

An aerial photograph of the town of Carlisle, Pennsylvania, taken during the 'golden hour' of sunset. The sky is a vibrant mix of orange, yellow, and red, with soft clouds catching the low light. The town below is a dense collection of buildings, mostly multi-story brick structures, interspersed with green trees. In the foreground, a large parking lot with several cars is visible. The overall scene conveys a sense of a close-knit community in a scenic setting.

Carlisle 2022 Community GHG Inventory

Justin King

Rory Peabody

Courtney Young

Agenda

01

Electricity

02

Natural Gas

03

Residential, Commercial, Industrial

04

Transportation

05

Solid Waste

06

Water & Waste Water

07

Summary



Utilities - Electricity

01

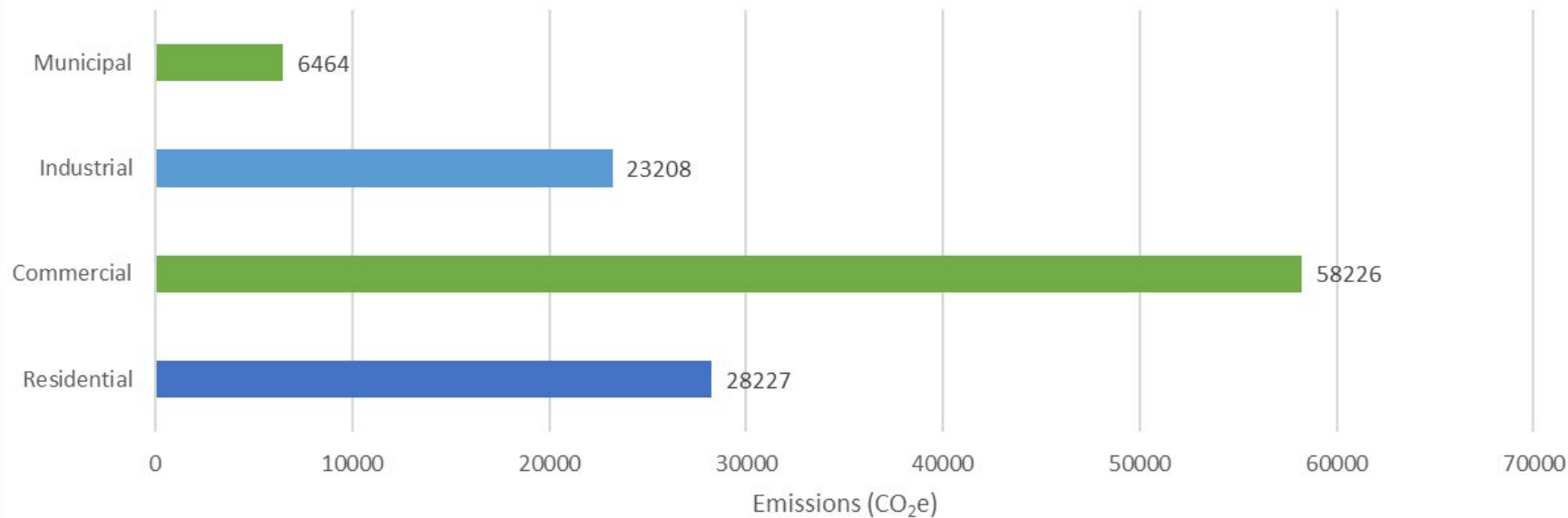
eGRID Subregion Representational Map



Subregion Output Emission Rates

eGRID subregion acronym	eGRID subregion name	Total output emission rates lb/MWh						
		CO ₂	CH ₄	N ₂ O	CO ₂ e	Annual NO _x	Ozone Season NO _x	SO ₂
RFCE	RFC East	672.8	0.049	0.007	676	0.3	0.3	0.337

Carlisle PPL Emissions (Population-Adjusted) - Electricity



Stationary Energy - Methods

Jobs by NAICS Industry Sector

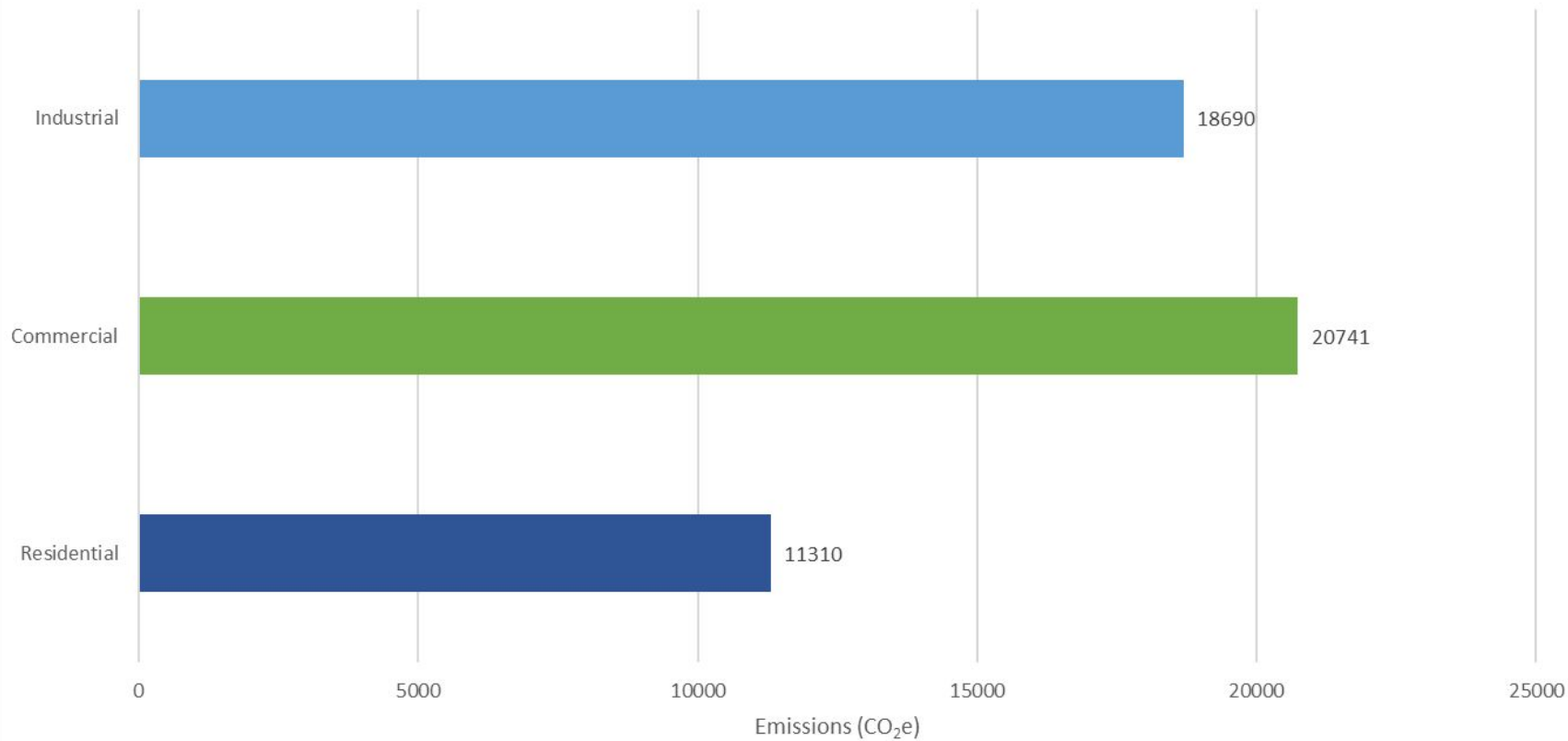
	2020		
	Count	Share	
Agriculture, Forestry, Fishing and Hunting	0	0.00%	commercial
Mining, Quarrying, and Oil and Gas Extraction	0	0.00%	industrial
Utilities	0	0.00%	commercial
Construction	218	1.50%	commercial
Manufacturing	1,965	13.90%	industrial
Wholesale Trade	146	1.00%	commercial
Retail Trade	1,685	11.90%	commercial
Transportation and Warehousing	2,738	19.40%	commercial
Information	116	0.80%	commercial
Finance and Insurance	120	0.80%	commercial
Real Estate and Rental and Leasing	63	0.40%	commercial
Professional, Scientific, and Technical Services	328	2.30%	commercial
Management of Companies and Enterprises	100	0.70%	commercial
Administration & Support, Waste Management and Remediation	1,325	9.40%	commercial
Educational Services	1,700	12.00%	commercial
Health Care and Social Assistance	1,460	10.30%	commercial
Arts, Entertainment, and Recreation	26	0.20%	commercial
Accommodation and Food Services	1,265	9.00%	commercial
Other Services (excluding Public Administration)	585	4.10%	commercial
Public Administration	287	2.00%	commercial



