Appendices

CITY & COUNTY OF HONOLULU

CLIMATE ACTION PLAN 2020-2025

CITY AND COUNTY OF HONOLULU
STATE OF HAWAII

RESILIENT O'AHU

UHERO
THE ECONOMIC RESEARCH ORGANIZATION AT THE UNIVERSITY OF HAWAI'I

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APPENDIX I. O‘AHU GHG INVENTORY

The Greenhouse Gas (GHG) Emissions Inventory for the City and County of Honolulu was developed by the Office of Climate Change, Sustainability and Resiliency (CCSR). The City 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 City’s jurisdiction encompassing the entire island of O‘ahu. The GPC Protocol is a global 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.

Inventories for 2005, 2015, and 2016 were completed in 2018 initially, then reviewed and updated in 2019 for the Climate Action Plan (CAP). Inventories for years 2017, 2018, and 2019 have been completed annually in the following years.

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. CCSR Staff chose 2015 to coincide with the State of Hawai‘i’s updated GHG Inventory, and 2017 inventory was updated using the most recent data that was publicly available as of Fall 2019. The GHG Inventory used in this CAP is the 2017 as it was the most current inventory at the start of the project.

Data Sources and Methods

The main data sources come from the United Nations Intergovernmental Panel on Climate Change (IPCC), U.S. Energy Information Agency (EIA), U.S. Environmental Protection Agency (EPA), State of Hawai‘i’s Department of Business, Economic Development, and Tourism (DBEDT), State of Hawai‘i’s Department of Health (DOH), Hawaiian Electric Company (HECO), and the U.S. Department of Transportation’s Bureau of Transportation Statistics (US DOT-BTS). To calculate the emissions, activity data is first scaled to consumption on O‘ahu from state-level consumption data, then converted to metric tons of carbon dioxide equivalent (MTCO2e) by applying the greenhouse gas emissions factor in the CURB (Climate Action for Urban Sustainability) tool.

TRANSPORTATION

Transportation GHG emissions are segmented into modes and estimated based on fuel consumption data primarily from the EIA State Energy Data Systems (SEDS) database and EIA Form 821 data (EIA, 2019). Emissions factors are based on the IPCC 4 standard.

Air Transportation

The City GHG Inventory includes estimates of emissions from domestic and international aviation to and from the island of Oʻahu. Jet fuel and aviation gasoline are scaled from EIA's SEDS fuel sales data using Oʻahu's proportion of de facto population. This accounts for the relative capacity of travel going to or leaving from Oʻahu to the neighbor islands or the continental U.S.

Ground Transportation

Ground transportation comprises emissions from on-highway and off-highway sectors. On-highway emissions are calculated using state-level consumption; gasoline and lubricant data from EIA's SEDS and diesel data from Form 821, and scaled based on the proportion of Oʻahu's de facto population relative to statewide population. Off-highway emissions are calculated using distillate fuel oil (DFO) data from the EIA's Form 821 and scaled by the proportion of Oʻahu's de facto population relative to statewide population.

Marine Transportation

DFO and RFO for marine transportation are estimated using EIA Form 821: Adjusted Sales of Distillate Fuel Oil and Residual Fuel Oil by End Use - Vessel Bunkering and scaled to Oʻahu using its proportion of de facto population.

BUILDINGS & OTHER STATIONARY ENERGY

Electricity

Electricity GHG emissions are estimated by multiplying utility kWh sales data reported in DBEDT's Monthly Energy Trends – *Electricity Sent to System* by the annual U.S. EPA eGRID factor for Oʻahu (DBEDT, 2019b; U.S. EPA, 2018).

Refinery & Other Petroleum

Emissions from stationary fuel use are estimated using hydrocarbon gas liquids (HGL) and liquid gas petroleum (LPG) data from EIA SEDS and scaled by Oʻahu's de facto population as a percentage of the State of Hawaiʻi's overall de facto population.

Other sources of stationary petroleum fuel use, "Other," "DFO" and Residual Fuel Oil "RFO," largely representing refining, are given in EIA State Energy Data: Consumption, Table CT6 – Industrial Sector Energy Consumption Estimates, Selected Years, 1960-2017, Hawaii.

Gas consumption is sourced through the EIA Query System (Natural Gas Deliveries) Form 176 and scaled to Oʻahu using the proportion of de facto population.

IPPU, WASTE, AND AFOLU

The GHG emissions value for IPPU, Waste and AFOLU (sources only) within the State of Hawaiʻi GHG Inventory for 2016 was adopted and scaled to Oʻahu using the proportion of defacto population (ICF & UHERO, 2019). For other years (2017, 2015 and 2005), CCSR extrapolated based on historic de facto population and actual year-over-year population growth (DBEDT, 2020a).

APPENDIX II. O'AHU GHG PATHWAYS ANALYSIS – METHODS AND DATA

This appendix describes the methodology and data used to develop baseline forecasts for GHG sectors for Oʻahu to the year 2045, including transportation (ground, air and marine), buildings & other (stationary sources: electricity, gas, refinery and other petroleum), industrial processes and and product use (IPPU), waste (solid waste and wastewater). Projections are not done for agriculture, forestry and other land uses (AFOLU) sources as it is out of scope to this work. Detailed bottom-up modeling is done for the three focal sectors of this CAP: ground transportation, electricity and waste. Top-down approaches are taken for other sectors.

TRANSPORTATION

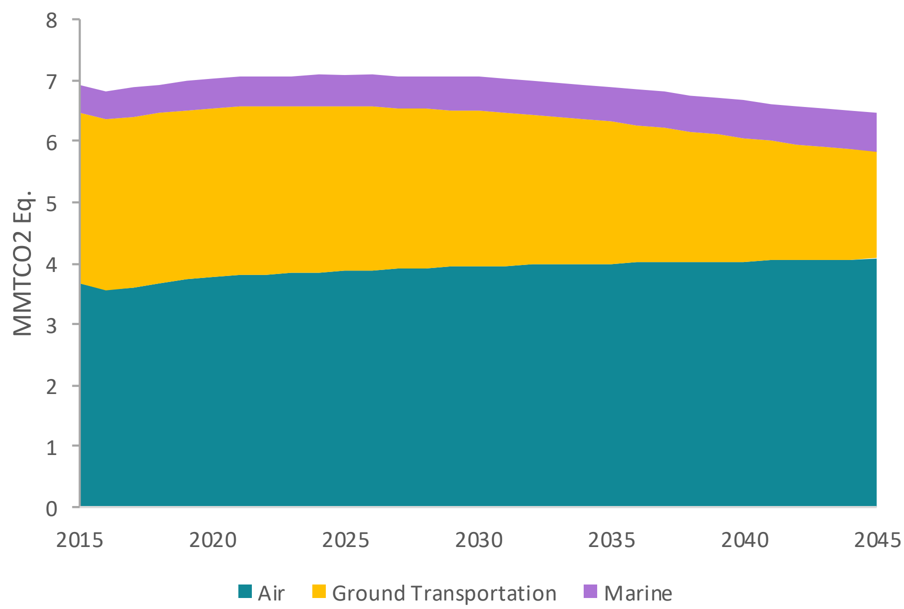


Figure II-1: Projected Baseline GHG Emissions in the Transportation Sector

Transportation sector emissions projections include those from ground transportation, as well as aviation and marine that are fueled on Oʻahu. Total baseline transportation sector emissions are projected to be 6.5 MMTCO2 Eq. in 2045, a 7% decline in annual emissions from 2015. GHG emissions from ground transportation are projected to decline by 38%, while emissions from air and marine activities are projected to increase by 12% and 41% respectively.

Ground Transportation

Projections in the ground transportation sector are based on vehicle fleet turnover models for "passenger cars and trucks," motorcycles, and heavy-duty vehicles. Passenger cars and trucks include cars, light trucks, minivans, and sports utility vehicles. Heavy duty vehicles include buses and other large service/commercial vehicles. Vehicle turnover models estimate the rate at which older vehicles retire and new ones enter the road. Major changes to GHG emissions result from changing assumptions about vehicle miles traveled (VMT) and vehicle fuel efficiency - including the adoption of electric vehicles (EVs). The year 2016 is used for calibration purposes and GHG emissions are projected to the year 2045 in 5-year increments starting in 2020.

Passenger Cars and Trucks

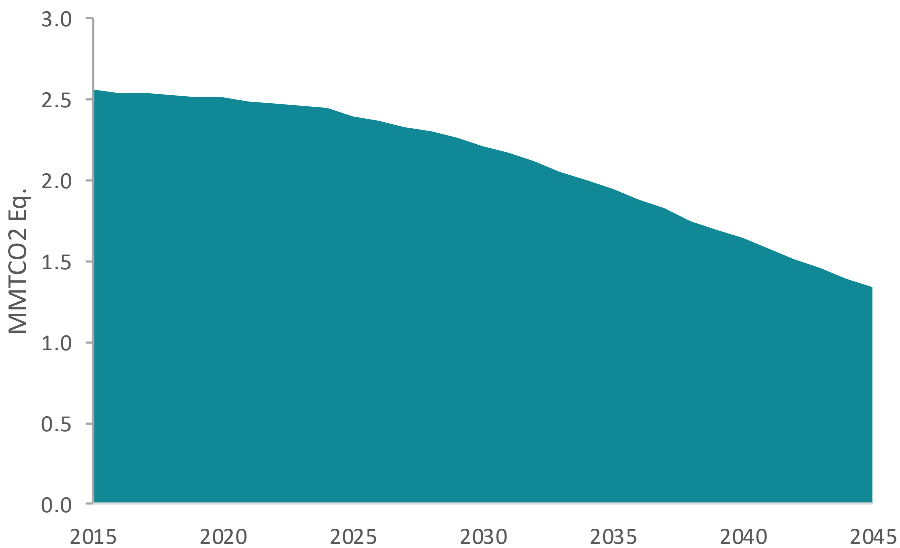


Figure II-2: Baseline GHG Projections for Passenger Cars and Trucks

The vast majority of ground transportation emissions, estimated at 90%, are from passenger cars and trucks. The primary sources of data for the turnover model for passenger cars and trucks are the City's GHG inventory (and data sources) and the State of Hawaiʻi Data Book, Section 18, Transportation (DBEDT, 2020c).

Baseline, 2016, VMT for O'ahu's passenger cars and trucks is provided by the State of Hawai'i Department of Business, Economic Development and Tourism (DBEDT, 2018a). To understand VMT by internal combustion engine vehicles (ICEVs) which, for this accounting purpose also includes hybrid electric vehicles, versus electric vehicles (EVs), the total VMT is adjusted for the number of EVs on the road, assuming that EVs travel the same distance on average as ICEVs. The number of EVs on O'ahu in 2016 is given by DBEDT (2019a), which is statewide data and estimated to O'ahu based on the relative share of population. EVs as a share of total passenger cars and trucks on O'ahu was quite small, with only 4,100 EVs in comparison to nearly three quarters of a million motor vehicles registered on O'ahu in 2016. Once VMT for ICEVs is estimated, the fuel efficiency of the fleet in 2016 is computed by the ratio of ICEV VMT and total gasoline consumed. The total fuel efficiency of O'ahu's ICEV vehicle fleet in 2016 is estimated to be 21 miles per gallon (mpg).

To estimate future GHG emissions from passenger cars and trucks, the 2016 baseline is projected into the future based on the assumptions about the following additional elements:

- A forecast for passenger cars and trucks VMT, accounting for the proposed impact of the Honolulu rail transit project.
- An assumption of the relative contribution to the overall change in VMT from the change in VMT per vehicle or the change in the number of vehicles.
- Assumptions about new vehicle characteristics such as fuel efficiency, the mix between cars and light duty trucks/vans/sports utility vehicles, and the rate of additional EV adoption.
- Lastly, new vehicles enter the fleet based on assumptions on the scrappage rate of vehicles by vintage.

VMT Forecast for Passenger cars and trucks. To estimate future VMT by passenger cars and trucks, an Ordinary Least Squares (OLS) regression is estimated between historic population (DBEDT, 2018b) and VMT (DBEDT, 2018a) from 1990 to 2017.[1] Using the state's most current long range-forecast for the growth rate of population to the year 2045 (DBEDT, 2018c), future VMT for passenger cars and trucks is projected to 2045.

[1] This time frame is chosen because there is a break in the VMT data in 1983 and population data is provided through 2015. The intercept is estimated to be -5,068 and estimated coefficient on population is 0.012.

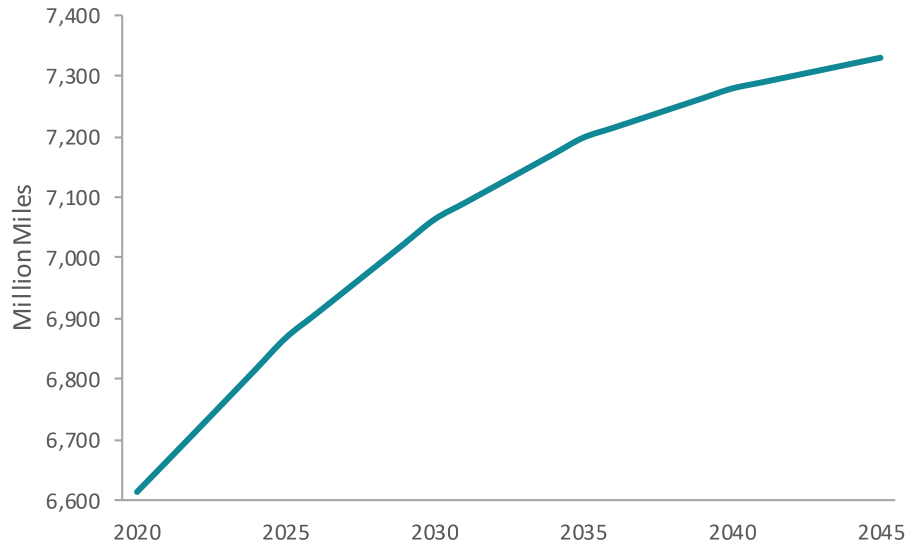


Figure II-3: Baseline projected VMT (million miles annually) - based on fitted relationship to population growth

Because the OLS regression is estimated using data over a time period in which there is no Honolulu Rail Transit, the resulting VMT can be thought of as the effective demand for travel that in the future includes travel supplied by the rail and by passenger cars and trucks. HART estimated the maximum VMT that could be displaced from passenger cars and trucks, once the rail is fully operational and running at full capacity, to be 566 million miles (HART, 2010). During the period 2021 to 2024, the rail system is expected to include ten miles of track. It is expected by HART to expand to 15 miles of track by 2025, though there is considerable uncertainty given the impacts of COVID-19, and 20 miles by 2045. The table below displays the assumptions made about the occupancy of the rail at different points in time, during peak and off-peak usage, and the assumed average length of trips. It is assumed that maximum capacity utilization and VMT reduction is achieved by 2045. Estimated impacts to VMT by passenger cars and trucks in years between those shown are linearly interpolated.

Table II-1: Assumed capacity utilization, average trip length, and corresponding VMT reduction from the operation of the Honolulu Rail Transit project. Total VMT Reduction at full capacity adopted from HART.

	2021	2024	2025	2030	2045
Capacity Utilization					
Peak	10%	25%	50%	90%	100%
Off Peak	10%	15%	25%	50%	100%
Avg. Length of Trip (miles)	10	10	15	15	20
VMT Reduction (million miles)	28	52	144	272	566

VMT and VMT per Passenger Car and Truck. The change in total VMT from passenger cars and trucks from one year to another is depends on the year over year change in VMT per vehicle and total number of vehicles. To approximate data on current vehicle sales, it is assumed that the change in VMT per vehicle accounts for half the change in total VMT and the change in number of vehicles accounts for the other half.

