



City of Aspen 2019-2020 Government Operations GHG Inventories

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GHG Inventory Contact Information

City of Aspen

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Introduction

The City of Aspen developed a community climate action plan in 2007 in which the City pledged to begin tracking greenhouse gas (GHG) emissions from municipal government operations and reduce future emissions through direct action and policy. GHG emissions from municipal operations are the result of building energy use, fleet vehicle and equipment fuel use, waste created at City-owned buildings, and employee business travel. In 2021, the City of Aspen hired Lotus Engineering and Sustainability, LLC. (Lotus) to complete the City of Aspen's 2019 and 2020 municipal operations GHG emissions inventories. This report details the results from the City of Aspen's 2019 and 2020 municipal operations GHG emissions inventories.

KEY FINDINGS

- The 2019 and 2020 inventories include additional sources of emissions (solid waste and specific business travel sources) that were not included in previous inventories.
- The City of Aspen's 2020 emissions have decreased by 30% as compared to the new 2017/2018 baseline for science-based targets. When waste is not included, the reduction is 43%.
- 2019 emissions were 3% higher than the 2017-2018 baseline. However, when waste emissions are excluded from the 2019 inventory, emissions have decreased by 31% compared to the baseline.
- Natural gas and electricity emissions in 2019 decreased significantly from 2018, by 63% and 46% respectively. It is unknown what the primary driver of this reduction was. Emissions further decreased by 8% for natural gas and 6% for electricity in 2020 compared to 2019; this was primarily driven by building closures due to COVID-19.
- Natural gas usage in City facilities in 2020 has decreased 81% and electricity usage in City facilities has decreased 34% since the City began tracking this data in 2004.
- Solid waste produced the most emissions in 2019, at 33% of the City's total, followed by vehicles and equipment at 23%.
- Natural gas use and diesel and gasoline use in City fleet and equipment produced the largest share of emissions in 2020, each at 24%. This was followed by electricity use at 22%.
- The 2020 inventory results show a 31% reduction in emissions since 2019; most of this is driven by the COVID-19 pandemic, which led to the closure of City facilities and paused business travel.

GHG Reduction Target

In the fall of 2021, the City of Aspen set new goals for reducing GHG emissions, including those from municipal operations. In alignment with ICLEI's Race to Zero¹ pledge, the City of Aspen has now pledged to achieve a 63% reduction in emissions from the 2017/2018 baseline by 2030, and a 100% reduction in emissions (i.e., achieving zero carbon) by 2050. In 2019, City of Aspen increased emissions by 3% relative to the new baseline; this is primarily driven by additional emissions sources (i.e., waste and specific business travel sources) included in 2019 that were not accounted for previously. In 2020, Aspen's emissions were 30% below the baseline; however, it should be noted that the COVID-19 pandemic likely had some impact on emissions in 2020 due to employees working from home and municipal operations being more limited.

See Figure 1 for changes in the City of Aspen's municipal GHG emissions since the 2017-2018 baseline. It should be noted that the City of Aspen's original goal of reducing municipal emissions by 30% from 2004 levels by 2020 was met in 2013. As of 2020, the City has reduced emissions 71% from the 2004 emissions estimates.