Utilities - Natural Gas

02

Carlisle UGI Emissions (Population-Adjusted) - Natural Gas

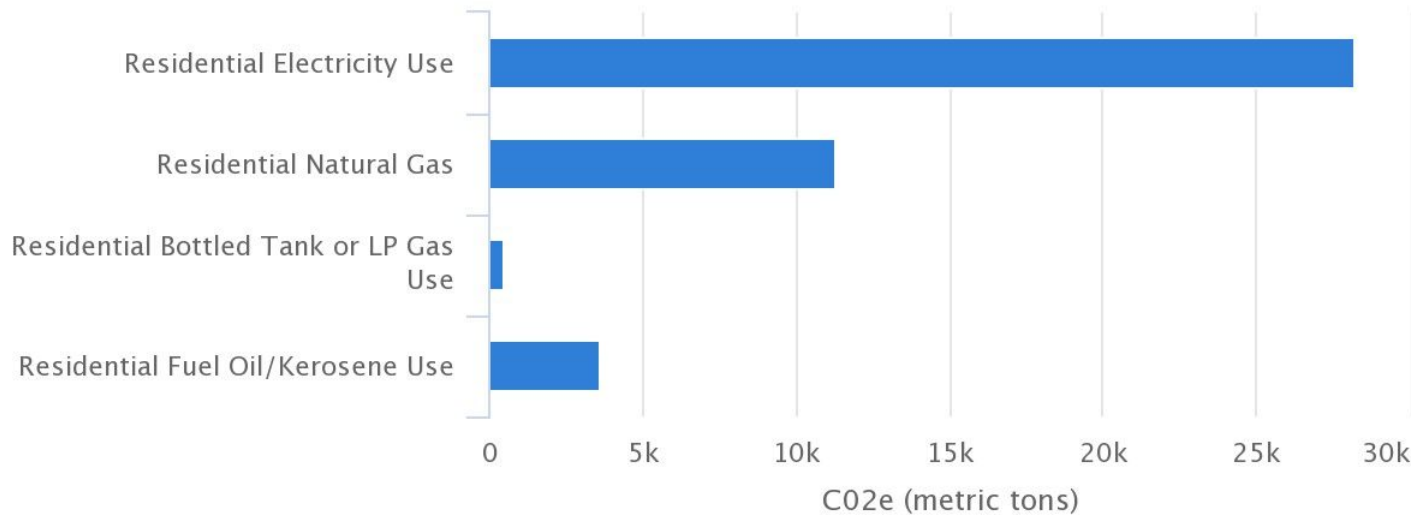




Residential,
Commercial,
Industrial

Residential Energy - Emissions

CO2e By Record



Residential Energy - Non-Utility Methods

B25040 | House Heating Fuel

American Community Survey

Universe: Occupied housing units

2022: ACS 5-Year Estimates De...

Notes

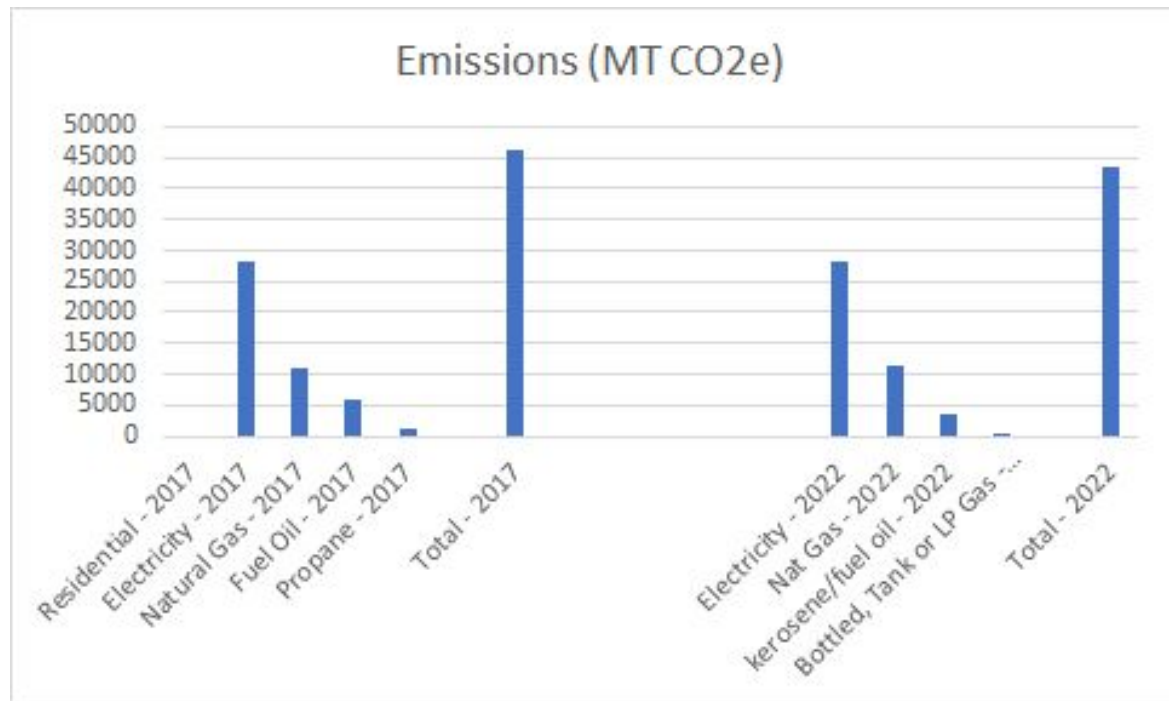
Geos

Carlisle borough, Pennsylvania

Label	Estimate	Margin of Error
▼ Total:	8,334	±342
Utility gas	4,338	±468
Bottled, tank, or LP gas	234	±107
Electricity	2,599	±316
Fuel oil, kerosene, etc.	847	±193
Coal or coke	0	±21
Wood	0	±21
Solar energy	18	±29
Other fuel	134	±118
No fuel used	164	±108

- Determine Usage/Customer:
- ~55 MM BTU/customer
- Apply to household data

Residential Energy - Emissions



Category	Emissions (MT CO2e)
Residential - 2017	
Electricity - 2017	28391
Natural Gas - 2017	10877
Fuel Oil - 2017	5845.5
Propane - 2017	1054.4
Total - 2017	46167.9
Electricity - 2022	28227
Nat Gas - 2022	11310
kerosene/fuel oil - 2022	3620.4
Bottled, Tank or LP Gas - 2022	453
Total - 2022	43610.4

- Fuel oil - 62% reduction
- Propane - 43% reduction

Residential Energy - Emissions

	Occupied housing units			
Label	Estimate	Margin of Error	2017 Usage (CO2e(MT))	2022 Usage (CO2e(MT))
HOUSE HEATING FUEL				
Utility gas	4,080	±382	10877	11310
Bottled, tank, or LP gas	140	±72	1054.4	452.86
Electricity	2,732	±296	28391	28227
Fuel oil, kerosene, etc.	920	±210	5845.5	3630.4
Coal or coke	0	±18		
All other fuels	104	±103		
No fuel used	123	±81		

