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City of Allentown 2020 Greenhouse Gas Inventory Report

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Introduction

The City of Allentown is committed to developing a climate action plan to reduce its greenhouse gas (GHG) emissions and adapt to the impacts of climate change. This commitment is stated in the City's recent comprehensive plan (Vision 2030).

The first step in developing a climate action plan is to establish a baseline of the city's GHG emissions. This enables the City to identify the most important sources of GHG emissions and to focus its resources on climate actions that would make the greatest difference. With this inventory, the City can establish sensible GHG reduction goals and targets, track progress against baseline emissions, and assess the effectiveness of selected mitigation measures.

This report presents the outcome of the GHG inventory undertaken in the fall of 2020 by the Allentown EAC through a Muhlenberg internship under a DEP-funded program utilizing ICLEI's emission calculation methodologies and tools. The inventory established a 2018 baseline of emissions within the City boundary. We expect this inventory to be updated every 2 – 3 years.

Looking forward, the next steps will include conducting vulnerability assessments and identifying, evaluating and implementing climate actions to achieve emission reductions as well as actions to address the physical and transitional impacts of climate change. The Allentown EAC expects to partner with the City in these efforts and already has begun (through a continuation of the Muhlenberg internship) to develop an inventory of climate actions that are underway, have been proposed in Vision 2030, or should be considered based on actions being taken by similarly-situated cities. We expect a report on the Climate Action Inventory to be issued later this year.

Methodology

This GHG Inventory was created with the guidance and assistance from ICLEI and funding from the Pennsylvania Department of Environmental Protection. The data was collected in accordance with the requirements of the U.S Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Data was collected for the 2018 calendar year for emissions related to residential energy, industrial energy, commercial energy, transportation and mobile sources, solid waste, water and wastewater. Emissions were calculated using Clearpath, one of the leading online software platforms for completing greenhouse gas inventories, forecasting, and monitoring at the community-wide scale. The 2018 baseline was suggested by ICLEI due to the amount of available data, both public and collected from utilities.

The greenhouse gases included in the inventory are: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4). As each greenhouse gas has a different impact on the atmosphere, with the global warming potential of each varying widely, the calculated emissions are standardized into one unit—carbon dioxide equivalents (CO_2e).

