT CO2e)

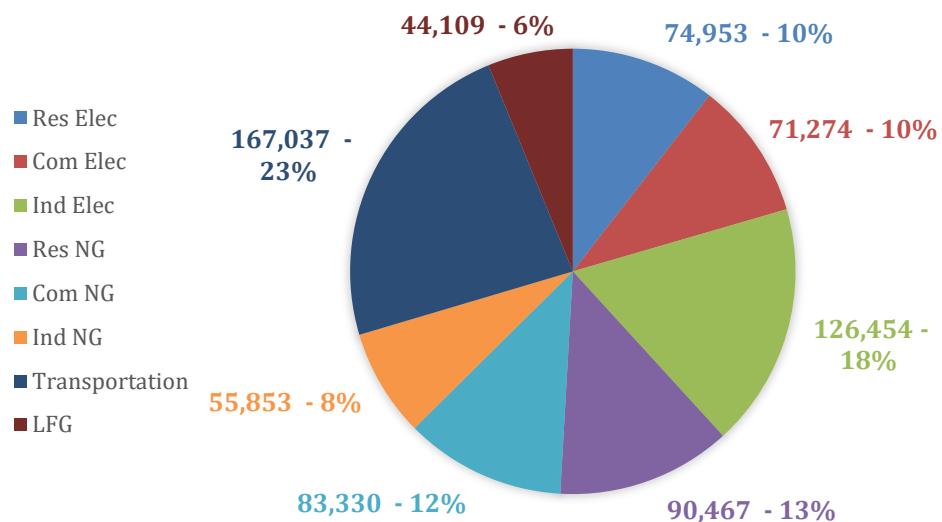


Table 6: 2017 Community-Wide Activity GHG Emissions by Source/Activity

Source/Activity	Source/Activity Data Quantity and Unit	Emissions (MT CO2e)
Residential Use of Electricity	178,723,502 kWh	81,384
Commercial Use of Electricity	170,842,390 kWh	77,795
Industrial Use of Electricity	294,858,079 kWh	134,267
Residential Natural Gas	18,032,763 Therms	95,426
Commercial Natural Gas	16,461,401 Therms	87,111
Industrial Natural Gas	11,278,833 Therms	59,505
On-road Vehicle Travel	376,066,000 VMT	168,446
Landfill Gas	1,918.6 MT CH ₄	53,721
Total GHG Emissions		757,655

Fig. 5: 2017 GHG Inventory for community of Dubuque, IA (MT CO2e)

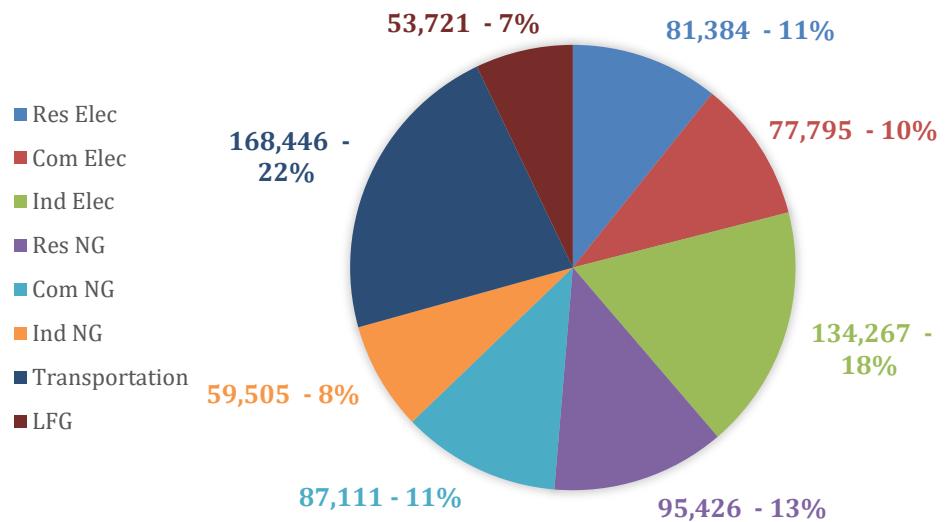


Table 7: 2018 Community-Wide Activity GHG Emissions by Source/Activity

Source/Activity	Source/Activity Data Quantity and Unit	Emissions (MT CO2e)
Residential Use of Electricity	195,081,128 kWh	88,832
Commercial Use of Electricity	179,506,618 kWh	81,740
Industrial Use of Electricity	302,241,519 kWh	137,629
Residential Natural Gas	21,554,718 Therms	114,064
Commercial Natural Gas	18,685,052 Therms	98,878
Industrial Natural Gas	12,628,187 Therms	66,826
On-road Vehicle Travel	373,133,000 VMT	167,132
Landfill Gas	2,296.6 MT CH ₄	64,305
Total GHG Emissions		819,406

Fig. 6: 2018 GHG Inventory for community of Dubuque, IA (MT CO2e)

