

# Inventory of County of Kaua`i Greenhouse Gas Emissions

## I. Introduction

The County of Kaua`i Inventory of Greenhouse Gas (GHG) Emissions is herein established as part of the County's commitment to mitigate GHG emissions and develop a comprehensive climate action plan (CAP). This initial GHG Inventory for the County was developed by the Office of Economic Development (OED) and measures annual direct and indirect GHG emissions, represented in metric tons of carbon dioxide equivalent (MT CO<sub>2</sub>e) for the year 2015. The primary sources of GHG emissions in the County are stationary fuel and electrical energy use in residential, commercial, and industrial buildings; on-road, off-road, marine, and air transportation that occurs within the County limits or transits between Kaua`i and domestic destinations; wastewater treatment and solid waste management; and agriculture, forestry, and other land use (AFOLU).

The County GHG inventory is developed under the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC Protocol) and estimates GHG emissions that occur in the County's jurisdiction encompassing the entire islands of Kaua`i and Ni`ihau. The GPC Protocol is a generally-accepted carbon emissions accounting and reporting standard for cities and municipalities developed by the World Resources Institute, C40 Cities Climate Leadership Group, and ICLEI – Local Governments for Sustainability.<sup>1</sup> The year 2005 acts as a baseline to measure progress against the United States' nationally determined contribution (NDC) to global GHG emissions as agreed under the Paris climate agreement.<sup>2</sup> The choice of 2015 coincides with the State of Hawai`i's latest GHG Inventory.

The GHG Inventory is the first step toward creating an island-wide CAP.<sup>3</sup> As such, its findings will be used as a starting point to determine emissions reduction targets over time; to identify and prioritize economy-wide and sector-specific carbon mitigation strategies for achieving reduction targets; and to gauge progress towards those goals.

OED consulted with ICLEI staff to apply best practices under the GCP protocol, identify quality data sources, and utilize credible estimation and scaling methods. OED utilized one publicly available GHG inventory tool – ClearPath – to organize and segment the inventories, and to apply standard emissions factors by fuel-type, i.e., MT CO<sub>2</sub>e per unit of fuel/energy type consumed.<sup>4</sup> OED staff also coordinated decisions regarding data sources and methods with staff at the City and County of Honolulu, County of Hawai`i, and County of Maui; and collaborated with other stakeholders as part of the review committee for the State of Hawai`i's GHG Inventory developed by the Clean Air Branch of the Department of Health. OED cross-referenced its sources and methods with the State's 1990, 2007, and 2015 GHG Inventories released in December 2008 and February 2019, and for some sectors with limited data availability, used the State inventory as a starting point from which to extrapolate.

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<sup>1</sup> GPC Protocol - <https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities>; ICLEI - <https://iclei.org/>; World Resources Institute - <https://www.wri.org/>; C40 - <https://www.c40.org/>

<sup>2</sup> Under the Paris Agreement to the United Nations Framework Convention of Climate Change (UNFCCC) ratified on April 22, 2016, the United States delegation agreed to reduce GHG emissions by 26% to 29% relative to 2005 levels. This corresponds to the United States' nationally determined contribution (NDC) to global GHG emissions.

<sup>3</sup> Climate Action Plan – a comprehensive roadmap that outline the specific activities that an agency will undertake to reduce greenhouse gas emissions sourced from <https://www.ca-ilg.org/climate-action-plans>. It is essential to acknowledge our commitment to the Paris Agreement and County-wide emissions reduction.

<sup>4</sup> ClearPath - <http://icleiusa.org/clearpath/>

The County’s community-wide inventory is designed to be updated and improved on a periodic basis as a new techniques and data become available.

