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Anchorage 2015 & 2020 Community Greenhouse Gas Inventory

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MUNICIPALITY OF ANCHORAGE

Photo: Frank Flavin

Photo: Anchorage Health Department

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Photo: Jeanette Lee

EXECUTIVE SUMMARY

2020 community-wide emissions were **3.61%** below 2015 levels. Building emissions decreased by 18.6%, representing the majority of reductions. Since 2015, Anchorage's population decreased 2.35% and the economy (GDP per capita) decreased by 3.52%. During this time, emissions per capita decreased **1.35%**.

Emission Trends

The **2015 Anchorage** community-wide greenhouse gas (GHG) emissions inventory found community GHG emissions totaling **5,216,353 metric tons** of carbon dioxide equivalent (CO_2e). The sectors included in the inventory are:

Buildings	Residential, commercial, and institutional buildings accounted for **45%** of communitywide emissions, with 55% of emissions from the use of natural gas, 42% from the use of electricity, and 3% from other fuels.
Transportation	Passenger, commercial, transit, rail, and aviation transportation accounted for **48%** of community-wide emissions, with 34% of emissions from the use of gasoline, 16% from the use of diesel and biodiesel, and 50% from the use of jet kerosene.
Solid Waste	Municipal solid waste, the City-operated sealed landfill, and composted waste accounted for **4%** of community-wide emissions, with 99.6% of these emissions from municipal solid waste and 0.4% from the City-operated landfills.
Wastewater	Emissions from the treatment of wastewater accounted for **3%** of community-wide emissions.

The **2020 Anchorage** community-wide GHG emissions inventory found community GHG emissions totaling **5,028,001 metric tons** of CO_2e. The sectors included in the inventory are:

Buildings	Residential, commercial, and institutional buildings accounted for **43%** of communitywide emissions, with 66% of emissions from the use of natural gas, 31% from the use of electricity, and 3% from other fuels.
Transportation	Passenger, commercial, transit, rail, and aviation transportation accounted for **49%** of community-wide emissions, with 28% of emissions from the use of gasoline, 12% from the use of diesel and biodiesel, and 60% from the use of jet kerosene.
Solid Waste	Municipal solid waste, City-operated sealed landfill, and composted waste accounted for **4%** of community-wide emissions, with 99% of these emissions from municipal solid waste and 1% from City-operated landfills.
Wastewater	Emissions from the treatment of wastewater accounted for **3%** of community-wide emissions.

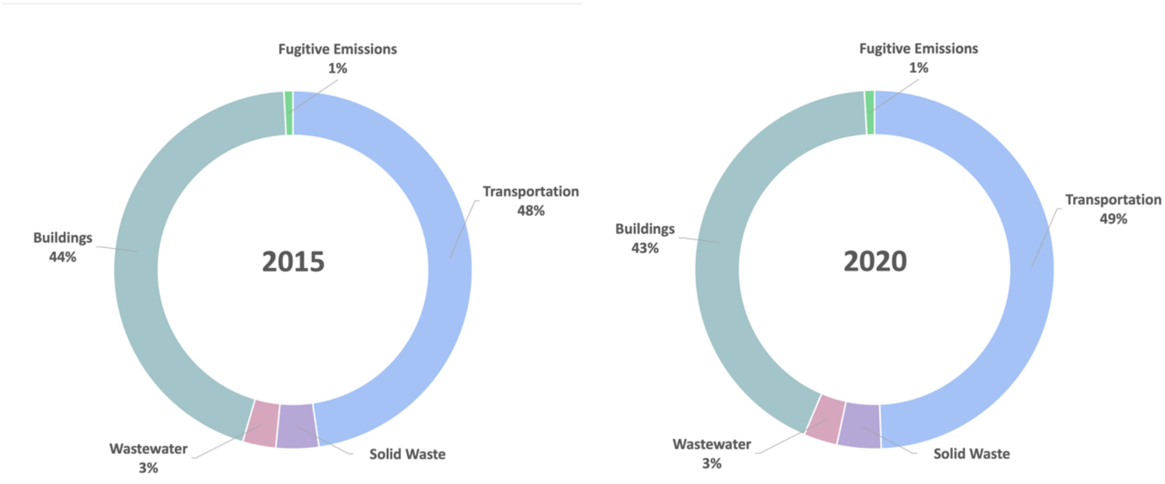


Figure 1. Overview of greenhouse gas inventories by sector in 2015 and 2020.

Emission Drivers

Looking at the level of activity and emission factors informs where emission reductions and increases largely came from:

Cleaner Grid	Emissions from the use of electricity represented **19%** of total emissions in 2015 but only **13%** in 2020. In 2015, Chugach Electric's electricity was sourced 86% from natural gas compared to 76% in 2020, largely displaced by hydropower and operating efficiencies. This resulted in 21% lower carbon emissions per unit of energy produced.
Pandemic Related Behavioral Changes	Emissions from different sectors changed due to pandemic related behavioral changes, with a decrease of **14%** in commercial building electricity emissions and **18%** in road transportation emissions from 2015.
Air Cargo Increases	As a strategic hub between Asia and North America, Anchorage is now the second busiest air cargo airport in North America. This growth has led to an increase of **20%** in airport emissions.

See more detail on emissions trends in Section V.

I. INTRODUCTION

The Anchorage Community-wide Greenhouse Gas (GHG) Inventory illustrates our progress to date on emissions reductions. As noted in the Closing Section, this inventory does not align well enough to the 2008 GHG Inventory, and thus does not allow for an accurate trending of data. Future iterations of this methodology and report will allow for more accurate accounting of emissions.

Alaska is feeling the effects of a warming climate. Temperatures are increasing twice as fast as those in the Lower 48, rising by over 4 degrees in winter and 3 degrees in summer since 1970. According to the fourth National Climate Assessment, Alaska is among the fastest warming regions on Earth *(Ch. 2: Climate, KM 7)*.[1] A warming climate is likely to further increase the frequency and size of wildfires. The retreat of sea ice affects fish and wildlife habitat that are important for subsistence, tourism, and recreational activities. The warming of north Pacific waters can contribute to ecosystem changes and an increase in ocean acidification, affecting marine habitat.

Many communities in the United States have started to take responsibility for addressing climate change at the local level. Taking climate action can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs and makes buildings more comfortable and healthier. When residents save on energy costs, they are more likely to spend at local businesses and add to the local economy. Reducing fossil fuel use improves air quality and public health. Increasing opportunities for walking and biking improves residents' health and well-being and can lead to safer streets. In addition to reducing climate risk, implementing these actions creates a healthier, safer, and more prosperous city!

Climate Change in Anchorage

Average winter temperatures in Anchorage have warmed 4.2°F since 1970, bringing more rain-on-snow events and increasing costs to maintain infrastructure and trails and clear roads and sidewalks. While December of 2021 Anchorage was much colder & drier than normal, December is the month with the fastest rate of warming in Anchorage. Precipitation is changing too; trends show that Anchorage residents can expect more snow in the winter and decreasing snow in the spring and fall. Historical snow

[1] Markon, C., S. Gray, M. Berman, L. Eerkes-Medrano, T. Hennessy, H. Huntington, J. Littell, M. McCammon, R. Thoman, and S. Trainor, 2018: Alaska. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 1185–1241. Retrieved May 2, 2022. doi: 10.7930/NCA4.2018.CH26 https://nca2018.globalchange.gov/chapter/26/

monitoring in Anchorage shows clearly that the date of the first snowfall of the year is getting later and the date of the last snowfall is getting earlier.[2] Insect infestations, earlier snowmelt, and dry vegetation

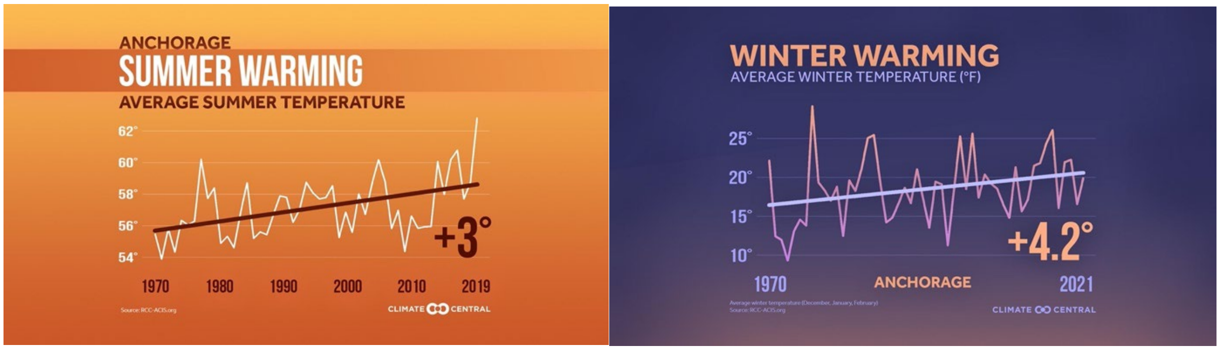


Figure 2. Changes in temperature trends in Anchorage during the summer months (left) and winter months (right).

are making Anchorage's forests more susceptible to wildfires. Estimated costs due to increased wildfires across Alaska are $1.1 to $2.1 billion annually from 2006 through the end of the century.[3]

Climate extremes in Anchorage, especially the highest daily maximum temperature, are expected to increase in a changing climate. Anchorage is known for mild summer temperatures. Historically, temperatures over 80°F have been almost unheard of, standing as all-time records. But in the last several years, the number of warm summer days has been increasing. On July 4th, 2019, Anchorage reached 90 degrees for the first time in the state's recorded history, topping the previous record of 85 degrees set on June 14, 1969. Daily summer highs tend to be about 7°F hotter than daily averages, with typical daily highs in July at 65 or 66°F. Average daily highs will likely reach 70°F by 2040. Additionally, highs over 80°F and even as high as 85°F will become much more common.