Characteristics of New Passenger cars and trucks. The model accounts for four different categories of vehicles: ICEV car, ICEV truck, EV car and EV truck. Similar to ICF and UHERO (2019), fuel efficiency of new passenger cars and trucks is estimated using the U.S. Environmental Protection Agency's (EPA) corporate average fuel economy (CAFE) standards for cars and light trucks, recently updated and substantially lowered through the Safer Affordable Fuel-Efficient 'SAFE' Vehicle Rules (EPA, 2020c). This requires light duty cars and trucks to have an EPA rated efficiency of 204 g CO_2e/mile and 284 g CO_2e/mile by 2026. These emission rates translate into 43.7 and 31.3 mpg for light duty cars and trucks (Federal Register, 2020a). This level of CAFE standard is assumed to remain constant through 2045. New vehicle fuel efficiency was adjusted to account for the difference between federal fuel standards and true on-road fuel efficiency as estimated by new car window labels. EPA estimates this difference to range from 20 to 25 percent (EPA, 2014). Similar to ICF and UHERO (2019), it is assumed that the actual fuel efficiency of new vehicles will be 22.5 percent lower than the CAFE standards.

In addition to EVs embedded in the fuel efficiency achieved through CAFE, the model assumes additional EV adoption for Oʻahu beyond the national average. Though still under 1% of registered vehicles, Hawaiʻi has considerably higher EV adoption per capita than most other states. In 2017, Hawaiʻi had the second largest EVs per 1,000 people in the U.S. (at 5.12), behind only California (at 8.64) (EERE, 2018). EV adoption is assumed to follow an increasing trend of EV sales, starting in 2020 2.2% of new vehicle sales are assumed to be EVs, rising to 10% in 2030, 34% in 2040 and 52% in 2045.[2] This is similar in trend to Coffman et al. (2015). It should be noted that this is an optimistic baseline assumption regarding EV adoption, with considerable uncertainty pending the future of CAFE standards and how vehicles manufacturers in the U.S. bring EVs to market in comparison to global markets.

[2] Fit using an S-shaped curve, where 100% of new vehicle sales are assumed to be EVs in the year 2075.

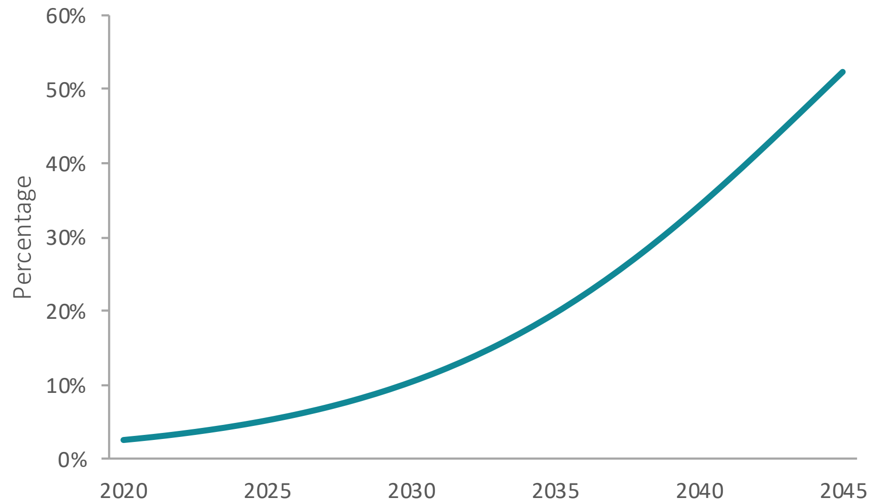


Figure II-4: Baseline of Percentage EVs of Vehicle Sales

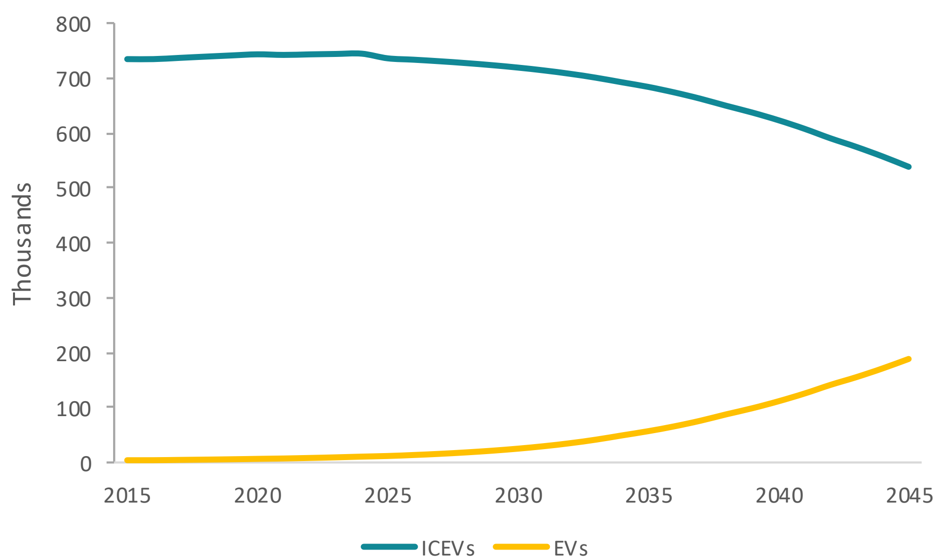


Figure II-5: Baseline Forecast of Electric Vehicles in comparison to Internal Combustion Engine Vehicles on the Road

The efficiency of the existing stock of EVs is taken from the GREET model at a value of 0.35 kWh/mile (Argonne National Laboratory, 2019). For post-2016 vintage electric vehicles, it is assumed to improve to approximately 0.29 kWh/mile (Lutsey and Nicholas, 2019). This study provides expected efficiencies for EV cars and trucks, for 2018 and post 2030.

The vehicle turnover model introduces new vehicles and retires older vehicles based on the assumed survival rate for cars and trucks by vehicle age (Davis and Boundy, 2019). Vehicle sales by type in the current year is the difference between the total number of vehicles by type in the current year less the total number of vehicles in the previous year that remain on the road in the current year.

Lastly, tailpipe GHG tailpipe emissions for each type and vintage are estimated as the product of the average VMT per vehicle by vintage and type, the number of relevant vehicles, the inverse of their fuel efficiency, and GHG emissions factor for the fuel combusted. Total emissions for each year are the sum of emissions from each vintage and vehicle type.

GHG emissions caused by both Honolulu Rail Transit and EVs through emissions from power generation are based on their estimated annual consumption of electricity and that year's average emissions factor from power generation (discussed below). EV electricity demand is estimated based on the parameters described above. For Honolulu Rail Transit, it will require 15 MW to operate the entire line (Honore, 2019). It is assumed that the line operates for 20 hours and that the entire line will be available in 2030. For all other years of the Rail's operation, to avoid the blunt assumption of a linear relationship, it is assumed that electricity demand scales up and down with the square root of the ratio of ridership in a given year to the ridership in 2030. Using a square-root ratio (as opposed to a linear one) accounts better for the fact that there will be some fixed electricity usage that is independent of ridership (e.g., lighting at each station). In addition, using a square-root ratio tracks better with the change in system length. These GHG emissions are added to the those from the electricity sector.

Motorcycles

GHG emissions from motorcycles are added to GHG emissions from passenger cars and trucks within the body of the CAP (Passenger Cars and Trucks "pathway analysis"). They are calculated based on the average fuel efficiency of motorcycles and the total annual VMT for motorcycles. The average fuel efficiency of motorcycles was assumed to be 44 mpg (FHWA, 2018b). Fuel economy of motorcycles is assumed to remain constant over time. Total VMT for motorcycles is the product of number of motorcycles (DBEDT, 2017a) on Oʻahu and average VMT per motorcycle. The average VMT per motorcycle is estimated based on the national average VMT for motorcycles (FHWA, 2018b), adjusted by the ratio of average VMT for all motor vehicles in Hawaiʻi. Total VMT for motorcycles is then assumed to grow at the rate of Hawai`i's GSP (DBEDT, 2018c). Motorcycle gasoline consumption is calculated by multiplying the average annual fuel efficiency of motorcyles by their annual VMT. GHG emissions from motorcycles are calculated by multiplying gasoline consumption by the CURB emissions factor for gasoline.

Heavy Duty Vehicles

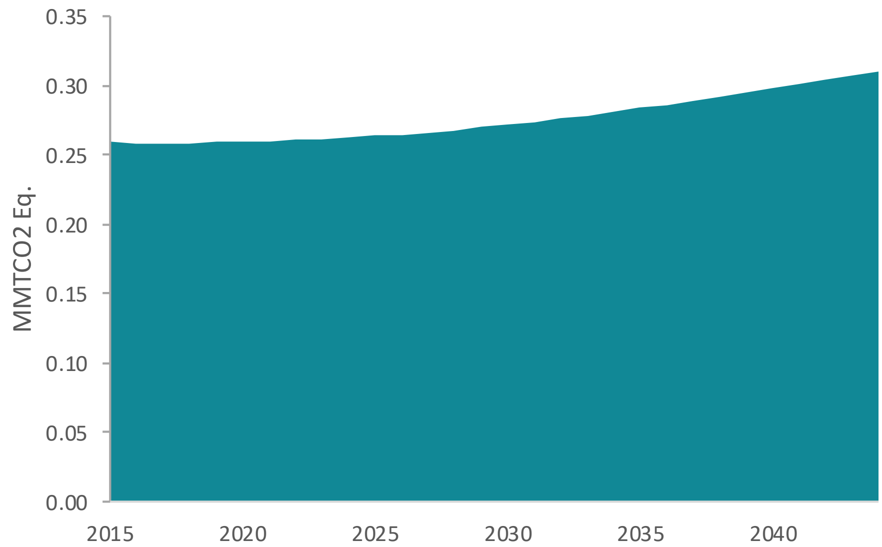


Figure II-6: Heavy Duty Vehicle Baseline GHG Forecast

Heavy duty vehicles are broken into four types: city buses, other city heavy duty vehicles, non-city buses, and other non-city heavy duty vehicles. City buses and other city heavy duty vehicles are broken out to illustrate pathways regarding the electrification of the city's vehicle fleet. GHG emissions from heavy duty vehicles are projected to grow 21% between 2015 and 2045 in the baseline projection.

As with the forecast of GHG emissions for passenger cars and trucks, 2016 is used for data calibration. Historic data for diesel fuel consumption and emissions associated with transportation diesel consumption are based on the City's GHG inventory for diesel consumption in the transportation sector and CURB emissions factors. These totals are the sum of fuel consumption and emissions of the four types of heavy duty vehicles and diesel powered passenger cars and trucks.

Fuel use for city buses and other city vehicles is computed from fuel consumption data from the City's 2019 Annual Sustainability Report (CCSR, 2019). It is assumed that 75% of fuel consumed by DTS was used for transit buses (excluding Handivans). This results in an average fuel efficiency (dividing by total miles bus travelled taken from the State of Hawai'i Data Book Table 18.25) of 5.4 miles per gallon. The remainder of the DTS fuel consumption and rest of the city's fuel consumption is allocated to all other city vehicles. The average fuel efficiency for other city heavy duty vehicles is assumed to be the same as that for other commercial heavy duty vehicles in 2016 (BTS, 2020).

Computing fuel consumption for non-city heavy duty vehicles requires finding the number of vehicles, fuel economy, and average mileage per vehicle for each category: Multiplying VMT per vehicle by number of vehicles and then dividing by the average fuel efficiency yields fuel consumption.

For commercial buses, DBEDT (2018d) reports the number of vehicles by type on Oʻahu. The FHWA (2018b) provides data on the national average VMT for commercial buses. This figure is lowered by 25% to account for the difference in the average travel distance for Hawaiʻi vehicles compared to the national average.

For other commercial heavy duty vehicles, DBEDT (2017) provides the number of vehicles (not including City buses) and fuel efficiency is adopted from FHWA (2018b). The total fuel consumption of these vehicles is the total consumption of diesel in the transportation sector less diesel consumption by all vehicles besides commercial heavy-duty vehicles. Knowing the total fuel consumption by these vehicles, the average VMT of these vehicles is combuted by dividing total fuel consumption by the product of the number of vehicles of this type and the average fuel efficiency of the vehicle type.

To compute GHG emissions, all 2016 diesel fuel consumed by heavy duty vehicles is multiplied by the CURB database's GHGs emissions factor for diesel. It is assumed that diesel is comprised of 5% biodiesel and 95% petroleum diesel. Since convention is to exclude emissions from biofuels, total GHG emissions are discounted by 5%.

To estimate future GHG emissions from heavy duty vehicles, the 2016 baseline is projected into the future based on the assumptions about the following additional elements:

- Forecasted heavy duty vehicle VMT.
- Change in fleet average fuel efficiency.
- The rate of electrification.
- Lastly, the future proportion of biodiesel use.

Unlike passenger cars and trucks, where VMT is projected based on the historic relationship to population, emissions from heavy duty vehicle use are assumed to grow at the rate of GSP (DBEDT, 2018c).

The fuel efficiency of new types of heavy duty vehicles is assumed to increase over time in proportion with the increase in EPA's fuel efficiency standards for heavy duty vehicles (EPA, 2016). Averaging across the different engine classes for heavy duty vehicles yields an average increase in fuel efficiency from 2016 to 2025 of about 11%.

For this analysis, approximately 9 % of vehicle miles are assumed to be driven by new vehicles each year, which is derived from estimates of heavy duty vehicle VMT by model year as obtained from the Inventory of U.S. GHGs Emissions (EPA,2018). Using this information, the fleet average fuel efficiency for each type of heavy duty vehicle is calculated based on the harmonic average of the fuel efficiency of new heavy duty vehicles and existing heavy duty vehicles in the fleet, weighted by their respective share of miles traveled. This computation for fleet average fuel efficiency accounts for the turnover of heavy duty vehicles over time.

Addition of electric vehicles for the different heavy duty vehicle categories is done on an energy basis, as explained in the heavy duty vehicle pathways. Lastly, biodiesel consumption is assumed to grow at the same rate as GSP. As such, fossil fuel diesel consumption is calculated by subtracting projected biodiesel consumption from total diesel consumption. Biodiesel is for this purpose considered a biogenic source of GHG emissions.

Annual GHG emissions from heavy duty vehicles are calculated by multiplying annual fossil fuel diesel consumption by the CURB emission factor for diesel.

Air Transportation

Total 2016 energy used by commercial air travel is taken from the City's GHG inventory. Air travel was disaggregated into the following two categories: visitor travel and other commercial travel, which includes air travel by Hawaiʻi residents and air travel for cargo. To be consistent with the GHG inventory, military air travel is disregarded.

The share of energy associated with visitors is the product of the share of energy for passenger travel and the share of passenger travel attributed to visitors. To split the energy used for air travel between that used to move passengers and cargo, a share is created based primarily on data on the number of passengers and tons of cargo and mail, summarized in Table II.2

(DBEDT, 2017b).

Table II.2 Passenger and cargo travel to and from Honolulu airport (DBEDT, 2017b)

	Passengers		Cargo (U.S. tons)		Mail (U.S. tons)	
Type of Travel	**Departures**	**Arrivals**	**Outgoing**	**Incoming**	**Outgoing**	**Incoming**
Overseas	7,197,718	7,180,498	207,650	328,943	6,454	8,808
Interisland	3,181,062	3,178,844	61,135	25,694	14,022	2,869

Since cargo and mail are reported in tons, they need to be converted to passenger equivalents. This conversion is done by taking the ratio of the number of passengers and tons of cargo carried by the assumed constraints of a Boeing 767. This plane can carry either 351 passengers or 58 tons of cargo (BOEING, 2014). Dividing the number of passengers by the tons of cargo yields a ratio of 5.15 passengers per ton of cargo.