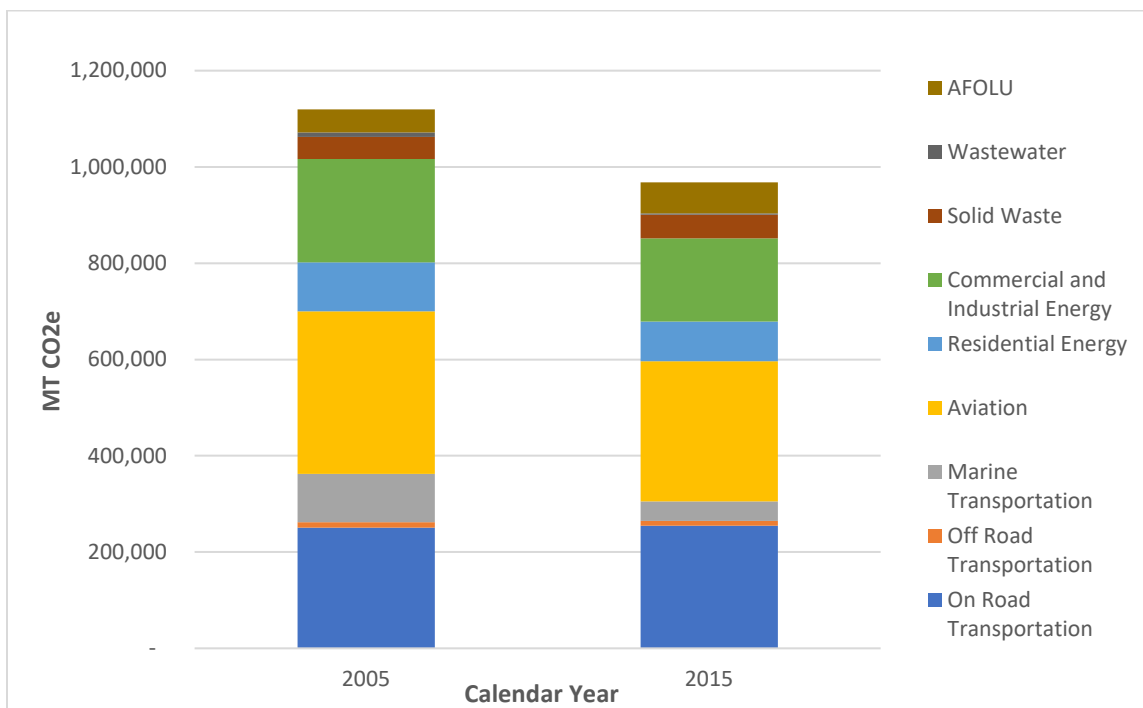
## II. Summary Findings

The County’s community-wide GHG emissions for 2015 were 968,059 MT CO<sub>2</sub>e, down 13.5% from 2005. Emissions from transportation, primarily jet fuel and motor gasoline, make up the largest source of GHG emissions at 61.6% of the total. Emissions from energy and electrical consumption in the residential, commercial, and industrial sectors represent the second largest source at 26.4%. The balance of GHG emissions come from the Waste, Wastewater, and AFOLU categories – 12% combined.

**Table 1: County of Kaua`i Inventory of Greenhouse Gases (MT CO<sub>2</sub>e)**

Sector	2005 (MT CO <sub>2</sub> e)	2015 (MT CO <sub>2</sub> e)	%Δ (2005 to 2015)
On Road Transportation	250,692	254,905	1.7%
Off Road Transportation	11,055	9,951	-10%
Marine Transportation	100,925	40,617	-59.8%
Aviation	337,584	290,901	-13.8%
Residential Energy	101,249	82,592	-18.4%
Commercial and Industrial Energy	214,812	172,919	-19.5%
Solid Waste	46,356	48,658	5%
Wastewater	8,715	2,936	-66.3%
AFOLU	48,224	64,580	33.9%
<b>TOTAL</b>	<b>1,119,612</b>	<b>968,059</b>	<b>-13.5%</b>

**Figure 1: County of Kauai 2005 and 2015 GHG Emissions Inventories**



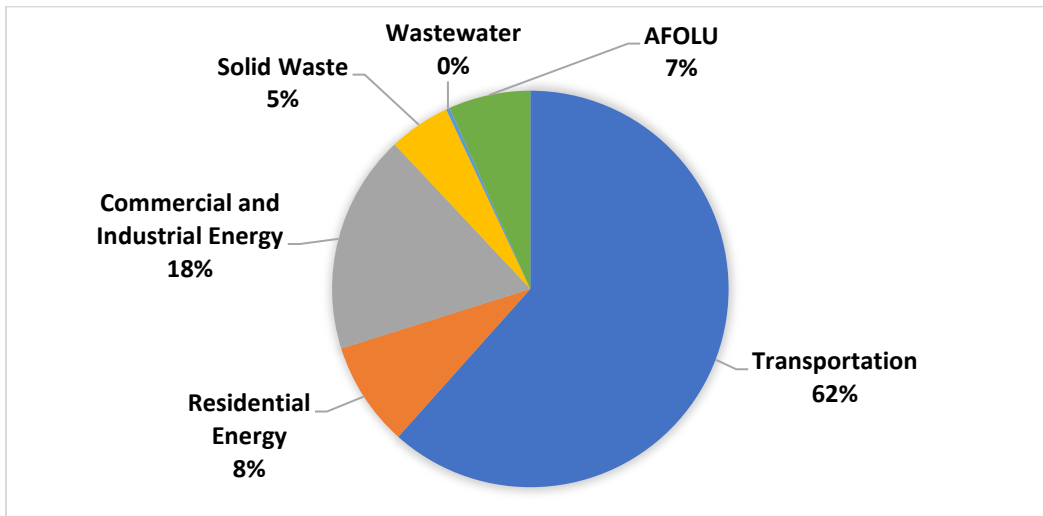
### III. Inventory By Year

The following presents the City’s baseline **2015** Community-scale GHG Inventory broken down by sector:

**Table 2: County of Kaua`i 2015 GHG Inventory**

Sector	GHG Emissions (MT CO <sub>2</sub> e)
Transportation	596,374
Residential Energy	82,592
Commercial and Industrial Energy	172,919
Solid Waste	48,658
Wastewater	2,936
AFOLU	64,580
<b>TOTAL</b>	<b>968,059</b>