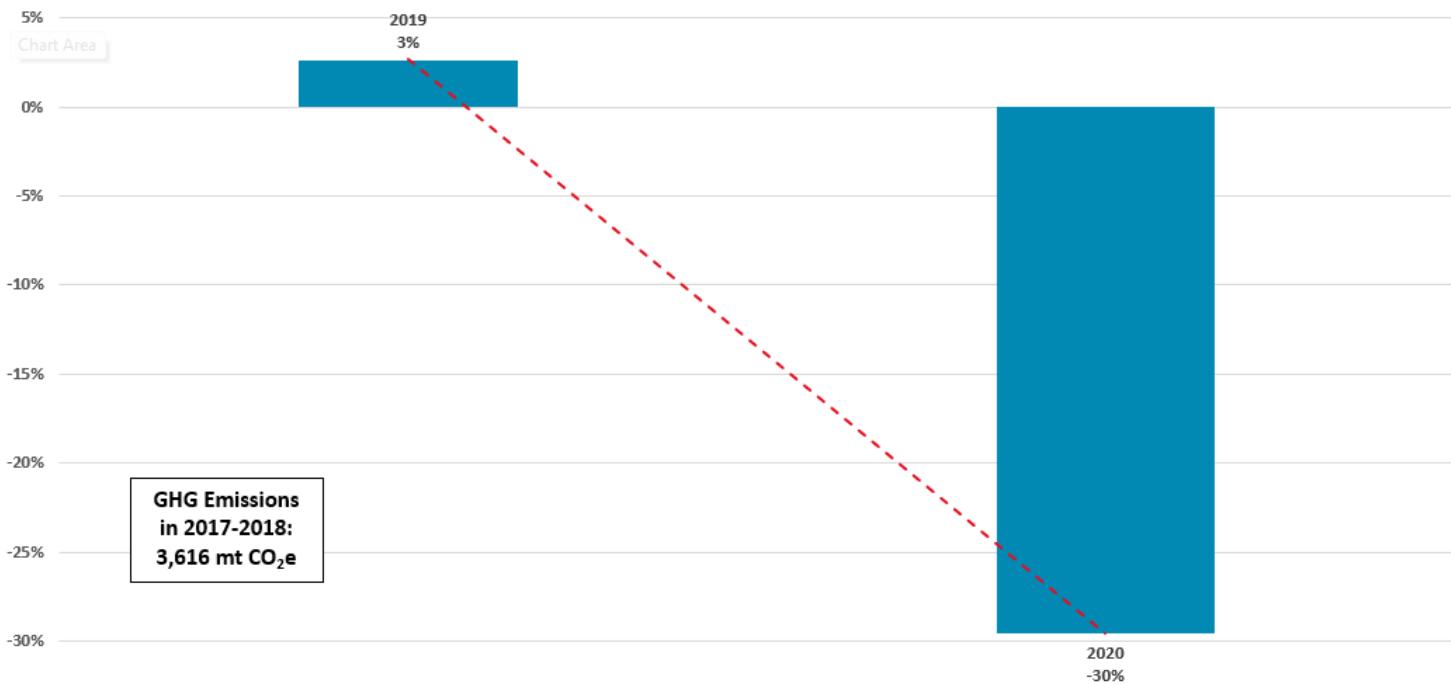


Figure 1: Trends in the reduction of Aspen's GHG emissions from municipal operations, 2017/18-2020.*

*Note, new emissions sources, as described below, were added to inventory calculations in 2019.

¹ See <https://icleiusa.org/race-to-zero/>.

2019 and 2020 Government Operations Emissions Summary

NET GHG EMISSIONS

In 2019, GHG emissions from the City of Aspen's municipal operations totaled 3,712 metric tons of carbon dioxide equivalent (mt CO₂e). In 2020, GHG emissions totaled 2,548 mt CO₂e; this represents a 31% reduction in emissions from the total calculated in the 2019 inventory.

There are a few notable differences between the 2019 and 2020 inventories and previous inventories. The 2019 and 2020 inventories were calculated on the calendar year (i.e., January 1–December 31), whereas all previous inventories were calculated between the months of October–September (i.e., the 2017/2018 inventory used data from October 2017–September 2018). This does not have a large impact on emissions as both methodologies utilize a full year of data. Another difference with the 2019 and 2020 inventories is the inclusion of emissions from landfilled waste. This is the primary driver of the increase in emissions seen in 2019 and 2020 as compared to previous years. A secondary driver of the emissions increase is the inclusion of emissions from reimbursed business travel in employee-owned vehicles in the 2019 and 2020 inventories; this was not calculated in prior years and the inclusion of this source led to a dramatic increase in business travel emissions. Finally, the most recent available emission factors and global warming potentials were used to calculate emissions.

In addition to the updated sources included, there are a few notable differences in municipal activities between the 2019 and 2020 inventories, nearly all of which are the result of impacts of the COVID-19 global health pandemic. COVID-19 resulted in the City's facilities being far less occupied, and therefore generating less waste and using less energy, than was the case in 2019 and many prior years. Additionally, business travel decreased between 2019 and 2020 as many employees shifted to teleworking and business trips, including local ones, were for the most part cancelled. Figure 2 shows GHG emissions by source for City of Aspen's municipal operations over time.