Overseas and interisland travel must be combined in such a way that accounts for the difference in energy used for the two different types of trips. However, no detailed data exist to do so. It is then assumed that overseas travel requires ten times the amount of energy that interisland travel does - based on interisland trips ranging in travel times of 30 to 60 minutes, and overseas trips ranging from 300 minutes (5 hrs) for trips to the continental U.S. West Coast to well over 600 minutes (10 hrs) for trips to Australia, Asia, and the U.S. East Coast. However, sensitivity tests are done and the resulting computation for air travel by passengers is quite insensitive to the ratio of travel time of overseas to interisland trips. Taken together, energy consumed in passenger travel accounts for 84% of total energy for commercial air travel.

The share of passenger travel by visitors is taken to equal the ratio of statewide visitor arrivals and the total number of passengers traveling to and from Hawaiʻi. DBEDT (2016) provides data on total overseas travel (Tables II.3). Since visitor data are not provided for interisland travel, it is assumed the share of interisland travel by visitors is the same as that of overseas travel.

Table II.3: Overseas Passenger Travel (DBEDT, 2016)

	Passengers	
Type of Travel	**Departures**	**Arrivals**
Overseas	10,241,737	10,223,372

Table II.4: Overseas passengers by origin (DBEDT, 2016)

North America	**Asia**	**Europe**	**Oceania**	**Other**	**Total**
6,052,306	1,936,393	143,922	390,364	298,817	8,821,802

Taking the ratio of visitor arrivals to the average of total passenger arrivals and departures results in a visitor share of passenger travel of 86%. The share of total air travel attributed to visitors, and hence the share of energy for air travel associated with visitors, equals the product of the share of passenger travel by visitors (86%) and the share of all travel by passengers (84%), or 72%.

Energy use in air travel attributed to visitors is assumed to grow at the rate of growth of visitor arrivals, as forecasted by DBEDT (2018c), adjusted by the forecasted gains in energy efficiency in aviation (EIA, 2019). The growth rate in visitor arrivals averages about 0.5% a year over the 2020 to 2045 time horizon, and energy efficiency averages about 0.6% per year over the same horizon. These changes lead to about a 1.5% reduction in emissions related to visitor travel in 2045 from the 2020 level.

Energy use in air travel attributed to residents and cargo is assumed to grow at the rate of growth of Hawaii's GSP based on DBEDT (2018c), also adjusted by the forecasted gains in energy efficiency in aviation (EIA, 2019). Real GSP is forecasted to grow by about 50% from 2020 to 2045. The growth in GSP coupled with the increase in energy efficiency results in an increase in emissions associated with cargo of about 30%.

Annual energy use in the two categories are summed together then multiplied by the CURB emissions factors for aviation gas and jet fuel. Combining the decline in emissions from visitor travel with the increase in emissions associated with delivery of cargo results in an increase of about 7% in total emissions associated with air travel.

Marine Transportation

Estimated GHG emissions from marine transportation take the 2016 GHG emissions level and grow it based on GSP (DBEDT, 2018c), adjusted for energy efficiency of marine transport (EIA, 2019). The EIA estimates the average increase in efficiency of shipping, measured in ton-miles per MMBtu, from 2017 to 2050 to be about 0.6% per year (EIA, 2019). This results in effect that the fossil fuel mixture for marine transportation does not change through 2045.

BUILDINGS & OTHER STATIONARY SOURCES

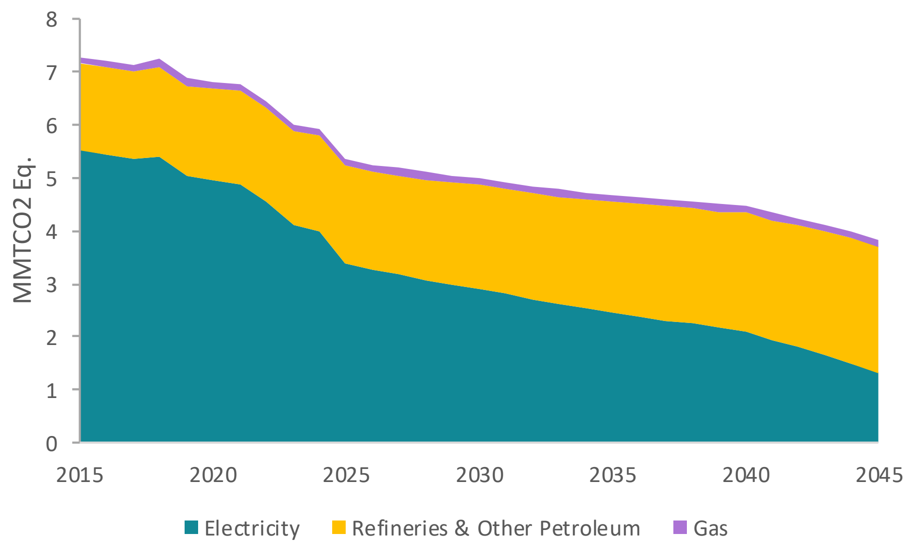


Figure II-7: Projected GHG Emissions in the Buildings & Other Sector

Buildings & Other Stationary Sources contain GHG emissions from three sub-sectors: *electricity*, *refineries and other petroleum*, and *gas*. Total emissions are projected to be 1.3 MMTCO2 Eq. in 2045, under the baseline pathway, a 47% reduction. Emissions from electricity are projected to decline substantially (by 76%), emissions from refineries and other petroleum use is projected to decline slightly (by 14%), while, emissions from the gas sector are assumed to remain constant. Separate models were used for each of the sub-sectors to develop these estimates, described below.

Electricity

GHG emissions projections within the electricity sector are based in data provided in the PSIP (PUC, 2016). This dataset represents all existing fossil-fuel burning units on Oʻahu. The planned expansion of renewable energy is used to both inform the "Baseline: RPS" pathway and determine the "PSIP" pathway. To use this dataset, it is updated and put into a form more easily used for scenario analysis.

- Renewable energy in the PSIP is adjusted for based on actual installed capacity through 2019 as well as near-term adjustments to the plan, as documented in ICF and UHERO (2019).

- Annual GHG emissions are converted from short to metric tons.
- For each year, from 2020 to 2045, generation from all thermal units is aggregated based on fossil fuel type. A weighted average heat rate for each fossil fuel (oil, ultra-low sulfur diesel, or bituminous coal) is used to calculate GHG emissions from fossil fuel generation.
- Oil-based units are aggregated to create a "representative fossil fuel unit."
- Generation from solar PV, wind, and biodiesel run units, representing "zero carbon" units, are aggregated to create a "representative zero carbon unit."
- Generation from bituminous coal is assumed to remain constant, until phased out by 2022 for the baseline.
- Generation from H-Power is also assumed to remain as given by the PSIP pathway. 41% of generation is considered non-biogenetic and allotted to fossil fuel generation, the remainder is counted as renewable generation.
- The installation of behind-the-meter, or distributed, solar PV is adopted from the PSIP.
- The representative oil and representative zero carbon units are scaled annually to meet the Renewable Portfolio Standard, assuming that H-Power remains on and counts toward the standard, and that behind-the-meter solar PV is worth twice its actual generation.

The electricity demand forecast is given in the PSIP E3 with Grid Modernization scenario. It is adjusted for demand due to EVs based on the baseline pathways in ground transportation, as well as electricity demand from the Honolulu Rail Transit Project.

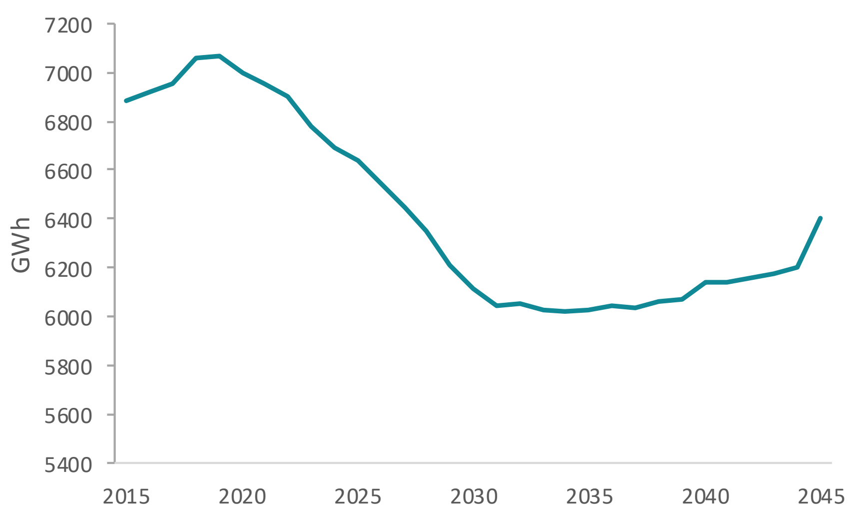


Figure II-8: Grid Electricity Generation in Baseline Electric Sector Pathway

Refineries & Other Petroleum

The majority, 83% in 2017, of GHG emissions from Refineries and Other Petroleum come from distillate fuel oil (DFO), hydrocarbon gas liquids (HGL), and naphtha used in the residential, commercial, and industrial sectors. The majority of this (85%) is naphtha, a byproduct of petroleum refinery processes, some of which is used to produce petroleum gas in the gas sector.[3] Emissions from DFO and HGL are projected based on annual growth in GSP from (DBEDT, 2018c) using the 2017 inventory year as a baseline. Naphtha emissions are projected to decline at the rate of emissions from refinery processes, described below.

The remaining 17% of emissions in this sector come from processes to refine oil. There are two petroleum refineries located on Oʻahu that are the primary providers of jet fuel, gasoline, and diesel. The 2015 baseline emissions from petroleum refineries were projected to 2045 based on the weighted average growth in the ground transportation and electric sectors (as described above). Assuming that refinery processes are largely determined by petroleum demand in these two sectors, refinery emissions are projected to decrease by 14% between 2015 and 2045.

Gas

Gas supply on Oʻahu comes predominantly (97%) from petroleum. The other 3% comes from a City collaboration with Honouliuli wastewater treatment plant (Hawaii Gas, 2019). Due to its relatively small contribution and uncertainty about future gas supply, emissions from gas are assumed to stay flat from 2017 to the year 2045.

[3] This is in an amount undetermined within the City's GHG Inventory. This is a point of uncertainty and may be creating double-counting.

INDUSTRIAL PROCESSES & PRODUCT USE (IPPU)

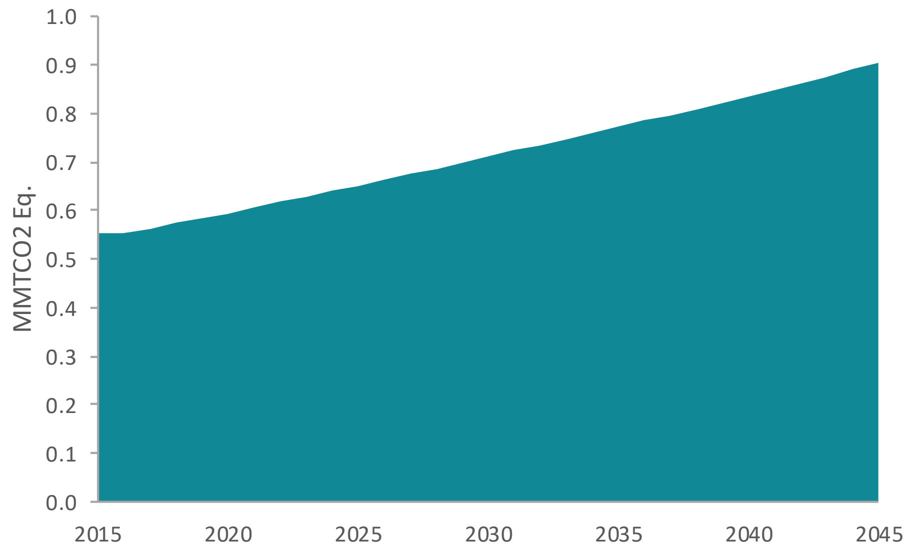


Figure II-9: Projected GHG Emissions from Industrial Processes & Product Use

IPPU emissions on Oʻahu are primarily from the substitution of ozone depleting substances, though there is small contribution from electrical transmission and distribution and cement production, as described in ICF & UHERO (2019). 2015 baseline emissions from substitution of ozone depleting substances were projected based on annual growth in GSP from DBEDT (2018c). Emissions from electrical transmission and distribution were projected based on electricity demand forecast from the baseline electric sector pathway and are thus assumed to decline by 7% between 2015 and 2045. Overall, IPPU emissions are projected to grow approximately 64% between 2015 and 2020. There is considerable uncertainty in future GHGs from the substitution of ozone depleting substances, like hydrofluorocarbons (HFCs), as described in ICF & UHERO (2019).

WASTE SECTOR

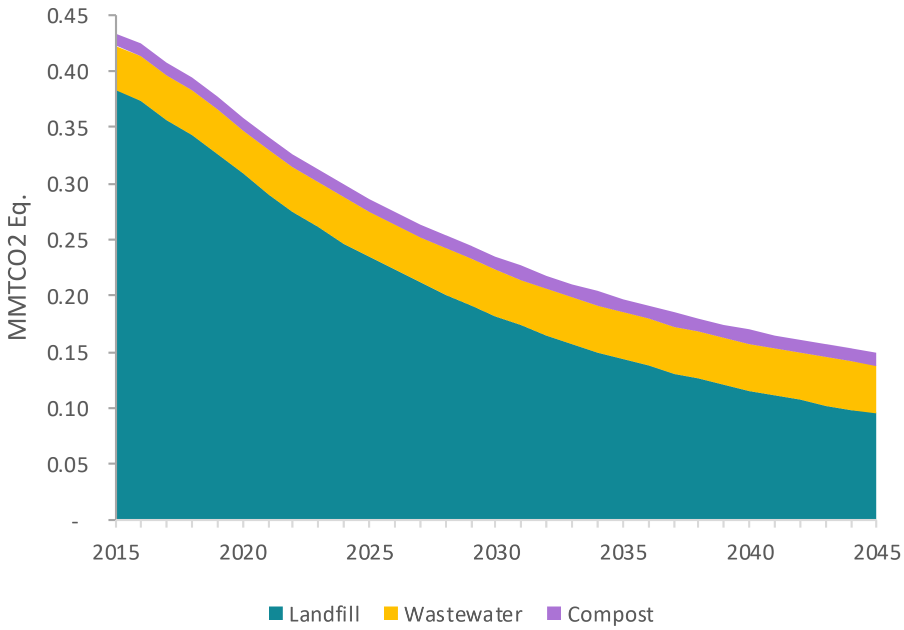


Figure II-10: Projected GHG Emissions in the Waste Sector

The Waste Sector accounted for 0.43 MMTCO2 Eq., or 3%, of greenhouse gas (GHG) emissions on Oʻahu in 2015, and is projected to be 0.15 MMTC02 Eq. in the year 2045, a 65% reduction. While emissions from landfills are projected to decline, emissions from composting and wastewater treatment are projected to increase slightly. Separate models were used for each of the sub-sectors to develop these estimates. These are described below.