Based on the 2020 GHG inventory compared to the 2015 emissions inventory, Anchorage has reduced emissions but is not on track to meet the goals of the 2019 Climate Action Plan, which were 40% reduction by 2030 and 80% reduction by 2050 from 2008 levels. The Climate Action Plan puts forward dozens of objectives to reduce emissions.

[2]Brettschneider, B. (2021, July 1). *The new normal(s)* . ACCAP Climate Dispatch. Retrieved June 24, 2022, from https://uaf-accap.org/wp-content/uploads/2021/09/climate-dispatch-July_2021_final-WEB.pdf

[3] Melvin, April M., Jessica Murray, Brent Boehlert, Jeremy A. Martinich, Lisa Rennels, and T. Scott Rupp. "Estimating Wildfire Response Costs in Alaska's Changing Climate." Climatic Change 141, no. 4 (April 24, 2017): 783–95. 017. https://doi.org/10.1007/s10584-017-1923-2

Based on the GHG inventory, these are some objectives that will have the greatest impact on future emissions:

1. Work with state and regional partners and utilities to enable long-term clean energy solutions
2. Institute mechanisms to encourage clean energy development, such as Commercial Property Assessed Clean Energy (C-PACE)
3. Improve energy efficiency of buildings in all sectors
4. Expand local renewable energy generation and use
5. Increase use of public transit and non-motorized transportation
6. Promote the use of energy-efficient vehicles
7. Advance land use planning that creates a more livable and resilient community
8. Capture potential energy in collected refuse
9. Create and implement waste reduction targets across Municipal operations and for the broader Anchorage community
10. Reduce food and yard waste in landfill

Climate Equity in Anchorage

Anchorage ranks among the most ethnically diverse cities in the United States. Black, Indigenous, and people of color (BIPOC) are often the most vulnerable communities affected by the impacts of climate change. Actions to reduce emissions and prepare for climate change can promote equity. Energy efficiency saves residents money by reducing energy bills, which is especially important for lower-income families who face a higher utility burden. Ensuring good air quality promotes better health, especially in neighborhoods near highways, power plants, and other infrastructure that impacts air quality. Developing mixed-use, walkable neighborhoods offers safer and more accessible services and reduces car dependence, improving quality of life and public health for everyone. Conversely, addressing equity issues such as income inequality, health disparities, and housing quality ensures that all residents are able to adapt to long term climate changes and prepare for and recover from extreme weather events. By advancing equity, we build opportunities for residents to respond to a range of challenges.

The maps below illustrate asthma rates, an indicator for air quality and health outcomes, and utility burden by census tract for Anchorage, Eagle River and Girdwood. Burdens are not shared equally across the Municipality, with the highest asthma rates and utility burden east of downtown along the highway corridor in Mountain View and Fairview neighborhoods. This map shows how higher asthma rates align with high energy burden. Solely focusing on the relationship between two indicators can miss the bigger picture that many inequitable burdens are often stacked on top of the same communities. The communities in yellow are also in ethnically diverse and lower income neighborhoods, and are along the Glenn highway, where vehicles emit a significant amount of greenhouse gasses and other pollutants.

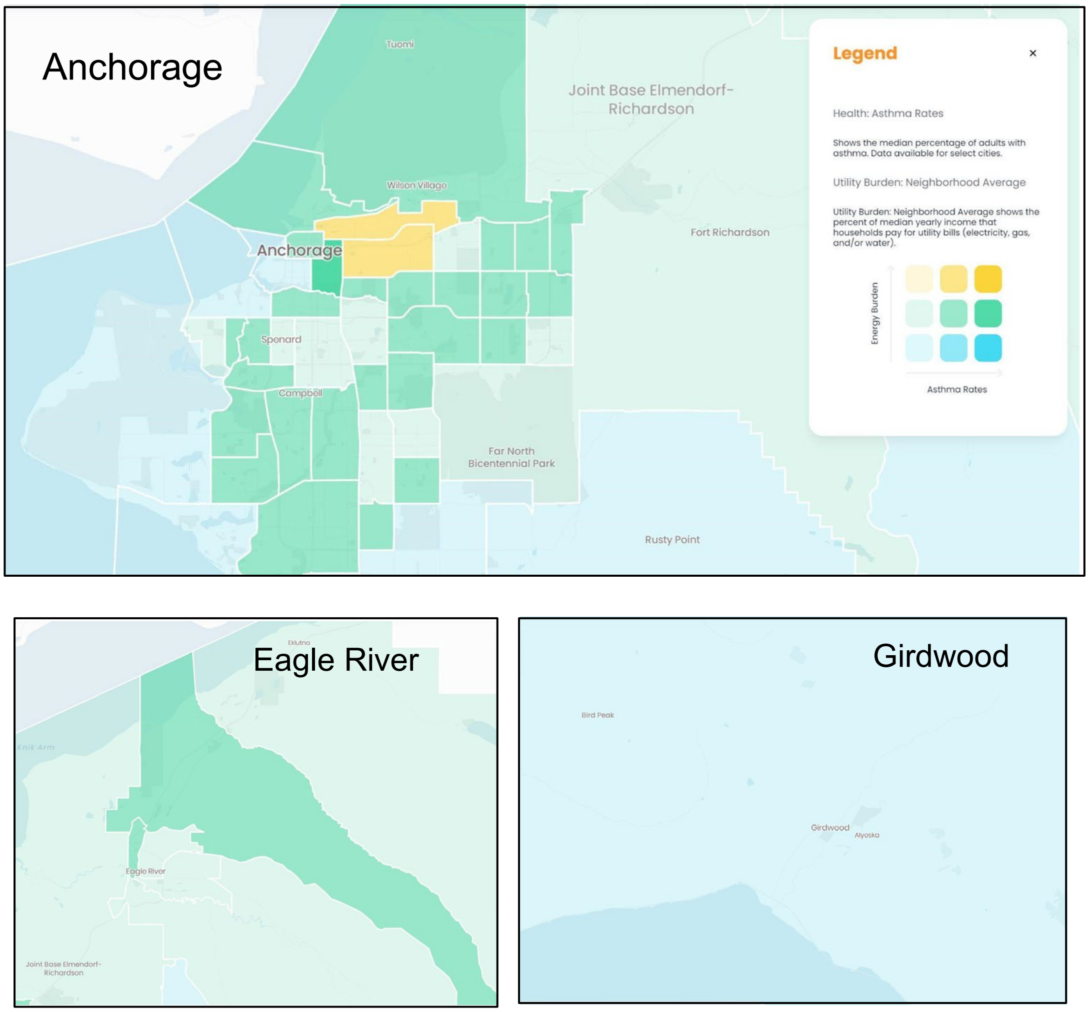


Figure 3. Maps of the municipality of Anchorage showing the asthma rates and utility burden. Asthma rates: the median percentage of adults with asthma. Utility Burden: Neighborhood Average shows the percent of median yearly income that households pay for utility bills (electricity, gas, and/or water).

II. INVENTORY DETAILS

The protocols, assumptions, and data used impact the emission levels reported. The methodology used is discussed below, along with a statement on expected accuracy and an explanation of the different versions of the inventory presented.

Methodology

The Anchorage GHG inventory is completed using the ICLEI ClearPath tool in accordance with the ICLEI – Local Governments for Sustainability US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol). The Community Protocol provides recommendations and data sources specifically relevant to the United States. For more information on the specific methodology, assumptions, and data sources used, see the Master City of Anchorage Community-Wide Greenhouse Gas Inventory Guide and accompanying worksheet.

While updates are scheduled annually per the Anchorage Climate Action Plan, five-year updates are more realistic due to the required cost, expertise, and workload. The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from the Municipality of Anchorage community as a whole.

The City's inventory accounts for three greenhouse gasses: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These greenhouse gasses represent 97% of emissions in the United States. Fluorinated gasses are not estimated based on data availability.