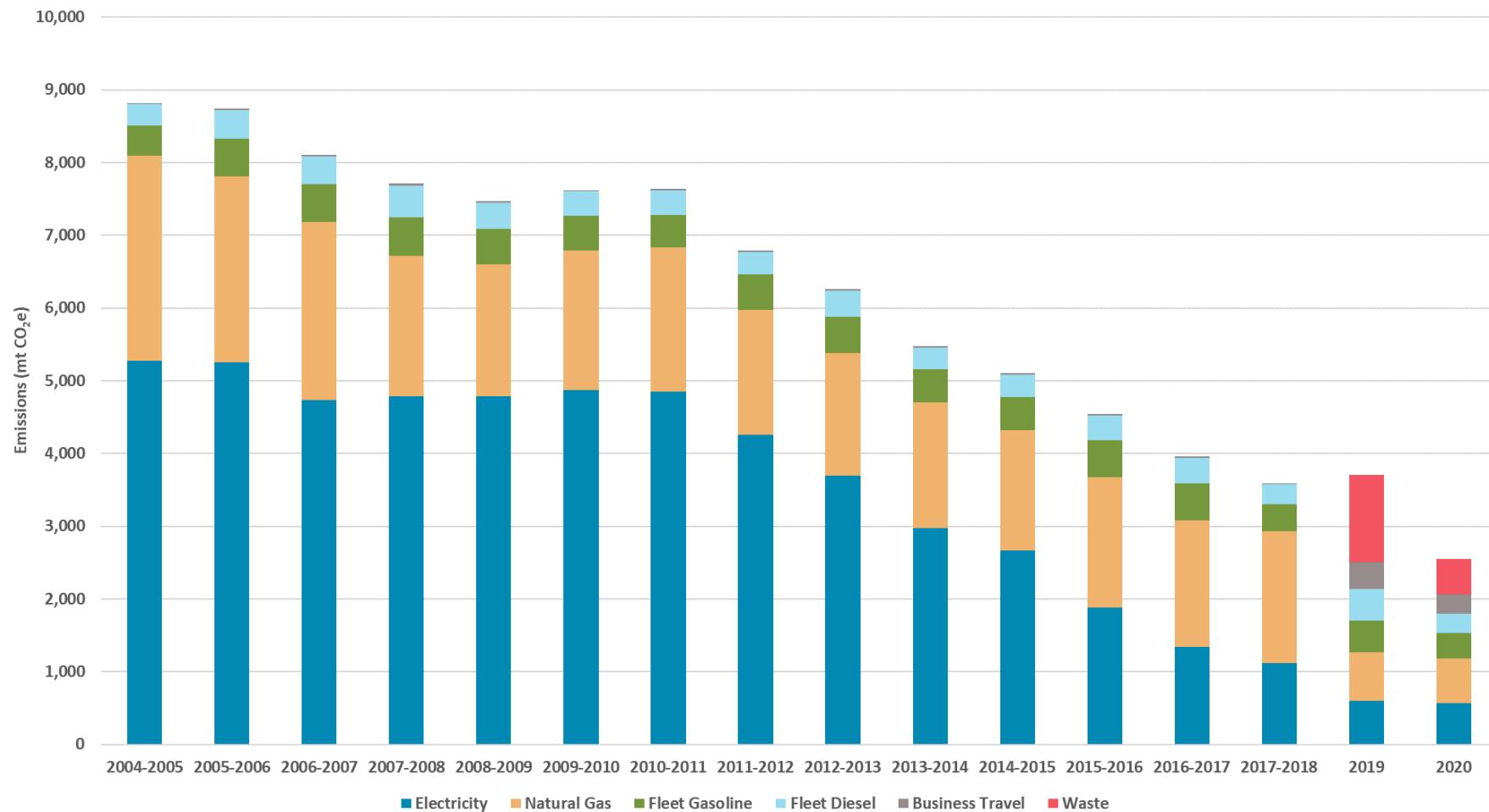


Figure 2: City of Aspen GHG emissions from municipal operations by source, 2004-2020 (mt CO₂e).**

**Waste was added to the municipal inventories as a new source of emissions in 2019. The sources of business travel emissions were also expanded in 2019 to include employee mileage reimbursements.

