

CITY OF HARRISONBURG GREENHOUSE GAS EMISSIONS INVENTORY

October 12, 2021





Greenhouse Gas Emissions Inventory

- Why Conduct An Inventory?
 - *Guiding Goal in the EAP*
 - *Provides Baseline*
- Project Scope
 - *Analysis Years (2016 - Baseline, 2019)*
 - *Municipal Inventory*
 - *Community Inventory*



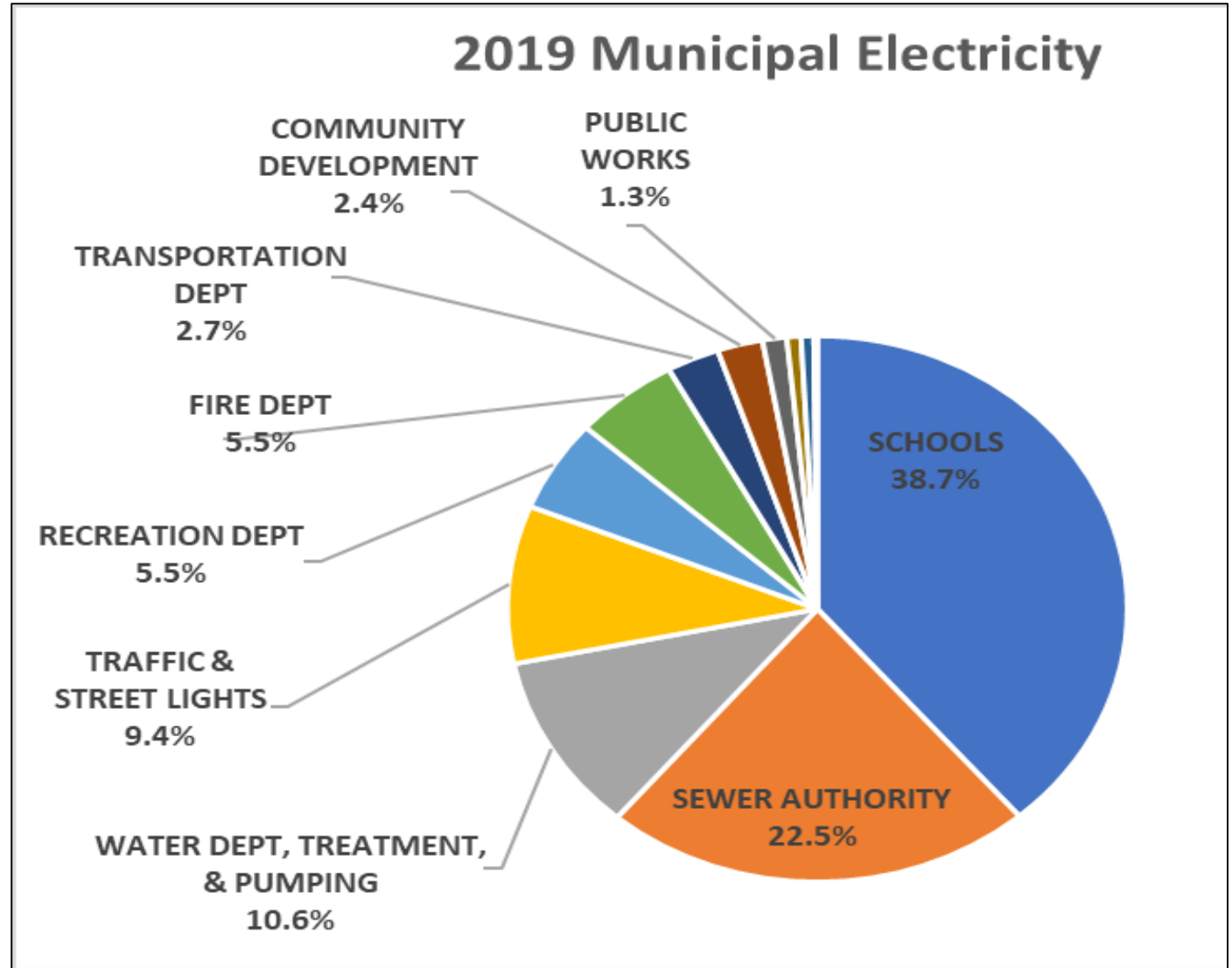
Greenhouse Gas Emissions Inventory

- Analysis Inputs and Outputs
 - *Electricity*
 - *Natural Gas*
 - *Fuel Oil*
 - *Diesel & Gasoline*
 - *Water & Wastewater*
 - *Landfill & Recycling*