**Figure 2: County of Kaua`i 2015 GHG Inventory**

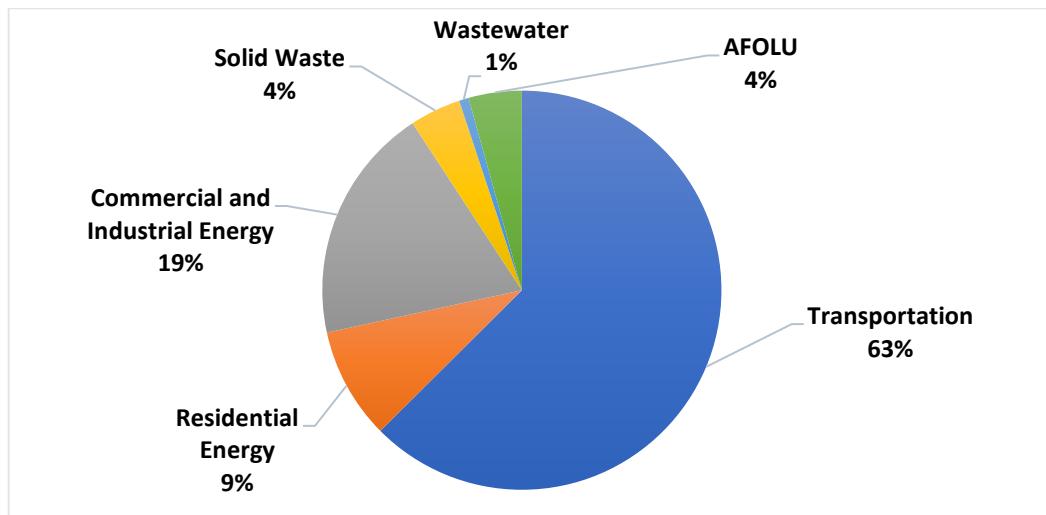


The following presents the County’s **2005** Community-scale GHG Inventory broken down by sector.

**Table 3: County of Kaua`i 2005 GHG Inventory**

Sector	GHG Emissions (MT CO <sub>2</sub> e)
Transportation	700,256
Residential Energy	101,249
Commercial and Industrial Energy	214,812
Solid Waste	46,356
Wastewater	8,715
AFOLU	48,224
<b>TOTAL</b>	<b>1,119,612</b>

**Figure 3: County of Kauaʻi 2005 GHG Inventory**



#### **IV. Findings By Sector**

The following section briefly discusses the findings in each sector for the year 2015.

##### **Residential**

Emissions in the Residential Sector come from grid electricity use and stationary fuel combustion of liquid propane gas (LPG) and diesel. Grid electricity is the largest source for the sector compared to stationary fuel use. Based on estimates, grid electricity use accounts for about 95.5% of residential emissions. Stationary fuel combustion emissions primarily come from propane and diesel.

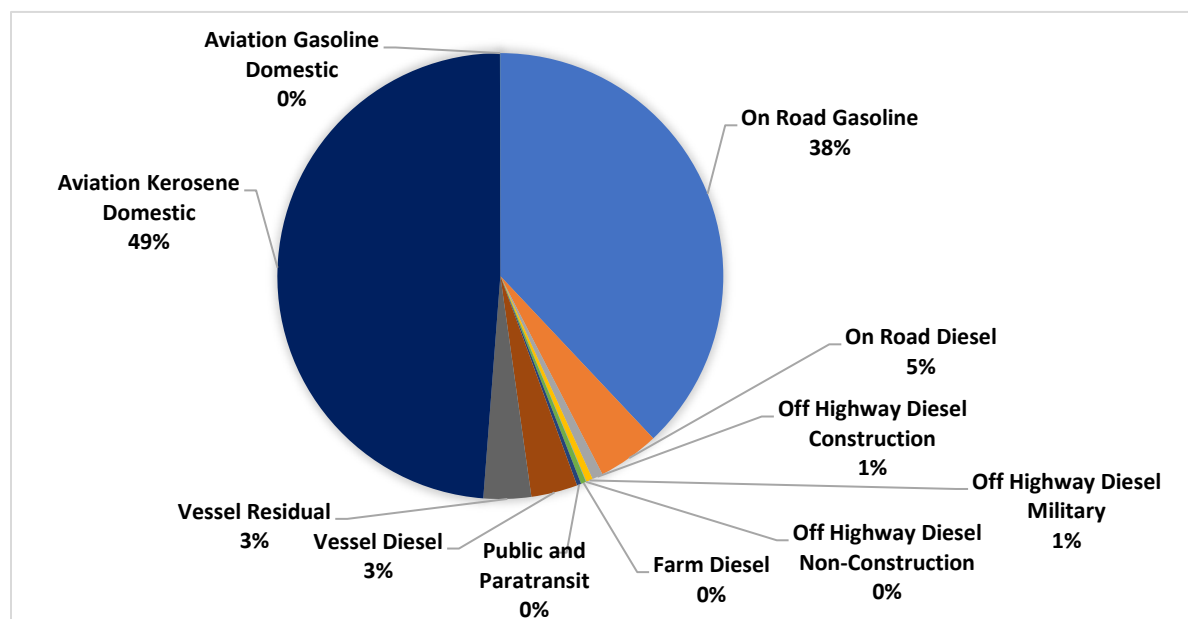
##### **Commercial & Industrial**

The Commercial and Industrial Sectors combine emissions from energy use in the commercial, manufacturing, construction, and energy industry categories. Due to the relatively low level of industrial activity relative to commercial activity, and the lack of segmented data, staff opted to combine these categories for reporting purposes. Should more granular data become available, staff will consider separating the categories. Grid electricity is the largest emitting source for the sector compared to stationary fuel combustion. Based on estimates, grid electricity use accounts for about 79.5% of Commercial and Industrial Sector emissions. Other stationary combustion emissions come from consumption of natural gas, liquid propane gas (LPG), diesel, and motor gasoline.

##### **Transportation**

Jet kerosene and gasoline for commercial aviation to and from domestic destinations in Hawaiʻi and the United States makes up the largest share of Kauaʻi's transportation-related GHG emissions at 48.8%. On-road consumption of motor gasoline also has significant emissions, at 38%. Diesel, distillate fuel oil, and residual fuel oil for on-road, off-road, water-borne navigation, and military make up most of the balance at 13.2% of the total.

