

2021 GHG Emission Inventory - Juneau

Public Review Draft

May 16, 2023



Introduction – 2021 GHG update

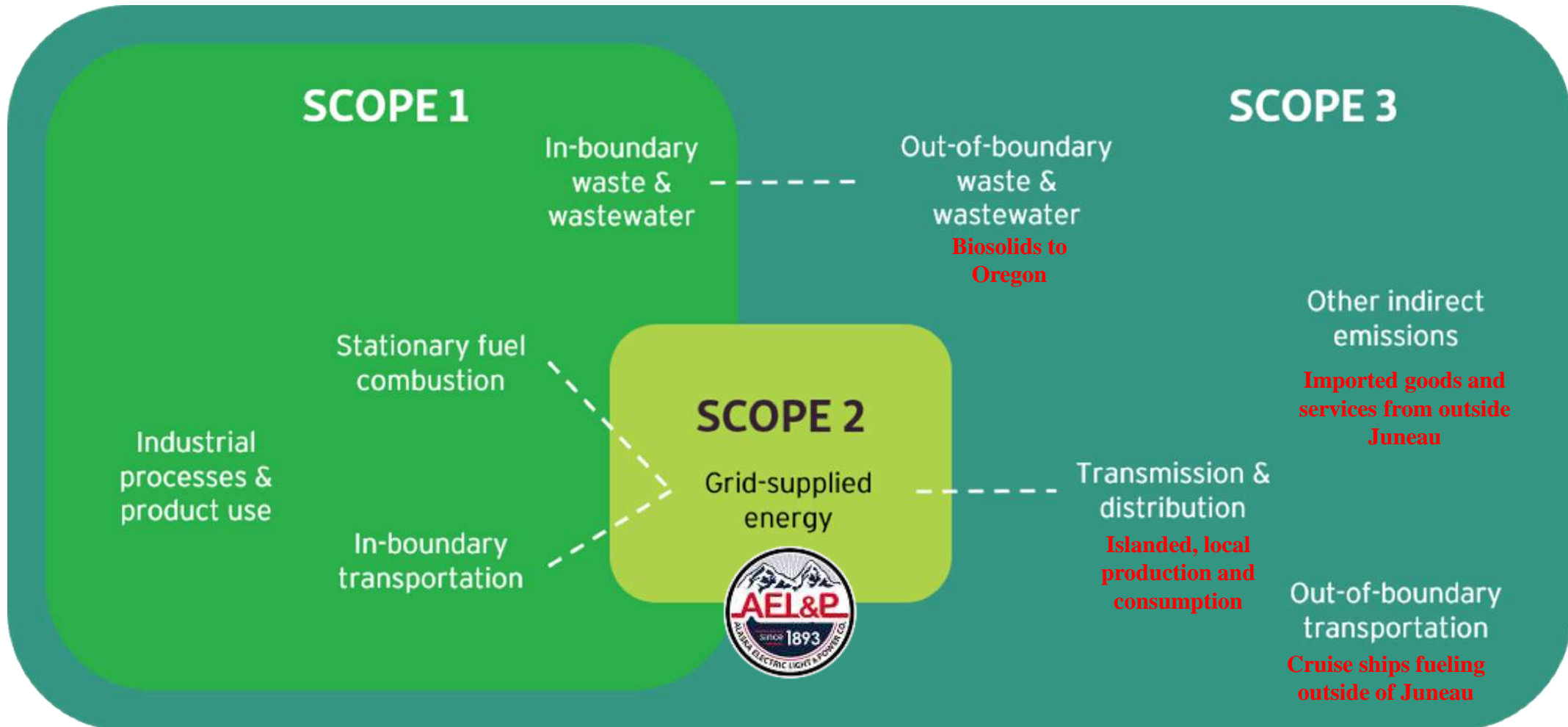
- CBJ completed GHG emission inventories in 2007 and 2010
 - Update to Juneau's GHG emissions with 2021 energy use and GHG emissions data
- Buildings and industry sector data collection efforts
 - AEL&P provided data on actual power consumption across all sectors
 - Liquid fuels (propane, diesel, heating oil, etc.) were “estimated” using activity data
 - Assessor data on land and structure parcels were used to estimate energy use intensity (EUI) by building type
 - ACS Census data for 2020 was used to see borough-wide home heating fuel usage estimates
 - EPA facility list for industrial emissions, with additional CSR reports for 2021 year
- Transportation sector data estimation efforts:
 - Multiple sources were consulted to estimate marine emissions through energy use at the dock and vessel level
 - Air travel fuels were provided by Juneau International Airport personnel, but marine and on-road were estimated
 - Vehicle miles travelled and vehicle registration gathered for on-road transportation