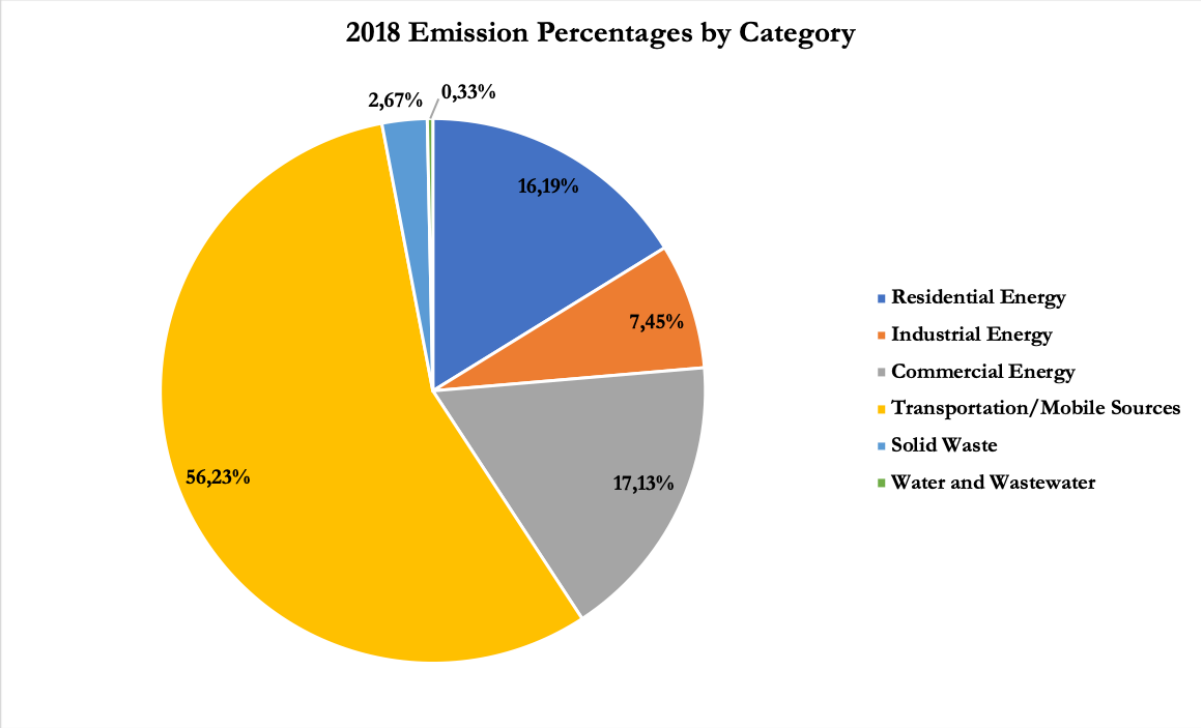
Institutional Data

Institutional data is essential as part of the Inventory because it establishes a frame of reference and enables the comparison of Allentown's level of emissions in relation to other cities, communities, or municipalities of similar size. In 2018, the City of Allentown reported their population to be 121,433. In the same year the city generated 2,402,569 metric tons (MT) of CO_2e. This would make the CO_2e per resident 19.79 MT CO2/person.

Emissions by Category (Table)

2018 Totals	CO_2e (Metric Tons)	Percent of Total
Residential Energy	388,977	16.19%
Industrial Energy	179,079	7.45%
Commercial Energy	411,503	17.13%
Transportation/Mobile Sources	1,350,888	56.23%
Solid Waste	64,245	2.67%
Water and Wastewater	7,877	.33%
Totals	2,402,569	100%
Corrected Total[1]	**2,394,692**	**--**

Figure 1- 2018 Emissions Percentages by Category



[1] The electricity used by waste and wastewater is provided by PPL and is therefore double counted in the inventory. Therefore, the corrected total accounts for the double counting and removes it, showing both total amounts.