**Figure 4: County of Kauaʻi Transportation Fuel GHG Emissions – 2015**



### **Waste, Wastewater, IPPU, AFOLU**

Overall, the Solid Waste (5%), Wastewater (0.3%), and AFOLU (6.8%) categories make up 12% of Kauaʻi’s 2015 GHG emissions, and the County estimates that these categories have grown along with population growth. Due to limited access to specific data, OED staff extrapolated and scaled these sectors from the State of Hawaiʻi’s 2007 and 2015 GHG Inventories. As new data and methods become available, OED will update and refine these numbers for greater specificity and accuracy.

### **V. Discussion of Data Sources and Methods**

The main data sources for this GHG inventory are furnished by the U.S. Energy Information Agency (EIA), U.S. Environmental Protection Agency (EPA), State of Hawaiʻi’s Department of Business, Economic Development, and Tourism (DBEDT), State of Hawaiʻi’s Department of Health (DOH), and the U.S. Department of Transportation’s Bureau of Transportation Statistics (US DOT-BTS).<sup>5</sup>

Wherever possible, OED seeks granular, segmented, and directly-measured data; however, it is necessary to balance precision and granularity of data with availability, quality, clarity, and transparency. As a rule, OED staff uses publically-available data sources with an established track record that can be reasonably assumed to be maintained into the future. Moreover, OED staff seeks credible data sources and estimating methods, and strives to develop a cohesive, mutually exclusive, and comprehensively exhaustive final dataset, i.e., eliminating double-counting and data gaps, and ensuring full jurisdictional coverage. Due to the limited availability of local, city-scale data, the majority of fuel use activity estimates rely on scaling factors to adjust state-level figures to community scale. For the Waste, Wastewater, and AFOLU sectors, emissions estimates are scaled and extrapolated from the State of Hawaiʻi’s 2007 and 2015 GHG Inventories. The scaling factor utilized for state-level data sets is Kauaʻi’s de facto population relative to the State’s overall de facto population for the given year of available

<sup>5</sup> [U.S Department of Transportation – Bureau of Transportation Statistics](https://www.bts.gov/)

data. For grid electricity, OED staff uses Kauaʻi-specific utility generation data provided by DBEDT, and applies carbon emission intensity factors calculated with data from DBEDT and the U.S EPA’s Emissions & Generation Resource Integrated Database (eGRID)<sup>6</sup> on Port Allen and Kapaia power plants.

OED staff utilizes the ClearPath inventory tool to organize fuel consumption and activity data, apply emissions factors by fuel type, and sort the final GHG inventory by sector. Fuel and electricity consumption activity data is translated into GHG emissions and presented in MT CO<sub>2</sub>e using emissions factors calculated from generally-accepted emissions factors established by the IPCC.<sup>7</sup> In addition to using off-the-shelf inventory tools, OED staff created a series of spreadsheets to execute estimation or scaling methods, and to maintain a record of data sources and calculation logic. The assumptions, calculations, and logic within the spreadsheets are designed to be user-friendly, easy-to-understand, transparent, and replicable.

A community-scope GHG inventory is an accounting method that estimates emissions levels from scientific data and other higher-level datasets. As with any methodology that uses scaling, modelling, or estimation methods as opposed to direct, point-source volumetric measurements, there is a level of uncertainty associated with the final output. OED staff, with guidance from its collaborators, utilizes best practices to develop its estimates as well as generally-accepted emission factors. This inventory represents OED staff’s best efforts to develop a GHG inventory that is accurate and representative given the available data. While a precise margin of error has not been calculated, these results have uncertain elements and should be viewed accordingly. As new techniques and data become available, OED will evaluate how it can reduce uncertainty and improve overall accuracy.

### **Emissions Factors**

Emissions factors (i.e., MT CO<sub>2</sub>e per unit of consumption) are used to determine sector-specific emissions by fuel type and category. For grid electricity, OED calculated system-level carbon emissions intensity factors using data from DBEDT and EPA eGRID. For transportation, emissions factors are based on the IPCC 4 standard and pre-input into the ClearPath inventory tool.

**Table 4: County of Kauaʻi Grid Electricity Emissions Factors**

<b>Year</b>	<b>CO<sub>2</sub> (lbs/MWh)</b>	<b>CH<sub>4</sub> (lbs/GWh)</b>	<b>NO<sub>2</sub> (lbs/GWh)</b>
2006 GE Emissions Factors	1328.29	55.89	31.16
2015 GE Emissions Factors	1065.41	45.18	29.20

**Note:** The 2005 Greenhouse Gas Inventory utilizes 2006 grid electricity emission factors due to using grid electricity data from 2006.

Source: US EPA, Emissions & Generation Resource Integrated Database (eGRID), Kapaia Annual eGRID Data (Fuel Consumption in MMBtu), Port Allen Annual eGRID Data (Fuel Consumption in MMBtu), State of Hawaiʻi’s Department of Business, Economic Development and Tourism (DBEDT) Data Warehouse

<sup>6</sup> [2016 Emission & Generation Resource Integrated Database \(eGRID\)](#)

<sup>7</sup> [IPCC Emission Factors for Greenhouse Gas Inventories](#)

**Table 5: eGRID Emission's Factors By Fuel Type for Naphtha and Diesel**

Fuel Type	kg CO <sub>2</sub>	g CH <sub>4</sub>	g N <sub>2</sub> O
Naphtha	68.02	3.0	0.6
Diesel	73.96	3.0	0.6