Methodology

- The inventory employed standard international protocols, boundary and methodology to:
 - **Global Protocol for Community-scale Greenhouse Gas Emission Inventories*** (GPC)
 - Determine metric tons of carbon dioxide equivalent (MTCO₂e) for three greenhouse gases:
 - Carbon dioxide (CO₂), Methane (CH₄) and Nitrous oxide (N₂O), based on activity (fuel usage)
- Using EPA and NREL models, we have created proxies or energy activity
 - Activity was converted to emission using Global Protocol for Community-Scale Greenhouse Gas Inventories (GHG) for categories (e.g., fuel use, electricity use)
 - Appropriate emission factors and global warming potential (GWP).
 - Emissions are not “weather-normalized” in line with 2007 and 2010.

**Developed by GHG Protocol standard developed by C40, World Resources Institute and ICLEI - Local Governments for Sustainability*

Methodology – GHG Scopes



Progress at a glance – Energy and Emissions

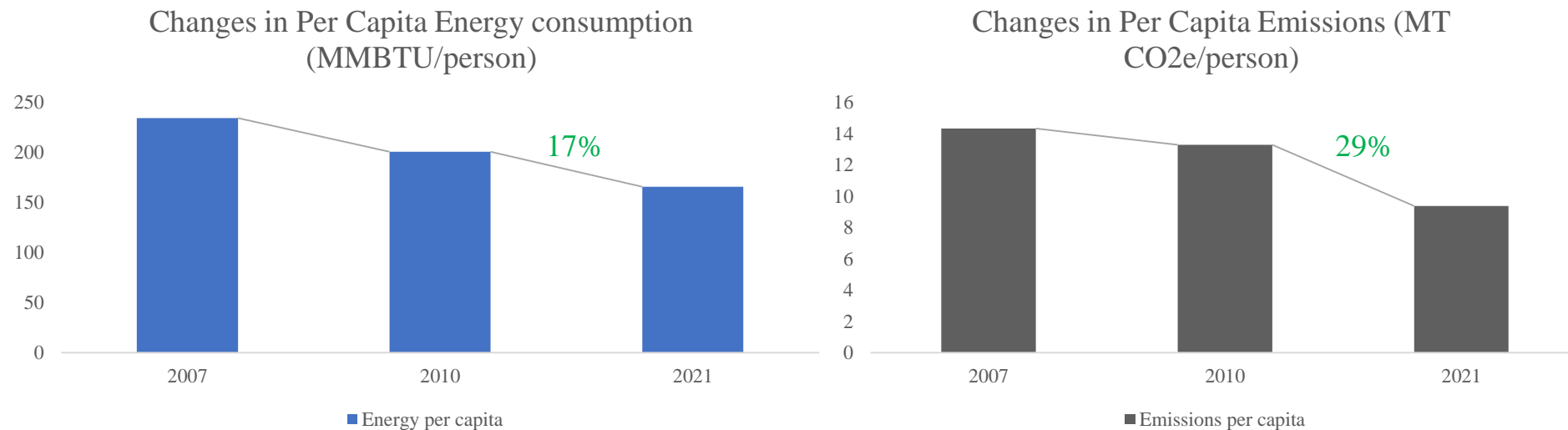
Energy Consumption in 2007 (MMBtu)	MT CO2e in 2007	Energy Consumption in 2010 (MMBtu)	MT CO2e in 2010	Energy Consumption in 2021 (MMBtu)	MTCO2e in 2021
7.2 million	440,000	6.3 million	416,716	5.3 million	299,965
<i>% Change from 2007</i>				-29%	-31%
<i>% Change from 2010</i>				-18%	-28%

Progress at a glance – Policy Goals

- Juneau Climate Action and Implementation Plan target: 25% reduction in emissions to be reached by 2032
 - **Achieved!**
- Juneau Renewable Energy Strategy (JRES): Increase renewable energy to 80% of the total community energy use by 2045.
 - Renewable energy (hydroelectricity) providing about 29% of total community energy use in 2021, compared with 20% in 2010.

Progress at a glance – Per Capita Changes

- Population of Juneau increased 1.8% from 2010 to 2021.
- Per capita energy reduction of over 17% in 2021 (166 MMBtu per capita)
 - From the 2010 inventory (201 MMBtu per capita), and 29% since 2007 (234 MMBtu per capita).
- Per capita emissions* reduced over 29% in 2021 (9.38 MT per capita)
 - From the 2010 inventory (13.28 MT per capita), and 34.5% since 2007 (14.32 MT per capita).