Accuracy

The inventory is completed using data derived from reported, aggregated, modeled, and/or scaled data. Some data sources are not updated on an annual basis, and therefore comparison of consecutive years may not represent actual changes in emission levels. Regardless, the city aims for a 5% accuracy in each year of estimation (I.e., accurately capturing at least 95% of emissions).

III. EMISSION TRENDS

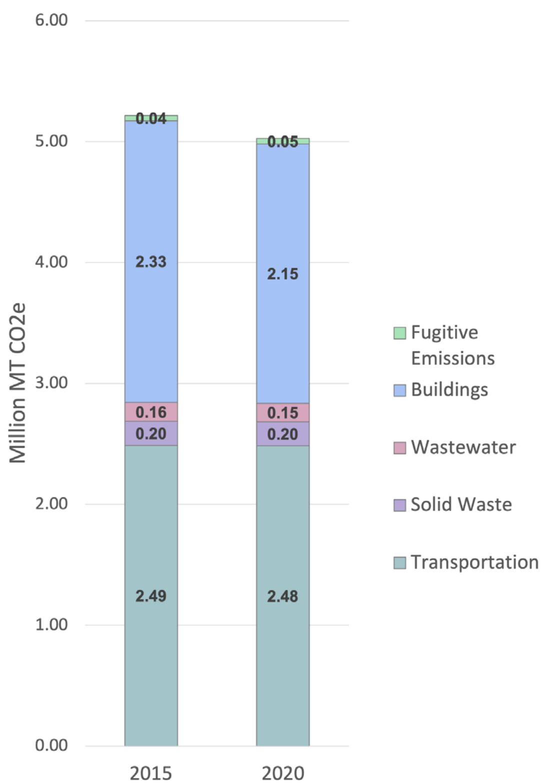


Figure 4. Overview of emissions by sector in 2015 and 2020.

Inventory emission levels in 2015 were 5.2 million metric tons of carbon dioxide equivalent (MT CO2e), and 5 million MT CO2e in 2020. From 2015 to 2020 emissions have decreased by 3.61%, roughly 0.72% per year. Figure 4 shows the changes in emission levels broken out by sector from 2015 and 2020. Figure 5 summarizes the changes in emission levels since 2015 attributed to each sector.

Buildings represent the vast majority of emission reductions, decreasing by 8.7% from 2015 to 2020. The decrease in commercial building emissions represents 93% of total reductions and residential building decreases represent 4.3% of total reductions. Small changes in water and wastewater emissions contributed 2.1% of total reductions, transportation contributed 1.5%, solid waste 0.8%, and industrial emissions didn't change. Fugitive emissions increased due to increased natural gas use.

Figure 5. Emission level changes by sector from 2015 to 2020. Green boxes represent a decrease in emissions, red represents an increase.

IV. POPULATION AND GDP TRENDS

Anchorage has shrunk since 2015, both in terms of population and GDP. Figure 6 illustrates changes in the Anchorage population, GDP, and emissions since 2015. Population, GDP and emissions have tracked each other relatively closely, signaling that more specific action for emissions reduction and energy efficiency is needed.

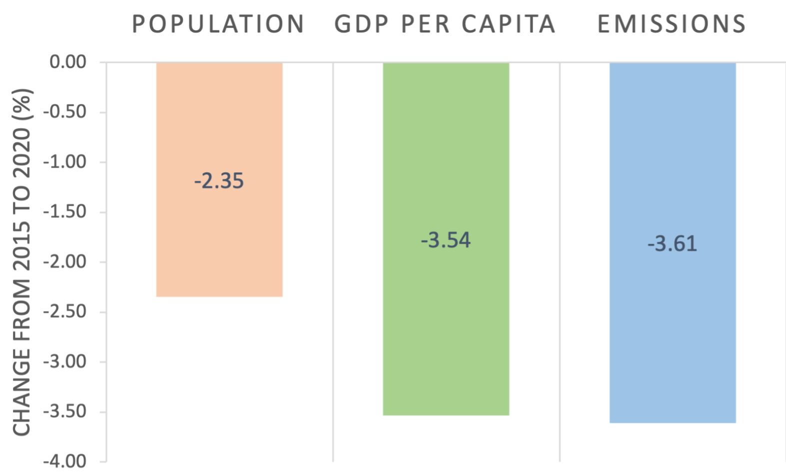


Figure 6. Changes in population, GDP per capita and greenhouse gas emissions between 2015 and 2020.

V. EMISSION DRIVERS

The aggregate rate of change of emissions since 2015 has been a 0.7% decrease each year. The largest reductions in emissions since 2015 can be attributed to a less carbon intense electricity grid. Changes to fuel sources used to generate electricity for the region represent 97% of total emission reductions. The main drivers of increases in emissions since 2015 are an increase in natural gas usage in buildings and the change in air cargo traffic at Ted Stevens International Airport.

Cleaner Grid

Emissions from the use of electricity represented 19% of Anchorage's total emissions in 2015 and 13% in 2020- a significant decrease due to a greener grid and operating efficiencies. The city's electricity comes from Chugach Electric Association (Chugach Electric), Municipal Light and Power (ML&P), and Matanuska Electric Association (MEA). ML&P, a municipally owned electric utility with a service territory fully within the Municipality boundaries, was sold to Chugach Electric, combining utilities on October 30, 2020. Chugach Electric and MEA are cooperatives with service territories partially within and partially outside Municipality boundaries. More information on the generation of these utilities can be found within the 2017 Anchorage Energy Landscape and Opportunities Analysis[4].

Chugach Electric Association shared that in the first year of combined operation after acquiring ML&P, about $21 million in savings were realized from fuel, labor, and the elimination of inter-governmental charges, including roughly $1 million monthly savings in fuel reduction. As the acquisition was not complete for all of 2020, it is presumed that these savings will be more clearly illustrated in future inventories.

> *"Following the acquisition of ML&P, we are able to capitalize on economic dispatch of the most efficient generation facilities in the state. We have seen a reduction of over 88,000 metric tons of CO2, equivalent to 19,000 gasoline powered passenger vehicles, over a one-year period. We look forward to continued progress in this area."*
>
> \- Chugach CEO Arthur Miller

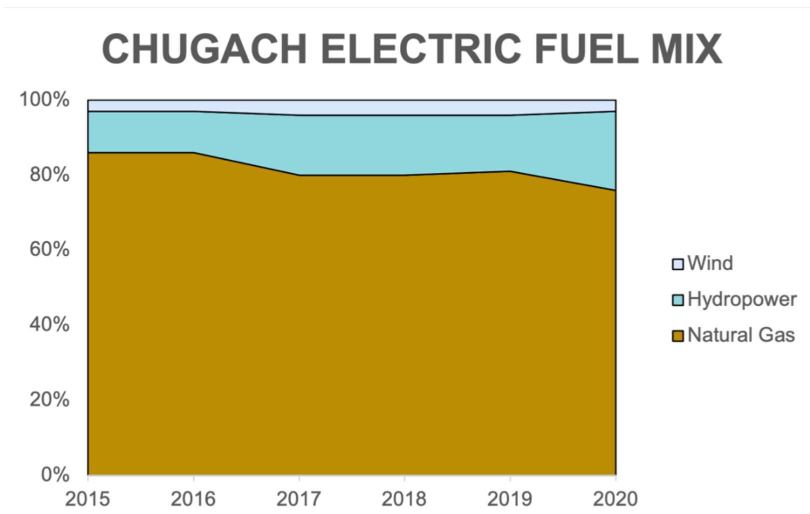


Figure 7. Chugach electric changing fuel mix from 2015 to 2020.

Per the inventory, the Anchorage grid emitted roughly 8% less emissions in residential and commercial buildings in 2020 compared to 2015. Over that time, the fuel mix added 10% more hydropower, displacing a significant amount of natural gas. This trend could continue due to decreases in natural gas availability. Recently, Hilcorp Alaska LLC informed Anchorage and adjacent utilities that the company currently does not have enough natural gas reserves in Cook Inlet to provide for the next round of gas

[4]Hirsch, B., & Crimp, P. (2017, May 1). *Anchorage energy landscape and opportunities analysis*. Resilient Anchorage. Retrieved April 2, 2022, from https://www.muni.org/Departments/Mayor/AWARE/ResilientAnchorage/Documents/Anchorage%20Energy%20Landscape%20and%20Opportunities%20Analysis%20May%202017.pdf

contracts during the next two to 11 years. Anchorage is highly dependent on natural gas for heating and electricity. Hilcorp is the dominant energy supplier, providing around 85% of the gas that heats and powers much of Alaska's population with Cook Inlet gas.