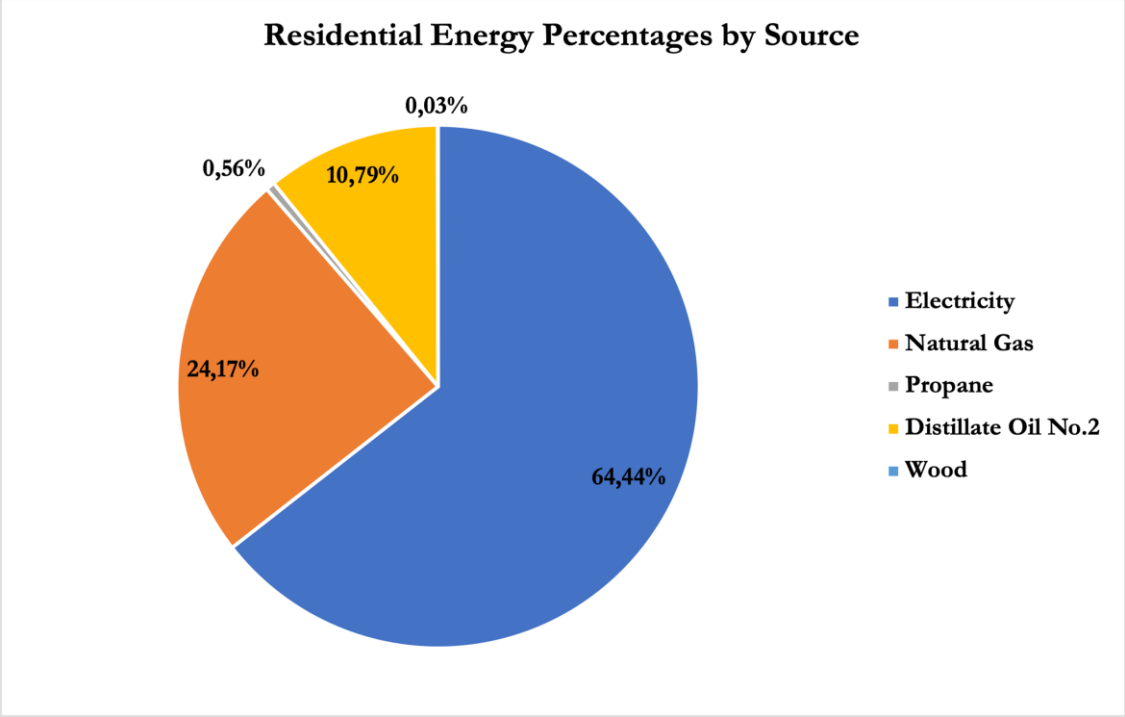
Residential Energy

Residential Energy was broken down into five sources: propane, distillate oil No.2, wood natural gas, and electricity.[2] Overall, residential energy created 388,977 metric tons CO_2e. Electricity produced the greatest quantity of emissions in this category. With a total of 250,666 metric tons CO_2e, this represented 64.44% of total residential energy emissions. The next highest producer of residential energy emissions was natural gas, which created 94,034 metric tons of CO_2e. The non-utility fuels (propane, wood, distillate oil No.2) created a combined total of 44,277 metric tons CO_2e, representing 11.38% of Allentown's residential emissions.[3]

Residential Energy by Category (Table)

2018 Residential Energy	Usage	CO_2e (Metric Tons)	Percent of Total
Electricity	767,751,647 kWh	250,666	66.44%
Natural Gas	17,680,120 therms	94,034	24.17%
Propane	35,126.53 MMBtu	2,180	.56%
Distillate Oil No.2	563,780.34 MMBtu	41,977	10.79%
Wood	12,002.05 MMBtu	120	.03%
Totals	--	**388,977**	**100%**

Figure 2- 2018 Residential Energy Percentages by Source



[2] Non-utility fuel data (propane, distillate oil No.2, and wood) was collected from the 2018 United States Census American Community Survey for selected housing characteristics in Allentown. The electricity data was obtained from PPL, and the natural gas data was collected from UGI.

[3] Non-utility fuel data was calculated based off an estimation and allocation process through the use of natural gas customers and usage provided by UGI. Through this data, therms per customer was calculated and then converted to MMBtu per consumer and applied to the number of reported households using each non-utility fuel type.