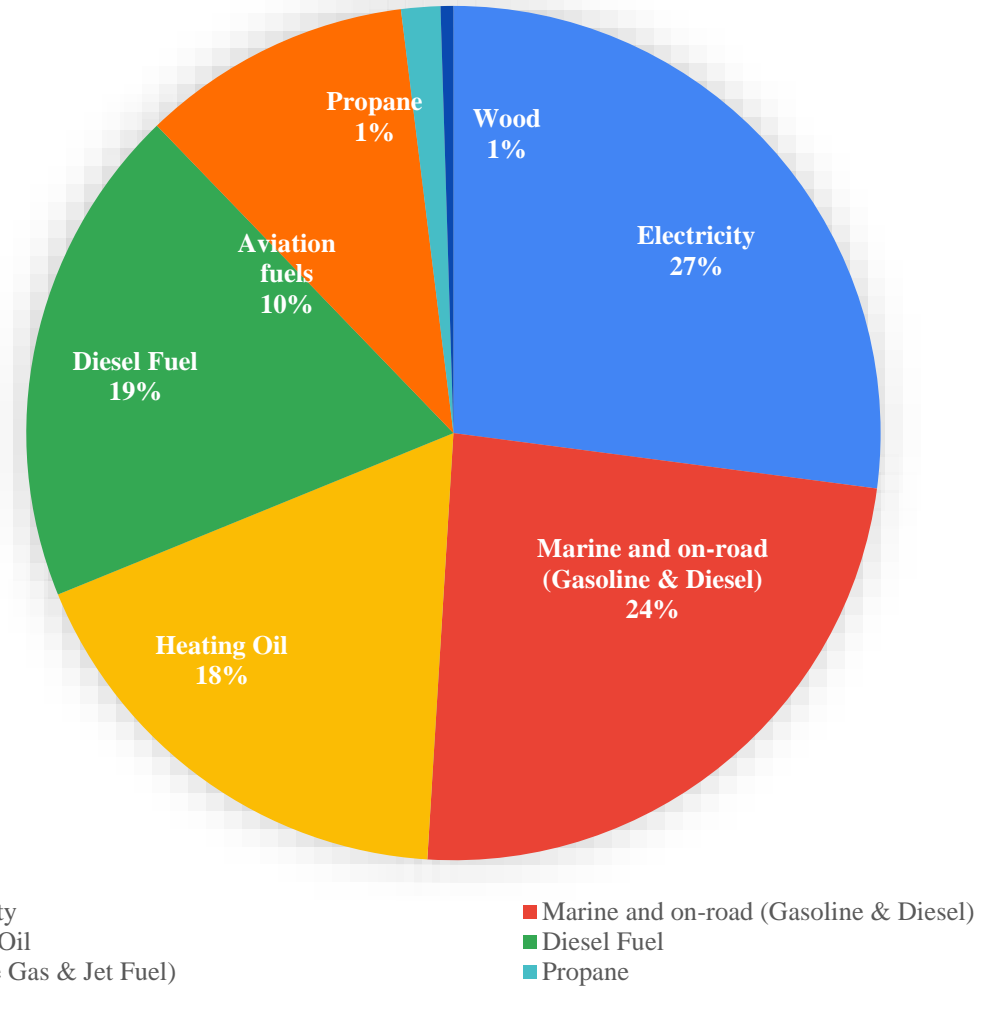
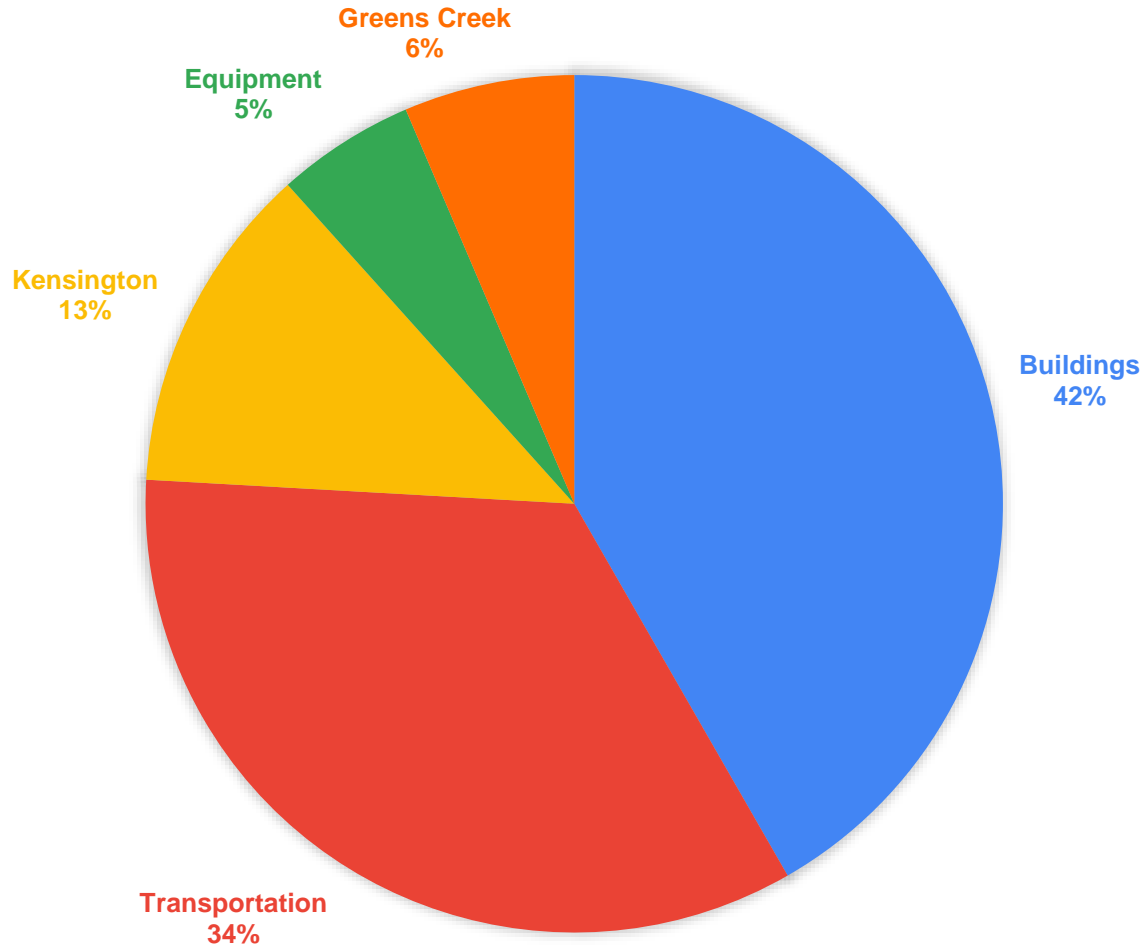
As a frame of reference, various other U.S. cities have wide ranging per capita emissions, for instance - Farmington, NM at 69 MT per capita, to Seattle at 2.2 MT per capita