**Table 6: County of Kaua'i Grid Electricity Emissions Factor Calculations**

KIUC GHG Emissions (lbs per Naphtha and Diesel fuel used at Kapaia and Port Allen)				Total kWh Generated	Emissions Factor lbs/kWh		
	lbs CO <sub>2</sub>	lbs CH <sub>4</sub>	lbs N <sub>2</sub> O	kWh	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
<b>2006</b>	648,297,979	27,282	15,273	487,376,298	1.3302	0.000056	3.13E-05
<b>2015</b>	493,783,491	20,941	13,533	463,468,712	1.0654	4.52E-05	2.92E-05

**Note:** To calculate emissions factors for grid electricity, this report referenced the EPA's eGRID emissions factors for naphtha and diesel oil. Kaua'i's emission factors were calculated using eGRID data on total fuel consumption by type reported for Kapaia and Port Allen Power Plants, then totaled by fuel type, then multiplied by eGRID emissions factors by fuel type, and then totaled by GHG type. After, the total emissions by GHG type were divided by kWh electricity consumption, as reported by DBEDT, to come to final emissions factors in lbs/kWh.

Data for this report include estimates of anthropogenic GHG emissions in MT CO<sub>2</sub>e for the County of Kaua'i for the years 2005 and 2015. The estimates cover emissions that occur due to activities within the jurisdiction of the County, with the exception of Aviation and Marine Transportation, which estimates all fuel use for domestic travel coming to and leaving from the islands of Kaua'i and Ni'ihau.

Fuel use and consumption types for the following sectors are as follows:

- Residential Sector– includes stationary fuel use and grid electricity consumption;
- Commercial Sector– includes stationary fuel use and grid electricity consumption;
- Industrial Sector – includes stationary fuel use and grid electricity consumption;
- Transportation Sector – includes breakdown of fuel consumption based on mode type, e.g., On-Road, Off-Road, Aviation, and Marine;
- Solid Waste Sector – estimations extrapolated from State of Hawai'i's 2007 and 2015 GHG Inventories
- Water and Wastewater Sector – estimations extrapolated from State of Hawai'i's 2007 and 2015 GHG Inventories
- Agriculture, Forestry, and Other Land Use (AFOLU) Sector – estimations extrapolated from State of Hawai'i's 2007 and 2015 GHG Inventories

**Note:** Stationary fuel combustion emissions on Kaua'i come primarily from propane and diesel fuels. However, the consumption values for these fuels are derived using Statewide natural gas and LPG (HGL) data, which are scaled down by Kaua'i's de facto population for the given year. This is done because while the relative consumption of propane is higher on the neighbor islands, the relative consumption of natural gas is higher on Oahu, and natural gas acts as a substitute for propane (LPG/HGL).

The following describes the data, methods, and assumptions by sector:

### Residential

Emissions estimates for the Residential Sector come from stationary fuel consumption and grid electricity use. Inputs to the inventory tools are derived from fuel and electricity data reported by EIA and DBEDT. Data for stationary fuels are scaled by Kaua'i's de facto population as a percentage of the

State of Hawai`i's overall de facto population. Data for grid electricity is taken directly from utility generation data as reported to DBEDT.

- Natural gas consumption is sourced through the EIA Query System (Natural Gas) Form 176 and scaled by Kaua`i's de facto population as a percentage of the State of Hawai`i's overall de facto population.
- Distillate Fuel Oil use is taken from EIA's Form 821 - *Adjusted Distillate Fuel Oil and Kerosene Sales by End Use* and scaled by Kaua`i's de facto population as a percentage of the State of Hawai`i's overall de facto population.
- Hydrocarbon Gas Liquids (HGL) and Liquid Gas Petroleum (LPG) is sourced from *EIA's: State Energy Data 2016: Consumption, Table CT4. Residential Sector Energy Consumption Estimates* and scaled by Kaua`i's de facto population as a percentage of the State of Hawai`i's overall de facto population.
- Grid Electricity use is sourced from utility data reported in DBEDT's Data Warehouse on "Electricity Total KWH Sold" for the County of Kaua`i.

**Table 7: Residential Sector Energy Inputs, Units, and GHG Emissions – 2005**

	Energy Input	Units	MT CO <sub>2e</sub>
Diesel	619.59	Gallons	6.36
Natural Gas	30,132.72	MMBtu	1,602
LPG (HGL)	33,795.82	MMBtu	2,148
Grid Electricity <sup>(2006)</sup>	160,271,86	kWh	97,493
<b>Total</b>			<b>101,249</b>

**Note:** Grid Electricity, as reported in the 2005 Greenhouse Gas Inventory, utilizes 2006 DBEDT Data, as data history on kWh consumption on Kaua`i stops at 2006. The accompanying factor set for Grid Electricity uses 2006 values, as well as scales by Kaua`i's 2006 de facto population, respectively. All stationary fuel combustion data reported in the 2005 Greenhouse Gas Inventory is derived from EIA data as reported for 2005.

**Table 8: Residential Sector Energy Inputs, Units, and GHG Emissions – 2015**

	Energy Input	Units	MT CO <sub>2e</sub>
Diesel	821.93	Gallons	8.39
Natural Gas	34,823.14	MMBtu	1,852
LPG (HGL)	29,354.54	MMBtu	1,866
Grid Electricity	161,826,042	kWh	78,865
<b>Total</b>			<b>82,592</b>

### **Commercial & Industrial**

Emissions estimates for the Commercial and Industrial sector come from stationary fuel consumption and grid electricity use. Inputs to the inventory tools are derived from fuel and electricity data reported by EIA and DBEDT. Data for stationary fuels are scaled by Kaua`i's de facto population as a percentage of the State of Hawai`i's overall de facto population. Data for grid electricity are taken directly from utility generation data as reported to DBEDT. Due to a lack a data specifying a breakdown between commercial and industrial sources, as well as the relatively small level of industrial activity on Kaua`i, these sectors are combined.