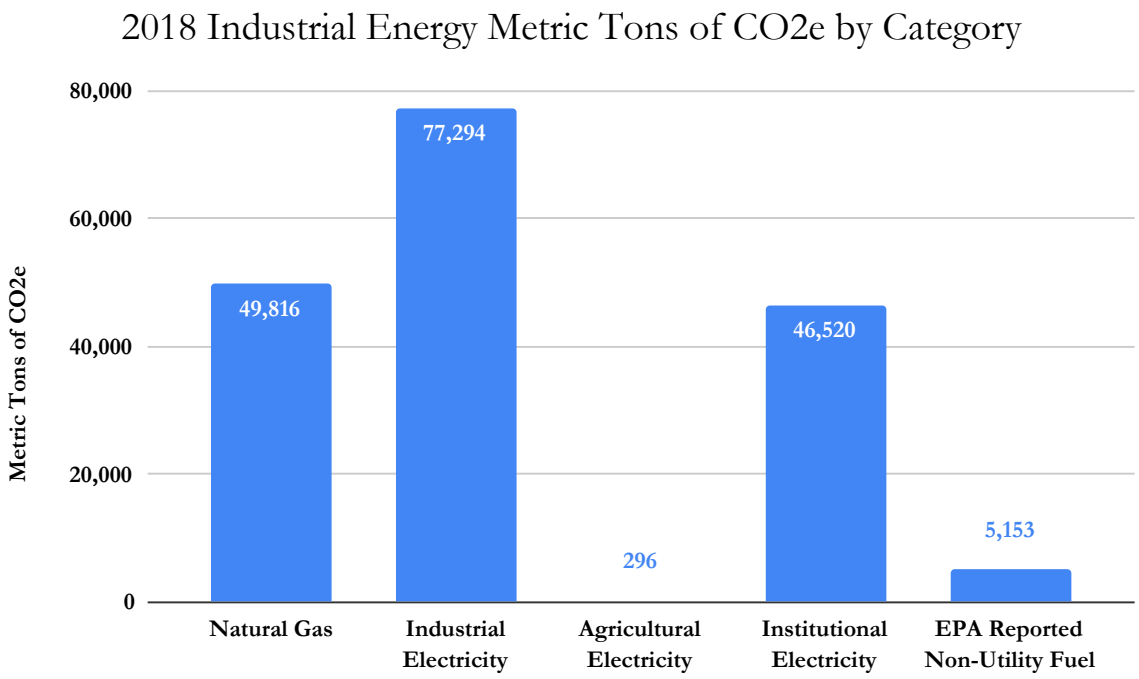
Industrial Energy

Industrial energy was broken down into five sources: natural gas, industrial electricity, agricultural electricity, institutional electricity, and EPA reported non-utility fuel.[4] Overall, industrial energy created 179,079 metric tons CO_2e, 7.45% of total emissions. Industrial electricity was the greatest producer of industrial energy emissions, representing 43.16% of total industrial energy emissions. Additionally, due to their intense use of electrical equipment, PPL released a significant amount of sulfur hexafluoride. Since they are such large consumers, they are required to report their emissions to the EPA. Therefore, "EPA Reported Non-Utility Fuel" represents the CO_2e equivalent from the sulfur hexafluoride emitted, which represents 2.88% of industrial energy emissions.

Industrial Energy by Category (Table)

2018 Industrial Energy	Usage	CO_2e (Metric Tons)	Percent of Total
Natural Gas	9,386,103 therms	49,816	27.18%
Industrial Electricity	236,740,785 kWh	77,294	43.16%
Agricultural Electricity	906,153 kWh	296	.16%
Institutional Electricity	142,482,495 kWh	46,520	25.98%
EPA Reported Non-Utility Fuel	n/a	5,153	2.88%
Totals	--	**179,079**	**100%**