Community emissions

Community energy and emissions analyses for divided into following sectors:

1. Transportation
 1. On-road: VMT based estimation for 2021, with data from State of AK Vehicle registrations for 2021
 2. Waterborne: Harbor fuel, state-NEI estimates and other information from third-party provides
 3. Air transport: JNU passenger and tons for 2021, with aviation gasoline and jet fuel logs by major airlines
2. Buildings and the built environment
 1. Both stationary combustion, fuel oil, wood, electricity, propane
 2. Purchased electricity, AEL&P provided 2021 generation and delivery of power from diesel and hydroelectric
3. Industrials processes and equipment
 1. Greens Creek Mine, reported stationary data for the 2021 EPA filing as well as CSR report
 2. Kensington Mine, reported stationary data for the 2021 EPA filing as well as CSR report
4. Solid waste treatment
 1. Capital Disposal landfill reported stationary data for the 2021 EPA filing

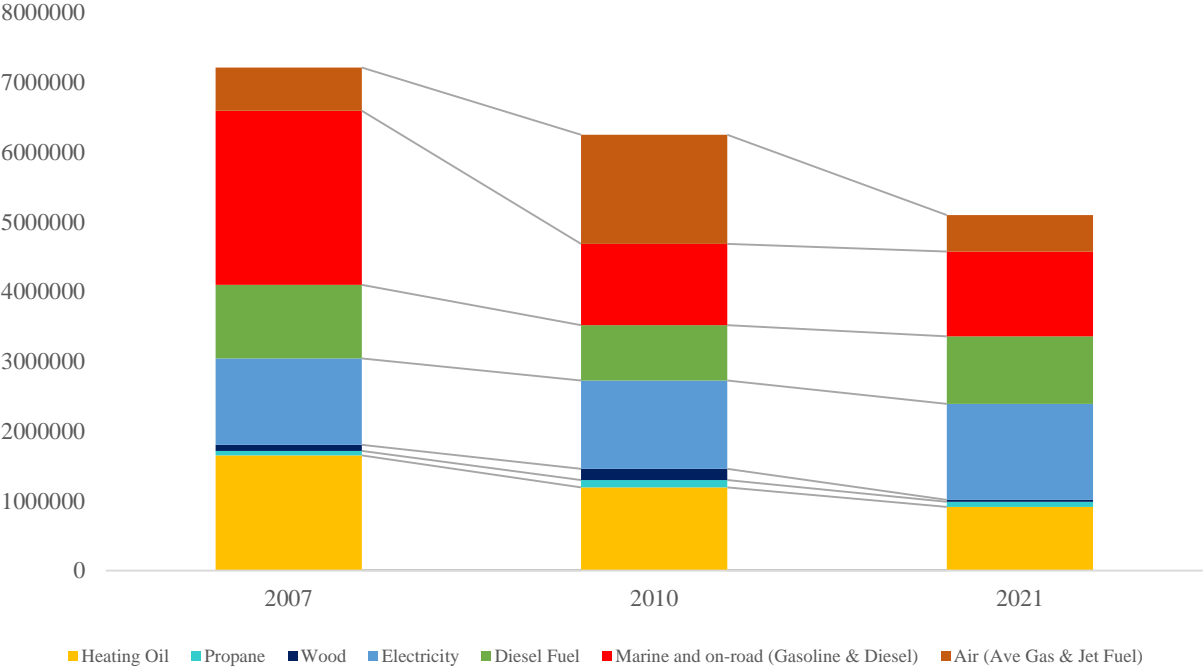
Community wide Energy (MMBtu) 2021



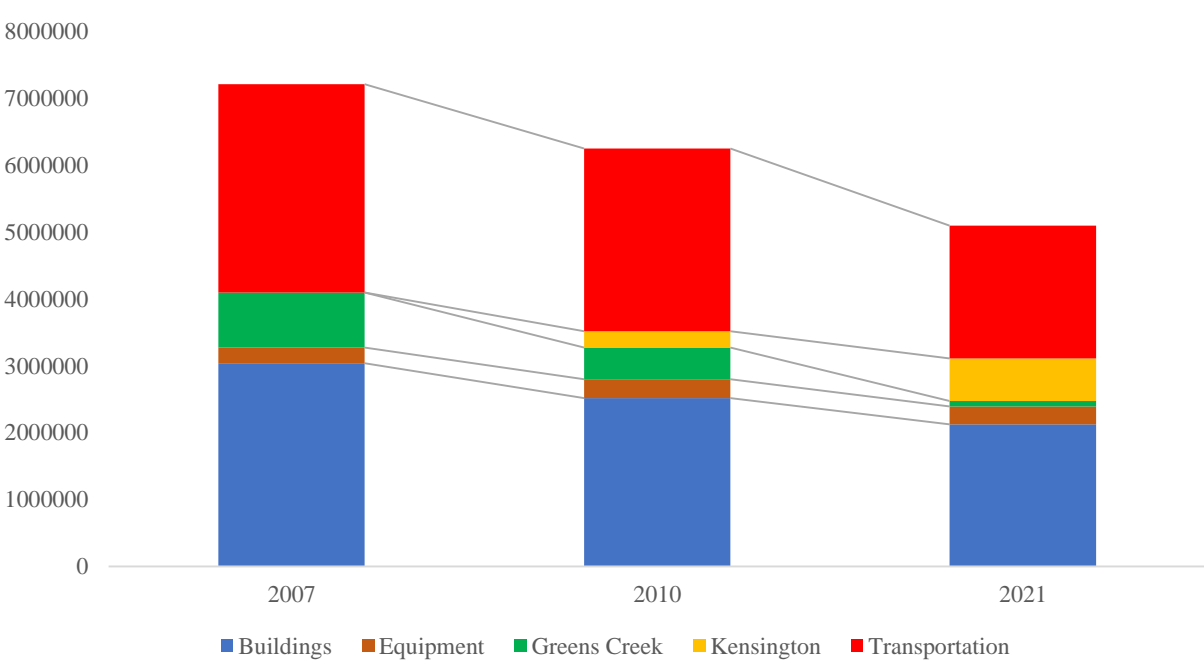
Juneau consumed 5.3 million MMBTU of energy