- Note: Data set accuracy and large margins of error

Commercial Energy - Data

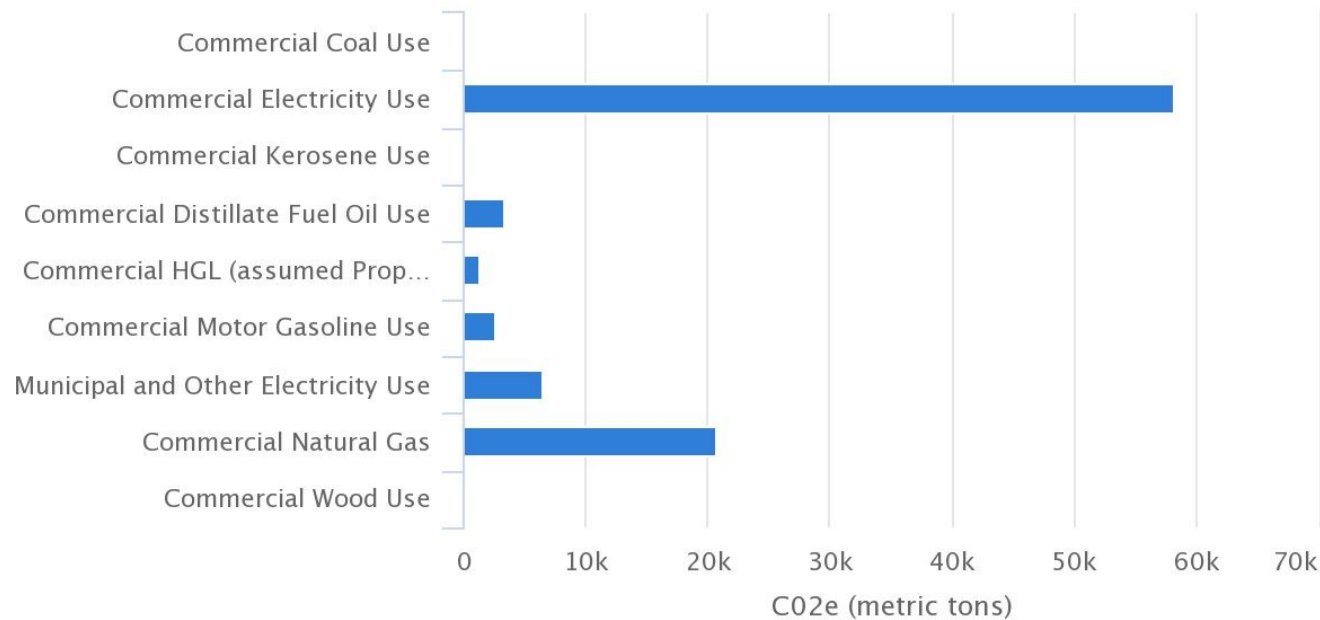
Table CT5. Commercial Sector Energy Consumption Estimates, 1960-2021, Pennsylvania

Year	Coal	Natural Gas ^a	Petroleum						Hydro- electric Power ^{e,f}	Biomass
			Distillate Fuel Oil	HGL ^b	Kerosene	Motor Gasoline ^c	Residual Fuel Oil	Total ^d		Wood and Waste ^{f,g}
	Thousand Short Tons	Billion Cubic Feet	Thousand Barrels						Million Kilowatthours	
Trillion Btu										
1960	90.0	58.1	25.4	1.4	1.4	10.9	34.7	73.8	NA	
2016	1.0	148.9	15.3	8.1	0.2	14.1	0.1	37.8	0.0	
2017	0.6	152.2	17.9	7.2	0.1	14.3	(s)	39.6	0.0	
2018	0.4	171.6	20.3	8.4	0.2	14.5	(s)	43.5	0.0	
2019	0.3	168.0	19.9	8.0	0.2	14.6	0.0	42.8	0.0	
2020	0.2	154.0	13.7	8.0	0.2	14.7	0.0	36.6	0.0	
2021	0.2	160.4	18.2	8.4	0.2	14.9	(s)	41.6	0.0	

- Acquire Commercial SEDS data
- Determine Industrial Carlisle:PA jobs ratio
- Apply commercial jobs ratio (~0.25%) and unit conversions

Commercial Energy - Emissions

CO2e By Record



Industrial Energy - Data

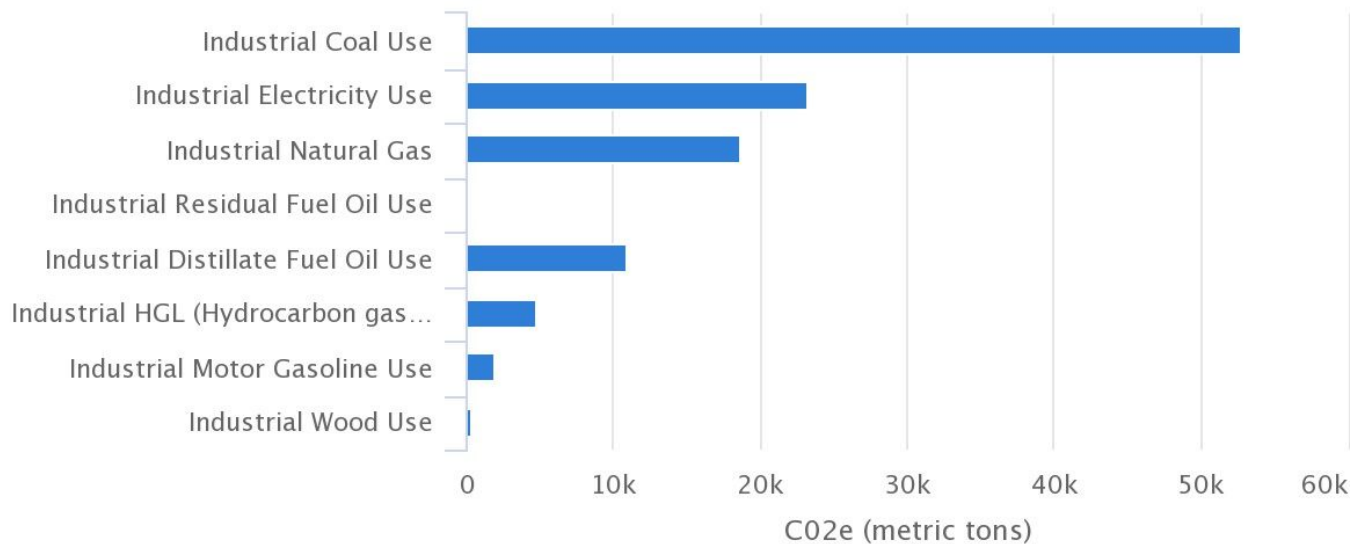
Table CT6. Industrial Sector Energy Consumption Estimates, 1960-2021, Pennsylvania

Year	Coal	Natural Gas ^a	Petroleum						Hydro-electric Power ^{e,f}	Biomass
			Distillate Fuel Oil	HGL ^b	Motor Gasoline ^c	Residual Fuel Oil	Other ^d	Total		
	Thousand Short Tons	Billion Cubic Feet	Thousand Barrels						Million kWh	Wood and Waste ^{f,g}
1960	33.140	213	8.645	992	1.456	29.692	17.976	58.762	16	--
Trillion Btu										
1960	873.1	220.0	50.4	3.8	7.6	186.7	110.7	359.1	0.2	19.8
2016	159.7	418.1	36.8	21.1 [R]	7.5	0.8	137.2	203.3 [R]	0.0	54.7
2017	167.1	432.7	41.8	20.6 [R]	7.6	0.6	141.6	212.2 [R]	0.0	54.6
2018	175.7	475.0	43.3	21.0 [R]	7.7	0.5	133.8 [R]	206.4 [R]	0.0	51.5
2019	170.4	516.1	43.8	20.6 [R]	7.7	0.6	111.4	184.0 [R]	0.0	49.0
2020	118.0	490.3	32.1	21.8 [R]	7.7	0.7	82.6 [R]	145.0 [R]	0.0	48.9
2021	164.6	534.2	42.9	22.5	7.6	0.6	87.6	161.3	0.0	47.8