Figure 3- 2018 Industrial Energy Metric Tons of CO_2e by Category

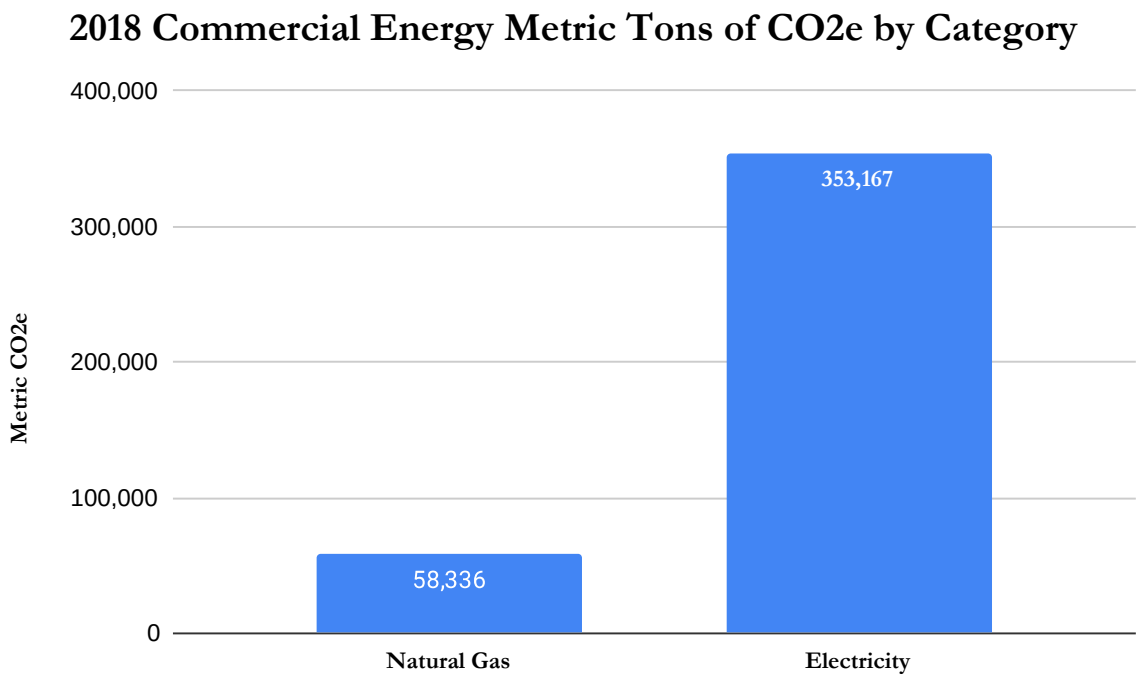


[4] Reported non-utility fuel was collected from publicly available EPA emissions data. Natural gas data was collected from UGI. Lastly, Data on industrial, agricultural, and institutional electricity were collected from PPL.

Commercial Energy

In 2018, Commercial energy represented 17.13% of Allentown's carbon emissions. This accounts for 411,503 MT CO_2e. Commercial energy was made up of two sources: natural gas and electricity.[5] Natural gas represented 14.17% of commercial energy emissions, which accounts for 58,336 metric tons CO_2e. The usage affiliated with these natural gas emissions were 10,968,110 therms. Commercial electricity generated significantly more emissions, 353,167 metric tons CO_2e were created. This accounts for 85.82% of Allentown's total commercial energy. The usage affiliated with these electricity emissions were 1,081,695,502 kWh.

Figure 4- 2018 Commercial Energy Metric Tons of CO_2e by Category



Transportation and Other Mobile Sources

In 2018, transportation and other mobile sources accounted for the greatest number of emissions throughout the inventory. Generating 1,350,888 MT CO_2e, this represents 56.23% of Allentown's carbon emissions. Transportation is broken down into seven sources: motorcycles, light trucks, heavy trucks, passenger vehicles, off-road gasoline vehicles, off-road diesel vehicles, and off-road "other" vehicles.[6] Passenger vehicles represented the highest number of emissions in Allentown's transportation. With 1,958,627,516.89 annual vehicle miles traveled (VMT), this accounted for 716,020 MT CO_2e, which represents 29.8% of Allentown's carbon emissions.[7]

[5] Natural gas data was collected from UGI and electricity data were collected from PPL.