GHG EMISSIONS BY SOURCE

In 2019, the City of Aspen's largest source of emissions was waste (33%), followed by fleet fuel use (23%) and facility natural gas use (18%). Facility electricity use and business travel emissions account for the remaining emissions, at 16% and 10%, respectively (Figure 4).

In 2020, the City of Aspen's largest sources of emissions were fleet fuel use and facility natural gas use, both of which comprised 24% of the City's total municipal emissions. Facility electricity use, waste, and business travel emissions account for the remaining emissions, at 22%, 19%, and 11%, respectively (Figure 3).

The changes in emissions by source since the City of Aspen began tracking operational GHG emissions in 2004 are illustrated in Figure 5. Further detail is provided in the text below.

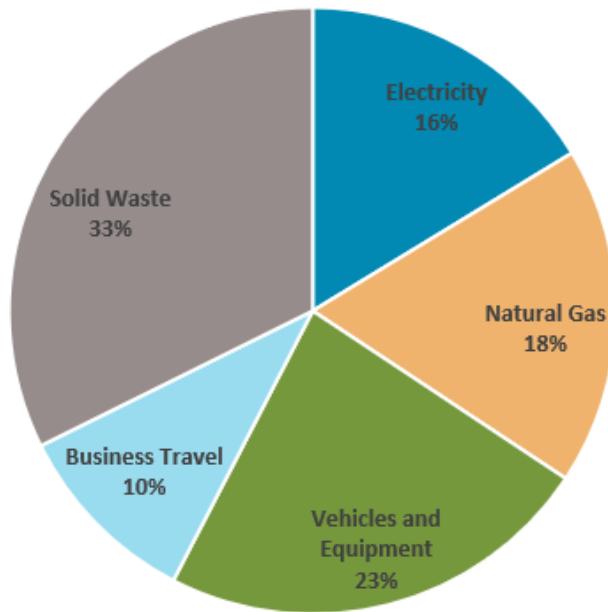


Figure 4: Aspen municipal emissions by source in 2019.

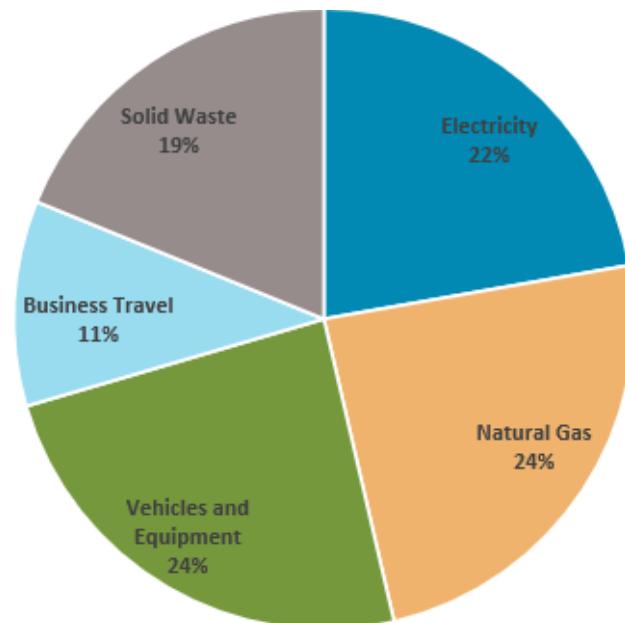


Figure 3: Aspen municipal emissions by source in 2020.