Pandemic Related Behavioral Changes

While the Anchorage grid showed reduced emissions, the pandemic is also responsible for emissions reductions. Daily patterns shifted; many people stayed home in 2020. Raw data show a significant reduction in commercial building use and vehicle miles traveled (VMT). Chugach Electric reported that power demand from commercial customers was down about 8%. Chugach and other utilities have been facing flat or decreasing energy use from a declining state population and more efficient appliances. While road-based vehicle emissions have been steadily rising worldwide for decades, they fell roughly 18% in Anchorage between 2015 and 2020. This is primarily due to the pandemic, which caused major disruptions to transportation. At the same time, vehicles are consistently becoming more efficient due to regulations and improvements in technology; nationally, cars became 2.7% more efficient between 2015 and 2020. Future inventories may be able to identify whether the shift of working from home is a long-term trend or a pandemic-specific response. Additionally, tourism in Anchorage also dropped in 2020 by 82%[5], leading to less rental vehicles and tour buses.

Air Cargo Traffic

One main driver to increases in emissions since 2015 is changes in air cargo traffic at Ted Stevens International Airport. Air cargo in Alaska increased 16.3% from 2015 to 2020, totaling 3.5 million tons. While the pandemic reduced human travel significantly, it boosted demand for air cargo. Supply chain constraints and continuing growth of e-commerce related to air freight is expected to continue to support elevated air cargo demand.

> *"Anchorage is a major air cargo gateway for trans-pacific air cargo," said Trudy Wassel, Anchorage Deputy Director. "Its strategic location on the great circle route makes us an important technical stop and trans-load hub for air cargo freighters flying between Asia and North America. Anchorage is the second busiest air cargo airport in North America— fourth busiest in the world."*

[5] Alaska Travel Industry Association & McKinley Research Group, LLC. (2021, May). The Economic Impacts of COVID-19 on Alaska's Visitor's Economy.

VI. EMISSION TRENDS BY SECTOR

Table 2 summarizes the sectors and sub-sectors included in the inventory and provides the emission sources for each and their scope.

Sector	Sub-Sector	Sources (Scope)
Buildings (Stationary Energy)	**Residential**	Electricity (2) Natural gas, propane, kerosene, wood (1)
	Commercial	Electricity (2) Natural gas (1)
	Industrial	Heating oils **electricity and natural gas use is included in commercial* (1)
Transportation	**Car and Truck Transportation**	Gas and diesel (1)
	Aviation	Aviation gas and jet kerosene (3)
	Local Bus Transit	Gas and diesel (1)
	Rail	Diesel (1)
	Port	Diesel (3)
	Snowmachines	Gas (1)
Solid Waste	**Landfills**	Landfill gas to energy and flares **electricity and natural gas use is included in commercial* (1)
	Municipal Waste	Municipal waste (1)
Water + Wastewater	**Wastewater Treatment**	Biosolid combustion, wastewater lagoon N2O and fugitive emissions, septic tank emissions **electricity and natural gas use is included in commercial* (1)
Upstream Fugitive Emissions	**Natural Gas Leakage**	Natural gas (1)

Per the U.S. Environmental Protection Agency, Scope 1 emissions are direct GHG emissions that occur from sources that are controlled or owned by an organization, or in this case Anchorage and its residents (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles).

Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although scope 2 emissions physically occur at the facility where they are generated, which may be outside the city boundaries, they are accounted for in the GHG inventory because they are a result of the city's energy use.

Scope 3 emissions are the result of activities from assets not owned or controlled by the city, but that the city indirectly impacts in its value chain. Scope 3 emissions include all sources not within a city's scope 1 and 2 boundary. The scope 3 emissions for one city are the scope 1 and 2 emissions of another organization.

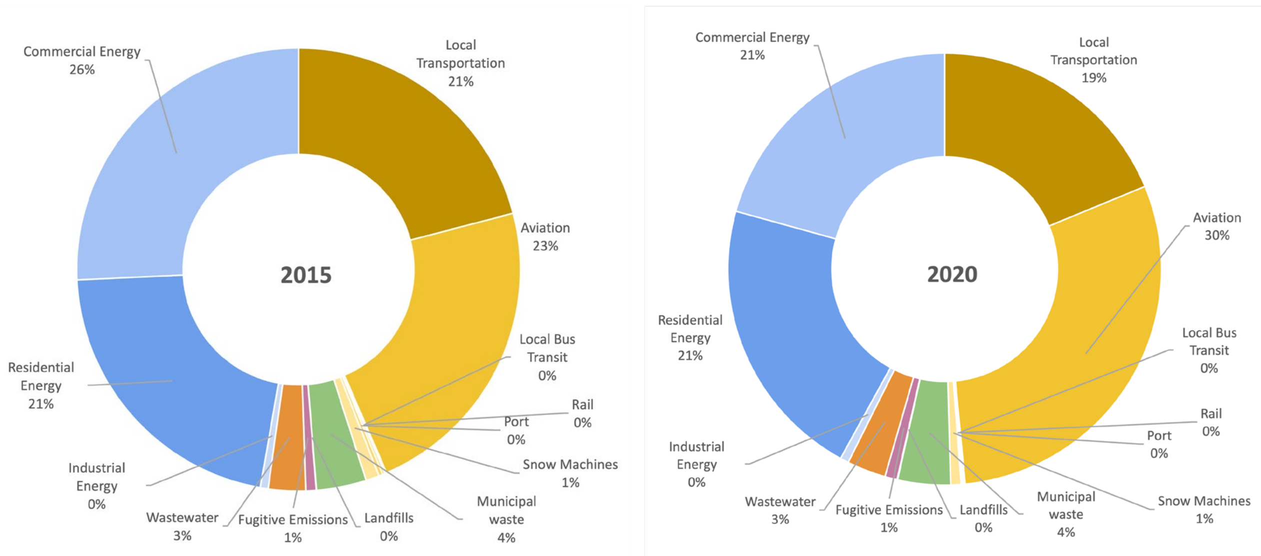


Figure 8. 2015 and 2020 greenhouse gas inventories by subsector (percent of total emissions).

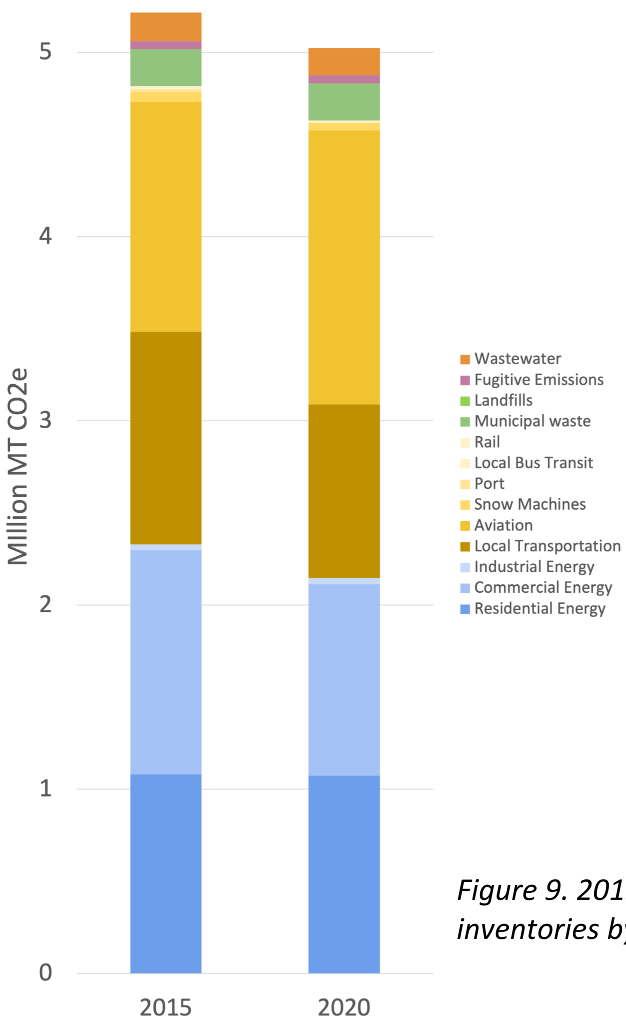


Figure 9. 2015 and 2020 greenhouse gas inventories by subsector (CO2e totals)

Buildings (stationary energy)

Building emissions accounted for 2.33 million MT CO_2e in 2020 (45% of total emissions) and 2.13 million MT CO_2e (43% of total emissions), an 8.3% overall decrease in emissions. Building emissions include those from residential buildings, commercial buildings and industrial energy. The majority of these emissions come from residential and commercial energy in both inventories. The biggest improvements in this sector are attributed to a cleaner electrical grid (see Section V. Emissions Drivers).