Landfill

Projected emissions from landfills are based on a First Order Decay (FOD) model that follows the methodology described in the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) (Fong et al., 2014). The FOD model represents GHG methane (CH_4) emitted from landfills in a given year. GHG emissions are estimated based on the decomposition of organic matter disposed at the landfill, ideally from its opening year (or as far back as possible). As such, the FOD model is an account of actual GHG emissions in a given inventory (or projection) year, generated from waste disposed of in previous years. The long timeframe means that policy actions today will only emerge in the FOD model over a several decades. Total waste tonnage, as well as rate of decay of organic matter drives the rate of emissions in the model. The rate of decay is determined by assumptions around waste composition and assumptions around local precipitation and temperature conditions. Future GHG emissions from landfills according to the FOD parameters are determined based on the following sources:

- Total waste tonnage for the years 2005 to 2019 follow reports from the Department of Environmental Services.[4] In addition, in a 2017 report the City provides total solid waste from the year 2000 to 2016 as well as estimates future tonnage to the year 2040 (ENV, 2017).
- Historical tonnage from 1960-2000 was estimated assuming that Oʻahu's trend in per capita waste is similar to the national average (where the year 2000 is used to harmonize national and local estimates (US EPA, 2017).
- Future tonnage from the year 2020-2045 follow projections in the City's Assessment of Municipal Solid Waste Handling Requirements for the Island of Oʻahu.(ENV, 2017)
- The rate of decay value assumes a tropical dry climate, with temperatures from 1960 through 2045 based on values presented in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2006).
- The amount organic content follows the City's 1999 waste composition study prior to 2006, the 2006 waste composition data between 2006 and 2017, and the 2017 waste composition date from 2017-2045.
- Degradable organic content for each waste type, as well as fraction of methane (assumed to be 0.5) and stoichiometric ratio (assumed to be 12/16), is based on 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
- Lastly, in accordance with the GPC, CH4 that is flared at the landfill is converted to biogenic CO2 and is thus not counted towards GHG emission totals. The amount of CH4 flared in 2016, 0.07 MMTCO2 Eq., was provided by Department of Environmental services.[5] The ratio of flared CH_4 to total CH_4 emissions is assumed to stay constant through 2045.
- The FOD estimates were then scaled to fit the updated City and County of Honolulu 2016 GHG inventory landfill emissions estimate[6], with a factor of 0.91.

[4] A. Sadri personal communication, March 30th 2020.

[5] A. Sadri personal communication, February 24th 2020.

[6] The City and County of Honolulu 2016 GHG inventory landfill emissions estimate was updated to adopt the 2019 release of the State of Hawaiʻi GHG Inventory landfill and AFOLU estimates (see ICF & UHERO, 2019).

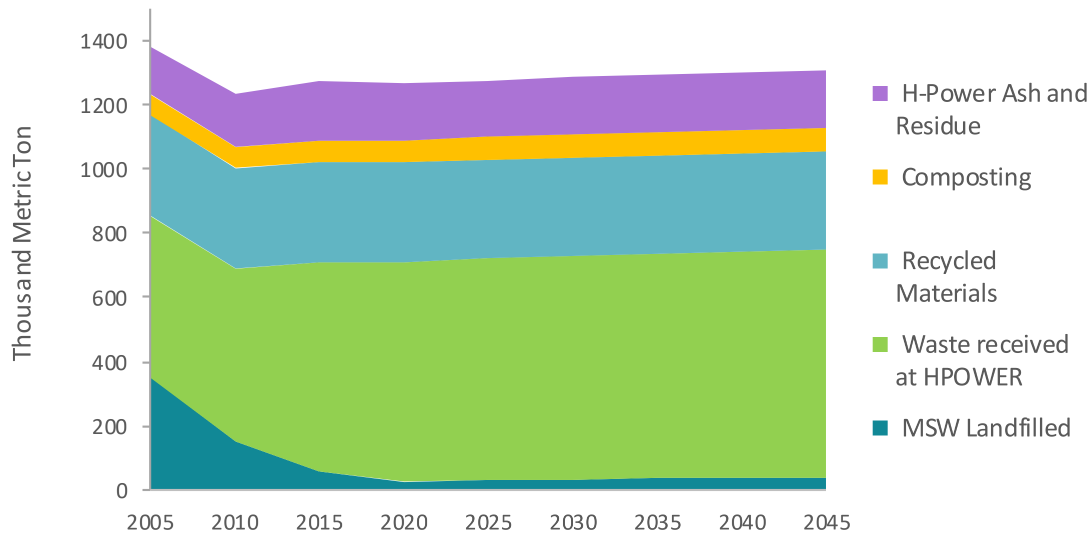


Figure II-11: Historical and Projected Solid Waste Tonnage by Treatment Type

Overall, the composition of the waste will determine degradable organic content and thus the methane generation potential of landfilled waste. Wood and paper products will, for example, have a relatively high ratio of degradable organic content while plastic and glass waste are assumed to have zero degradable organic content (IPCC, 2006). Similarly, bottom ash from waste-to-energy facilities have very little degradable organic content (Zhang et al., 2004). Because of this, bottom ash sent to the landfill from H-Power is excluded both from the estimate of degradable organic content and total tonnage.

The FOD model is calibrated with major assumptions around the rate of decay, which are sensitive to environmental conditions. The 1999 and 2006 waste composition reports are used to classify waste into what is slowly, moderately and rapidly degrading, based on IPCC Guidelines (IPCC, 2006). The rate of decay value assumes a tropical dry climate from 1960 through 2045. The State of Hawai'i GHG inventory is used as a model check. When similar degradation parameters are adopted, GHG results are similar in value in the year 2016 (ICF & UHERO, 2019); however, this FOD model uses a larger rate of decay value of 0.06, compared to 0.02 used in the State inventory, based on assessment of landfill composition on O'ahu. As such, this model assumes that waste degrades faster.

Wastewater

Wastewater GHG emissions rise slightly and by the year 2045, estimated to be 0.04 MMTC02 Eq. Wastewater can be treated either aerobically (with the presence of oxygen) or anaerobically (in the absence of oxygen). While both treatment forms produce nitrous oxide (N_2O), only anaerobic treatment produces CH_4. Indirect N_2O emissions also occur from wastewater effluent released to ocean or freshwater sources. Treatment of wastewater produces biogenic sources of CO_2, which is not included in emission totals. As with the solid Waste Sector, CH_4 that is flared at wastewater treatment facilities is converted to CO_2 and is also assumed to be biogenic. Wastewater GHG emissions are projected into the future at the rate of expected de facto population growth to the year 2045, as shown below (DBEDT, 2018c).

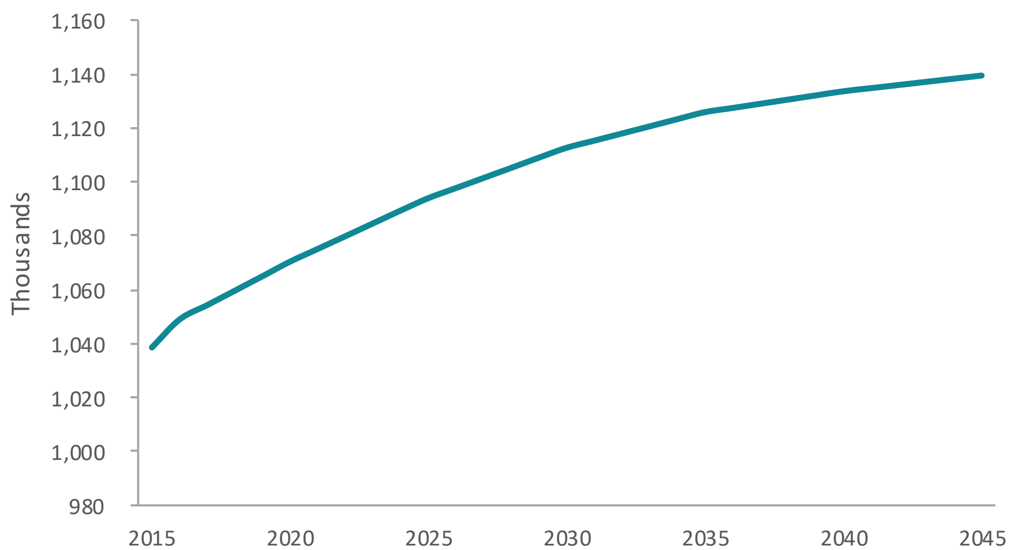


Figure II-12: De Facto Population Estimate, based on DBEDT's Long-range Economic Forecast

Composting

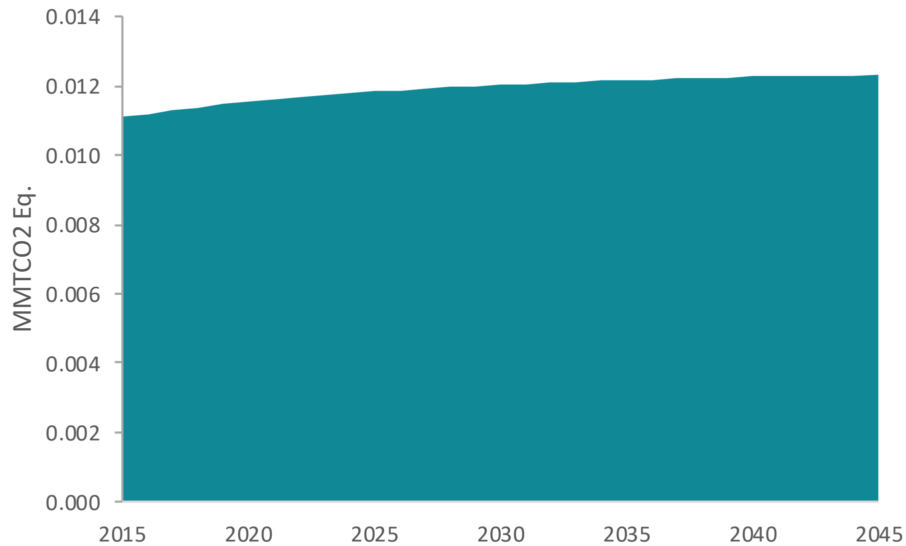


Figure II-13: Projected GHG Emissions from Composting

Projected GHG emissions from composting takes the 2015 GHG estimate and grows it based on the rate of expected de facto population growth to the year 2045 (DBEDT, 2018c). This assumes constant per capita composting rates. As shown in Figure II-13 composting emissions remains relatively stable to the year 2045 at about 0.1 MMTC02 Eq. Approximately 50,000 tons of compostable waste is collected from “green bin” curbside pickup and another 20,000 tons per year comes from Kapaa Transfer Station and the six convenience centers.

APPENDIX III. ISLAND-WIDE SURVEY, VIRTUAL OPEN HOUSE AND PUBLIC MEETING SERIES

CITY AND COUNTY OF HONOLULU RESIDENT SURVEY

SMS Research, a professional survey research center in Honolulu, conducted the public opinion survey among Oʻahu residents on behalf of the University of Hawaiʻi. The survey instrument was developed by the University of Hawaiʻi and programmed by SMS. The survey was fielded through a Hawaiʻi resident online panel from April 8, 2020 to April 30, 2020. The sample was drawn from two distinct regions on Oʻahu. The first region consisted of zip codes encompassing:

- Aiea
- Ala Moana-Kakaʻako
- Waikiki
- Kaimuki-Kahala
- Kalihi Palama
- Airport-Moanalua
- Salt Lake-Aliamanu
- ʻĀina Haina
- Manoa
- Hawaiʻi Kai
- Hickam Field
- Joint Base Pearl Harbor

These zip codes constitute the Primary Urban Center and East Honolulu, for the purposes of brevity, this will be referred to as the Urban Core. The second region consisted of all the other areas on O’ahu. 380 residents were sampled from each of the two areas for a total of 760 respondents. Participants were 18 years or older, lived in Hawaiʻi for more than a year, and in normal circumstances (prior to the coronavirus) regularly left their house. To reflect the demographic composition of Oʻahu, respondents were given weights based on where they lived (zip code), age, gender, ethnicity, household income level and education level. Where participants lived was taken from the 2014-2018 American Community Survey (ACS) 5-year estimates made available by the Hawai’i Department of Business, Economic Development, and Tourism (DBEDT, 2020b). All other weighting variables—age, gender, and ethnicity, education, and income—were taken from the United States Census Bureau’s 2018 ACS 1-year estimates (ACS, 2018a; ACS 2018b; ACS 2018c).[7]

[7] Correction made to Hawaiian (Part Hawaiian) using the 2018 ACS 5-year estimate (ACS, 2018d).

Table III.1 shows the area, ethnicity, gender, education, and income distributions used to weight the online panel. The weights were created using a technique called "raking" following what the American National Election Studies uses. It takes population estimate proportions and then using an algorithm, creates weights for each respondent that best try to make the sample proportions for each category used (in this case where they lived, age, gender, education, and income) to reflect the population proportions. In short, the weights ensure that the overall distributions for the sample match the population parameters as the sample becomes more representative of the population. The final sample provides a margin of error of +/- 3.6 percent with a 95 percent confidence interval.

Table III-1: Area, Ethnicity, Gender, Education, and Income Estimates for Honolulu County

	%
Area	
Urban Core	46.2%
Outside Urban Core	53.8%
Age Bracket	
18 to 19 years	2.8%
20 to 24 years	9.0%
25 to 34 years	19.1%
35 to 44 years	16.4%
45 to 54 years	15.1%
55 to 59 years	7.4%
60 to 64 years	7.7%
65 to 74 years	12.2%
75 to 84 years	6.3%
85 years and over	3.9%
Ethnicity	
White/Caucasian	20.5%
Hawaiian/Part-Hawaiian	19.8%

Chinese	5.2%
Filipino	15.6%
Japanese	13.1%
Korean	2.3%
Other Asian	6.0%
Other Pacific Islander	4.5%
Black/African American	2.6%
Other	1.1%
Mixed (Not Native Hawaiian)	9.4%
Gender	
Male	50.0%
Female	50.0%
Education	
High school graduate or GED	35.3%
Some college	32.5%
College graduate	21.5%
Post graduate	10.7%
Income	
Less than $35,000	18.4%
$35,000 but less than $50,000	9.8%
$50,000 but less than $75,000	16.2%
$75,000 but less than $100,000	13.0%
$100,000 but less than $150,000	20.7%
$150,000 but less than $200,000	10.7%
$200,000 but less than $300,000	11.2%

Table III-2: Results By Total Sample, Urban Core, and Outside Urban Core[8]

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Were you employed as of February 2020?	Yes	499	65.70%	233	67.50%	266	64.20%
	No	256	33.70%	112	32.50%	143	34.60%
	Don't know	5	0.70%	0	0.00%	5	1.20%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Since the mandate to shelter in place due to the novel coronavirus...	I am now working at home	175	35.10%	69	29.60%	106	39.90%
	Nothing has changed, I already worked at home	17	3.40%	9	4.00%	7	2.80%
	I am going to work right now, I am an essential worker	159	31.90%	67	28.80%	92	34.70%
	I am not working right now, my type of work cannot be done remotely	56	11.30%	32	13.80%	24	9.00%
	I am not working right now, I am recently laid off	69	13.90%	49	21.20%	20	7.50%
	Other	19	3.90%	6	2.60%	13	5.10%
	Don't know	0	0.00%	0	0.00%	0	0.00%
	Refused	3	0.50%	0	0.00%	3	1.00%
	Total	**499**	**100.00%**	**233**	**100.00%**	**266**	**100.00%**

[8] The subscript "a" within the tables results denotes number rounds down to zero.