Inventory Data

- Schools are the largest contributor to Municipal Electricity Use

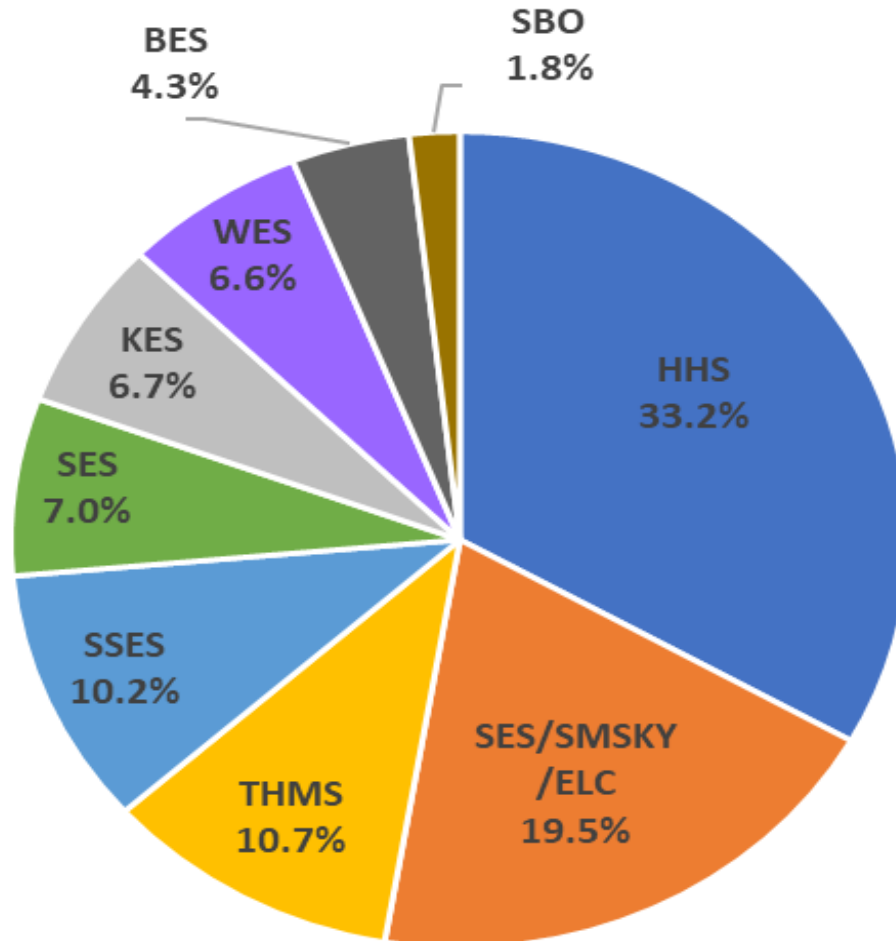




Inventory Data

- A detailed breakdown of school electricity shows Harrisonburg High Schools with the largest electricity use.