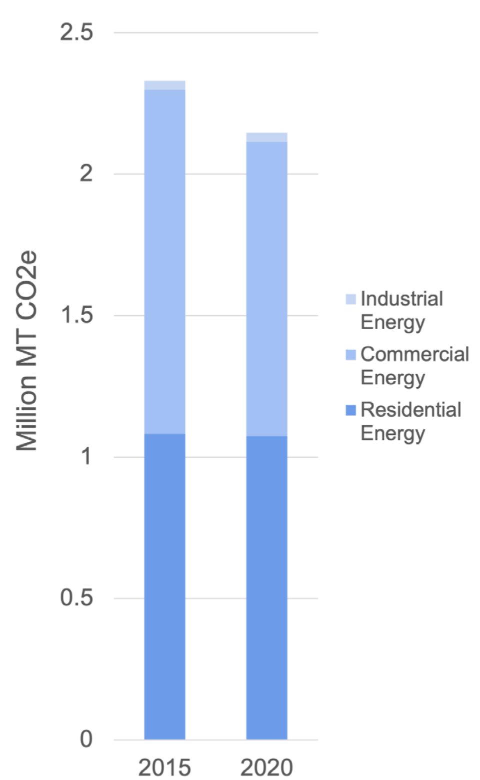


Figure 10. Emissions from buildings 2015 and 2020 by building type.

Building emissions in 2015 were made up of 1.28 million MT CO_2e (55%) from methane gas from heating and cooking, 980,000 MT CO_2e (42%) from electricity, and 63,000 MT CO_2e (3%) from propane, kerosene, and wood burning. Building emissions in 2020 were made up of 1.41 million MT CO_2e (66%) from methane gas from heating and cooking, 670,000 MT CO_2e (31%) from electricity and 66,000 (3%) from other fuels. See section 5 for the electric fuel mix.

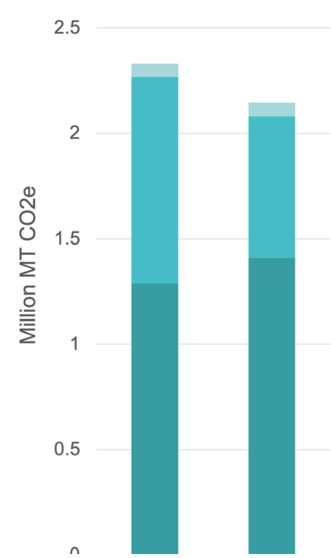


Figure 11. Emissions from buildings in 2015 and 2020 by fuel type used.

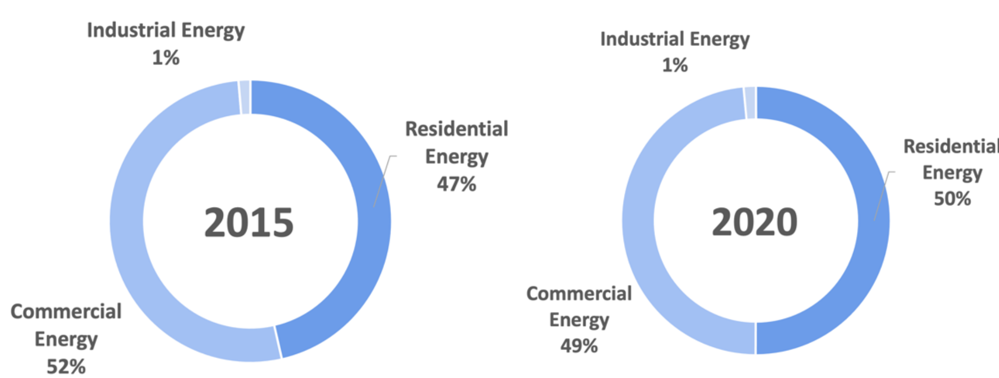


Figure 12. Percent of emissions from different building types in 2015 and 2020.

Residential Energy

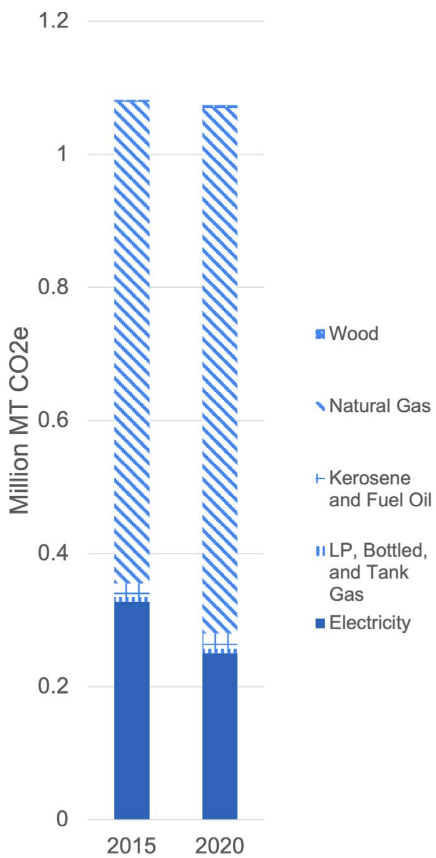


Figure 13. Emissions from residential energy usage in 2015 and 2020 by fuel type.

Residential energy accounted for 1.08 million MT CO_2e (21% of total) in 2015, with natural gas (72,000 MT CO_2e) and electricity (328,000 MT CO_2e) making up the majority of emissions. In 2020, residential energy accounted for 1.07 million MT CO_2e (21% of total), a 0.74% decrease, with natural gas (80,000 MT CO_2e) and electricity (250,000 MT CO_2e) again making up the majority of emissions.

According to the latest housing assessment prepared for the Alaska Housing Finance Corporation (AHFC) in 2018, single family homes in Anchorage have the highest energy consumption in the state. Anchorage residential energy consumption, including multi-family buildings, is 2.5 times the national average.

However, Anchorage homes are reducing their energy use through retrofits and more efficient appliances, using a total of 3.6% less electricity in 2020 than in 2015. According to Chugach Electric Association, residential monthly electrical usage went from 650 kWh in 2015 to 600 kWh in 2020. While electrical use went down, emission from heating fuels increased just over 9% from 2015 to 2020. This is likely due to the fact that people were home more during the pandemic. This increase in heating fuel emissions – a 9% increase in natural gas emission, 12% in kerosene and 37% in wood – offsets the 23% reduction in total electricity emissions for a total residential emissions reduction of 0.74%

The 2017 Anchorage Energy Landscape and Opportunities Analysis conservatively estimated that cost effective retrofits would result in 20% energy savings for residential units and 25% energy and operations savings for private commercial facilities.

Solar energy use has been on the rise in Anchorage, primarily for small, residential projects. Nearly 600 residential customers have installed solar within Chugach Electric Association service territory, for a total of 3,310 kilowatts (kW) of capacity.[6]

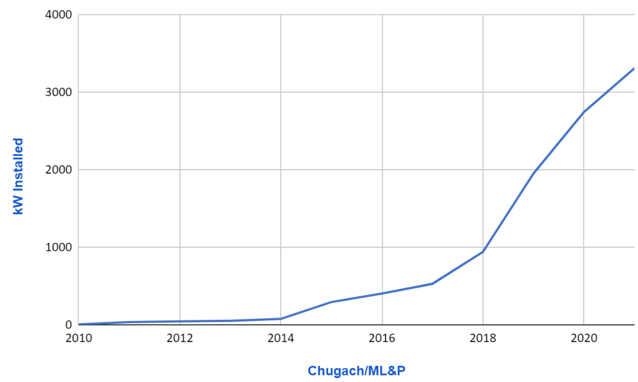
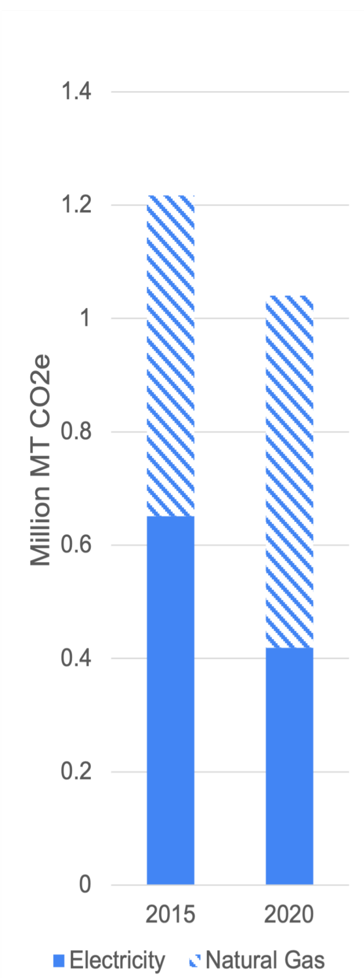


Figure 14. Installed Solar Capacity in Chugach Electric and ML&P territory.