How concerned are you about the novel coronavirus?	Very concerned	462	60.80%	213	61.60%	249	60.20%
	Somewhat concerned	242	31.90%	110	31.70%	133	32.00%
	Somewhat not concerned	23	3.10%	13	3.70%	11	2.60%
	Not concerned at all	22	2.90%	5	1.50%	17	4.00%
	Don't know	10	1.30%	5	1.40%	5	1.20%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Where do you get the majority of information about the novel coronavirus?	Neighbors and friends	41	5.40%	17	5.00%	24	5.80%
	Social media posts	115	15.10%	51	14.90%	63	15.30%
	Newspaper and TV News	429	56.50%	213	61.50%	217	52.30%
	Official government websites and announcements	124	16.30%	52	15.20%	72	17.30%
	Medical doctor	5	0.70%	2	0.60%	3	0.70%
	Other	35	4.50%	8	2.40%	26	6.40%
	Don't know	8	1.10%	2	0.60%	6	1.50%
	Refused	3	0.30%	0	0.00%	3	0.60%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Who do you trust the most to give you accurate information about the novel coronavirus?	Neighbors and friends	47	6.20%	18	5.20%	29	7.10%
	Social media posts	28	3.60%	12	3.40%	16	3.90%
	Newspaper and TV News	269	35.40%	139	40.20%	130	31.30%
	Official government websites and announcements	182	24.00%	75	21.50%	108	26.00%
	Medical doctor	118	15.50%	67	19.30%	51	12.30%
	Other	64	8.50%	14	4.00%	50	12.20%

	Don't know	49	6.50%	22	6.30%	28	6.70%
	Refused	3	0.30%	0	0.00%	3	0.60%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Has the experience of the novel coronavirus influenced your thinking about your ability to work remotely – that is, you would like to work remotely more often even after the novel coronavirus passes?	Yes	254	33.40%	110	31.80%	144	34.80%
	No, I already work from home	60	7.90%	22	6.40%	38	9.10%
	No, my type of work cannot be done remotely	206	27.10%	99	28.60%	107	25.90%
	No, I do not want to work remotely even though I could	71	9.30%	29	8.40%	42	10.10%
	No, other	89	11.70%	39	11.30%	50	12.00%
	Don't know	69	9.10%	38	11.10%	31	7.50%
	Refused	11	1.40%	8	2.30%	3	0.60%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
How many days a week would you want to work from home?	0	10	3.90%	8	7.60%	1	1.00%
	1	17	6.70%	7	6.10%	10	7.20%
	2	64	25.10%	25	22.30%	39	27.20%
	3	34	13.30%	11	9.60%	23	16.20%
	4	19	7.50%	10	9.00%	9	6.30%
	5	69	27.20%	36	32.50%	34	23.20%
	6	11	4.50%	2	2.20%	9	6.30%
	7	30	11.80%	12	10.60%	18	12.60%
	Total	**254**	**100.00%**	**110**	**100.00%**	**144**	**100.00%**

Individuals Employed as of Feb. 2020		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Has the experience of the novel coronavirus influenced your thinking about your ability to work remotely – that is, you would like to work remotely more often even after the novel coronavirus passes?	Yes	192	38.40%	91	38.80%	101	38.10%
	No, I already work from home	38	7.70%	12	5.00%	27	10.10%
	No, my type of work cannot be done remotely	196	39.20%	90	38.60%	106	39.80%
	No, I do not want to work remotely even though I could	49	9.80%	26	11.10%	23	8.60%
	No, other	3	0.70%	2	0.70%	2	0.70%
	Don't know	19	3.70%	14	5.90%	5	1.90%
	Refused	3	0.50%	0	0.00%	3	1.00%
	Total	**499**	**100.00%**	**233**	**100.00%**	**266**	**100.00%**
How many days a week would you want to work from home?	0	4	2.10%	3	2.80%	1	1.40%
	1	14	7.20%	7	7.40%	7	7.10%
	2	60	31.10%	24	26.30%	36	35.40%
	3	28	14.30%	9	10.10%	18	18.10%
	4	10	5.20%	5	5.90%	5	4.60%
	5	51	26.50%	29	31.90%	22	21.70%
	6	10	5.40%	2	2.70%	8	7.90%
	7	16	8.10%	12	12.90%	4	3.80%
	Total	**192**	**100.00%**	**91**	**100.00%**	**101**	**100.00%**

In a normal week prior to the novel coronavirus, what is your main mode of travel for each of the following purposes?		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Work	Car as driver	435	57.20%	184	53.30%	250	60.40%
	Car as passenger	37	4.80%	13	3.80%	23	5.70%
	Bus	44	5.80%	23	6.60%	21	5.10%
	Walk	31	4.10%	25	7.10%	6	1.50%
	Bicycle	8	1.10%	5	1.50%	3	0.70%
	Motorcycle/Moped	6	0.80%	5	1.60%	0	0.10%
	Taxi/Rideshare Service	7	0.90%	1	0.40%	5	1.30%
	Other	5	0.70%	3	0.80%	3	0.70%
	N/A	188	24.80%	86	24.80%	102	24.70%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
School	Car as driver	90	11.80%	34	9.90%	56	13.40%
	Car as passenger	63	8.30%	19	5.60%	44	10.60%
	Bus	33	4.30%	16	4.50%	17	4.10%
	Walk	14	1.80%	2	0.70%	11	2.70%
	Bicycle	4	0.50%	1	0.20%	3	0.80%
	Motorcycle/Moped	6	0.80%	5	1.40%	1	0.20%
	Taxi/Rideshare Service	0	0.00%	0	0.00%	0	0.00%
	Other	6	0.70%	0	0.00%	6	1.30%
	N/A	545	71.80%	269	77.70%	277	66.80%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Drop off child at daycare/school	Car as driver	153	20.10%	66	19.10%	86	20.90%
	Car as passenger	25	3.30%	2	0.60%	23	5.50%
	Bus	43	5.70%	14	4.00%	29	7.10%
	Walk	6	0.80%	2	0.50%	4	1.10%

	Bicycle	0	0.00%	0	0.00%	0	0.00%
	Motorcycle/Moped	0	0.00%	0	0.00%	0	0.00%
	Taxi/Rideshare Service	3	0.40%	3	0.70%	0	0.10%
	Other	0	0.00%	0	0.00%	0	0.00%
	N/A	530	69.80%	259	75.00%	271	65.50%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Drop off elderly at daycare/doctor	Car as driver	123	16.20%	61	17.60%	62	15.00%
	Car as passenger	35	4.70%	8	2.20%	28	6.70%
	Bus	24	3.20%	9	2.60%	15	3.60%
	Walk	25	3.20%	6	1.90%	18	4.40%
	Bicycle	0[a]	0.00%	0	0.00%	0	0.10%
	Motorcycle/Moped	0	0.00%	0	0.00%	0	0.00%
	Taxi/Rideshare Service	8	1.10%	4	1.30%	4	0.90%
	Other	7	0.90%	1	0.40%	5	1.30%
	N/A	538	70.80%	256	74.10%	282	68.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Errands	Car as driver	507	66.70%	239	69.10%	268	64.70%
	Car as passenger	117	15.40%	53	15.20%	64	15.50%
	Bus	47	6.20%	17	4.80%	31	7.40%
	Walk	27	3.60%	17	4.80%	11	2.60%
	Bicycle	21	2.80%	7	2.00%	14	3.50%
	Motorcycle/Moped	5	0.70%	5	1.50%	0	0.00%
	Taxi/Rideshare Service	1	0.10%	0	0.00%	1	0.20%
	Other	4	0.50%	3	0.70%	1	0.30%
	N/A	31	4.00%	6	1.80%	24	5.90%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Leisure	Car as driver	434	57.10%	198	57.30%	235	56.90%

	Car as passenger	151	19.90%	62	17.80%	90	21.70%
	Bus	38	4.90%	13	3.80%	24	5.90%
	Walk	38	5.00%	20	5.80%	18	4.40%
	Bicycle	7	1.00%	2	0.70%	5	1.20%
	Motorcycle/Moped	20	2.60%	11	3.10%	9	2.20%
	Taxi/Rideshare Service	9	1.20%	9	2.50%	1	0.20%
	Other	8	1.10%	5	1.60%	3	0.70%
	N/A	55	7.20%	26	7.40%	29	7.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

Under normal circumstances, how many days of week do you travel to each?		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Work	0	44	7.70%	24	9.20%	20	6.30%
	1	52	9.10%	11	4.30%	41	13.00%
	2	18	3.20%	5	2.10%	13	4.00%
	3	36	6.40%	13	5.00%	23	7.50%
	4	28	5.00%	20	7.60%	9	2.80%
	5	296	51.80%	138	53.10%	158	50.70%
	6	65	11.40%	29	11.10%	36	11.60%
	7	32	5.60%	20	7.50%	13	4.10%
	Total	572	100.00%	260	100.00%	312	100.00%
School	0	53	24.90%	14	18.30%	39	28.60%
	1	45	21.10%	7	8.60%	39	28.20%
	2	22	10.30%	8	10.20%	14	10.30%
	3	18	8.50%	14	18.50%	4	2.90%
	4	12	5.40%	3	3.50%	9	6.40%
	5	60	28.10%	30	38.80%	30	22.10%
	6	1	0.50%	0	0.30%	1	0.60%
	7	3	1.20%	1	1.80%	1	0.90%
	Total	215	100.00%	77	100.00%	137	100.00%
Drop off child at daycare/school	0	54	23.50%	21	24.80%	33	22.80%
	1	47	20.50%	7	8.40%	40	27.80%
	2	14	6.10%	9	10.30%	5	3.60%
	3	11	5.00%	2	2.70%	9	6.30%
	4	12	5.00%	4	5.00%	7	5.00%
	5	89	38.90%	42	48.80%	47	33.00%
	6	0[a]	0.10%	0	0.20%	0	0.00%

	7	2	0.90%	0	0.00%	2	1.40%
	Total	230	100.00%	87	100.00%	143	100.00%
Drop off elderly at daycare/doctor	0	70	31.60%	25	27.90%	45	34.20%
	1	80	35.90%	31	35.10%	48	36.40%
	2	28	12.50%	6	7.30%	21	16.10%
	3	12	5.40%	5	6.00%	7	5.00%
	4	6	2.50%	2	2.40%	3	2.60%
	5	16	7.10%	10	11.20%	6	4.30%
	6	5	2.30%	5	5.60%	0	0.00%
	7	6	2.70%	4	4.60%	2	1.40%
	Total	222	100.00%	90	100.00%	133	100.00%
Errands-Days	0	3	0.40%	2	0.50%	1	0.20%
	1	126	17.20%	48	14.10%	78	20.00%
	2	201	27.50%	90	26.40%	111	28.50%
	3	175	24.00%	83	24.60%	92	23.50%
	4	76	10.50%	38	11.10%	39	9.90%
	5	67	9.20%	39	11.50%	28	7.30%
	6	35	4.80%	12	3.60%	23	5.90%
	7	46	6.30%	28	8.20%	18	4.70%
	Total	729	100.00%	340	100.00%	390	100.00%
Leisure	0	31	4.40%	19	6.00%	12	3.00%
	1	177	25.10%	61	19.00%	117	30.30%
	2	219	31.00%	105	32.70%	114	29.60%
	3	109	15.40%	55	17.10%	54	14.00%
	4	60	8.40%	27	8.30%	33	8.60%
	5	48	6.80%	28	8.80%	20	5.10%
	6	8	1.10%	3	1.00%	4	1.10%
	7	55	7.80%	23	7.00%	32	8.40%
	Total	705	100.00%	320	100.00%	385	100.00%

How much time does it typically take to complete a round trip to your destination (commute time only, do not include time at destination)?		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Work	Less than 15 minutes	84	16.00%	38	16.00%	47	15.90%
	Between 15 and 29 minutes	151	28.50%	93	39.50%	57	19.60%
	Between 30 and 44 minutes	73	13.80%	36	15.20%	37	12.60%
	Between 45 and 59 minutes	87	16.50%	31	13.10%	56	19.20%
	Between 60 and 89 minutes	77	14.50%	26	11.10%	50	17.20%
	Between 90 and 120 minutes	29	5.50%	6	2.70%	23	7.80%
	Over 120 minutes	28	5.30%	6	2.40%	22	7.60%
	Don't know	0[a]	0.00%	0	0.10%	0	0.00%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**528**	**100.00%**	**236**	**100.00%**	**292**	**100.00%**
School	Less than 15 minutes	50	31.10%	24	37.60%	27	27.00%
	Between 15 and 29 minutes	41	25.60%	13	20.20%	28	29.00%
	Between 30 and 44 minutes	46	28.50%	19	29.40%	27	28.00%
	Between 45 and 59 minutes	9	5.70%	2	3.80%	7	6.90%
	Between 60 and 89 minutes	2	1.30%	2	2.80%	0	0.30%
	Between 90 and 120 minutes	7	4.60%	1	2.10%	6	6.10%

	Over 120 minutes	4	2.50%	2	2.60%	2	2.50%
	Don't know	1	0.70%	1	1.50%	0	0.20%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**161**	**100.00%**	**63**	**100.00%**	**98**	**100.00%**
Drop off child at daycare/school	Less than 15 minutes	59	33.70%	23	35.60%	36	32.70%
	Between 15 and 29 minutes	68	38.50%	30	46.70%	37	33.70%
	Between 30 and 44 minutes	35	19.80%	8	12.60%	27	24.00%
	Between 45 and 59 minutes	12	6.70%	1	1.90%	10	9.50%
	Between 60 and 89 minutes	0[a]	0.30%	0	0.70%	0	0.00%
	Between 90 and 120 minutes	1	0.60%	1	1.50%	0	0.10%
	Over 120 minutes	1	0.40%	1	1.00%	0	0.00%
	Don't know	0	0.00%	0	0.00%	0	0.00%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**176**	**100.00%**	**65**	**100.00%**	**110**	**100.00%**
Drop off elderly at daycare/doctor	Less than 15 minutes	16	10.40%	4	5.70%	12	13.90%
	Between 15 and 29 minutes	51	33.80%	23	35.40%	28	32.70%
	Between 30 and 44 minutes	32	20.90%	18	28.40%	13	15.40%
	Between 45 and 59 minutes	32	21.40%	12	18.70%	20	23.30%
	Between 60 and 89 minutes	15	10.00%	7	11.20%	8	9.20%
	Between 90 and 120 minutes	4	2.40%	0	0.20%	3	4.00%

	Over 120 minutes	2	1.10%	0	0.30%	1	1.70%
	Don't know	0	0.00%	0	0.00%	0	0.00%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**152**	**100.00%**	**65**	**100.00%**	**87**	**100.00%**
Errands	Less than 15 minutes	74	10.20%	45	13.30%	29	7.50%
	Between 15 and 29 minutes	212	29.10%	97	28.70%	115	29.50%
	Between 30 and 44 minutes	139	19.10%	60	17.70%	79	20.30%
	Between 45 and 59 minutes	95	13.10%	44	13.10%	51	13.20%
	Between 60 and 89 minutes	91	12.60%	57	16.90%	34	8.80%
	Between 90 and 120 minutes	49	6.80%	18	5.20%	32	8.10%
	Over 120 minutes	58	8.00%	16	4.80%	42	10.80%
	Don't know	8	1.10%	1	0.30%	7	1.80%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**727**	**100.00%**	**338**	**100.00%**	**389**	**100.00%**
Leisure	Less than 15 minutes	32	4.70%	16	5.20%	16	4.20%
	Between 15 and 29 minutes	172	25.50%	88	29.20%	84	22.50%
	Between 30 and 44 minutes	127	18.90%	47	15.80%	80	21.40%
	Between 45 and 59 minutes	94	14.00%	49	16.20%	45	12.20%
	Between 60 and 89 minutes	95	14.10%	41	13.60%	54	14.50%

	Between 90 and 120 minutes	52	7.60%	24	7.90%	28	7.40%
	Over 120 minutes	72	10.70%	24	7.90%	48	12.90%
	Don't know	30	4.50%	12	3.90%	18	4.90%
	Refused	1	0.10%	1	0.30%	0	0.00%
	Total	**675**	**100.00%**	**301**	**100.00%**	**374**	**100.00%**
What kind of vehicle do you most often drive or ride?	Conventional gasoline car	436	63.30%	208	67.00%	228	60.20%
	Conventional gasoline truck/van/SUV	209	30.30%	91	29.30%	118	31.20%
	Hybrid vehicle	21	3.10%	4	1.30%	17	4.60%
	Battery electric vehicle	7	0.90%	5	1.60%	2	0.40%
	Plug-in hybrid electric vehicle	5	0.80%	0	0.00%	5	1.40%
	Don’t know	10	1.50%	2	0.50%	8	2.20%
	Refused	1	0.10%	1	0.30%	0	0.00%