2019 School System Electricity

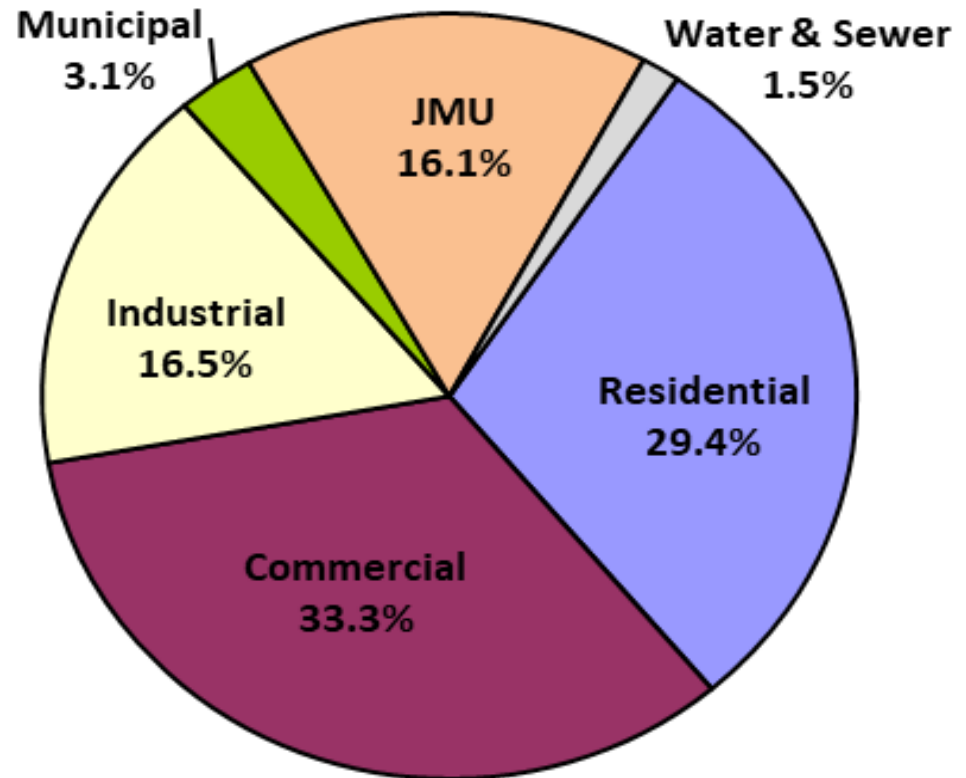




Inventory Data

- For the Community, Residential and Commercial sectors use roughly twice the electricity of the Industrial sector and JMU, with Municipal and Water/Sewer much smaller contributors.

2019 Harrisonburg Community Electrical Usage





Dominion Fuel-Specific Generation

	Total and Fuel-Specific Electricity Generation (MWH)								
YEAR	2000	2005	2015	2016	2016 (%)	2017	2018	2019	2019 (%)
Total	71,536,133	109,328,723	98,455,046	108,368,094		102,060,029	100,659,937	94,855,233	
Coal	37,772,810	51,607,246	22,613,052	21,947,757	20.3%	15,376,307	12,302,427	7,177,447	7.6%
Natural Gas	3,698,671	7,728,873	28,858,084	38,370,996	35.4%	37,654,007	38,838,261	38,386,925	40.5%
Nuclear	26,552,901	44,164,092	42,888,281	43,951,909	40.6%	44,548,239	43,541,335	43,833,345	46.2%
Petroleum	3,021,949	4,710,344	847,768	459,162	0.4%	271,644	626,111	123,323	0.1%
Total Renewable Energy	489,802	1,118,168	3,247,861	3,638,270	3.4%	4,209,832	5,351,803	5,334,193	5.6%
- Biomass/Biogas		540,007	1,193,180	1,266,746	1.2%	1,163,454	1,196,101	1,007,679	1.1%
- Hydroelectric	489,802	578,161	613,069	771,100	0.7%	488,627	850,529	690,754	0.7%
- Solar			747,748	934,322	0.9%	1,983,498	2,686,996	3,037,885	3.2%
- Wind			693,864	666,103	0.6%	574,253	618,177	597,876	0.6%