- Natural gas consumption was sourced from the EIA Query System (Natural Gas) Form 176 and scaled by Kaua`i's de facto population as a percentage of the State of Hawai`i's overall de facto population.



- Distillate Fuel Oil (DFO) use is estimated from EIA’s Form 821 - Adjusted Distillate Fuel Oil and Kerosene Sales by End Use and scaled by Kaua’i’s de facto population scaling factor.
- LPG (HGL) consumption is estimated by scaling down EIA’s SEDS data using Kaua’i’s de facto population as a percentage of the State of Hawai’i’s overall de facto population.
- Motor Gasoline use is calculated using the U.S EIA SEDS CT Tables and scaled by Kaua’i’s de facto population as a percentage of the State of Hawai’i’s overall de facto population.
- Grid Electricity – Commercial use is sourced from utility data reported in DBEDT’s Data Warehouse on “*Electricity Total KWH Sold*” and “*Grid Electricity used by Electric Utility Stations*” for the County of Kaua’i. Industrial use is sourced from utility data reported in DBEDT’s Data Warehouse on “*Grid Electricity used by Electric Utility Stations*” for the County of Kaua’i.

**Note:** The City and County of Honolulu is accounting for the majority of emissions from Industrial Sector, including grid electricity from manufacturing and construction, and within the Energy Industries sector, including grid electricity used by IPPs, as well as stationary fuel combustion from refinery emissions, distillate fuel oil, residual fuel oil, and naphtha.

**Table 9: Commercial and Industrial Sector Energy Inputs, Units, and GHG Emissions – 2005**

	Energy Input	Units	MT CO <sub>2</sub> e
<b>Commercial</b>			
Natural Gas	107,329.20	MMBtu	5,705
Distillate Fuel Oil	950,620.17	Gallons	9,762
LPG (HGL)	56,326.37	MMBtu	3,579
Motor Gasoline	5,632.64	MMBtu	398
Grid Electricity <sup>(2006)</sup>	289,206,827	kWh	175,924
Grid Electricity – Street Lights <sup>(2006)</sup>	2,601,027	kWh	1,269
<b>Industrial</b>			
Natural Gas	25,623.55	MMBtu	1,360
Distillate Fuel Oil	234,148.73	Gallons	2,399
LPG (HGL)	788,569.20	Gallons	4,599
Motor Gasoline	239,428.46	MMBtu	2,781
Grid Electricity <sup>(2006)</sup>	11,566,499	kWh	7,036
<b>Total</b>			<b>214,812</b>

**Note:** Grid Electricity, as reported in the 2005 Greenhouse Gas Inventory, utilizes 2006 DBEDT Data, as data history on kWh consumption on Kaua’i stops at 2006. The accompanying factor set for Grid Electricity uses 2006 values, as well as scales by Kaua’i’s 2006 de facto population, respectively. All stationary fuel combustion data reported in the 2005 Greenhouse Gas Inventory is derived from EIA data as reported for 2005.

**Table 10: Commercial and Industrial Sector Energy Inputs, Units, and GHG Emissions – 2015**

	Energy Input	Units	MT CO <sub>2</sub> e
<b>Commercial</b>			
Natural Gas	116,177.56	MMBtu	6,179
Distillate Fuel Oil	550,984.70	Gallons	5,661
LPG (HGL)	135,030.88	MMBtu	8,584
Motor Gasoline	93,934.53	MMBtu	6,645
Grid Electricity	267,471,950	kWh	130,351
Grid Electricity – Street Lights	2,780,067	kWh	1,355
<b>Industrial</b>			
Natural Gas	26,906	MMBtu	1,428
Distillate Fuel Oil	99,805.43	Gallons	1,022

LPG (HGL)	82,192.71	Gallons	101
Motor Gasoline	410,963.55	MMBtu	5,796
Grid Electricity	11,891,209	kWh	5,795
<b>Total</b>			<b>172,919</b>

## **Transportation**

Transportation GHG emissions are segmented into modes and estimated based on fuel consumption data from EIA State Energy Data 2016: Consumption, Table CT7, Transportation and the EIA *Form 821: Adjusted Sales of Distillate Fuel Oil and Residual Fuel Oil by End Use*.

### ***On-Road Transportation***

- For motor gasoline, OED staff uses EIA State Energy Data 2016: Consumption, Table CT7, Transportation and scales by de facto population.
- Diesel and Residual Fuel Oil (RFO) consumption is estimated using EIA SEDS and Form EIA 821: Adjusted Distillate Fuel Oil and Kerosene Sales by End Use and scaled by de facto population.

### ***Marine Transportation***

- DFO use for marine transportation is estimated using EIA, Form 821: Adjusted Sales of Distillate Fuel Oil and Residual Fuel Oil by End Use - Vessel Bunkering and scaled by de facto population.
- RFO estimates are sourced from the EIA, Form EIA 821: Adjusted Distillate Fuel Oil and Kerosene Sales by End Use - Vessel Bunkering and scaled by de facto population.