Now I have a few questions about transportation. Please respond to these transportation questions regarding your perspectives prior to the outbreak of COVID-19. How strongly do you agree or disagree that...		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
I would be willing to pay to use roads that are less congested	Strongly agree	138	18.20%	46	13.30%	92	22.20%
	Somewhat agree	155	20.50%	78	22.40%	78	18.80%
	Neither agree nor disagree	116	15.30%	53	15.40%	63	15.10%
	Somewhat disagree	122	16.00%	72	20.70%	50	12.20%
	Strongly disagree	219	28.80%	96	27.90%	123	29.60%
	Don't know	9	1.20%	1	0.20%	9	2.10%
	Total	760	100.00%	346	100.00%	414	100.00%
Car sharing programs (like Toyota's HUI and zipcar) are accessible to me	Strongly agree	61	8.00%	44	12.70%	17	4.00%
	Somewhat agree	147	19.30%	49	14.30%	97	23.50%
	Neither agree nor disagree	137	18.00%	62	18.00%	75	18.00%
	Somewhat disagree	86	11.30%	50	14.50%	36	8.60%
	Strongly disagree	141	18.50%	64	18.60%	76	18.40%
	Don't know	189	24.90%	76	21.90%	113	27.40%
	Total	760	100.00%	346	100.00%	414	100.00%
The Bus is convenient for most of my destinations	Strongly agree	161	21.20%	58	16.90%	103	24.80%
	Somewhat agree	129	17.00%	62	17.90%	67	16.20%
	Neither agree nor disagree	109	14.40%	46	13.20%	63	15.30%
	Somewhat disagree	115	15.10%	57	16.50%	58	14.00%
	Strongly disagree	219	28.80%	112	32.30%	107	25.90%
	Don't know	27	3.60%	11	3.20%	16	3.80%
	Total	760	100.00%	346	100.00%	414	100.00%
I am willing to give up some street	Strongly agree	95	12.50%	47	13.60%	48	11.50%
	Somewhat agree	209	27.40%	97	28.20%	111	26.80%

parking for more safe walking and biking paths	Neither agree nor disagree	178	23.50%	74	21.30%	105	25.30%
	Somewhat disagree	133	17.40%	66	19.00%	67	16.10%
	Strongly disagree	129	16.90%	49	14.00%	80	19.40%
	Don't know	17	2.20%	13	3.80%	4	0.90%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
I would be interested in renting or buying a home that costs less, but has parking stalls for rent rather than a dedicated stall	Strongly agree	87	11.50%	25	7.20%	62	15.00%
	Somewhat agree	102	13.50%	63	18.20%	39	9.50%
	Neither agree nor disagree	155	20.40%	70	20.20%	85	20.60%
	Somewhat disagree	125	16.50%	56	16.10%	70	16.80%
	Strongly disagree	253	33.20%	116	33.50%	137	33.10%
	Don't know	38	4.90%	17	4.80%	21	5.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
The Bus is affordable to me	Strongly agree	195	25.70%	87	25.00%	109	26.30%
	Somewhat agree	194	25.60%	83	24.10%	111	26.80%
	Neither agree nor disagree	167	22.00%	84	24.40%	83	20.10%
	Somewhat disagree	88	11.60%	42	12.20%	46	11.20%
	Strongly disagree	65	8.50%	29	8.50%	35	8.50%
	Don't know	50	6.60%	20	5.90%	30	7.20%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Once fully operational, around 2025, I am likely to use the high-speed Rail at least three days a week	Strongly agree	90	11.90%	28	8.10%	62	15.00%
	Somewhat agree	92	12.10%	42	12.00%	50	12.20%
	Neither agree nor disagree	138	18.10%	71	20.50%	67	16.10%
	Somewhat disagree	66	8.70%	22	6.30%	44	10.60%
	Strongly disagree	298	39.20%	146	42.30%	152	36.60%
	Don't know	76	10.00%	37	10.70%	39	9.40%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

Regarding walking or riding a bike to get to my destinations. Please respond to these transportation questions regarding your perspectives prior to the outbreak of COVID-19. How strongly do you agree or disagree that...		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
I do not walk to my destination because of concerns about traffic safety	Strongly agree	138	18.10%	46	13.20%	92	22.20%
	Somewhat agree	104	13.70%	46	13.40%	58	14.10%
	Neither agree nor disagree	192	25.20%	96	27.90%	95	23.10%
	Somewhat disagree	123	16.20%	61	17.70%	62	14.90%
	Strongly disagree	191	25.10%	91	26.20%	100	24.20%
	Don't know	12	1.60%	6	1.60%	6	1.50%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
I do not use a bike to my destination because of concerns about traffic safety	Strongly agree	154	20.30%	70	20.10%	85	20.40%
	Somewhat agree	203	26.70%	94	27.10%	109	26.30%
	Neither agree nor disagree	145	19.10%	61	17.60%	85	20.40%
	Somewhat disagree	85	11.10%	34	9.80%	51	12.30%
	Strongly disagree	155	20.40%	77	22.10%	78	19.00%
	Don't know	18	2.40%	11	3.30%	7	1.60%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
I would walk more to my destination if the streets had more shade trees	Strongly agree	136	17.90%	47	13.70%	89	21.50%
	Somewhat agree	133	17.50%	75	21.70%	58	13.90%
	Neither agree nor disagree	221	29.10%	92	26.70%	129	31.20%
	Somewhat disagree	112	14.70%	53	15.40%	58	14.10%
	Strongly disagree	142	18.60%	65	18.90%	76	18.40%
	Don't know	17	2.20%	12	3.60%	4	1.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
I would use an electric scooter if it	Strongly agree	73	9.60%	35	10.10%	38	9.10%
	Somewhat agree	173	22.70%	53	15.40%	119	28.80%

were publicly available to me	Neither agree nor disagree	158	20.80%	66	19.20%	91	22.00%
	Somewhat disagree	113	14.80%	68	19.60%	45	10.90%
	Strongly disagree	208	27.30%	109	31.60%	98	23.80%
	Don't know	37	4.80%	14	4.00%	23	5.50%
	Total	760	100.00%	346	100.00%	414	100.00%
Bikeshare programs (like Biki) are accessible to me	Strongly agree	131	17.30%	59	17.20%	72	17.40%
	Somewhat agree	134	17.60%	79	22.70%	55	13.30%
	Neither agree nor disagree	119	15.60%	52	14.90%	67	16.20%
	Somewhat disagree	116	15.30%	51	14.70%	65	15.70%
	Strongly disagree	188	24.80%	75	21.60%	114	27.40%
	Don't know	72	9.40%	31	8.90%	41	9.90%
	Total	760	100.00%	346	100.00%	414	100.00%
I would like to have a mix of places such as restaurants, stores, and markets within walking distance in my neighborhood	Strongly agree	288	37.90%	127	36.60%	161	39.00%
	Somewhat agree	269	35.40%	121	35.10%	147	35.60%
	Neither agree nor disagree	131	17.20%	64	18.50%	67	16.20%
	Somewhat disagree	24	3.20%	17	4.90%	7	1.80%
	Strongly disagree	36	4.70%	10	2.80%	27	6.40%
	Don't know	12	1.60%	7	2.10%	4	1.10%
	Total	760	100.00%	346	100.00%	414	100.00%

The City and County of Honolulu is exploring a variety of transportation and energy policies. How supportive would you be of...		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Using public funds to replace City buses with electric buses that emit less tailpipe emissions	Strongly support	219	28.80%	81	23.40%	138	33.30%
	Somewhat support	253	33.20%	134	38.60%	119	28.70%
	Neither support nor oppose	159	20.90%	71	20.60%	88	21.20%
	Somewhat oppose	58	7.60%	24	6.80%	34	8.20%
	Strongly oppose	31	4.10%	12	3.40%	20	4.80%
	Don't know	41	5.40%	25	7.20%	16	3.80%
	Total	760	100.00%	346	100.00%	414	100.00%
A program where gas guzzlers pay a fee which is used to support the purchase of more fuel-efficient vehicles	Strongly support	105	13.80%	46	13.30%	58	14.10%
	Somewhat support	215	28.30%	92	26.70%	122	29.60%
	Neither support nor oppose	164	21.60%	78	22.60%	86	20.70%
	Somewhat oppose	98	12.90%	36	10.40%	62	15.00%
	Strongly oppose	146	19.30%	76	21.80%	71	17.10%
	Don't know	32	4.20%	18	5.20%	14	3.40%
	Total	760	100.00%	346	100.00%	414	100.00%
Using public funds to provide electric vehicle charging stations at City facilities	Strongly support	128	16.90%	44	12.60%	85	20.50%
	Somewhat support	213	28.00%	93	26.70%	120	29.10%
	Neither support nor oppose	198	26.00%	99	28.60%	99	23.80%
	Somewhat oppose	91	12.00%	40	11.50%	51	12.40%
	Strongly oppose	96	12.70%	54	15.50%	43	10.30%
	Don't know	34	4.40%	18	5.10%	16	3.80%
	Total	760	100.00%	346	100.00%	414	100.00%
	Strongly support	52	6.90%	24	6.90%	29	6.90%

Raising the current City gas tax from roughly 16 cents per gallon to 21 cents per gallon (a 5-cent increase) to reduce fossil fuel use	Somewhat support	109	14.30%	41	11.80%	68	16.40%
	Neither support nor oppose	177	23.30%	81	23.40%	96	23.30%
	Somewhat oppose	125	16.40%	62	18.00%	63	15.20%
	Strongly oppose	259	34.10%	111	32.20%	148	35.80%
	Don't know	37	4.90%	27	7.80%	10	2.40%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Raising the current City gas tax from roughly 16 cents per gallon to 41 cents per gallon (a 25-cent increase) to further reduce fossil fuel use	Strongly support	73	9.60%	16	4.50%	57	13.80%
	Somewhat support	57	7.50%	31	8.90%	26	6.40%
	Neither support nor oppose	131	17.20%	64	18.40%	67	16.30%
	Somewhat oppose	127	16.70%	60	17.50%	66	16.10%
	Strongly oppose	341	44.90%	158	45.80%	183	44.20%
	Don't know	31	4.10%	17	5.00%	14	3.30%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Allowing buildings to be built higher around rail stations to increase housing supply near public transit	Strongly support	96	12.70%	32	9.20%	64	15.50%
	Somewhat support	204	26.90%	85	24.60%	119	28.80%
	Neither support nor oppose	201	26.40%	94	27.10%	107	25.90%
	Somewhat oppose	106	14.00%	49	14.20%	57	13.80%
	Strongly oppose	130	17.20%	73	21.00%	58	14.00%
	Don't know	22	2.90%	14	3.90%	9	2.10%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Using public funds to support energy efficiency retrofits for large existing private buildings	Strongly support	93	12.30%	28	8.20%	65	15.70%
	Somewhat support	162	21.40%	78	22.60%	84	20.40%
	Neither support nor oppose	184	24.20%	86	25.00%	97	23.50%
	Somewhat oppose	132	17.40%	59	17.00%	73	17.70%
	Strongly oppose	161	21.20%	74	21.30%	87	21.00%
	Don't know	27	3.60%	20	5.80%	7	1.70%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

Under normal circumstances, do you pay for monthly parking?	Yes	168	22.10%	65	18.90%	103	24.80%
	No	561	73.80%	269	77.60%	293	70.60%
	I don't know or lease a vehicle	18	2.30%	7	1.90%	11	2.70%
	Don't know	7	0.90%	1	0.40%	5	1.30%
	Refused	7	0.90%	4	1.20%	3	0.60%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

		Where do you live?		
		Total	**Urban Core**	**Outside Urban Core**
Approximately how much is your normal monthly parking bill?	Mean	$140	$147	$136
	Median	$100	$100	$100
	Standard Deviation	169	158	176
At what monthly price would parking charges be so high that you would not use your car to get to your most important destination?	Mean	$190	$172	$206
	Median	$100	$100	$100
	Standard Deviation	754	528	901

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Do you own or lease an electric vehicle	Own	99	13.00%	27	7.80%	72	17.40%
	Lease	10	1.30%	7	2.00%	3	0.70%
	I do not own or lease an electric vehicle	629	82.80%	307	88.70%	323	77.90%
	Don't know	10	1.30%	1	0.30%	9	2.20%
	Refused	11	1.50%	4	1.20%	7	1.80%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
What are the reasons for not yet purchasing or leasing an electric vehicle?	Purchase cost	298	45.80%	115	36.90%	183	54.00%
	Operating cost	105	16.10%	38	12.00%	67	19.90%
	Range	93	14.30%	29	9.40%	64	18.90%
	Lack of public charging infrastructure	176	27.00%	63	20.10%	113	33.40%
	Lack of home charging infrastructure	260	39.90%	94	30.10%	166	49.00%
	Time it takes to charge electric vehicle	121	18.60%	56	17.90%	65	19.20%
	Availability of models on island	55	8.50%	12	3.90%	43	12.70%
	Engine power/speed	85	13.00%	33	10.60%	52	15.20%
	Size/build	48	7.30%	16	5.30%	31	9.30%
	Don't need a new vehicle	303	46.50%	157	50.30%	145	42.90%
	Other	63	9.60%	33	10.70%	29	8.60%
	None	58	9.00%	27	8.50%	32	9.30%
	Very likely	42	6.50%	26	8.40%	16	4.80%

How likely are you to purchase an electric vehicle in the next five years?	Somewhat likely	97	15.30%	48	15.60%	50	15.10%
	Somewhat unlikely	126	19.90%	58	18.90%	68	20.70%
	Very unlikely	242	38.10%	111	36.30%	131	39.80%
	Don't know	117	18.40%	53	17.50%	64	19.30%
	Refused	11	1.80%	10	3.40%	1	0.30%
	Total	**636**	**100.00%**	**306**	**100.00%**	**330**	**100.00%**
Where do you typically charge your electric vehicle?	Home	58	67.70%	17	62.00%	41	70.40%
	Public (for example, grocery store, school, etc.)	10	12.00%	1	4.90%	9	15.20%
	Work	3	3.80%	1	4.90%	2	3.30%
	Don't know	14	15.90%	7	26.70%	6	10.90%
	Refused	1	0.70%		1.50%		0.30%
	Total	**86**	**100.00%**	**27**	**100.00%**	**59**	**100.00%**
Where would you most like to see more electric vehicle charging infrastructure, if any?	In homes	196	25.80%	86	24.80%	110	26.70%
	In public places (for example, grocery store, school, etc.)	280	36.90%	126	36.50%	154	37.20%
	At work	78	10.20%	32	9.10%	46	11.10%
	None	43	5.60%	17	4.90%	26	6.20%
	Don't know	152	20.00%	76	22.10%	75	18.20%
	Refused	12	1.50%	9	2.60%	3	0.60%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Do you have solar photovoltaic on your dwelling?	Yes	252	33.10%	103	29.80%	149	35.90%
	No	441	58.00%	207	59.90%	234	56.50%
	Don't know	63	8.30%	34	9.90%	29	7.00%
	Refused	4	0.50%	1	0.40%	3	0.60%
	Total	760	100.00%	346	100.00%	414	100.00%

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Do you have solar water heating on your dwelling?	Yes	242	31.90%	98	28.40%	144	34.80%
	No	440	57.90%	208	60.00%	232	56.10%
	Don't know	69	9.10%	39	11.30%	30	7.30%
	Refused	9	1.10%	1	0.30%	8	1.90%

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Have you taken advantage of any energy efficiency rebates for appliances, electronics, and/or equipment from Hawaiʻi Energy?	Yes	276	36.40%	124	35.90%	152	36.70%
	No	267	35.20%	128	37.00%	139	33.70%
	I'm not aware of the program	159	20.90%	66	19.10%	93	22.30%
	Don't know	55	7.20%	27	7.90%	27	6.60%
	Refused	3	0.40%	0	0.00%	3	0.60%
	Total	760	100.00%	346	100.00%	414	100.00%

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
What do you see as positive outcomes of renewable energy development?	Job creation	337	44.40%	149	43.10%	188	45.40%
	Greenhouse gas emissions reduction	486	64.00%	231	66.90%	254	61.60%
	Stabilization of electricity rates	379	50.00%	173	50.00%	207	50.00%
	Other	23	3.00%	7	2.10%	16	3.80%
	Don't know	93	12.20%	37	10.70%	56	13.50%
	None	27	3.50%	10	2.90%	17	4.10%