Community wide Energy (MMBtu) by Source and Sector

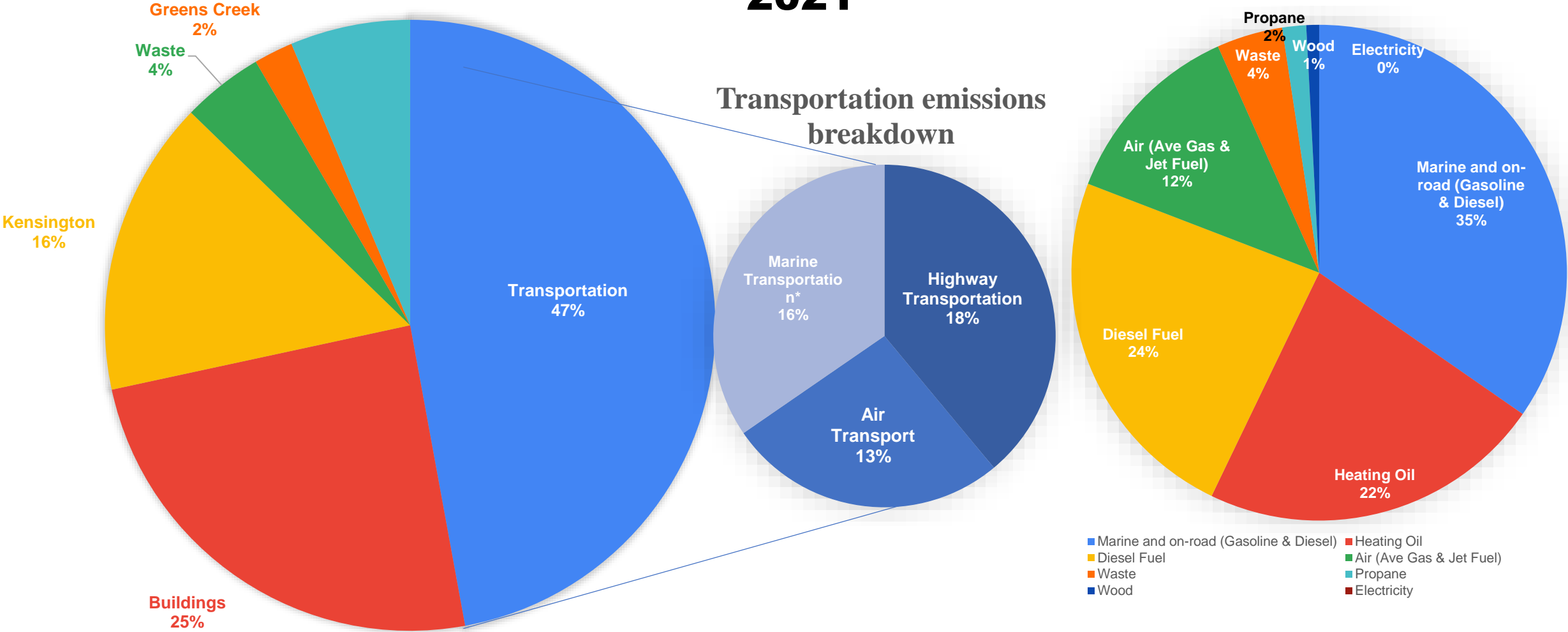
Changes in energy consumption (Source)



Changes in energy consumption (Sector)