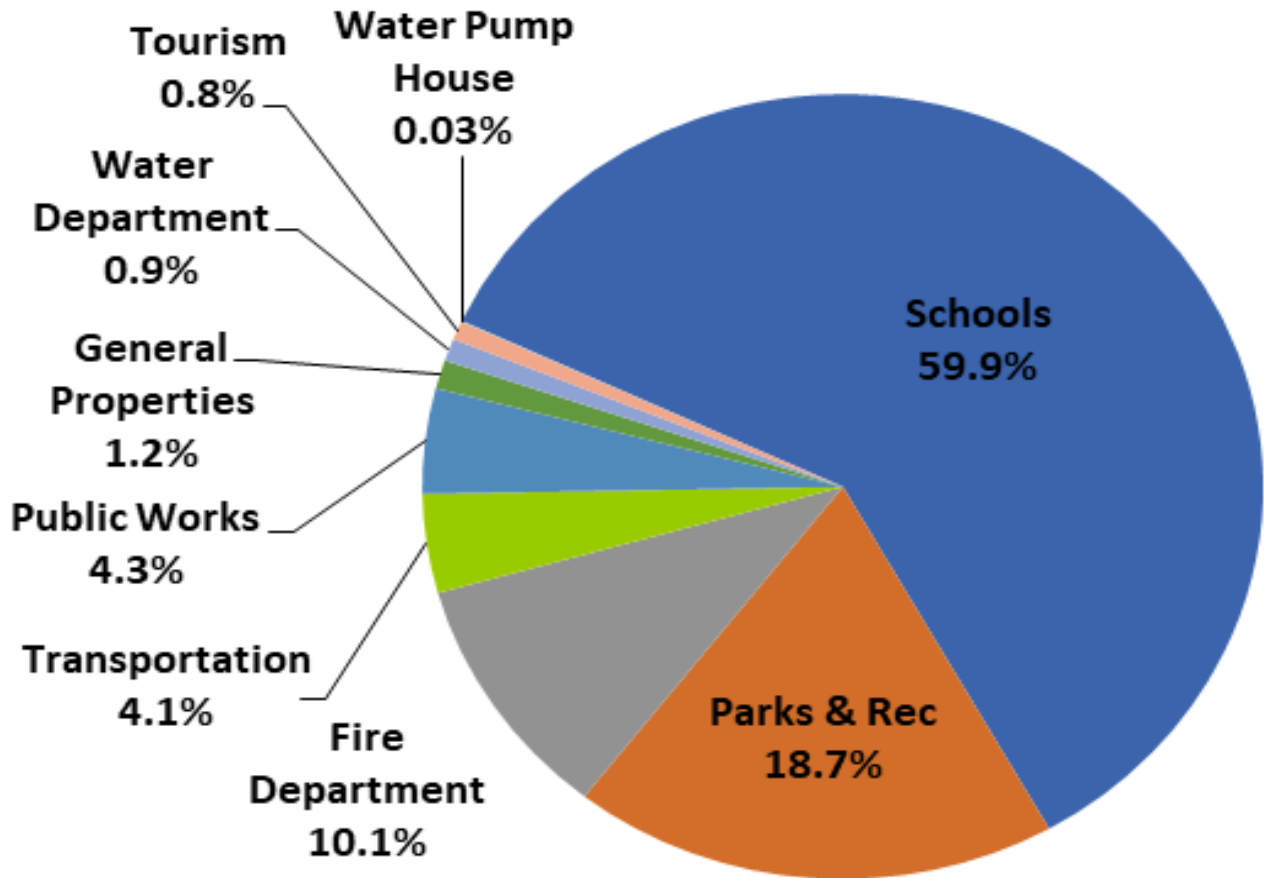
- Note the decrease in Coal use and increase in Natural Gas, Nuclear, and Solar energy for Dominion Energy from 2016 to 2019.
- In March 2020, Virginia passed the Clean Economy Act, making Virginia the eighth state to commit to 100 percent carbon-free electricity. The law applies to the two major utilities in the state: Dominion Virginia and Appalachian Power Company. It calls for both utilities to achieve 30 percent renewable energy by 2030, and they must close their carbon-emitting electricity facilities, like coal and natural gas plants, by 2045 and 2050, respectively.