Commercial Energy

Commercial energy accounted for 1.21 million MT CO_2e (23% of total emissions) in 2015, with 650,000 MT CO_2e coming from electricity and 570,000 MT CO_2e coming from natural gas. In 2020, commercial energy accounted for 1.04 million MT CO_2e (21% of total emissions), a 14.5% decrease, with 420,000 MT CO_2e coming from electricity and 620,000 MT CO_2e coming from natural gas. This is likely due to changes from the cleaner grid as well as in the occupation of commercial space during the pandemic; as people worked from home, commercial spaces weren't using as much electricity, but they had to stay heated. Though not a part of the methodology, 2020 was notably colder than 2015, which may explain the high heating use (2020 saw a nearly 13% increase in heating degree days, a measurement of how cold the temperature is to to quantify the demand for energy needed to heat a building, compiled from the National Weather Service).

Figure 15. Emissions from commercial energy usage in 2015 and 2020 by fuel type.

[6] Chris Pike, Alaska Center for Energy and Power, pers. Comm.

Industrial Energy

Electricity and natural gas used in industrial buildings is included in the commercial building section due to the method of data collection. However, large industrial sites are required to submit other fuels they use to the EPA. #1 and #2 heating oils used at industrial sites accounted for 32,000 MT CO_2e (0.6% of total emissions) in both 2015 and 2020.

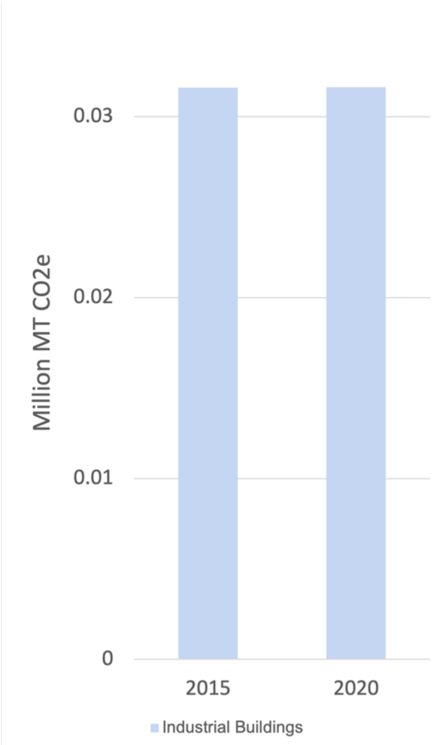


Figure 16. Emissions from industrial buildings in 2015 and 2020.

Transportation

Transportation accounted for 2.487 million MT CO_2e in 2015 (48% of total 2015 emissions). In 2020, transportation accounted for 2.484 million MT CO_2e (49% of total 2020 emissions), representing a 0.12% decrease from 2015. Transportation emissions include local car and truck transportation, aviation traffic from Ted Stevens International and Merrill Field airports, rail, port, snowmachines and local bus transit (the People Mover).

The majority of emissions comes from local transportation and aviation, while port, rail, bus and snowmachines make up less than 4% of transportation emissions both years. ATVs are not licensed and therefore are not included in this methodology. Local transportation saw a decrease in emissions in 2020, likely related to the COVID-19 pandemic, while aviation emissions increased significantly, as Anchorage actively looks to increase its air cargo capacity.

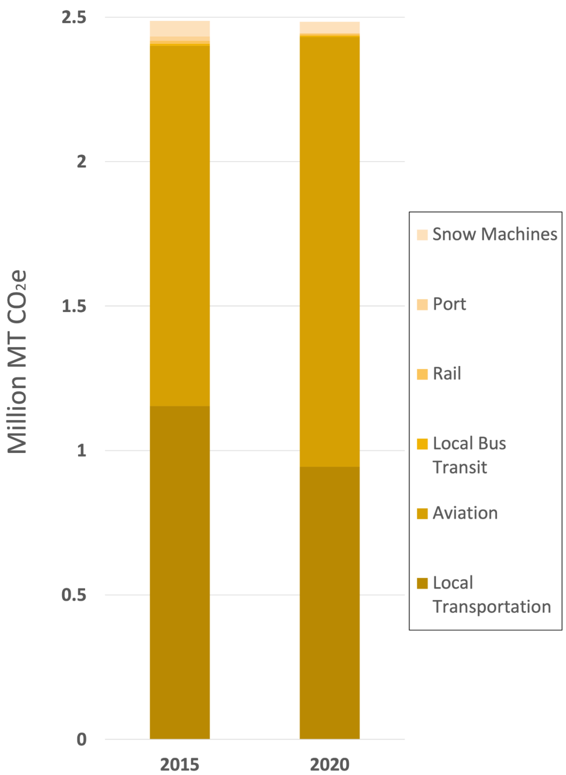


Figure 17 . Transportation emission levels in 2015 and 2020.

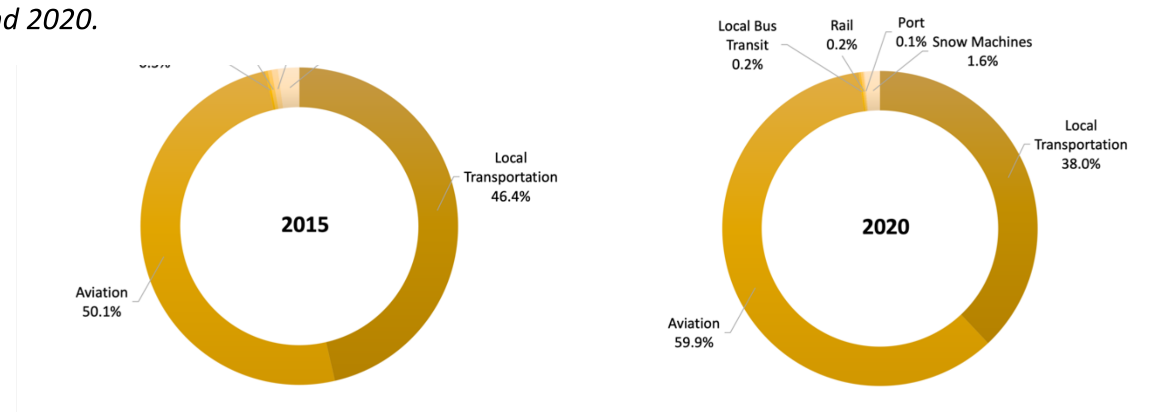
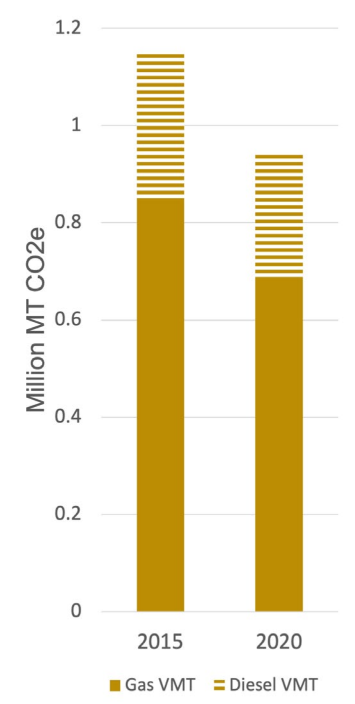


Figure 18. Composition of transportation emissions in 2015 and 2020.

Local transportation



Local transportation accounted for 1.15 million MT CO2e in 2015 (22% of total emissions) and 0.94 million MT CO_2e in 2020 (19% of total emissions), an 18% decrease. Local transportation includes passenger and freight road traffic and includes both diesel and gas usage. This decrease is primarily due to changes in behavior during the 2020 COVID-19 pandemic, when there was a decrease in daily commuting as well as an 82% decline in tourism in the state[7], though improvements in vehicle efficiency likely contributed as well. Additionally, there was a 15% increase in trail usage in 2020 - however, it is not clear this trend will translate to decreases in non-motorized transportation in the future. Cycling traffic decreased by 2%.[8]

Figure 19. Local transportation emission levels in 2015 and 2020.

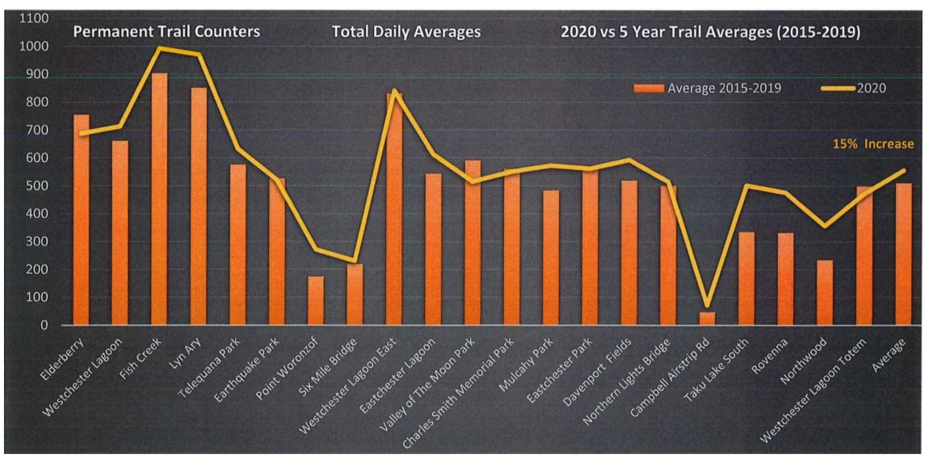


Figure 20. 2020 vs 5 year trail use averages (2015 - 2019).