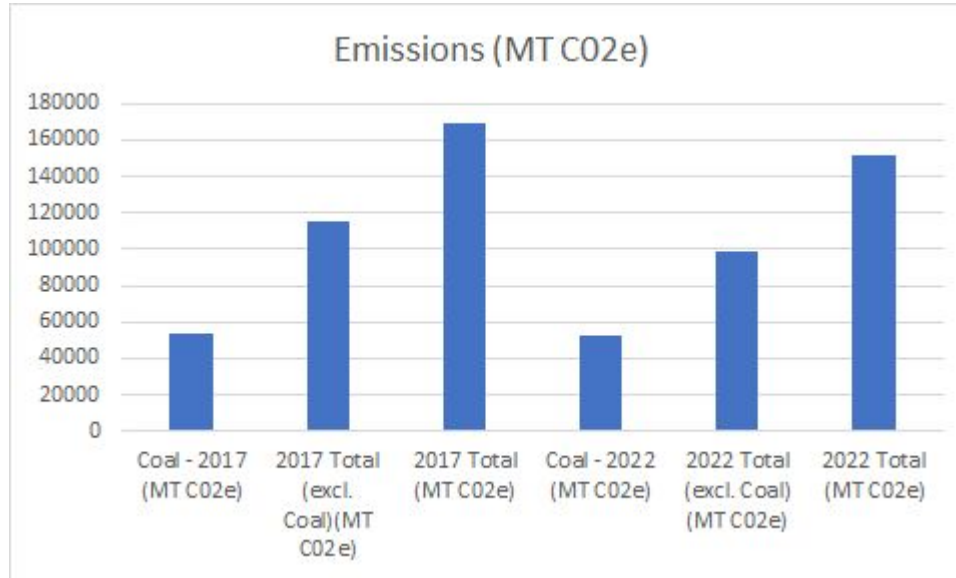
- Acquire Industrial SEDS data
- Determine Industrial Carlisle:PA jobs ratio
- Apply industrial jobs ratio (~0.34%) and unit conversions

Industrial Energy - Emissions

CO2e By Record



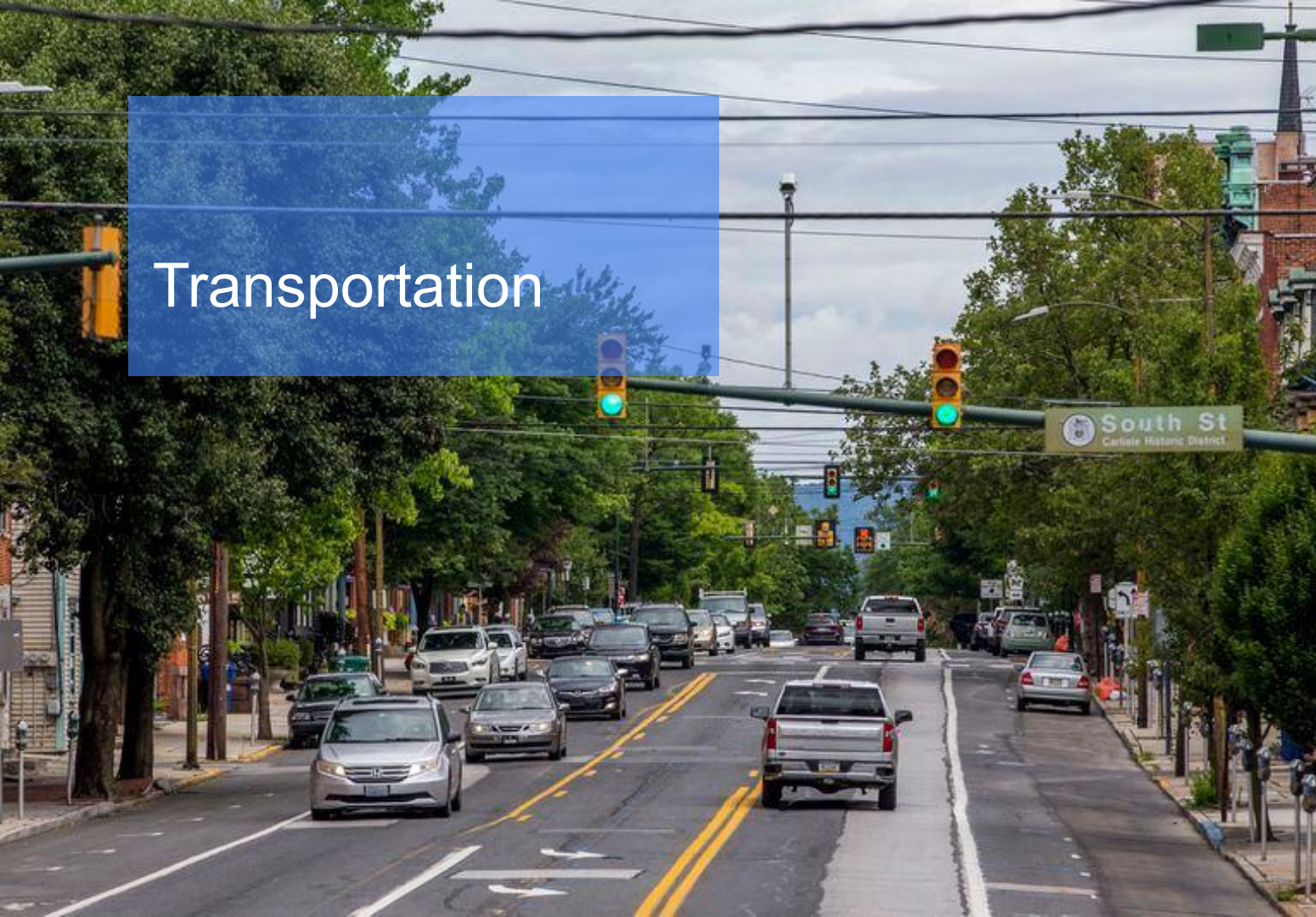
Non Residential Energy - 2017 vs. 2022



Category	Emissions (MT CO2e)
Coal - 2017 (MT CO2e)	53621.2
2017 Total (excl. Coal)(MT CO2e)	115209
2017 Total (MT CO2e)	168830.2
Coal - 2022 (MT CO2e)	52727.066
2022 Total (excl. Coal) (MT CO2e)	99296
2022 Total (MT CO2e)	152023.066