Inventory Data

- Schools are also the largest contributor to Municipal Natural Gas Use

2019 Harrisonburg Municipal Natural Gas Usage

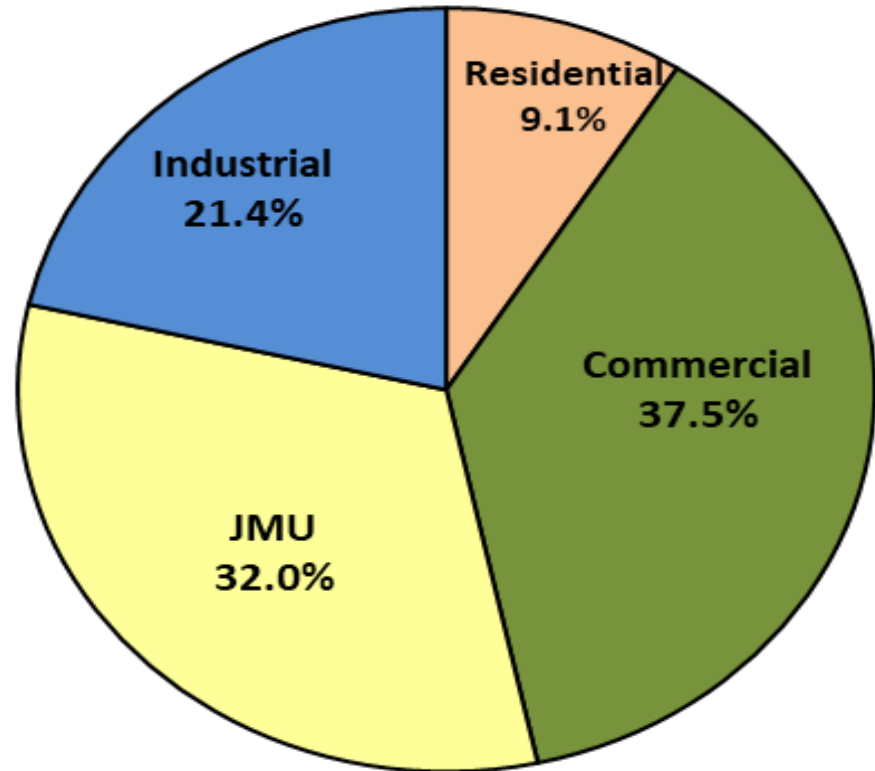




Inventory Data

- For the Community, the Commercial sector uses the most natural gas, followed by JMU, Industrial, and Residential.

2019 Harrisonburg Natural Gas Usage

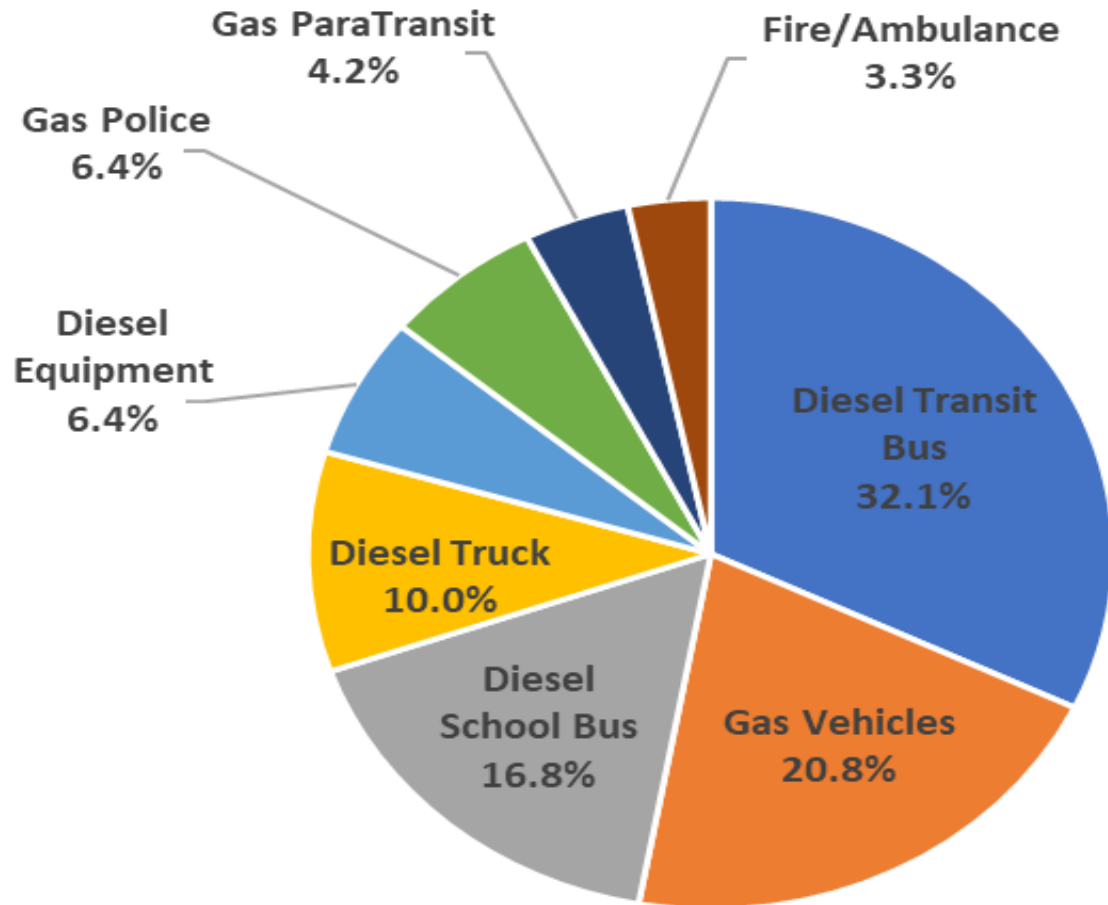




Inventory Data

- Diesel fuel for Transit Buses dominates the Transportation Fuel sector.