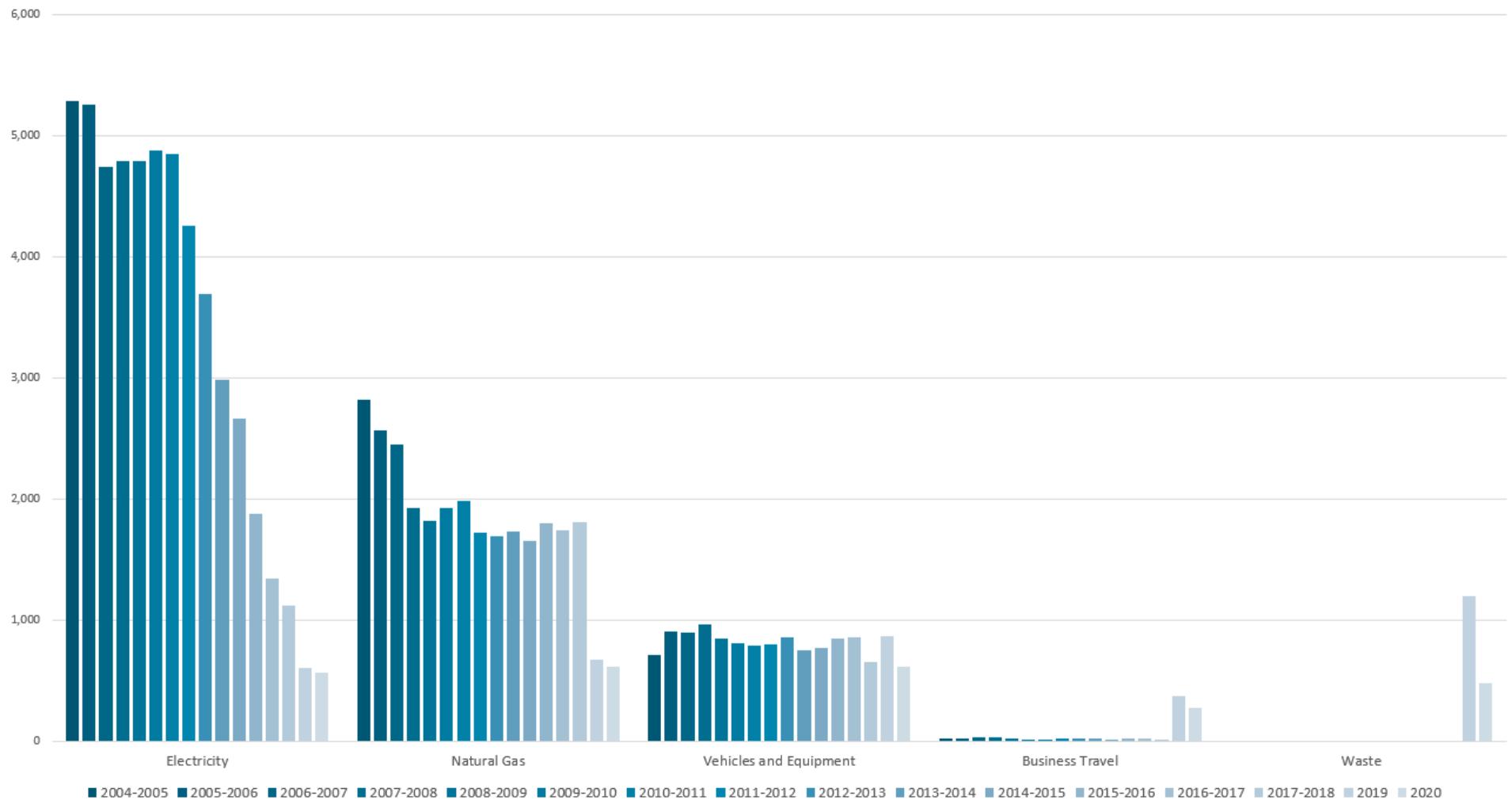


Figure 5: Emissions by source, 2004-2020 (mt CO2e).

STATIONARY ENERGY

Stationary energy emissions include emissions from electrical power loads in buildings, streetlights, and traffic signals, as well as emissions from the on-site combustion of fuels (i.e., natural gas) used to heat buildings.

2019 Stationary Energy Emissions Detail

In 2019, natural gas use in buildings resulted in 669 mt CO₂e while electricity uses in buildings resulted in 605 mt CO₂e. Natural gas and electricity emissions both decreased in 2019 relative to the previous 2017/2018 inventory by 63% and 46%, respectively. Since the City began tracking in 2004, natural gas emissions have decreased by 76% and electricity emissions have decreased by 89%.