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
What do you see as negative outcomes of renewable energy development?	Community impacts	171	22.50%	63	18.30%	108	26.00%
	Habitat or species impacts	214	28.20%	81	23.70%	132	31.90%
	Visual impacts	225	29.70%	90	26.20%	135	32.60%
	Potential electricity rate increases	291	38.40%	136	39.70%	154	37.30%
	Other	39	5.10%	7	2.10%	32	7.60%
	Don't know	162	21.40%	77	22.40%	85	20.60%
	None	97	12.80%	48	14.00%	49	11.90%

	Where do you live?		
	Total	Urban Core	Outside Urban Core

		Count	Column N %	Count	Column N %	Count	Column N %
There are greenhouse gas emissions associated with waste. Would you be willing to pay a fee based on the amount of trash you placed at the curb – so you pay less if you reduce the amount of waste you generate?	Yes	248	32.60%	113	32.70%	135	32.60%
	No	337	44.30%	149	43.00%	188	45.40%
	Don't know	162	21.40%	76	21.90%	87	20.90%
	Refused	13	1.70%	8	2.40%	5	1.10%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

		Where do you live?		
		Total	Urban Core	Outside Urban Core
What would you consider as a reasonable price to pay for your current weekly trash pick-up?	Mean	$38	$38	$37
	Median	$10	$10	$10
	Standard Deviation	115	125	106

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
How concerned are you about climate change?	Very concerned	337	44.40%	150	43.30%	187	45.30%
	Somewhat concerned	265	34.90%	132	38.10%	134	32.30%
	Somewhat not concerned	80	10.60%	31	8.80%	50	12.10%
	Not concerned at all	49	6.50%	24	6.80%	26	6.20%
	Don't know	20	2.60%	9	2.50%	11	2.70%
	Refused	8	1.00%	2	0.40%	6	1.50%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Where do you get the majority of information about climate change?	Neighbors and friends	31	4.10%	11	3.10%	20	4.80%
	Social media posts	121	15.90%	53	15.20%	68	16.40%
	Newspaper and TV News	408	53.70%	207	59.90%	201	48.60%
	Official government websites and announcements	99	13.10%	42	12.00%	58	13.90%
	Other	50	6.60%	15	4.30%	35	8.40%
	Don't know	39	5.10%	15	4.20%	24	5.80%
	Refused	13	1.70%	4	1.20%	9	2.10%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Who do you trust the most to give you accurate information about climate change?	Neighbors and friends	21	2.70%	5	1.40%	16	3.90%
	Social media posts	50	6.50%	14	4.10%	36	8.60%
	Newspaper and TV News	312	41.00%	160	46.20%	152	36.70%

		Count	Column N %	Count	Column N %	Count	Column N %
	Official government websites and announcements	192	25.30%	96	27.80%	96	23.20%
	Other	73	9.60%	21	6.00%	52	12.60%
	Don't know	94	12.30%	44	12.80%	50	12.00%
	Refused	19	2.40%	6	1.70%	13	3.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
Do you have more than one job?	Yes	159	20.90%	75	21.60%	84	20.30%
	No	592	77.90%	271	78.30%	322	77.70%
	Don't know	3	0.40%	1	0.20%	2	0.60%
	Refused	6	0.80%	0	0.00%	6	1.40%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
What is the zip code of your primary place of work?	85001	3	0.60%	0	0.00%	3	1.10%
	86813	0[a]	0.10%	0	0.10%	0	0.00%
	89512	0[a]	0.00%	0	0.00%	0	0.00%
	91343	0[a]	0.00%	0	0.00%	0	0.00%
	96701	20	4.00%	15	6.40%	5	2.00%
	96703	0[a]	0.00%	0	0.00%	0	0.10%
	96706	13	2.60%	0	0.00%	13	4.90%
	96707	6	1.20%	1	0.30%	5	2.10%

	96709	4	0.80%	0	0.00%	4	1.50%
	96712	1	0.20%	0	0.00%	1	0.40%
	96716	2	0.30%	0	0.00%	2	0.60%
	96717	0[a]	0.10%	0	0.00%	0	0.10%
	96731	4	0.80%	0	0.00%	4	1.40%
	96734	16	3.30%	3	1.50%	13	4.80%
	96740	0[a]	0.10%	0	0.20%	0	0.00%
	96744	34	6.90%	8	3.60%	26	9.80%
	96745	2	0.40%	0	0.00%	2	0.80%
	96750	3	0.50%	0	0.00%	3	1.00%
	96762	0[a]	0.10%	0	0.00%	0	0.20%
	96766	1	0.20%	0	0.00%	1	0.40%
	96778	0[a]	0.10%	0	0.00%	0	0.10%
	96781	5	1.00%	5	2.10%	0	0.00%
	96782	5	1.00%	5	2.00%	0	0.10%
	96786	8	1.50%	0	0.00%	8	2.90%
	96787	0[a]	0.00%	0	0.00%	0	0.00%
	96788	2	0.40%	0	0.00%	2	0.70%
	96789	53	10.60%	4	1.50%	49	18.60%
	96791	0[a]	0.00%	0	0.00%	0	0.10%
	96792	15	3.10%	0	0.00%	15	5.80%
	96795	3	0.50%	1	0.30%	2	0.80%
	96797	21	4.20%	8	3.40%	13	5.00%
	96801	3	0.50%	0	0.00%	3	1.00%
	96811	0[a]	0.00%	0	0.10%	0	0.00%
	96813	72	14.40%	34	14.70%	38	14.20%
	96814	31	6.20%	23	10.00%	8	2.90%
	96815	14	2.90%	12	5.10%	2	0.90%
	96816	28	5.60%	27	11.70%	1	0.30%

	96817	15	3.00%	11	4.80%	4	1.50%
	96818	11	2.30%	9	3.90%	2	0.90%
	96819	29	5.80%	10	4.20%	19	7.20%
	96820	4	0.80%	4	1.70%	0	0.00%
	96821	1	0.20%	1	0.30%	0	0.00%
	96822	26	5.20%	18	7.80%	8	2.90%
	96824	1	0.30%	1	0.50%	0	0.00%
	96825	17	3.30%	17	7.10%	0	0.00%
	96826	11	2.30%	10	4.20%	2	0.60%
	96850	0[a]	0.00%	0	0.10%	0	0.00%
	96853	3	0.60%	3	1.10%	0	0.10%
	96857	1	0.20%	0	0.00%	1	0.40%
	96858	0[a]	0.10%	0	0.10%	0	0.10%
	96859	0[a]	0.10%	0	0.10%	0	0.10%
	96860	3	0.70%	2	1.00%	1	0.40%
	96861	1	0.30%	1	0.30%	0	0.20%
	96872	0[a]	0.00%	0	0.00%	0	0.10%
	97692	2	0.50%	0	0.00%	2	0.90%
	97808	1	0.10%	0	0.00%	1	0.20%
	Total	499	100.00%	233	100.00%	266	100.00%

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
What type of home do you live in?	Single-family house	436	57.40%	172	49.70%	264	63.70%
	Townhouse	71	9.40%	13	3.90%	58	13.90%
	Condominium	97	12.80%	63	18.30%	34	8.20%
	Duplex/multiplex	43	5.70%	23	6.70%	20	4.80%

	Apartment	89	11.70%	64	18.50%	25	6.00%
	Co-op	9	1.20%	1	0.30%	8	1.90%
	Other (specify)	10	1.30%	7	2.10%	2	0.60%
	Don't know	0[a]	0.10%	0	0.10%	0	0.00%
	Refused	5	0.60%	1	0.40%	3	0.80%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
What is the last grade in school that you completed?	Less than high school	17	2.20%	4	1.30%	12	3.00%
	High school graduate or GED	255	33.60%	83	24.10%	172	41.50%
	Business/trade school	36	4.80%	12	3.50%	24	5.80%
	Some college	212	27.90%	110	31.80%	102	24.60%
	College graduate	160	21.10%	90	26.10%	70	16.80%
	Post graduate	80	10.50%	46	13.20%	34	8.20%
	Don't know	0	0.00%	0	0.00%	0	0.00%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Which of the following categories includes your total annual household income, before taxes, for 2019?	Less than $35,000	142	18.60%	60	17.40%	82	19.70%
	$35,000 but less than $50,000	73	9.60%	45	13.00%	28	6.80%
	$50,000 but less than $75,000	122	16.10%	57	16.60%	65	15.70%
	$75,000 but less than $100,000	98	12.80%	65	18.80%	32	7.80%
	$100,000 but less than $150,000	157	20.60%	74	21.30%	83	20.10%
	$150,000 but less than $200,000	82	10.80%	16	4.50%	67	16.10%
	$200,000 but less than $300,000	60	7.90%	24	6.80%	36	8.80%
	$300,000 but less than $400,000	10	1.30%	5	1.40%	5	1.20%
	$400,000 or more	17	2.20%	1	0.20%	16	3.80%
	Don’t know	0	0.00%	0	0.00%	0	0.00%

	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
With which ethnicity do you most identify (select one only)?	White/Caucasian	155	20.50%	59	17.20%	96	23.20%
	Hawaiian/Part-Hawaiian	150	19.80%	50	14.50%	100	24.10%
	Chinese	39	5.20%	24	7.00%	15	3.60%
	Filipino	119	15.60%	41	11.80%	78	18.80%
	Japanese	100	13.10%	61	17.50%	39	9.40%
	Korean'	17	2.30%	13	3.80%	4	1.00%
	Other Asian	46	6.00%	35	10.20%	10	2.50%
	Other Pacific Islander	34	4.50%	16	4.60%	19	4.50%
	Black/African American	20	2.60%	15	4.50%	4	1.00%
	Other (please specify)	8	1.10%	4	1.20%	4	0.90%
	Mixed (Not Native Hawaiian)	71	9.40%	27	7.70%	44	10.70%
	Don't know	0	0.00%	0	0.00%	0	0.00%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
To which gender do you identify with?	Male	382	50.30%	173	50.00%	210	50.60%
	Female	378	49.70%	173	50.00%	204	49.40%
	Gender non-conforming	0	0.00%	0	0.00%	0	0.00%
	Refused	0	0.00%	0	0.00%	0	0.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Age	18 to 19	21	2.80%	11	3.30%	10	2.50%
	20 to 29	142	18.70%	50	14.60%	92	22.20%
	30 to 39	146	19.30%	67	19.40%	79	19.20%

	40 to 49	122	16.10%	45	13.10%	77	18.60%
	50 to 59	105	13.80%	40	11.60%	65	15.70%
	60 to 69	127	16.80%	78	22.50%	50	12.00%
	70 to 79	68	9.00%	32	9.20%	37	8.80%
	80 and above	27	3.50%	22	6.40%	5	1.10%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Household Size	1	92	12.10%	58	16.70%	34	8.30%
	2	226	29.70%	116	33.60%	110	26.50%
	3	179	23.60%	73	21.10%	106	25.70%
	4	114	15.00%	58	16.70%	57	13.70%
	5 or more	148	19.50%	41	12.00%	107	25.90%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**
Children in the household	YES, children in HH	347	45.70%	140	40.50%	207	50.00%
	NO children in HH	413	54.30%	206	59.50%	207	50.00%
	Total	**760**	**100.00%**	**346**	**100.00%**	**414**	**100.00%**

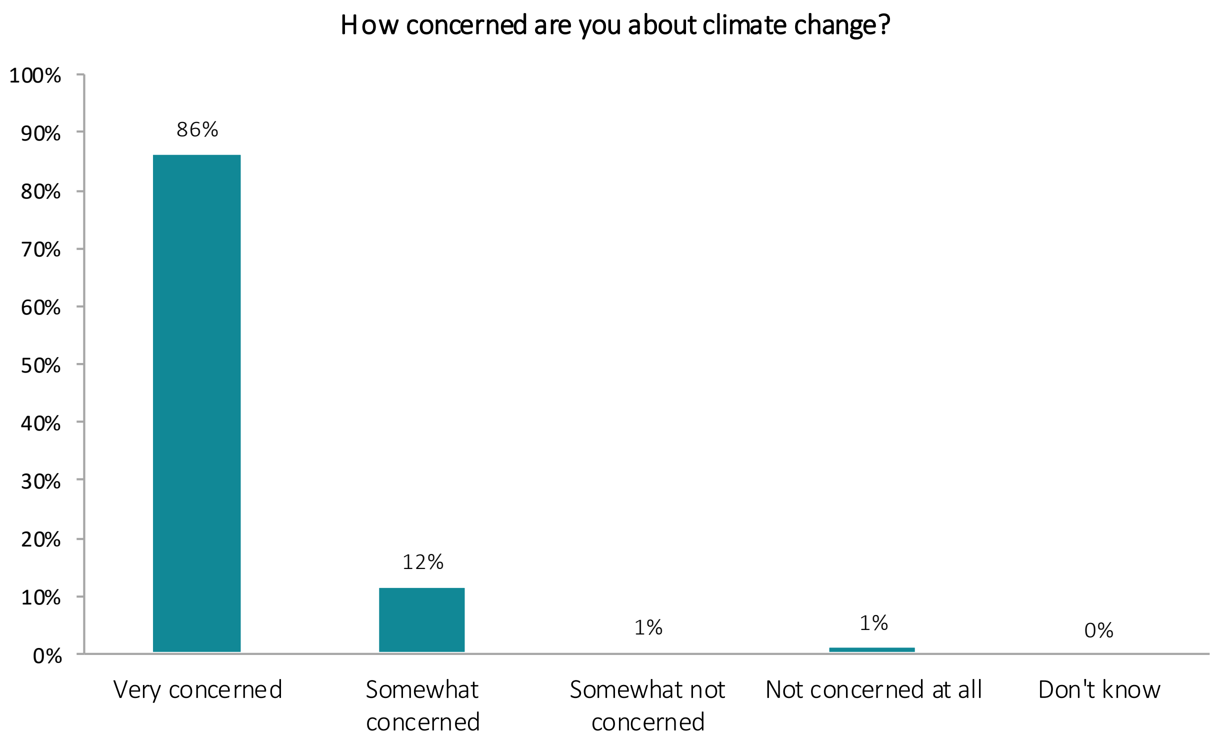
		Where do you live?					
		Total		Urban Core		Outside Urban Core	
		Count	Column N %	Count	Column N %	Count	Column N %
What is the zip code where you live?	96701	39	5.10%	39	11.20%	0	0.00%
	96706	80	10.50%	0	0.00%	80	19.30%
	96707	27	3.50%	0	0.00%	27	6.40%
	96709	0[a]	0.00%	0	0.00%	0	0.00%
	96712	0[a]	0.00%	0	0.00%	0	0.00%
	96717	5	0.70%	0	0.00%	5	1.20%
	96730	2	0.30%	0	0.00%	2	0.50%
	96731	1	0.10%	0	0.00%	1	0.20%
	96734	34	4.50%	0	0.00%	34	8.30%
	96744	60	7.90%	0	0.00%	60	14.50%
	96759	0	0.00%	0	0.00%	0	0.00%
	96762	0[a]	0.00%	0	0.00%	0	0.10%
	96782	31	4.10%	31	9.00%	0	0.00%
	96786	20	2.60%	0	0.00%	20	4.80%
	96789	46	6.10%	0	0.00%	46	11.20%
	96791	5	0.60%	0	0.00%	5	1.20%
	96792	42	5.60%	0	0.00%	42	10.20%
	96795	5	0.60%	0	0.00%	5	1.20%
	96797	67	8.80%	0	0.00%	67	16.20%
	96801	3	0.40%	0	0.00%	3	0.80%
	96802	0	0.00%	0	0.00%	0	0.00%
	96803	0	0.00%	0	0.00%	0	0.00%
	96804	0	0.00%	0	0.00%	0	0.00%
	96805	0[a]	0.00%	0	0.00%	0	0.10%
	96806	0	0.00%	0	0.00%	0	0.00%