2019 Transportation/Equipment Fuels

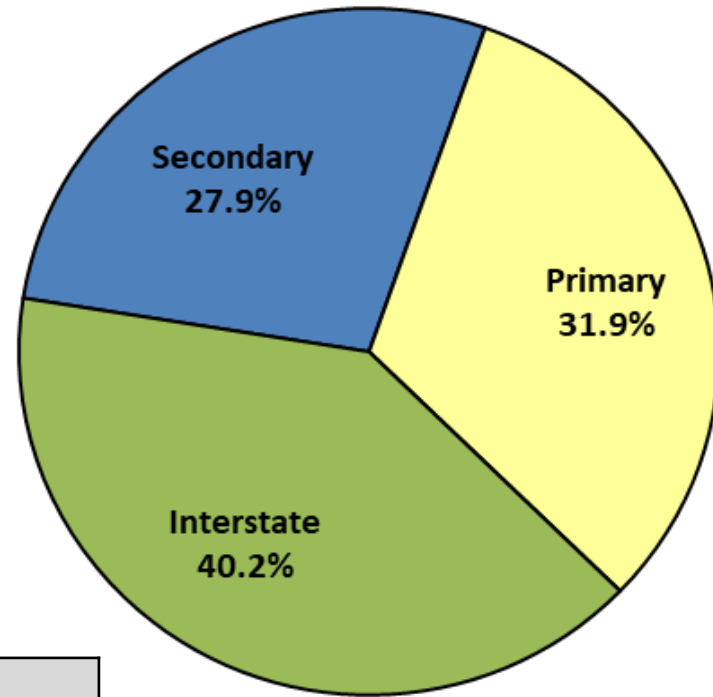




Inventory Data

- Community transportation is dominated by Passenger vehicles with more Interstate travel than Primary or Secondary Roads.

Harrisonburg VMT By Road Type (2019)



Vehicle Class	Percentage (%)	Fuel	Year
Passenger Vehicles	72.4	Gasoline	2019
Light Trucks	15.6	Gasoline	2019
Heavy Trucks	11.7	Diesel	2019
Motorcycles	0.2	Gasoline	2019
Totals	100		



Inventory Data

Harrisonburg City Waste	Municipal Solid Waste (residential refuse)	Commerical Refuse ¹	Non-chargeable on report	Concrete, Dirt, Rock	Construction/ Demolition/ Wood Debris	Industrial Waste ²	Vegetative/ Yard Waste ³	Unsorted Rubbish	Sludge	Total
2016	2,732	7,249	48	510	4,224	48	1,002	126	22	15,961
2019	11,584	18,218	419	64	3,954	126	465	59	434	35,323
¹ Includes agriculture and cows										
² Includes flyash										
³ Includes commercial brush, re-route brush, xmas trees										
⁴ The accuracy of the waste tonnage reported is dependent on the Rockingham County Landfill customers, including private haulers, providing the attendant with the correct source of their refuse.										

Category	Amount (tons)	Savings (tons CO2/ton)	WARM v15 Categories
Cardboard	188.7	3.14	Corrugated containers
Glass	99.3	0.28	Glass
Tin/Scrap	95.7	4.39	Mixed Metals
Mixed Paper	78.2	3.55	Mixed Paper
Plastic 1	19.8	1.04	PET
Plastic 2	9.6	0.76	HDPE
Plastic Bags	7.6	0.00	LDPE
Aluminum	3.0	9.13	Aluminum Cans
Totals	502	1,245	metric tons CO2



Municipal Emissions

Emissions by Sector

Sector	ClearPath 2016 (mtons)	ClearPath 2019 (mtons)	2019 Sector (%)	2019 - 2016 Baseline Difference (%)
Buildings/Facilities	8,973	7,125	42.9%	-20.6%
Vehicle Fleet	3,473	3,590	21.6%	3.4%
Water & Sewer	3,896	2,724	16.4%	-30.1%
Transit Fleet	2,003	2,143	12.9%	7.0%
Street/Traffic Lights	1,022	699	4.2%	-31.6%
Electric Grid Loss	476	336	2.0%	-29.4%
Totals	19,843	16,617	100.0%	-16.3%