2020 Stationary Energy Emissions Detail

In 2020, natural gas use in buildings resulted in 615 mt CO₂e emissions while electricity uses in buildings resulted in 566 mt CO₂e emissions. Natural gas and electricity emissions both decreased in 2020 relative to the 2019 inventory by six and eight percent, respectively. Since the new baseline of 2017/2018, natural gas emissions have decreased by 66% and electricity emissions have decreased by 49%. Since the City began tracking in 2004, natural gas emissions have decreased by 78% and electricity emissions have decreased by 89%. Additionally, electricity use has decreased 34% and natural gas usage in City-owned facilities has decreased 81% since 2004.

Carbon Intensity of Stationary Energy Use

The City of Aspen's facilities are served by two electric providers: Aspen Electric, the City's municipally owned electric utility, and Holy Cross Energy (HCE). Most of City of Aspen's facilities are serviced by Aspen Electric, which achieved 100% renewable energy in 2015. As Holy Cross Energy works towards its stated goal of providing 100% carbon-free energy to customers by 2030, City of Aspen's electricity emissions should continue to decrease through 2030.²

In 2019 the City of Aspen opted into HCE's We Care program,³ which offers customers the ability to purchase 100% renewable electricity. Because of this, the City of Aspen's buildings now are powered by 100% renewable electricity regardless of electric provider. It should be noted that the We Care program constitutes the purchase of Renewable Energy Credits (RECs), which offset the carbon intensity of energy use;

² See: <https://www.holycross.com/holy-cross-energy-announces-100x30-carbon-free-electricity-goal-part-of-new-strategic-plan-to-lead-the-responsible-transition-to-a-clean-energy-future/>.

³ See: <https://www.holycross.com/we-care/>.

however, GHG reporting protocols do not allow for the ‘subtraction’ of emissions from energy use that is offset by RECs, which is why electricity emissions are still included in the City of Aspen’s municipal GHG totals. Regardless, it is still noteworthy and worthwhile to invest in these offsets to reduce the overall carbon intensity of municipal operations.

The carbon intensity of natural gas is not anticipated to change drastically over the coming years, and as such additional reductions in emissions from natural gas will need to be driven primarily through improving building energy efficiency and implementing fuel switching (e.g., building electrification) projects in the City of Aspen’s facilities. In total, the City of Aspen owns 28 facilities which total nearly 203,000 square feet (Table 1). Between 2019 and 2020, City of Aspen facilities reduced the amount of energy emissions per building and square foot of owned facilities by 7%. As electricity emissions continue to reduce due to HCE’s stated 2030 goals, it will be critical for the City of Aspen to work towards reducing natural gas use in buildings it operates if it hopes to reach its 2030 and 2050 goals.

Table 1. Building and facility square feet under the City of Aspen’s operational control.

City of Aspen Facilities	Value	Energy Emissions Metrics – 2019	Energy Emissions Metrics – 2020	Percent Change
Total square footage owned by City	202,568 sq. ft.	0.0063 mtCO ₂ e/sf	0.0058 mtCO ₂ e/sf	-7.9%
Number of facilities owned and occupied by City	28	45.5 mt CO ₂ e/building	42.2 CO ₂ e/building	-7.2%

VEHICLE FLEET AND EQUIPMENT

Fleet vehicles and equipment use gasoline and diesel fuel to operate; in 2019/2020 the City of Aspen also had two all-electric vehicles (EVs), though neither were frequently used, and their total energy use is not sub metered. Therefore, emissions resulting from the use of these vehicles could not be analyzed in these inventories. It is assumed any electricity use from these EVs is still accounted for in the stationary energy sector.

In past years, the City of Aspen included “department travel” in vehicle fleet activities; this activity represented fuel purchased at public facilities when employees traveled in personal vehicles for work. For the 2019 and 2020 inventories, these emissions have been re-allocated into the Business Travel sector per suggested reporting protocol.

The City of Aspen currently has 105 fleet vehicles powered by traditional fuel sources (i.e., gasoline or diesel) and 104 pieces of equipment (Table 2). A detailed list of fleet vehicles and equipment is found in Table 3 below.