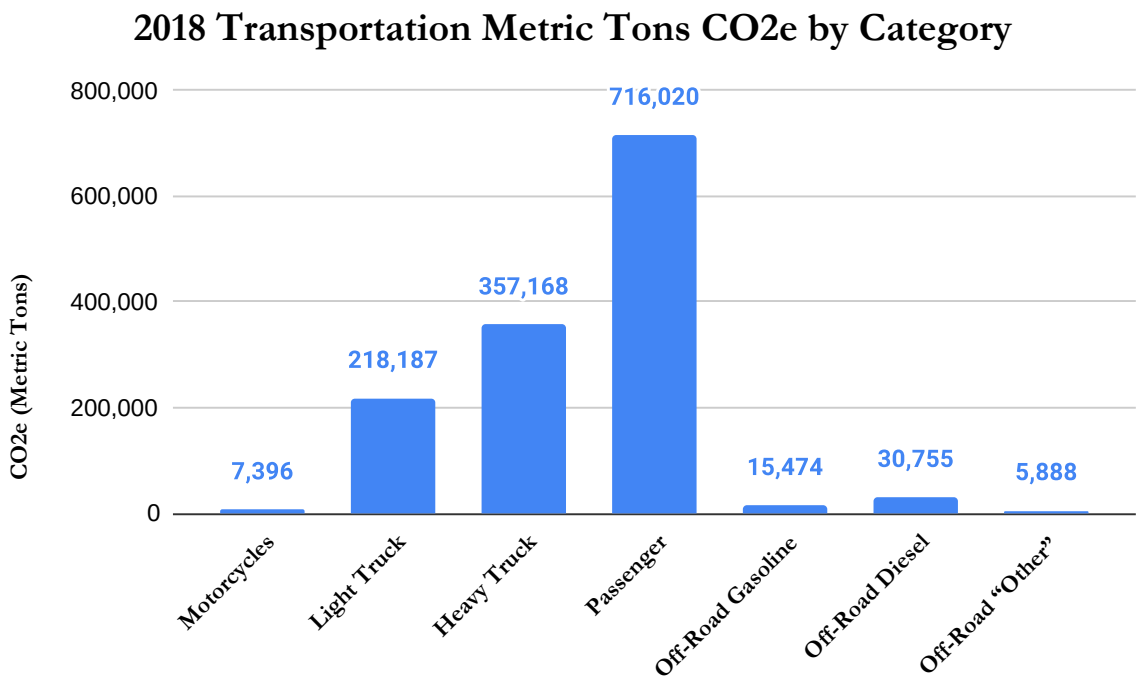
[6] Data for motorcycles, light trucks, heavy trucks and passenger vehicles were collected from PennDOT travel data. All Off-road emissions were calculated from the EPA's 2017 National Emissions Inventory (NEI) Data and an allocation process was conducted based off county and city population.

[7] For this data we used Penndot travel data for rural, small urban, and urbanized areas. This data had a subsection that included Allentown, Easton and Bethlehem. To perform the allocation for Allentown we used an allocation

Transportation and Other Mobile Sources by Category (Table)

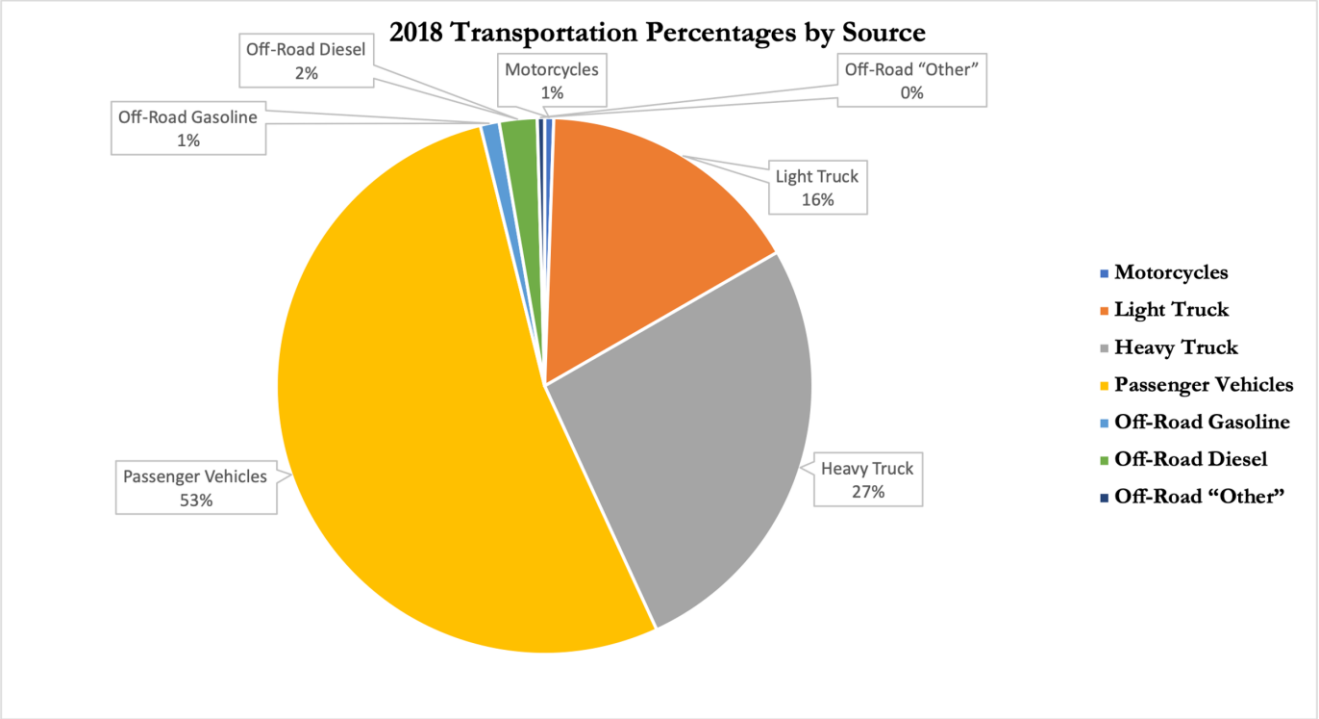
2018 Transportation	Annual VMT	CO_2e (Metric Tons)	Percent of Total
Motorcycles	20,232,669.55	7,396	.55%
Light Truck	431,192,344.85	218,187	16.15%
Heavy Truck	217,566,888.13	357,168	26.44%
Passenger Vehicles	1,958,627,516.89	716,020	53%
Off-Road Gasoline	n/a	15,474	1.14%
Off-Road Diesel	n/a	30,755	2.28%
Off-Road "Other"	n/a	5,888	.44%
Totals	**2,627,619,419.42**	**1,350,888**	**100%**