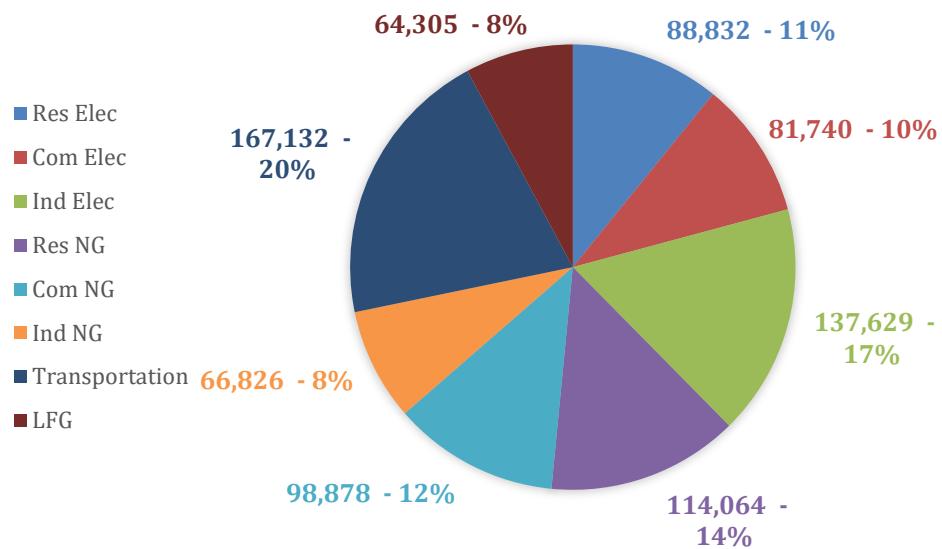
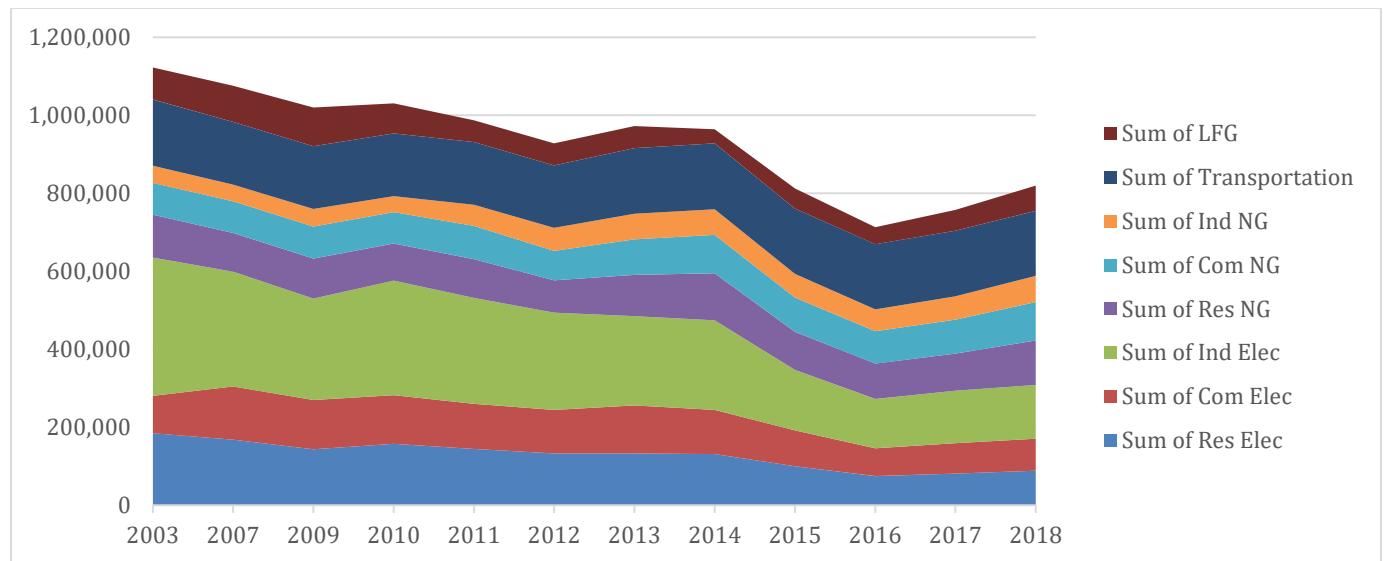


Fig. 7: Dubuque Community wide GHG Emissions Inventories by year (MT CO₂e)