Table 2. City of Aspen Fleet Vehicles and Equipment Pieces in 2019/2020.

Fleet Vehicles and Equipment	Total
Fleet Vehicles	105
Pieces of Equipment	104

Table 3: Vehicle categories and associated Aspen vehicle class codes.

Vehicle Category	Aspen Class Codes and Unit Types Included
Gasoline Motorcycle	42—Motorcycle
Gasoline Passenger Vehicle	07—SAAB Police
Gasoline Light-Duty Truck	01—4WD PU 20—Vans 21—Utility Veh.
Gasoline Heavy-Duty Trucks	15—Single Axel Trk 03—Heavy PU 04—Boom Trucks
Diesel Light-Duty Trucks	01—4WD PU
Diesel Heavy-Duty Trucks	15—Single Axel Trk 03—Heavy PU 04—Boom Trucks 90—Fire Trucks 09—Flush Trucks 18—Tandem Axel Trk
Gasoline-Powered Equipment	14—Aux Engines 50—Fuel Dummy 60—Go-4 Carts 23—Mowers-Greens 31—Sandtrap Equip. 43—Snowmobiles 27—Tractors 35—Welders 25—Work Carts
Diesel-Powered Equipment	14—Aux Engines 02—Backhoes 05—Comp. Mobil 40—Compactors 08—Dozers

	50—Fuel Dummy 32—Grinders 12—Loaders 3-Yard 11—Loaders Small 10—Motor Graders 24—Mowers—Fairway 29—Mowers—Rough 16—Snowblowers 34—Snowcats 17—Sweepers 27—Tractors 25—Work Carts
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2019 Vehicle Fleet Emissions Detail

The City of Aspen's fleet vehicles and mobile and stationary equipment emitted 864 mt CO₂e in 2019, or 23% of the City of Aspen's total emissions from municipal operations. Emissions from both gasoline and diesel fuel use increased in 2019 relative to the 2017/2018 inventory by 13% and 60%, respectively. Gasoline emissions accounted for 58% of Aspen's fleet emissions (353 mt CO₂e) while diesel accounted for 42% (261 mt CO₂e).

2020 Vehicle Fleet Emissions Detail

In 2020, the City of Aspen's fleet vehicles and mobile and stationary equipment emitted 614 mt CO₂e in 2020, or 24% of Aspen's total emissions from municipal operations. The split in emissions resulting from gasoline and diesel use was the same in 2020 as 2019 (i.e., 58% and 42%, respectively).

Emissions from both gasoline and diesel fuel use decreased in 2020 relative to the 2019 inventory, by 17% and 40%, respectively. Relative to 2017/2018 baseline, gasoline emissions have decreased 6% and diesel emissions have decreased by 5%. Since 2004, gallons of gasoline consumed have decreased by 30% and gallons of diesel consumed have decreased by 24%.

It should be noted that the decreases between 2019 and 2020 are likely in part due to travel restrictions and lockdown measures from the COVID-19 pandemic. These emissions may increase again once the pandemic wanes and travel resumes, which reflects the need for Aspen to take action to continue to reduce emissions from fleet and equipment use. If fleet vehicles and equipment continue to rely on gasoline and diesel fuel sources, meeting emissions reduction goals will be more challenging.

BUSINESS TRAVEL

Business travel emissions include emissions from business air travel, business travel in ground transportation vehicles (such as rental cars, taxis, and fuel purchases at public facilities, etc.), and reimbursed mileage for business travel in employee-owned vehicles. This is different from previous inventories, in which only calculated emissions from the “consumption of jet fuel used for employee travel on commercial flights for official City business” were included in “Air Travel” Sector. As noted in the Vehicle Fleet section, previous inventories accounted for emissions from employee purchases of fuel at public facilities for business travel within the “Ground Transportation” sector. Other employee mileage reimbursements and ground travel (i.e., that occurring in rental cars, taxis, etc.) was not accounted for before 2019.

An important source of Business Travel emissions that is included in many municipal inventories is emissions from employees commuting to and from work. The City of Aspen does not include these emissions in their inventories; however, this is an important source of emissions over which the City of Aspen can have considerable influence.