Electric Vehicles (EVs) are on the rise in Anchorage. Chugach Electric Association estimates that an EV charged on their grid is responsible for a 62% emissions reduction over a standard internal combustion engine car. As of December 2021, there were over 1,200 battery EVs in Alaska. Alaska expects to

[7] Alaska Travel Industry Association & McKinley Research Group, LLC. (2021, May). The Economic Impacts of COVID-19 on Alaska's Visitor's Economy.
[8] Trail Usage During a Pandemic Year, Municipality of Anchorage Traffic Engineering Department, 1.29.21

receive over $50M over the next five years for EV fast charging through the Infrastructure and Investment Jobs Act.

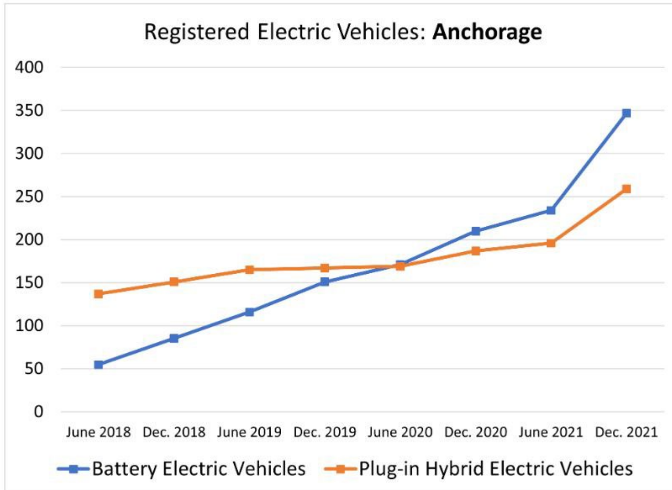


Figure 21. Registered electric vehicles in Anchorage, Source: Chugach Electric Association.

Local Buses

Local buses (the People Mover and AnchorRIDES) accounted for 6900 MT CO_2e in 2015 (1% of total 2015 emissions) and 5200 MT CO_2e in 2020 (1% of total 2020 emissions), a 25% decrease from 2015. This decrease has been attributed to a significant decrease in ridership and thus bus trips related to the COVID-19 pandemic (see figure 22). Bus ridership had been increasing since 2017 after years of decline and 2020 had been following the same trend until March, when ridership declined precipitously and stayed low throughout the year.

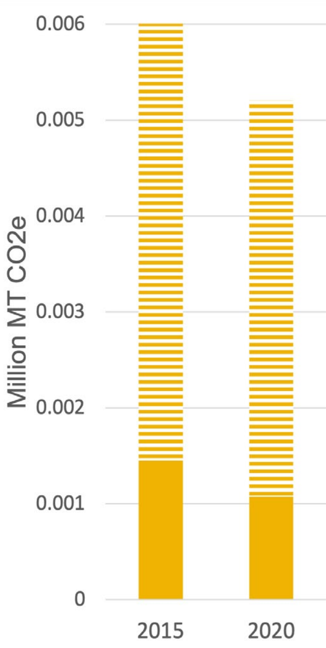


Figure 23. Emissions from local buses in 2015 and 2020.

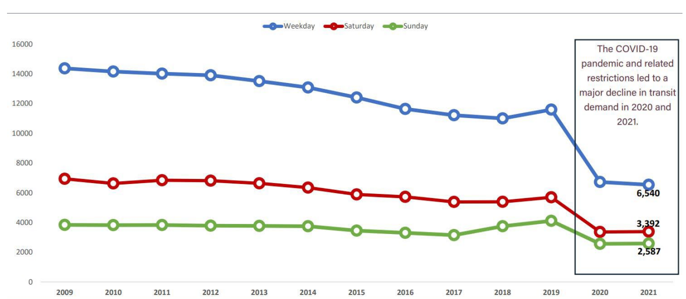


Figure 22. People Mover ridership levels from 2009-2021.

Aviation

Aviation accounted for 1.25 million MT CO_2e in 2015 and 1.5 million MT CO_2e in 2020, a 19% increase now representing 30% of total emissions. Aviation emissions include 20% of the fuel sold by each airport to account for the amount of fuel planes use within 50 miles of taking off or landing in Anchorage. Ted Stevens International Airport accounted for the majority of that increase (+240,000 MT CO_2e) resulting in a 19.25% increase in emissions between the two inventories. Merrill Field, a significantly smaller airport, had massive changes in use as emissions from jet fuel increased 130%. However, these changes only resulted in an additional 780 MT CO_2e due to the size of the airport.

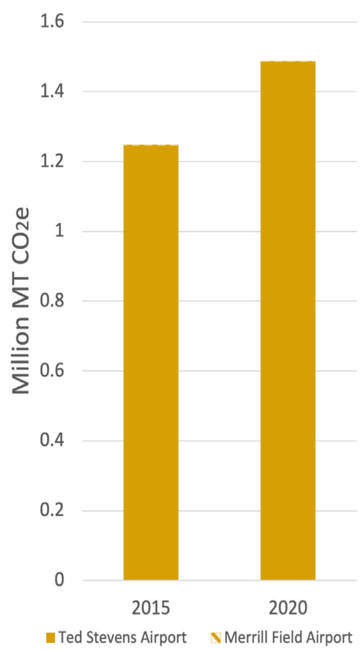
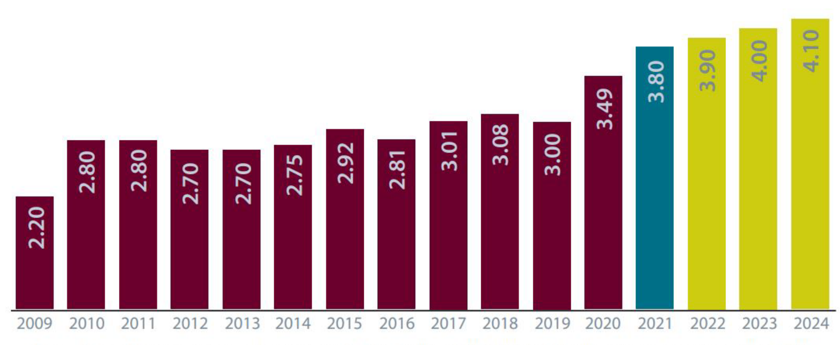


Figure 24. Aviation emission levels from 2015 and 2020.

Air cargo in Alaska increased 16.3% from 2015 to 2020, totaling 3.5 million tons of cargo. The pandemic boosted demand for air cargo which is anticipated to hold through the near-term due to port congestion, restocking inventories in the U.S. and continuing growth of e-commerce related to air freight, according to the Anchorage Economic Development Corporation (AEDC). Alaska's strategic location between the U.S. and Asia transits are expected to continue to boost Anchorage traffic, leading to multiple long-term infrastructure projects totaling $700M in investments. According to the 2021 3-Year Economic Outlook Report, "air cargo traffic will remain at elevated levels through 2021, then generally match global rates of economic growth through 2024."[9]

Figure 25. Anchorage air cargo volume (Million Tons), 2009 - 2024.



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[9] *2021 3-Year economic outlook report*. Anchorage Economic Development Corporation. (2021). Retrieved June 23, 2022, from https://aedcweb.com/project/2021-3-year-outlook-report/

Solid Waste

Solid waste emissions accounted for 201,000 MT CO_2e in 2015 (4% of total 2015 emissions) and 199,000 MT CO_2e in 2020 (4% of total 2020 emissions), a 0.72% decrease from 2015. Municipal waste accounted for the majority of these emissions (200,000 MT CO_2e in 2015; 198,000 MT CO_2e in 2020), a 1.3% decrease. The largest overall change was an increase (1,168 MT CO_2e; 174%) in emissions from gas flared by landfills.

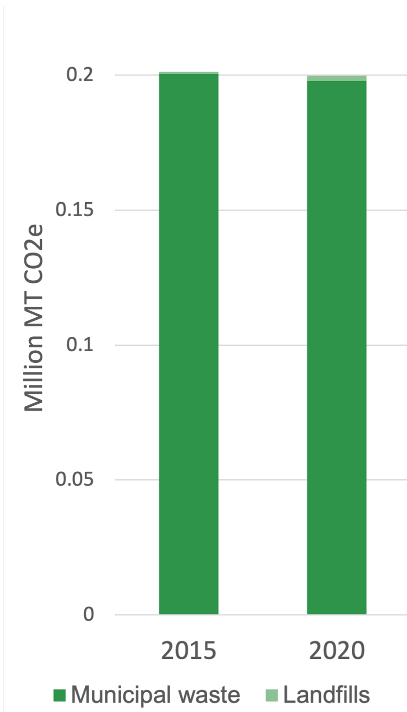


Figure 26. Emissions from solid waste in 2015 and 2020.