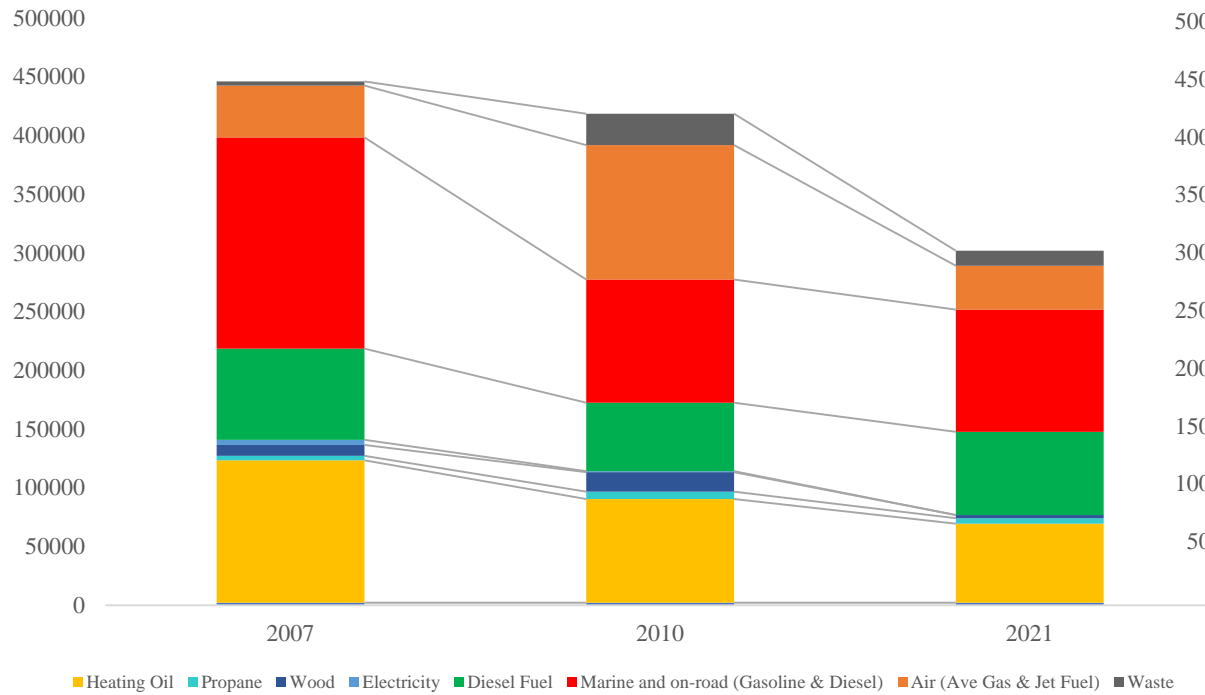
Community wide Emissions (MT CO₂e) 2021



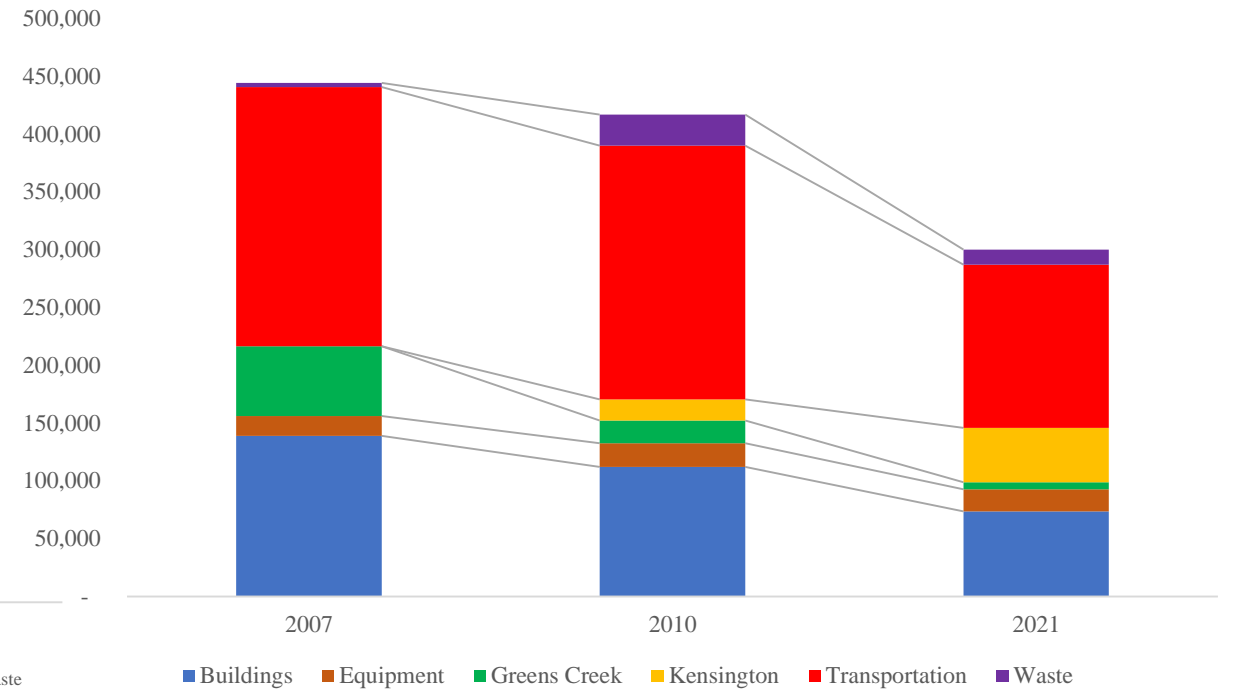
Juneau released almost 299,965 MT CO₂e in 2021

Community wide Emissions (MMBtu) by Source and sector

Changes in GHG emissions (Source)



Changes in GHG emissions (Sector)



Transportation emissions – On Road

On-road transportation emissions included emissions from burning gallons of gasoline and diesel combusted by vehicles.

- Past GHG emissions from highway transportation are based on actual gallons provided by fuel distributors,
- Unavailable in 2021, so alternative method was utilized

Method to estimate vehicle miles traveled (VMT) was used, a recommendation from 2010.

- 2021 Average Annual Daily Traffic (AADT) Count from the Alaska Department of Transportation & Public Facilities,
- 2021 vehicles by class codes, the inventory used State of Alaska Division of Motor Vehicles' (DMV) list of vehicles
- The 2021 update estimated **152,063,352** miles of travel by passenger/light-duty (LV) and heavy-duty vehicles (MDHD)