Transportation

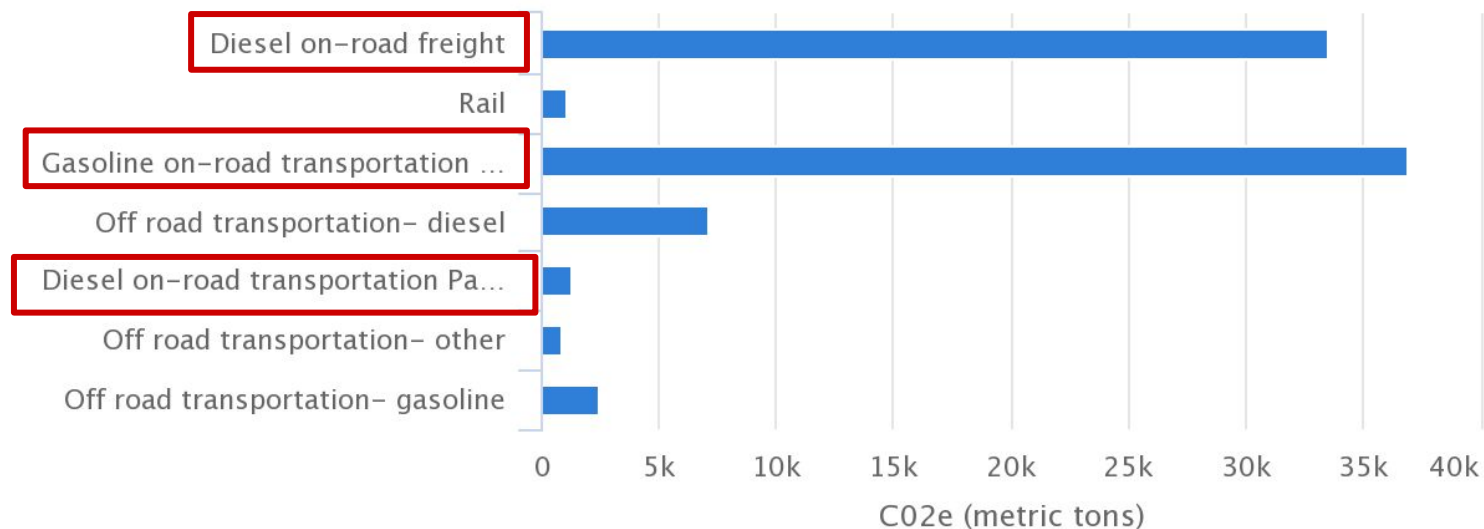


04



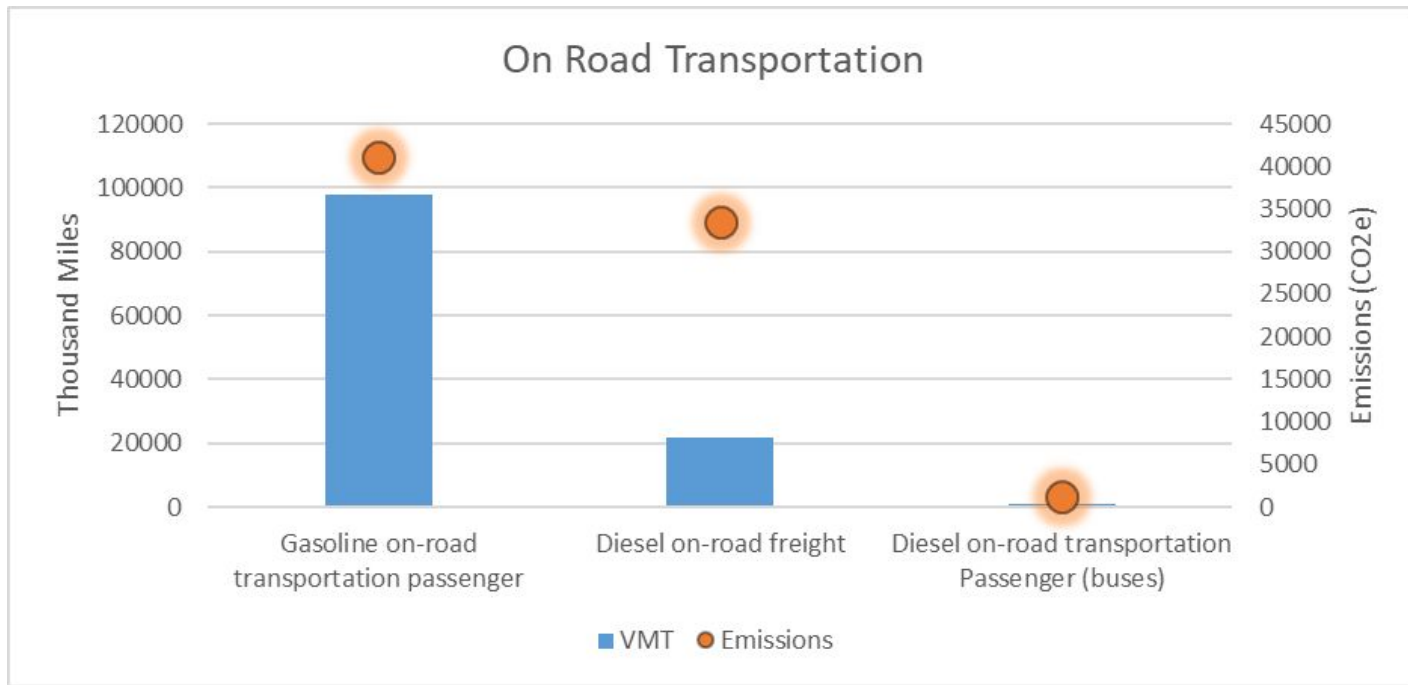
On Road Transportation- Emissions

CO2e By Record





On Road Transportation- Emissions





On Road Transportation- Methods

State level statistics to understand the percentage of miles attributed to each vehicle class

PA Highway Statistics

2021

TRAVEL – VEHICLE TYPE BY HIGHWAY FUNCTIONAL CLASSIFICATION

FUNCTIONAL CLASSIFICATION	DAILY VEHICLE MILES TRAVELED (THOUSANDS)																
	MOTORCYCLES	PASSENGER CARS	SINGLE-UNIT VEHICLES	OTHER TWO-AXLE, SINGLE-UNIT TRUCKS	BUSES	TWO-AXLE, SIX-TIRE, SINGLE-UNIT TRUCKS	SINGLE-UNIT TRUCKS	FOUR OR MORE AXLE SINGLE-UNIT TRUCKS	TRAILER TRUCKS	FOUR OR FEWER AXLE SINGLE-TRAILER TRUCKS	SINGLE-TRAILER TRUCKS	FIVE-AXLE SINGLE-TRAILER TRUCKS	SIX OR MORE AXLE SINGLE-TRAILER TRUCKS	FIVE OR FEWER AXLE MULTI-TRAILER TRUCKS	SIX-AXLE MULTI-TRAILER TRUCKS	SEVEN OR MORE AXLE MULTI-TRAILER TRUCKS	TOTAL
GRAND TOTAL	2,366	197,488	49,129	2,200	9,591	2,363	914	2,021	14,138	299	522	239	69	281,339			

7

Bureau of Planning and Research
Transportation Planning Division

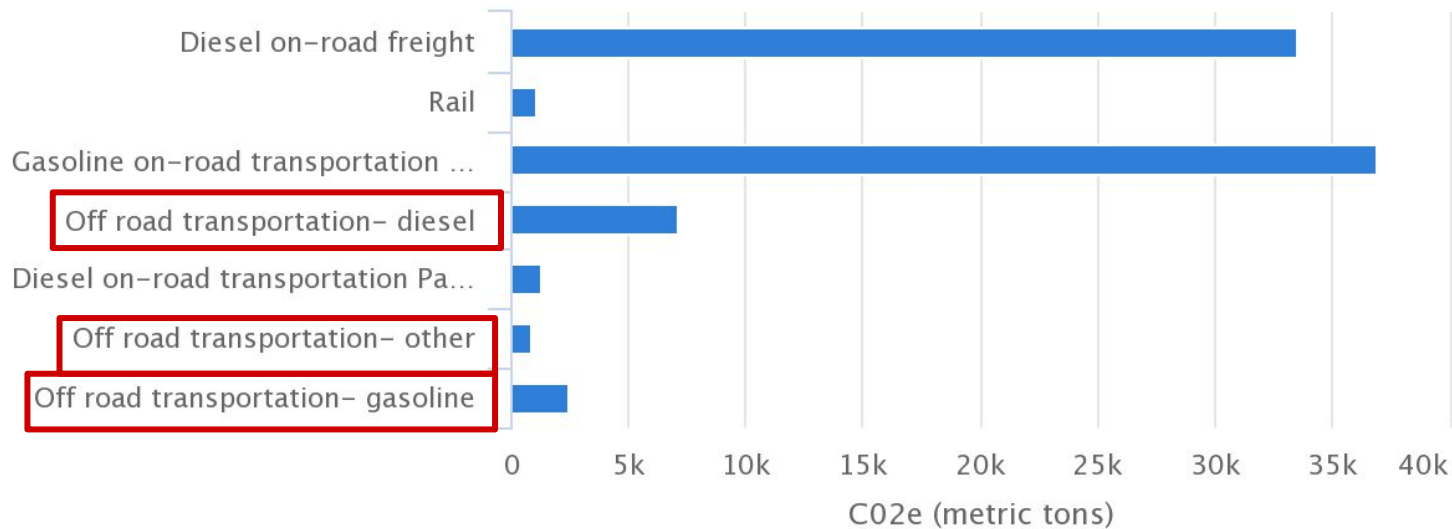
Vehicle Miles Traveled for Carlisle allowed us to scale the state level breakdown to the borough.