### ***Aviation***

- The County GHG Inventory includes estimates of domestic aviation to and from the island of Kaua'i. Jet fuel and gasoline are scaled from EIA data using domestic available-seat-miles and de facto population. Domestic available-seat-miles are sourced from US Department of Transportation, Bureau of Transportation Statistics: Passengers, All Carriers, and are based on the average available-seat-miles from Lihue International Airport, Daniel Inouye International Airport, Kahului Airport, Kona International Airport, and Hilo Airport (Origin and Destination Airports). This takes into account the relative capacity of domestic travel going to or leaving from Kaua'i to the neighbor islands for the continental U.S.
- Aviation fuel consumption is estimated using the EIA SEDS CT7 Table and scaled by Domestic Available Seat Miles. Sources include the EIA State Energy Data 2016: Consumption, Table CT7 – Transportation and U.S. Department of Transportation, Bureau of Transportation Statistics: Passengers, All Carriers.

### ***Off-Road Transportation***

- For gallons of RFO and DFO staff uses EIA Form 821: Adjusted Sales of Distillate Fuel Oil and Residual Fuel Oil by End Use and scaled by de facto population.
- Off-Road Construction, Non-Construction, Farm, and Military are treated as separate entries.

**Table 13: Transportation Sector Energy Inputs, Units, and GHG Emissions – 2005**

Source	Energy Input	Units	MT CO <sub>2</sub> e
<b>On-Road</b>			
Gasoline	25,627,711	Gallons	225,011
Diesel	2,515,310	Gallons	25,681
<b>Water-Borne Navigation</b>			
Diesel	6,743,224	Gallons	69,497
Residual Fuel Oil	2,638,553	Gallons	31,428
<b>Aviation</b>			
Jet Kerosene	35,150,620	Gallons	336,797
Jet Gasoline	94,468	Gallons	787
<b>Off-Road</b>			
Diesel (Constr.)	680,535	Gallons	7,011
Diesel (Non-Constr.)	-	-	-
Diesel (Military)	87,193	Gallons	890
Diesel (Farm)	305,627	Gallons	3,154
<b>Total</b>			<b>700,256</b>

**Note:** Public and Para Transit emissions assumed to be included in On-Road diesel emissions for 2005. No data available for diesel non-construction emissions in 2005.

**Table 14: Transportation Sector Energy Inputs, Units, and GHG Emissions – 2015**

Source	Energy Input	Units	MT CO <sub>2</sub> e
<b>On-Road</b>			
Gasoline	25,792,072	Gallons	226,454
Diesel	2,604,048	Gallons	26,587
Diesel – Public and Para Transit	182,520	Gallons	1,864
<b>Water-Borne Navigation</b>			
Diesel	1,946,793	Gallons	20,051
Residual Fuel Oil	1,727,691	Gallons	20,566
<b>Aviation</b>			
Jet Kerosene	30,348,134	Gallons	290,731
Jet Gasoline	20,351	Gallons	170
<b>Off-Road</b>			
Diesel (Constr.)	451,238	Gallons	4,646
Diesel (Non-Constr.)	17,906	Gallons	183
Diesel (Military)	282,978	Gallons	2,889
Diesel (Farm)	216,343	Gallons	2,233
<b>Total</b>			<b>596,374</b>

### **Solid Waste**

Due to a limited availability of community-scale Solid Waste emissions data, OED staff opts to scale this sector using the State’s 2007 and 2015 GHG Inventories as a starting point. For 2015, OED takes the figure from the State GHG Inventory and scales it by de facto population. For 2005, OED scales by de facto population for 2007 and reports 2007 emissions values.

**Table 15: Solid Waste Inputs, Units, and GHG Emissions – 2005**

	Units	MT CO <sub>2</sub> e
MSW – Landfills <sup>(2007)</sup>	MT CO <sub>2</sub> e	45,370
MSW – Compost <sup>(2007)</sup>	MT CO <sub>2</sub> e	1,315
<b>Total MT CO<sub>2</sub>e</b>		<b>46,356</b>

**Table 16: Solid Waste Units and GHG Emissions – 2015**

	Units	MT CO <sub>2</sub> e
MSW – Landfills	MT CO <sub>2</sub> e	47,343
MSW – Compost	MT CO <sub>2</sub> e	1,315
<b>Total MT CO<sub>2</sub>e</b>		<b>48,658</b>

### Water and Wastewater

Due to a limited availability of community-scale Water and Wastewater emissions data, OED staff opts to scale this sector using the State’s 2007 and 2015 GHG Inventories as a starting point. For 2015, OED takes the figure from the State GHG Inventory and scales it by de facto population. For 2005, OED scales by de facto population for 2007 and reports 2007 emissions values.

**Table 17: Water and Wastewater Estimates, Units and Scaled GHG Emissions – 2005**

	Statewide Emissions	Units	Scaled MT CO <sub>2</sub> e
Wastewater <sup>(2007)</sup>	150,000	MT CO <sub>2</sub> e	8,715
<b>Total MT CO<sub>2</sub>e</b>			<b>8,715</b>

**Table 18: Water and Wastewater Estimates, Unites, and Scaled GHG Emissions – 2016**

	Statewide Emissions	Units	Scaled MT CO <sub>2</sub> e
Wastewater	50,000	MT CO <sub>2</sub> e	2,936
<b>Total MT CO<sub>2</sub>e</b>			<b>2,936</b>

### Agriculture, Forestry and Other Land Uses

Due to a limited availability of community-scale AFOLU emissions data, OED staff opts to scale this sector using the State’s 2007 and 2015 GHG Inventories as a starting point. For 2015, OED takes the net emissions figure from the State GHG Inventory and scales it by de facto population. For 2005, OED scales by de facto population for 2007 and reports 2007 emissions values.