Landfill operations generate methane, a powerful greenhouse gas, during the decomposition process. The gas is chilled and delivered to a power plant at the Anchorage Regional Landfill (ARL), where it is burned by five engines to create up to 7 megawatts of electricity for Fort Richardson (part of Joint Base Elmendorf Richardson). The project produces enough electricity to power the equivalent of 6,400 homes, keeping methane gas from reaching the atmosphere. After the project was built, a change in the local electric rate structure made landfill gas more expensive than grid energy, decreasing demand and causing more landfill gas to be flared. The rate structure is expected to change in the next few years, hopefully reversing these trends.

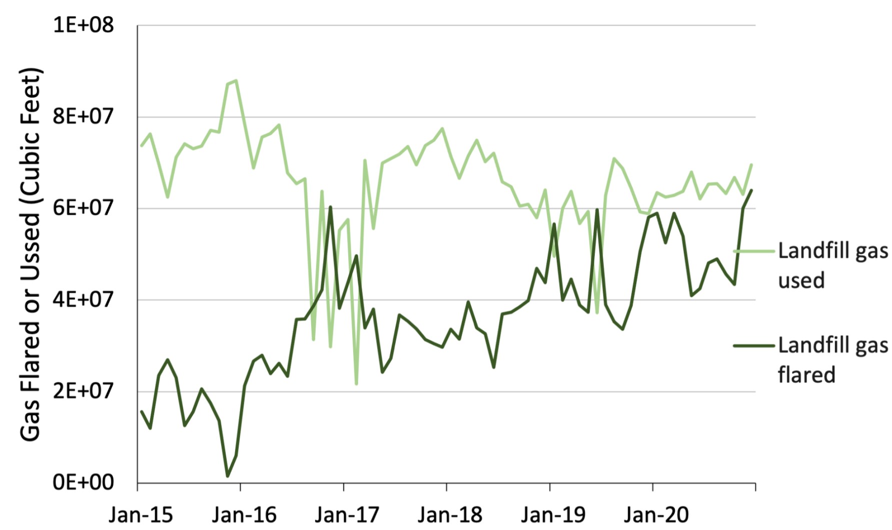
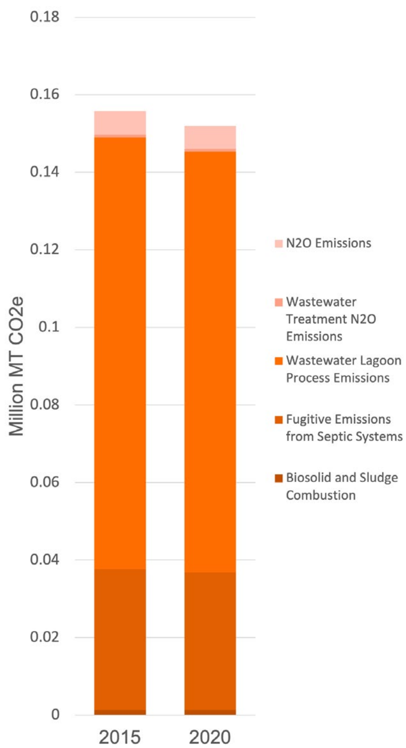


Figure 27. Anchorage Landfill gas used and flared in cubic feet, 2015 - 2020. As less landfill gas-generated electricity is used, more is flared, increasing greenhouse gas emissions.

Water and Wastewater

Wastewater emissions accounted for 156,000 MT CO_2e in 2015 (3% of total emissions) and 152,000 MT CO_2e in 2020 (3% of total emissions), a 2.5% decrease. Estimates for wastewater emissions come from wastewater treatment N_2O emissions, lagoon process emissions, fugitive emissions from septic systems and biosolid and sludge combustion. Emissions from drinking water treatment and distribution are accounted for in the commercial buildings section.



Looking forward, Anchorage Water and Wastewater Utility (AWWU) is developing two projects that will generate energy from water flowing through pipes. AWWU anticipates creating over 500-megawatt hours annually, or the equivalent of about 75 homes' electricity use for one year.

Figure 28. Emissions from wastewater plants in 2015 and 2020.

Fugitive Emissions

Fugitive emissions accounted for 42,000 MT CO_2e in 2015 (1% of total emissions) and 46,000 MT CO_2e in 2020 (1% of total emissions), a 9.5% increase. Fugitive emissions include natural gas - which is actually methane, a greenhouse gas 30 times more potent than CO_2 - escaping from pipes and appliances before being burned. The increase between 2015 and 2020 is due to additional natural gas being burned for heating and cooking in both commercial and residential buildings.

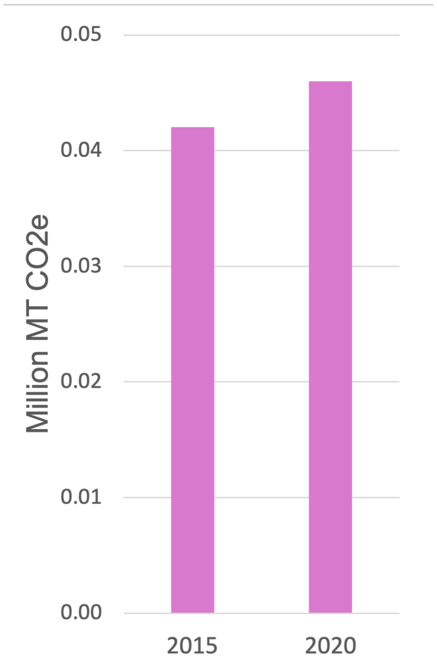


Figure 29. Emissions from fugitive emissions in 2015 and 2020.

VII. CLOSING

Anchorage saw a modest reduction in community-wide emissions, decreasing 3.61% from 2015 to 2020 levels. The 2020 Anchorage community-wide GHG emissions inventory found community GHG emissions totaling 5,028,001 metric tons of CO_2e, down from 5,216,353 metric tons of CO_2e in 2015. While a reduction is encouraging, the broader context reveals that there is more work to be done. Trends in 2021 are showing that vehicle transportation is making a recovery from slow downs during COVID, and the electric fuel mix in 2021 shows a greater proportion of natural gas in Chugach Electric's territory when compared to 2020. These two factors make up the majority of the community's progress in reducing emissions. Further, cargo traffic at Ted Stevens International Airport is expected to continue to expand and increase.

This Anchorage GHG inventory is completed in accordance with the ICLEI – Community Protocol. In the future, we aim to develop an inventory every five years. Currently the Municipality and the Alaska Department of Environmental Conservation (DEC) are using different methodologies, and therefore will have differing data. The Municipality intends to work closely with the DEC on future inventories. Our future goal is to integrate the Anchorage GHG inventory with the larger statewide inventory through a standard accounting methodology.

Through the Climate Action Plan, Anchorage committed to a reduction from 2008 of 80% by 2050 with an interim goal of 40% by 2030. However, data from 2008 reflects municipal operations only, whereas this represents community-wide emissions. It is not plausible to complete a 2008 community-wide inventory at this time. It is worth noting that due to a changing energy mix, population, and economy, and improvements in energy efficiency, energy-related CO2 emissions across the state declined by 10.5% between 2008 and 2015.[10] This suggests emissions reductions in Anchorage during that period, though it does not allow us to recreate the data.

Using 2015 as a new baseline year for community-scale emissions provides a better data set to lay a solid baseline for ongoing tracking. Future iterations should use this same methodology outlined in this document for consistent monitoring.

However, even if larger emissions reductions were realized from 2008 to 2015, the 3.6% reduction shown in this inventory indicates that Anchorage is not on target to meet its interim or long-term goal. We will need to step up efforts to try to meet this lofty but necessary goal.

A regular GHG inventory is important to understanding the sources of emissions within our community in order to find strategic opportunities to reduce them. This inventory is intended to support the 2019

[10] Energy-Related CO2 Emission Data Tables, Energy Information Administration. Retrieved August 16, 2022 from, https://www.eia.gov/environment/emissions/state/

Anchorage Climate Action Plan which includes objectives and actions for reducing our emissions 80% by 2050. Anchorage has the resources and knowledge to make significant reductions. With leadership, urgency, and will, we can meet these ambitious but necessary goals.

This report is based on the Ann Arbor 2019 Community-Wide Greenhouse Gas Inventory Report.

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Special thank you to volunteer subject matter experts Haley Crim and Abra Atwood through the Thriving Earth Exchange. The Thriving Earth Exchange strengthens and enhances collaboration among communities, scientists, and partner organizations so that all communities can build healthy, resilient, thriving, just, and ecologically responsible futures.