Vehicle Miles of Travel (VMT) Summary Carlisle Borough (includes portion of I-81 in boundary)			
Based on PennDOT 2022 Traffic Volume Data			
Total Road Mileage (miles) in Source Data =	82		
VMT Description	Daily VMT	Annualized VMT (Daily x 365)	% of Total
Total VMT for Area	328,677	119,967,105	--
Portion of VMT Related To Trucks	58,887	21,493,755	18%
VMT by Road Ownership			
1 State	249,600	91,104,000	76%
2 Turnpike	-	-	0%
3 Agency	-	-	0%
4 Non-State Non Federal Aid Roads	67,301	24,564,865	20%
5 Non-State Federal Aid Roads	11,775	4,297,875	4%
6 Toll Bridges	-	-	0%
8 Other Local Roads	-	-	0%
Total Check (may differ slightly from total VMT)	328,676	119,966,740	100%
VMT by PennDOT Functional Class			
1 Rural Interstate	-	-	0%
2 Rural Principal Arterial	-	-	0%
3 Rural Other Freeway/Expressway	-	-	0%
6 Rural Minor Arterial	-	-	0%
7 Rural Major Collector	2,897	1,057,405	1%
8 Rural Minor Collector	-	-	0%
9 Rural Local	-	-	0%
11 Urban Interstate	85,249	31,115,885	26%
12 Urban Other Freeway	-	-	0%
14 Urban Principal Arterial	27,069	9,880,185	8%
16 Urban Minor Arterial	86,506	31,574,690	26%
17 Urban Collector	59,596	21,752,540	18%
18 Urban Minor Collector	-	-	0%
19 Urban Local	67,359	24,586,035	20%
99 Undetermined	-	-	0%
Total Check (may differ slightly from total VMT)	328,676	119,966,740	100%



Off Road Transportation-Emissions

CO2e By Record





Off Road Transportation- Methods



United States
Environmental Protection
Agency

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Air Emissions InventoriesCONTACT US

Air Emissions Inventory Home

Data and Documentation

2023 NEI Documentation

2020 NEI Data

2017 NEI Data

2014 NEI Data

2011 NEI Data

2008 NEI Data

Earlier NEIs

Reports and Summaries

Air Pollutants Emissions

2020 National Emissions Inventory (NEI) Data

Documentation

The 2020 NEI includes air emissions sources of both criteria and hazardous air pollutants, and data are available for many facilities and county totals. The [Emissions Inventory System](#) (EIS) helps the EPA to build the NEI.

2020 NEI Data and Documentation

- [2020 NEI Technical Support Document \(TSD\)](#)
- [Online 2020 NEI Data Retrieval Tool](#)
- [2020 NEI and Trends Report](#)
- [Supporting Data and Summaries](#)



Off Road Transportation- Methods

STATE_NAME
Pennsylvania

STATE_COUNTY
PA - Cumberland

SCC_LEVEL_2
Off-highway Vehicle ...

POLLUTANT_TYPE
GHG

POLLUTANT
Carbon Dioxide

Selections

Location

Select one or more

Pollutant

Pollutant Type-Pollutant

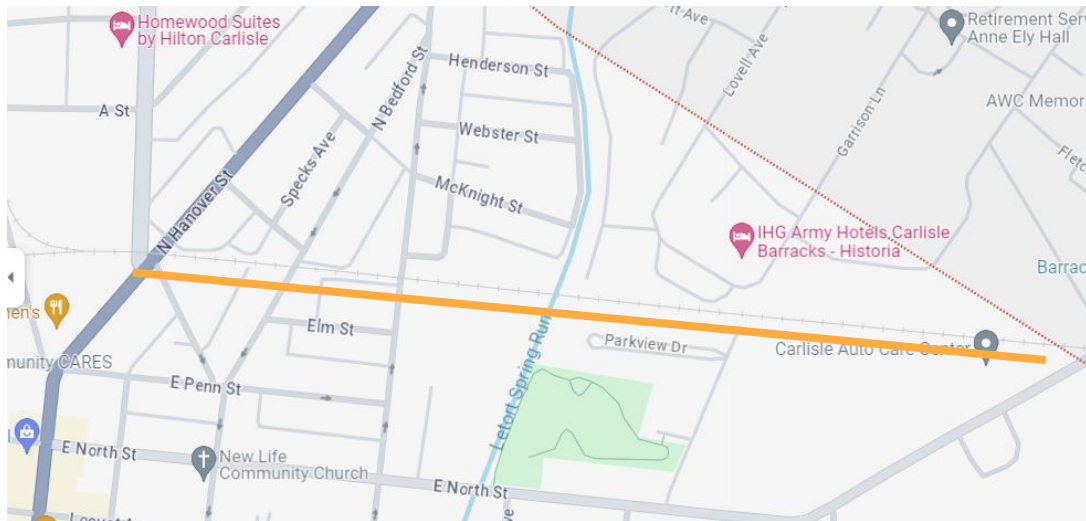
To download data selection, right click on table and select Export data

Overview		County Level Data		Facility Data													
2020 County-Level Process Data for Mobile and Nonpoint Emissions																	
POLLUTANT	Q	Emissions (Tons)	POLL...	Q	SCC Code	Q	EIS Sector	Q	Sourc...	Q	SCC LEVEL 1	Q	SCC LEVEL 2	Q	SCC LEVEL 3	Q	SCC LEVEL 4
Carbon Dioxide		2.72157	GHG		2260005022		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Agricultural Equipment		2-Stroke Agric
Carbon Dioxide		340.85920	GHG		2265005022		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Agricultural Equipment		4-Stroke Agric
Carbon Dioxide		88.36866	GHG		2260006022		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Commercial Equipme...		2-Stroke Comr
Carbon Dioxide		5,034.00400	GHG		2265006022		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Commercial Equipme...		4-Stroke Comr
Carbon Dioxide		162.03100	GHG		2260002022		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Construction Equipm...		2-Stroke Cons
Carbon Dioxide		1,143.00700	GHG		2265002022		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Construction Equipm...		4-Stroke Cons
Carbon Dioxide		1.76493	GHG		2260003022		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Industrial Equipment		2-Stroke Indus
Carbon Dioxide		6.33443	GHG		2265003060		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Industrial Equipment		4-Stroke AC/R
Carbon Dioxide		1,335.62900	GHG		2265003022		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Industrial Equipment		4-Stroke Indus
Carbon Dioxide		513.17200	GHG		2260004021		Mobile - Non-Road Equipment - Gasoline		Nonroad		Mobile Sources		Off-highway Vehicle ...		Lawn and Garden Eq...		2-Stroke Chair
Carbon Dioxide		91.42973	GHG		2260004020		Mobile - Non-Road Equipment - Gasoline								Lawn and Garden Eq...		2-Stroke Chair
Carbon Dioxide		915.50540	GHG		2260004044		Mobile - Non-Road Equipment - Gasoline								Lawn and Garden Eq...		2-Stroke Lawn
Carbon Dioxide		215.65420	GHG		2260004033		Mobile - Non-Road Equipment - Gasoline								Lawn and Garden Eq...		2-Stroke Lawn
Carbon Dioxide		0.20035	GHG		2260004022		Mobile - Non-Road Equipment - Gasoline								Lawn and Garden Eq...		2-Stroke Mow
Carbon Dioxide		138.50770	GHG		2260004036		Mobile - Non-Road Equipment - Gasoline								Lawn and Garden Eq...		2-Stroke Snow
Carbon Dioxide		41.06560	GHG		2260004035		Mobile - Non-Road Equipment - Gasoline								Lawn and Garden Eq...		2-Stroke Snow
Carbon Dioxide		4,093.06300	GHG		2265004044		Mobile - Non-Road Equipment - Gasoline								Lawn and Garden Eq...		4-Stroke Lawn
Totals		30,594.71966															

Data then scaled down
using Carlisle's
population.