2019 Business Travel Emissions Detail

In 2019, Business Travel emissions totaled 374 mt CO₂e, or ten percent of City of Aspen’s emissions. Within Business Travel emissions, emissions from employee air travel totaled 11 mt CO₂e while ground transportation and reimbursed employee mileage totaled 363 mt CO₂e in 2019. The 2019 emissions value for business travel represents a 32% increase over the 2017/2018 baseline value for this sector.

2020 Business Travel Emissions Detail

In 2020, Business Travel emissions totaled 272 mt CO₂e, or 11% of the City of Aspen’s emissions. In 2020, emissions from employee air travel totaled one mt CO₂e and reimbursed employee mileage emissions totaled 271 mt CO₂e.

There was a 27% reduction in business travel emissions in 2020 relative to 2019. This decrease in emissions from business travel between 2019 and 2020 is almost exclusively due to the COVID-19 pandemic, which halted nearly all business travel, especially air travel, starting in April 2020. This trend may reverse, and Aspen may see an increase in business travel emissions in future years when the pandemic passes and travel globally resumes, unless further mitigation measures are taken. Relative to the 2017/2018 baseline, business travel emissions have increased by 23%.

WASTE

Emissions from landfilled waste in municipal facilities is new to the City of Aspen's inventory calculations in 2019. It should be noted that waste data for municipal operations is notoriously difficult to track. In general, waste weights are based off the total number of waste carts that are serviced by the hauling company, with an assumption of an average weight per full cart applied. When waste haulers report data, they assume all carts collected are full, rather than weighing the actual amount of waste collected. Therefore, without a change to service level (i.e., number of carts serviced), waste data is unlikely to change significantly from year to year and it is likely that values for waste collected and waste emissions are an overestimate.

The City of Aspen may consider opportunities to work with its waste hauler to improve methods of estimating waste totals or consider running regular internal audits on waste cart volume and level of fullness in order to improve the estimates around total waste collected and landfilled for future years.

2019 Waste Emissions Detail

In 2019, waste emissions totaled 1,200 mt CO₂e and accounted for 33% of the City of Aspen's overall emissions from municipal operations.

2020 Waste Emissions Detail

In 2020, waste emissions totaled 480 mt CO₂e and accounted for 19% of the City of Aspen's overall emissions from municipal operations. It should be noted that in 2020 waste, recycling, and compost data was not available. Therefore, due to the impacts of COVID-19, it was assumed that city facilities for January through March 2020 were at normal occupancy, and from April 2020 through December 2020 facilities were at 20% occupancy. Therefore, the quantity of waste created, and the associated emissions, is estimated to have decreased by 60% between 2019 and 2020.

Inventory Improvement Opportunities

The City of Aspen's municipal inventories have been improving since the City began tracking this data in 2005 through using higher quality data and improved calculation methodologies. To continue this trend towards greater accuracy and accountability in tracking municipal GHG emissions, the City of Aspen may consider the following:

- Begin to account for emissions associated with employee commuting. This will likely involve the need for a detailed employee commuting survey and would facilitate the development of policies and programs that support teleworking,

promote walking and biking to work, or enhance the use of public transit. This could have secondary benefits of reducing Community-wide emissions as well.

- Improve data tracking and accountability for waste created at municipal facilities.

Conclusion

In 2019, City of Aspen's emissions from municipal operations totaled 3,712 mt CO₂e. In 2020, the City of Aspen's emissions from municipal operations totaled 2,548 mt CO₂e, a 31% decrease from the 2019 emissions total. Since the 2017/2018 baseline, the City of Aspen has reduced greenhouse gas emissions by 30%. Since the City began tracking data in 2004 emissions have been reduced by 71%. The City of Aspen has not yet reached its 2030 goal of a 63% reduction in emissions from the 2017/2018 baseline. Some of the progress made in 2020 is the result of reduced activities in 2020 on account of the COVID-19 pandemic, and the City of Aspen will need to continue to monitor emissions and aggressively address key emissions sources in order to maintain progress towards the 2030 goal and meet the 2050 carbon neutrality goal. Specifically focusing on implementing strategies around reducing waste, natural gas use, and fleet fuel use will be necessary to successfully achieve the 2050 goal.