Emissions by Source

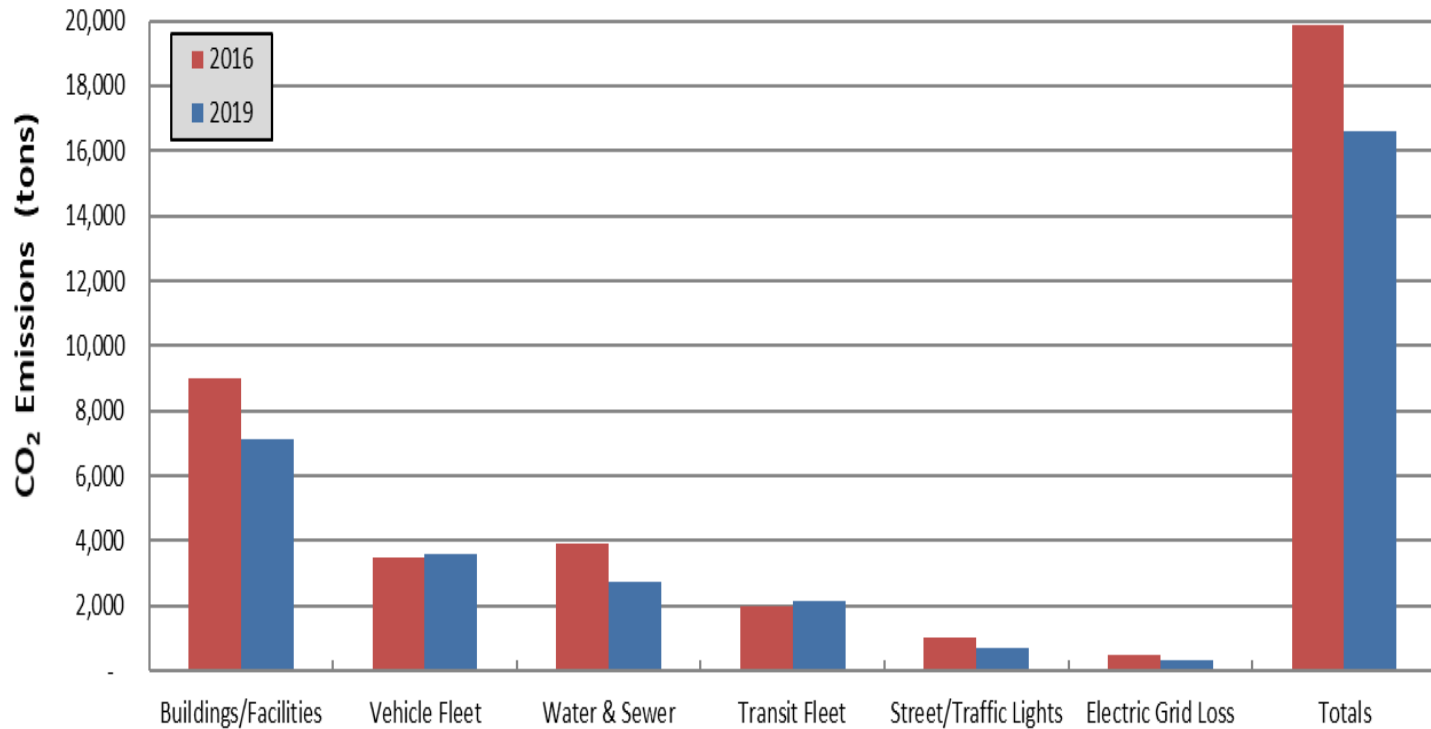
Emissions Source	ClearPath 2016 (mtons)	ClearPath 2019 (mtons)	2019 Sector (%)	2019 - 2016 Baseline Difference (%)
Electricity	11,384	8,067	48.5%	-29.1%
Diesel	3,930	4,115	24.8%	4.7%
Natural Gas	2,226	2,008	12.1%	-9.8%
Gasoline	1,546	1,619	9.7%	4.7%
Fuel Oil	509	557	3.4%	9.4%
Biogas	252	253	1.5%	0.4%
Totals	19,847	16,619	100.0%	-16.3%

- Municipal Emissions are dominated by Buildings/Facilities and Electricity, but both have decreased significantly since 2016 – mainly due to the utility electricity fuel mix.