Rail



Emissions/ mile were determined using EPA and Norfolk Southern data.

Map measurements led us to understand .02% of NS lines lie within Carlisle.

1,040.7 metric tons CO₂e



Solid Waste

05



Waste Characterization Study

FINAL REPORT

September 2022

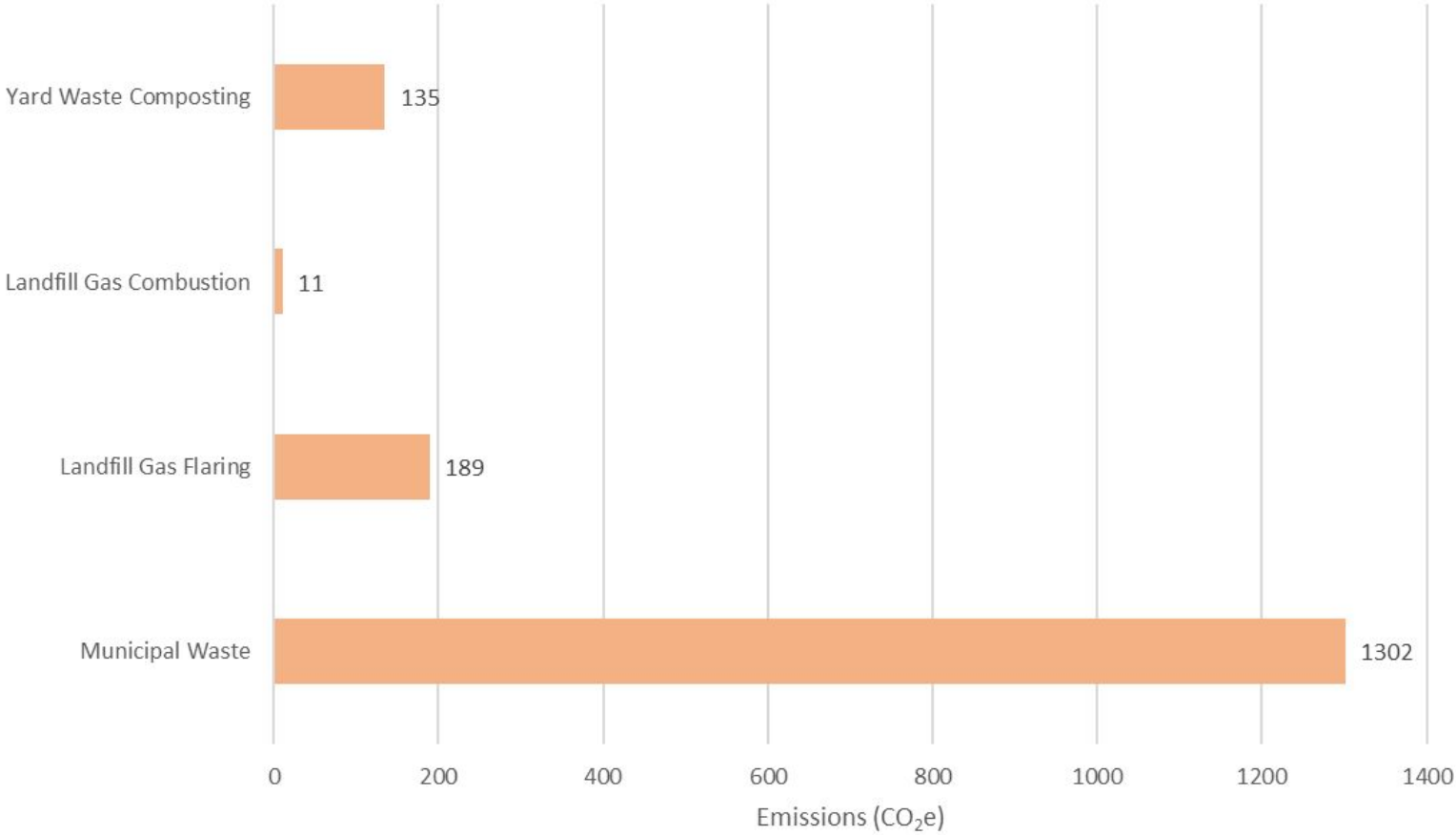


Table 4-1 Statewide Aggregate Disposed MSW Composition Detail

Material Category	Est. Percent	MOE	Tons	Material Category	Est. Percent	MOE	Tons
Paper	25.8%	0.6%	2,420,102	Organics	39.8%	0.8%	3,742,309
Corrugated Cardboard/Kraft Paper	7.3%	0.4%	685,454	Food Waste	17.0%	0.3%	1,593,109
Newspaper	0.7%	0.1%	62,828	Yard Waste - Grass	0.8%	0.2%	79,111
Office/High Grade Paper	0.5%	0.1%	45,190	Yard Waste - Other	2.7%	0.3%	252,950
Magazine & Catalogs	0.8%	0.1%	73,329	Wood - Unpainted	3.6%	0.4%	334,997
Aseptic Boxes & Gable Top Cartons	0.3%	0.1%	31,035	Wood - Painted	2.4%	0.2%	229,596
Mixed Recyclable Paper (Low Grade)	5.5%	0.2%	515,880	Textiles & Leather Products	4.0%	0.3%	372,118
Compostable Paper	7.3%	0.2%	687,153	Diapers & Sanitary Products	2.9%	0.2%	274,921
Non-recyclable Paper	3.4%	0.3%	319,234	Animal By-Products	2.7%	0.2%	253,827
Plastic	18.9%	0.6%	1,774,458	Fines	1.4%	0.1%	129,066
#1 PET Bottles & Jars	1.3%	0.1%	126,388	Other Organics	2.4%	0.2%	222,614
#1 PET Non-Bottles & Containers	0.2%	0.0%	18,368	Inorganics	9.1%	0.5%	854,617
#2 HDPE Natural Bottles	0.4%	0.0%	38,415	Electronics - Covered Devices	0.1%	0.0%	11,640
#2 HDPE Colored Bottles	0.4%	0.0%	38,511	Other Electronics	0.5%	0.1%	42,728
#3 - #7 Bottles	0.1%	0.0%	5,485	Carpet & Carpet Padding	1.4%	0.3%	133,009
#2 - #7 Non-Bottle Rigid Containers	1.4%	0.1%	127,931	Drywall/Gypsum Board	0.5%	0.1%	50,900
Expanded Polystyrene	0.9%	0.1%	87,438	Concrete, Rock, Brick	0.3%	0.1%	29,915
Clean Retail Plastic Bags	0.1%	0.0%	9,068	Asphalt Roofing	0.3%	0.2%	26,272
Industrial Film	2.1%	0.3%	194,187	Asphalt Paving	0.0%	0.0%	3,484
All Other Film	6.7%	0.3%	627,195	Other C&D	1.7%	0.2%	155,153
Durable/Bulky Rigid Plastics	2.3%	0.2%	218,558	Medically-Related Waste	0.1%	0.0%	12,714
Remainder/Composite Plastic	3.0%	0.3%	282,913	Lithium Batteries	0.0%	0.0%	144
Metals	3.9%	0.3%	366,255	Automotive Batteries	0.0%	0.0%	22
Steel Cans	0.8%	0.1%	75,358	Other Batteries	0.1%	0.0%	6,484
Aluminum Cans	0.6%	0.0%	54,861	Other HHW	0.0%	0.0%	4,317
Other Aluminum	0.3%	0.0%	32,429	Bulky Materials	1.5%	0.2%	140,677
Other Ferrous Metals	1.7%	0.2%	156,484	Furniture	1.7%	0.3%	157,018
Other Non-Ferrous Metals	0.5%	0.1%	47,123	Other Inorganics	0.6%	0.1%	52,651
Glass	2.5%	0.2%	234,962	PPE	0.3%	0.0%	27,491
Clear Glass Containers	1.1%	0.1%	105,315				
Green Glass Containers	0.3%	0.0%	30,506				
Brown Glass Containers	0.4%	0.1%	41,510				
Non-Recyclable Glass	0.6%	0.1%	57,630				
				Grand Total	100.0%		9,392,702
				Number of Samples	1,258		

Margin of error is calculated at a 90 percent level of confidence.