Figure 5- 2018 Transportation Metric Tons of CO_2e by Category



process based on city and county populations. Additionally, we needed to determine what percentage of each vehicle type made up the allocation amount. For this we used the Penndot highway vehicle type classification. We used the data from the "urban" section and calculated percentages of each type of vehicle. There are many categories that were combined to make up heavy trucks-- each category to the right of "bus" on the chart were combined to create the heavy truck percentage. We combined these due to the fact that a heavy truck has at least two axles and six or more tires. We then applied these percentages to the allocation to determine the VMT associated with each vehicle type. Additionally, we assumed that passenger vehicle, motorcycle and light trucks were operating on gasoline, with only heavy trucks operating on diesel. Lastly, each VMT was multiplied by 365 to create the annual VMT data for each vehicle type.

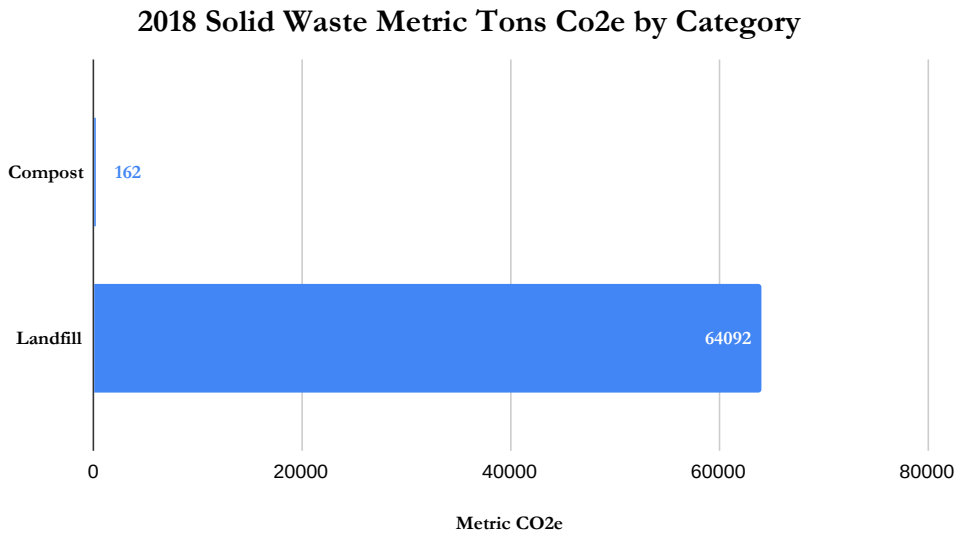
Figure 6- 2018 Transportation Percentages by Source



Solid Waste

In 2018, solid waste represented 2.67% of Allentown's carbon emissions. This represents 62,245 MT CO_2e. Solid waste was composed of two sources: composting and landfill emissions.[8] Composting generated 162 metric tons of CO_2e, while the landfill generated 64,092 MT CO_2e.