**Table 19: Agriculture, Forestry and Other Land Uses Estimates, Units, and Scaled GHG Emissions – 2005**

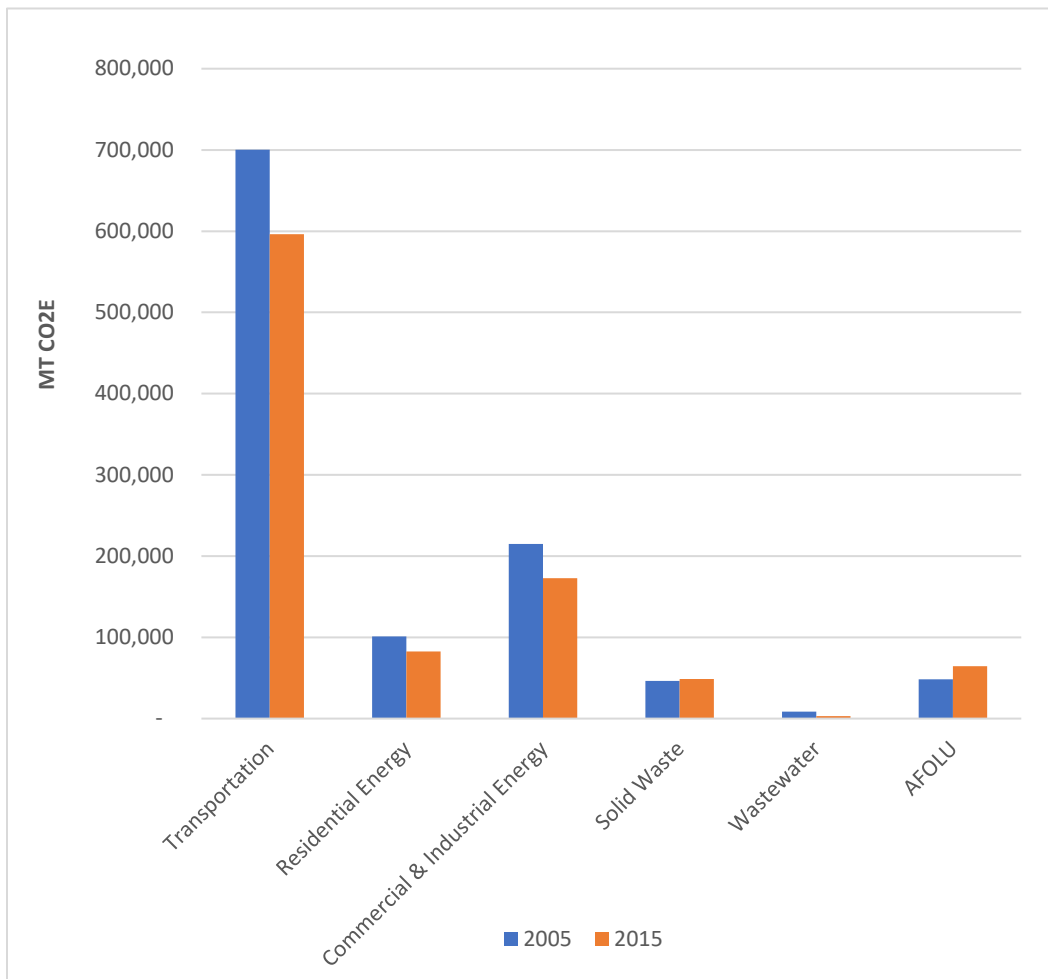
	Statewide Emissions	Units	Scaled MT CO <sub>2</sub> e
AFOLU <sup>(2007)</sup>	830,000	MT CO <sub>2</sub> e	48,224
<b>Total MT CO<sub>2</sub></b>			<b>48,224</b>

**Table 20: Agriculture, Forestry and Other Land Uses Estimates, Units, and Scaled GHG Emissions – 2015**

	Statewide Emissions	Units	Scaled MT CO <sub>2</sub> e
AFOLU	1,100,000	MT CO <sub>2</sub> e	64,580
<b>Total MT CO<sub>2</sub></b>			<b>64,580</b>

**VI. Comparison**

**Figure 5: County of Kauaʻi GHG Inventory Emissions Comparison by Sector and Year**



## **Appendix A: Glossary of Terms and Acronyms**

<b>AFOLU</b>	Agriculture, Forestry and Other Land Use
<b>CAP</b>	Climate Action Plan
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>CO<sub>2</sub>e</b>	Carbon Dioxide Equivalent
<b>CH<sub>4</sub></b>	Methane
<b>DBEDT</b>	Department of Business, Economic Development and Tourism
<b>DFO</b>	Distillate Fuel Oil or Diesel
<b>EIA</b>	Energy Information Administration
<b>eGRID</b>	Emissions & Generation Resource Integrated Database
<b>EPA</b>	Environmental Protection Agency
<b>GHG</b>	Greenhouse Gas
<b>GPC</b>	Global Protocol for Community-Scale Greenhouse Gas Inventories
<b>HGL</b>	LPG – Liquefied Petroleum Gas (LPG to HGL since 2016)
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>MSW</b>	Municipal Solid Waste
<b>MMT</b>	Million Metric Tons
<b>N<sub>2</sub>O</b>	Nitrous Oxide
<b>OED</b>	Office of Economic Development
<b>RFO</b>	Residual Fuel Oil
<b>SEDS</b>	State Energy Data System
<b>UNFCCC</b>	United Nations Climate Change Conference