Municipal Emissions

ClearPath Harrisonburg Municipal GHG Emissions (CO₂ equiv)



Emissions by Sector



Community Emissions

Emissions by Sector

Sector	ClearPath 2016 (mtons)	ClearPath 2019 (mtons)	2016 Baseline Difference (%)	2019 Sector (%)
Commercial	200,143	164,549	-17.8%	31.1%
Transportation	179,691	182,964	1.8%	34.5%
Residential	81,244	62,207	-23.4%	11.7%
Industrial	63,653	51,175	-19.6%	9.7%
Solid Waste	42,287	57,681	36.4%	10.9%
Grid Loss	10,549	8,264	-21.7%	1.6%
Water & Wastewater	3,896	2,724	-30.1%	0.5%
Totals	581,463	529,564	-8.9%	100.0%

Emissions by Source

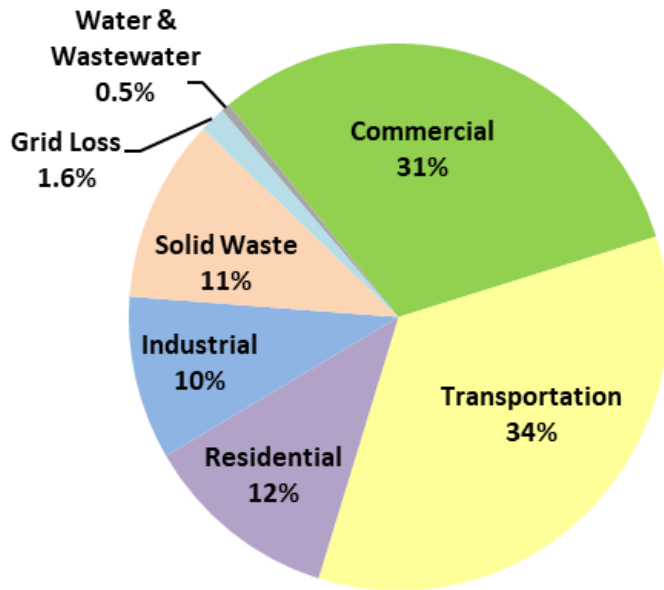
Emissions Source	ClearPath 2016 (mtons)	ClearPath 2019 (mtons)	Baseline Difference (%)	2019 Source (%)
Electricity	244,976	170,311	-30.5%	32.2%
Gasoline	116,826	118,133	1.1%	22.3%
Natural Gas	108,886	114,422	5.1%	21.6%
Diesel	62,865	64,832	3.1%	12.2%
Waste	42,287	57,681	36.4%	10.9%
Fuel Oil	5,374	3,935	-26.8%	0.7%
Biogas	252	253	0.4%	0.0%
Totals	581,466	529,567	-8.9%	100.0%

- Community emissions are led by the Transportation/Commercial sectors and Electricity. Overall emissions are lower due to the utility electricity fuel mix but Transportation emissions have increased slightly.

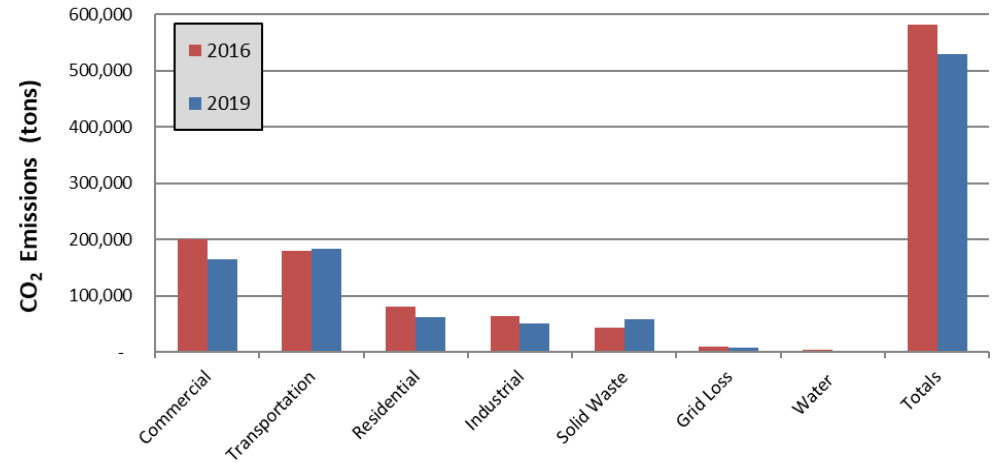


Community Emissions

ClearPath Harrisonburg Community GHG Emissions By Sector (2019)



ClearPath Harrisonburg Community GHG Emissions (CO₂ equiv)



- Municipal Operations contribute only 3.1% to the overall Community emissions.

Emissions by Sector



Recommendation and Next Steps

- Recommend EPSAC
 - *Review GHG Emissions Report*
 - *Use To Implement Phase 2 and Phase 3 of the Environmental Action Plan*