Figure 7- 2018 Solid Waste Metric Tons of CO_2e by Category



[8] All solid waste data was collected from The Allentown Bureau of Recycling and Solid Waste.

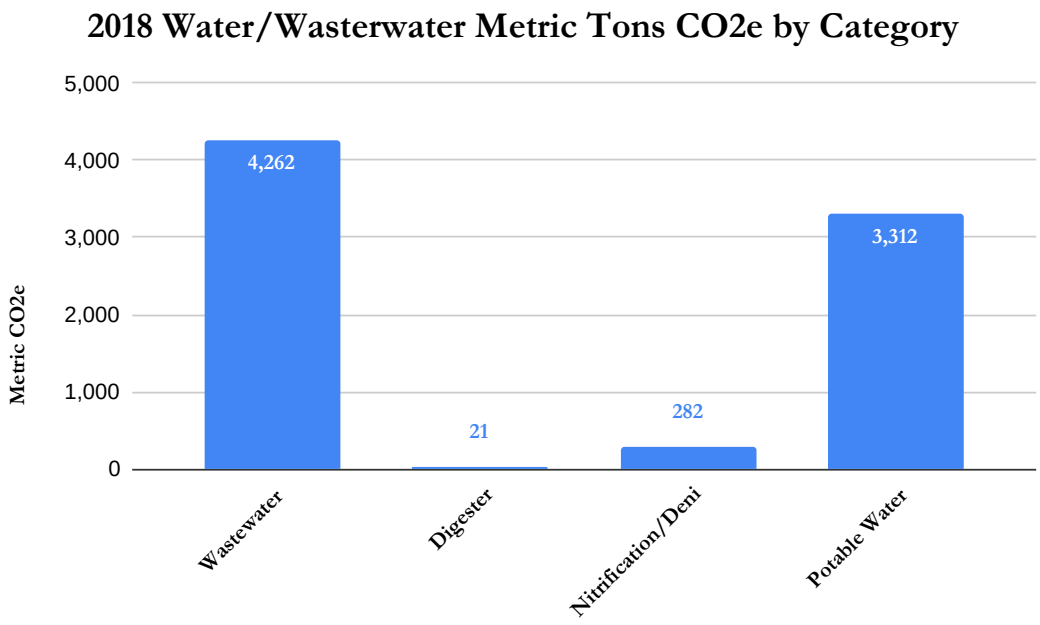
Water and Wastewater

In 2018, water and wastewater emissions represented .33% of Allentown's carbon emissions. This accounts for 7,877 MT CO_2e. Water and wastewater was broken down into four sources: wastewater, digester, nitrification/denitrification, and potable water.[9] Wastewater produced the greatest number of emissions, representing 54.11% of total water and wastewater emissions. This accounts for 4,262 MT CO_2e.

Water and Wastewater by Category (Table)

2018 Water & Wastewater	Usage (Gallons)	CO_2e (Metric Tons)	Percent of Total
Wastewater	13,164	4,262	54.11%
Digester	n/a	21	.27%
Nitrification/Denitrification	n/a	282	3.58%
Potable Water	4,748.3	3,312	42.05%
Totals	--	**7,877**	**100%**

Figure 8- 2018 Waste and Wastewater Metric Tons of CO_2e by Category



[9] All water and wastewater data were collected from the Lehigh County Authority.

Figure 9- 2018 Water and Wastewater Percentages by Source