BUSINESS-AS-USUAL FORECAST

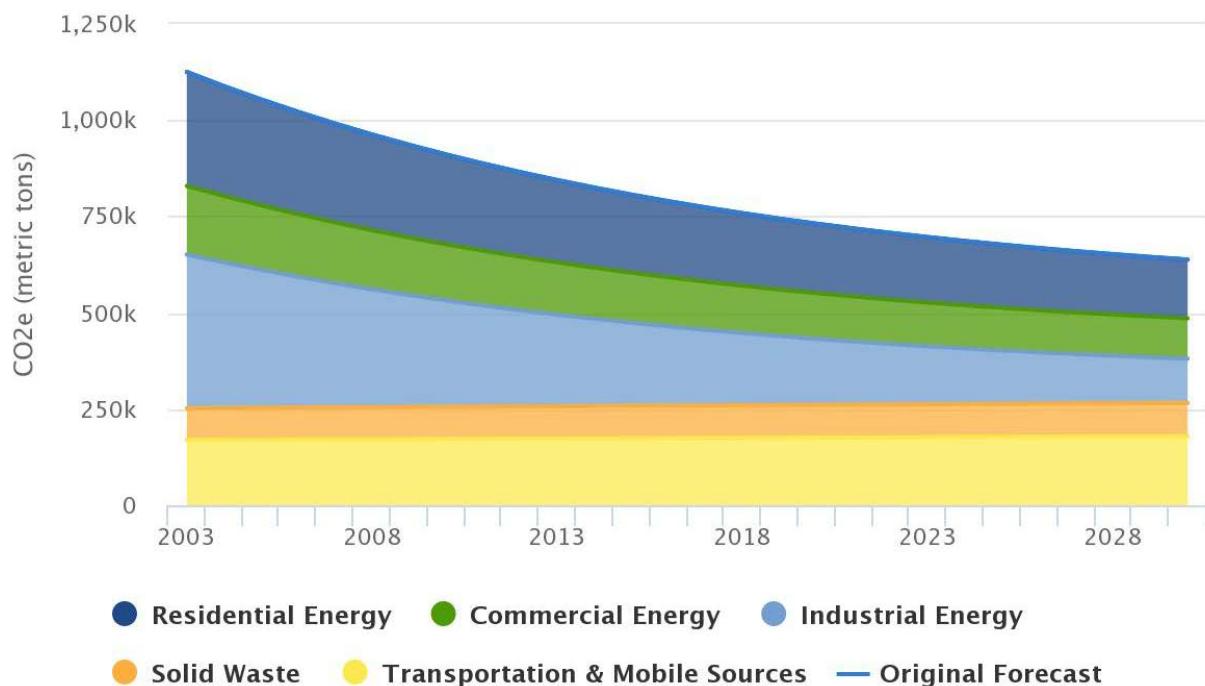
To illustrate the potential emissions growth based on projected population growth of 0.1965% annually from the 2003 baseline year going forward and an average annual rate of change in electricity grid carbon intensity of -6.1%, the City of Dubuque conducted a business-as-usual emissions forecast for the year 2030. Under this scenario with the only the aforementioned growth factors applied, the City of Dubuque's emissions are projected to shrink by approximately 43.2% by the year 2030, from 1,122,597 to 638,024 MT CO₂e. Table 8 and Figure 8 below show the results of the forecast. The decrease in emissions from residential, commercial, and industrial energy use can primarily be attributed to the grid electricity emissions. These emissions are projected to decrease because the percentage of electricity generated by renewable resources is increasing at a considerable rate and the percentage generated by fossil fuels is decreasing.

The population growth rate factor used is the average annual rate of change in population for the City of Dubuque from 2014 to 2017 using data obtained from the City of Dubuque. Rate of change of carbon intensity factors was estimated from the average annual rate of change in carbon intensity factors for the state of Iowa from 2007 to 2016 that were obtained from the EPA's Emissions and Generating Resource Integrated Database (eGRID).

Table 8: Dubuque Community-Wide Activity GHG Emissions Business-As-Usual Forecast

Source/Activity	2003 Emissions (MT CO ₂ e)	2030 Emissions (MT CO ₂ e)	% Change from 2003 to 2030
Residential Energy	295,023	152,504	-48.3%
Commercial Energy	177,313	104,825	-40.9%
Industrial Energy	398,061	114,769	-71.2%
On-road Vehicle Travel	169,881	179,127	+5.4%
Landfill Gas	82,319	86,799	+5.4%
Total Emissions	1,122,597	638,024	-43.2%

Fig. 8: Dubuque Community wide GHG Emissions Business-As-Usual Forecast



CONCLUSION

The Dubuque community has achieved a 27% reduction in emissions, putting them on track to meet their 50% by 2030 target. In 2019, an initiative to update the 50% by 2030 Plan is moving forward and will review available science and add adaption and equity strategies.

Emissions reduction strategies to consider for the climate action plan include energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, and waste reduction among others. All of these sectors will be important to focus on in Dubuque's Climate Action Planning update process. Through these efforts and others the city of Dubuque can achieve additional benefits beyond reducing emissions, including saving money and improving Dubuque's economic vitality and its quality of life.

Dubuque should continue to track key energy use and emissions indicators on an on-going basis. ICLEI recommends completing a re-inventory at least every five years to measure emissions reduction progress.