Solid Waste Emissions





Water & Wastewater

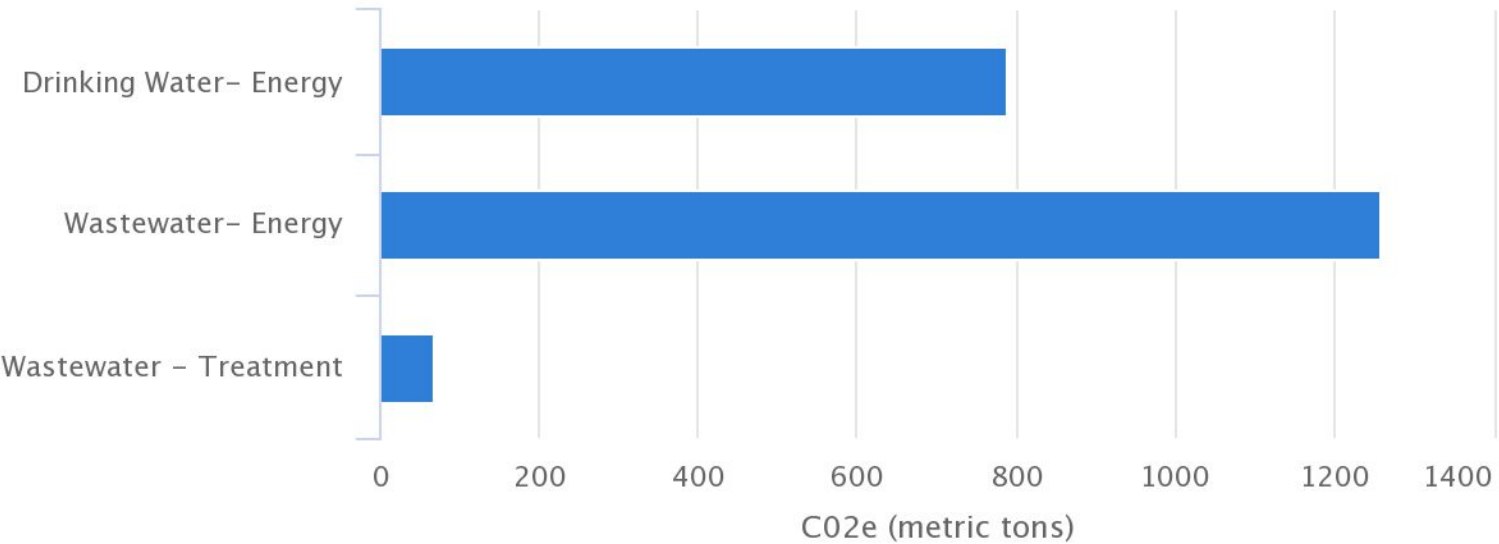


06



Emissions

CO2e By Record





Energy

Electricity and natural gas used to operate:

- water plant
- pump stations
- water tanks
- pumping stations
- sewer plants





Wastewater - Treatment

Population served: 29,580

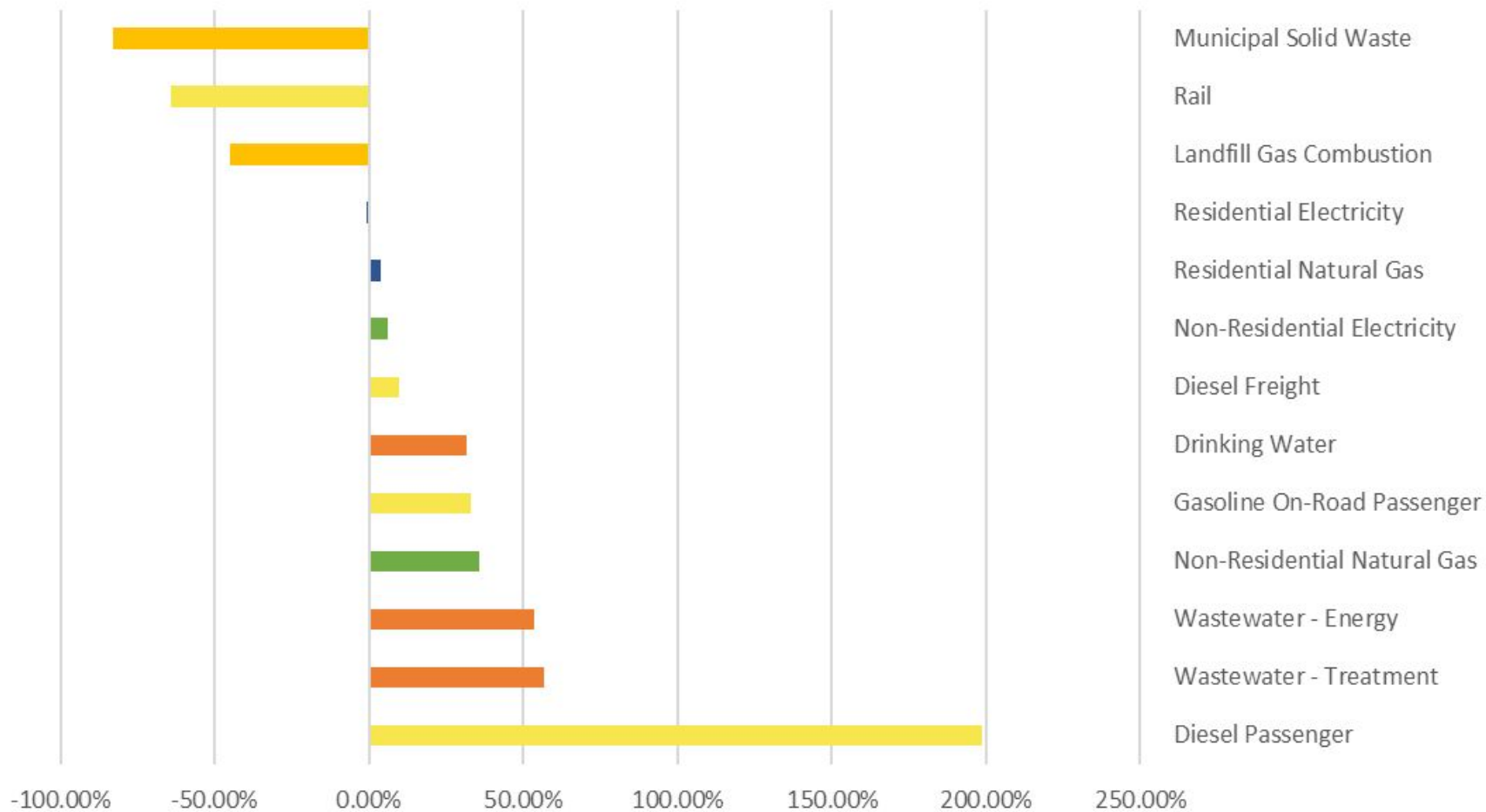
Emissions extrapolated based on population served.



An aerial photograph of a city at sunset. The sky is a mix of orange, yellow, and blue. The city below is densely packed with buildings, many of which are lit up with warm lights. A blue rectangular overlay box is positioned in the upper left quadrant of the image.

Summary

Carlisle Community Inventory Changes 2017-2022



Carlisle Community Emissions Sources