Transportation emissions - Aviation

- Collected data on total enplanements from FAA
 - 306,512 enplaned passengers in 2021
 - Small carriers reporting directly to FAA, and not to JIA
- The 2021 data on enplanements from Juneau International Airport
 - 253,170 passengers.
 - 1,594,283 tons of mail
 - 4,264,882 tons of freight
- Total gallons of liquid fuels for 2021 was 3,909,529
 - 170,530 gallons of aviation gasoline and 3,738,999 gallons of jet fuel
 - 0.4% reduction from 2010 numbers.
- *Note: Only fuel consumed within Juneau for air transportation is being counted as the in-boundary scope 1. Flights that have fueled elsewhere before arriving at the airport, are not being counted above (scope 3 emissions).*

Transportation emissions - Marine

- Marine transportation emissions includes all marine gasoline and diesel sold by the major fuel distributors within Juneau, AK
- These figures included fuel for the Alaska Marine Highway and other marine fuel pumped in Juneau
 - Not include the fuel used to ship goods to Juneau or fuel used by cruise ships (Scope 3)
- In the 2021 update, due to no data provided by fuel distributors, an alternative process was used.
 - Consulted the State, and Port of Juneau for both traffic and fuel estimates. Last state data was from 2017, Port had partial 2021 – Port data had actual marine transportation energy, and thus emissions some locations (next slide)
 - Used Marinetraffic.com for records of port calls - a list of arrivals to and departures from Juneau in 2021 for scope 3

Cruise ships emissions – Scope 3

- A large portion of marine emissions is due to diesel usage in cruise ships
- Cruise ships are in the Port of Juneau about 6,800 hours* annually
- On average, they collectively burn about 352 gallons/hour.
- This results in about **24,354** metric tons of CO₂e annually
 - Based on 2.4 million gallons of liquid fuels in generators in onboard power plants
 - Represents more than 8% of 2021 total scope 1 emissions.

*According to the 2022 Juneau Cruise Ship Dock Electrification Study (pg. 40-41)

Industrial processes and waste

Coeur Alaska Kensington Gold Mine supplied the EPA 2021 for stationary combustion emissions:

- Used 4.47 million gallons of Distillate Fuel oil (#2) as well as 204,785 gallons of Liquified Petroleum Gas (LPG)
- Emitted 46,917 metric tons of CO₂e, which increased drastically (2.5x) from 2010 – at 18,285 metric tons.
- Additional emissions for equipment-based mobile combustion related GHG emissions reported directly

Juneau's solid waste landfill in Capital Disposal landfill. In 2021, emitted 12,904 mt CO₂e which decreased significantly from the 2010.

- 1,539 MMBtu of diesel use, and 3,066 MMBtu of used oil use, emitting 341 metric tons of CO₂e in 2021, and 12,562 metric tons of CH₄
- The normalized comparison is between 12,904 mt CO₂e in 2021 which is 48% of the 26,893 mt CO₂e in 2010.
- Additional emissions for equipment-based mobile combustion related GHG emissions reported directly

The Hecla Greens Creek Mining supplied the EPA 2021 for stationary combustion emissions:

- Used 0.604 million gallons of Distillate Fuel oil (#2), 4,003 gallons of propane, and 38,000 gallons of used oil,
- Emitting the 6,603 metric tons of total emissions (67% reduction from 19,735 MT CO₂e in 2010)
- Additional emissions for equipment-based mobile combustion related GHG emissions reported directly

Power sector GHG emissions

Supplier specific emission factors provided by AEL&P (MTCO₂e per MWh)

- Diesel emissions of 2.24 lbs. per kWh (0.00102 MT CO₂e per kWh)
- 616,000,000 kWh of diesel generation reporting in CY2021 (see table below)
- 6% decrease in electricity emissions (MT CO₂e), despite a 9% increase in total electricity consumption (MWh) between 2010 and 2021.
 - Indicates decoupling between emissions and electricity based on changes in source

Electricity generation CY 2021	
Diesel generation (MWh)	616
Hydro Generation (MWh)	431,652
Total Generation	432,268
% Diesel	0.14%
% Hydro	99.86%
Gallons of diesel combusted	51,408

Electricity load across sectors	MWh in 2021
Commercial	97,663
Government	74,842
Residential	160,068
Transportation	71,639

Total occupied housing units	12,922	100%
Heating oil (Fuel oil, kerosene, etc.)	6,838	53%
Electricity	4,164	32%
Other	698	6%
Propane (Bottled, tank, or LP gas)	643	5%
Wood	242	3%

Conclusions & Recommendations

2021 GHG emissions inventory reveals that both energy use and GHG emissions decreased for the overall community compared to the 2010 inventory.

- Comparing the two non-consecutive years of overall community GHG and energy information over an 11-year periods provides two data reference points, not necessarily a “trend”
- Multiple variables may influence energy use and GHG emissions such as tourism, weather, availability and accuracy of data, etc.
- 2010 report recommended that annual energy use and GHG emissions inventories be conducted for five consecutive years. 2021 voices same recommendations.