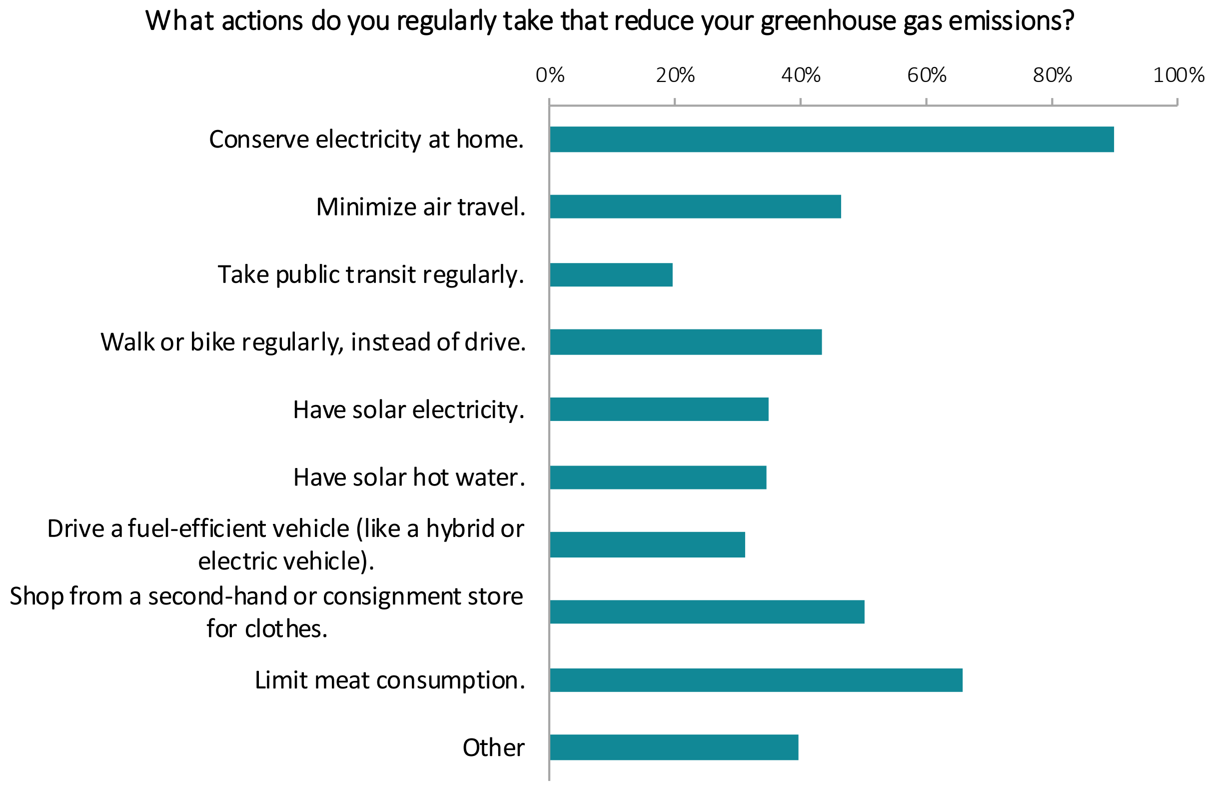
	96807	1	0.10%	0	0.00%	1	0.10%
	96808	0	0.00%	0	0.00%	0	0.00%
	96809	0[a]	0.00%	0	0.00%	0	0.00%
	96810	0	0.00%	0	0.00%	0	0.00%
	96811	0	0.00%	0	0.00%	0	0.00%
	96812	0[a]	0.00%	0	0.00%	0	0.10%
	96813	13	1.70%	0	0.00%	13	3.20%
	96814	9	1.20%	9	2.60%	0	0.00%
	96815	25	3.30%	25	7.20%	0	0.00%
	96816	51	6.70%	51	14.80%	0	0.00%
	96817	64	8.40%	64	18.40%	0	0.00%
	96818	31	4.10%	31	9.10%	0	0.00%
	96819	27	3.60%	27	7.80%	0	0.00%
	96820	1	0.10%	0	0.00%	1	0.20%
	96821	2	0.20%	2	0.50%	0	0.00%
	96822	24	3.10%	24	6.90%	0	0.00%
	96823	0	0.00%	0	0.00%	0	0.00%
	96824	0	0.00%	0	0.00%	0	0.00%
	96825	37	4.90%	37	10.80%	0	0.00%
	96826	1	0.10%	0	0.00%	1	0.20%
	96828	0	0.00%	0	0.00%	0	0.00%
	96830	0	0.00%	0	0.00%	0	0.00%
	96836	0	0.00%	0	0.00%	0	0.00%
	96837	0	0.00%	0	0.00%	0	0.00%
	96838	0	0.00%	0	0.00%	0	0.00%
	96839	0	0.00%	0	0.00%	0	0.00%
	96840	0	0.00%	0	0.00%	0	0.00%
	96841	0	0.00%	0	0.00%	0	0.00%
	96843	0	0.00%	0	0.00%	0	0.00%

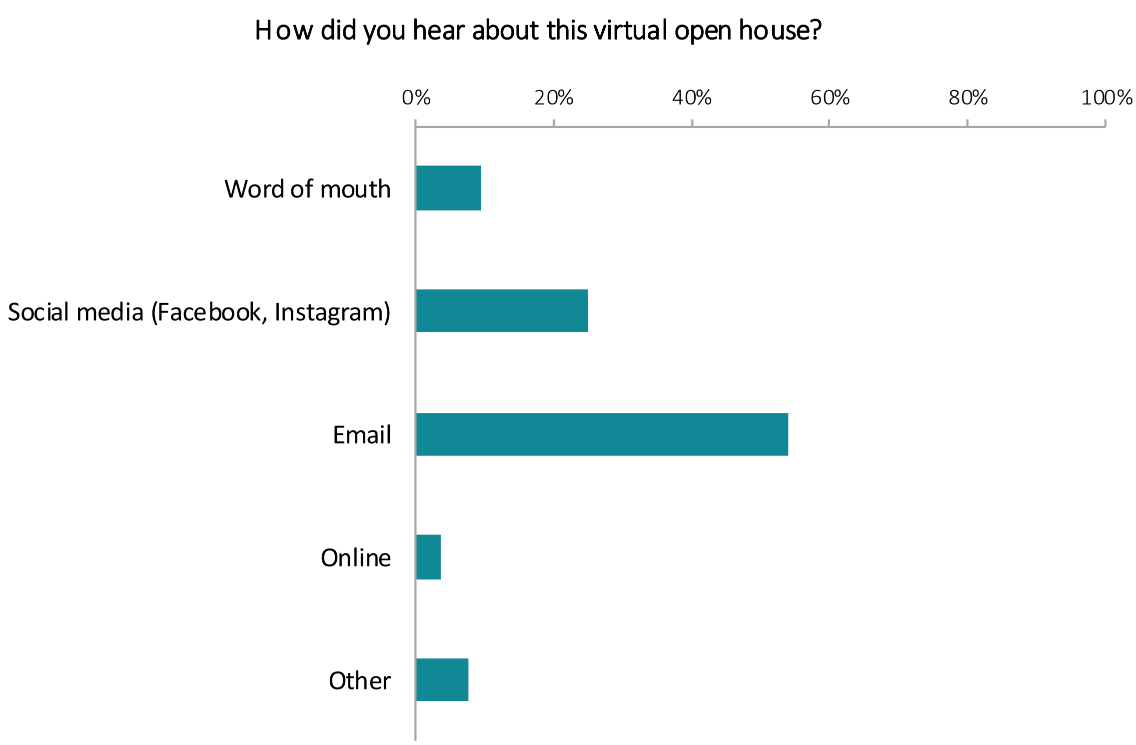
	96844	0	0.00%	0	0.00%	0	0.00%
	96846	0	0.00%	0	0.00%	0	0.00%
	96847	0	0.00%	0	0.00%	0	0.00%
	96848	0	0.00%	0	0.00%	0	0.00%
	96849	0	0.00%	0	0.00%	0	0.00%
	96850	0	0.00%	0	0.00%	0	0.00%
	96853	5	0.70%	5	1.60%	0	0.00%
	96854	0	0.00%	0	0.00%	0	0.00%
	96857	0	0.00%	0	0.00%	0	0.00%
	96858	0	0.00%	0	0.00%	0	0.00%
	96859	0	0.00%	0	0.00%	0	0.00%
	96860	0	0.00%	0	0.00%	0	0.00%
	96861	0	0.00%	0	0.00%	0	0.00%
	96863	0	0.00%	0	0.00%	0	0.00%
	96898	0	0.00%	0	0.00%	0	0.00%
	Total	760	100.00%	346	100.00%	414	100.00%

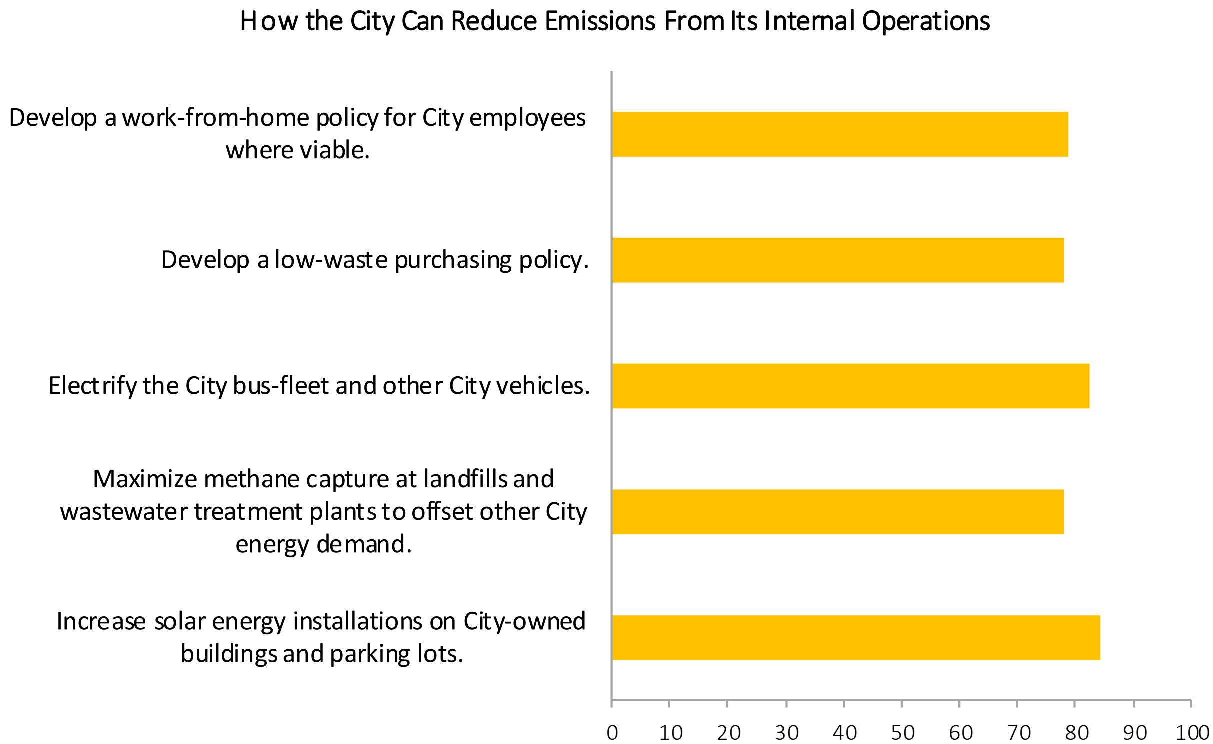
VIRTUAL OPEN HOUSE

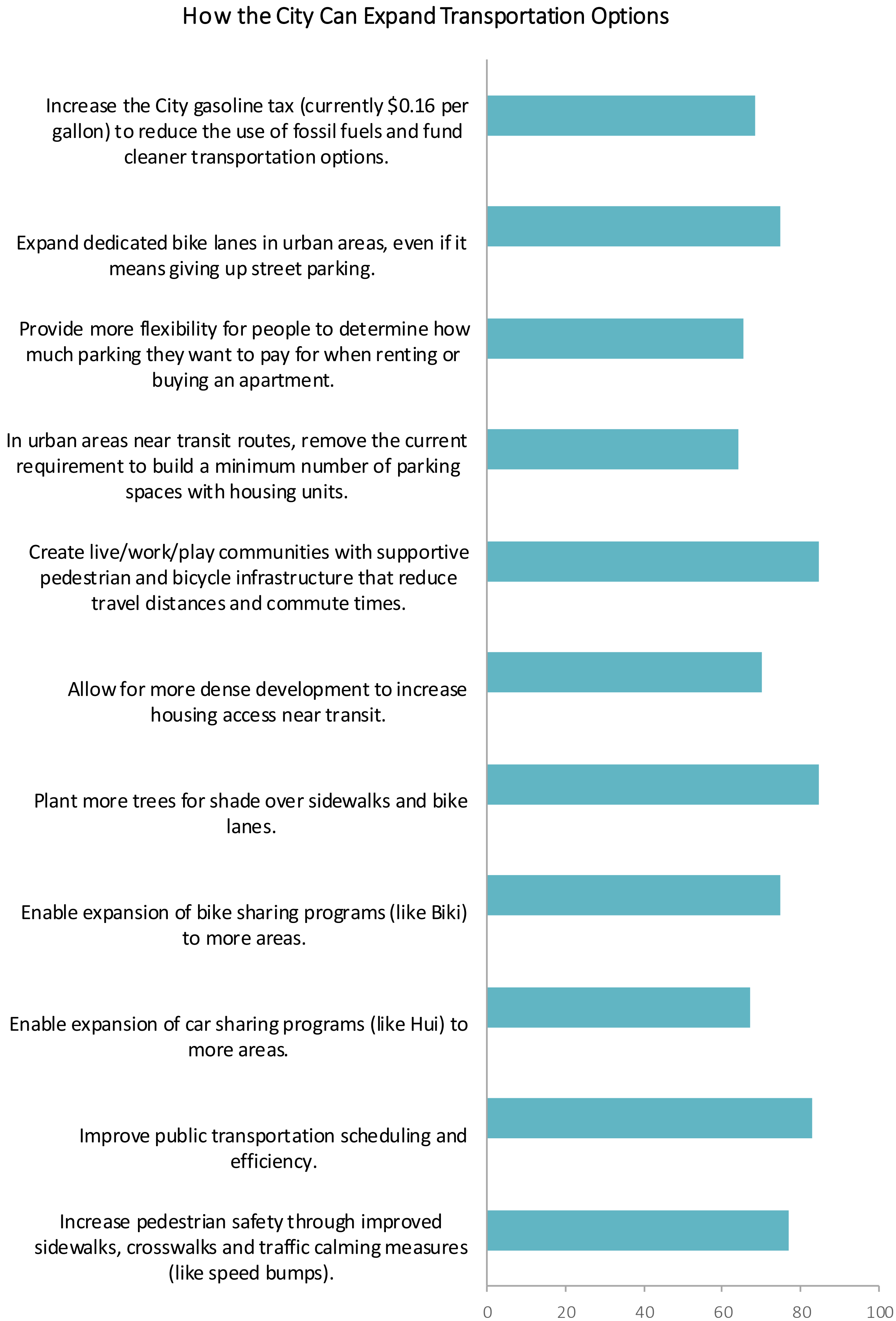
Between May 14 to June 22, 2020, in lieu of having in-person community workshops, CCSR sought public input via a virtual open house. CCSR reached out to their partner networks and social media to get the word out. A total of 614 Oʻahu residents participated. The survey consisted of series of questions that asked participants to help prioritize actions by rating its importance from 0 – 100, followed by open-ended questions that asked for additional comments and ideas. The figures below present the average ratings; "I Don't Know" responses are excluded.



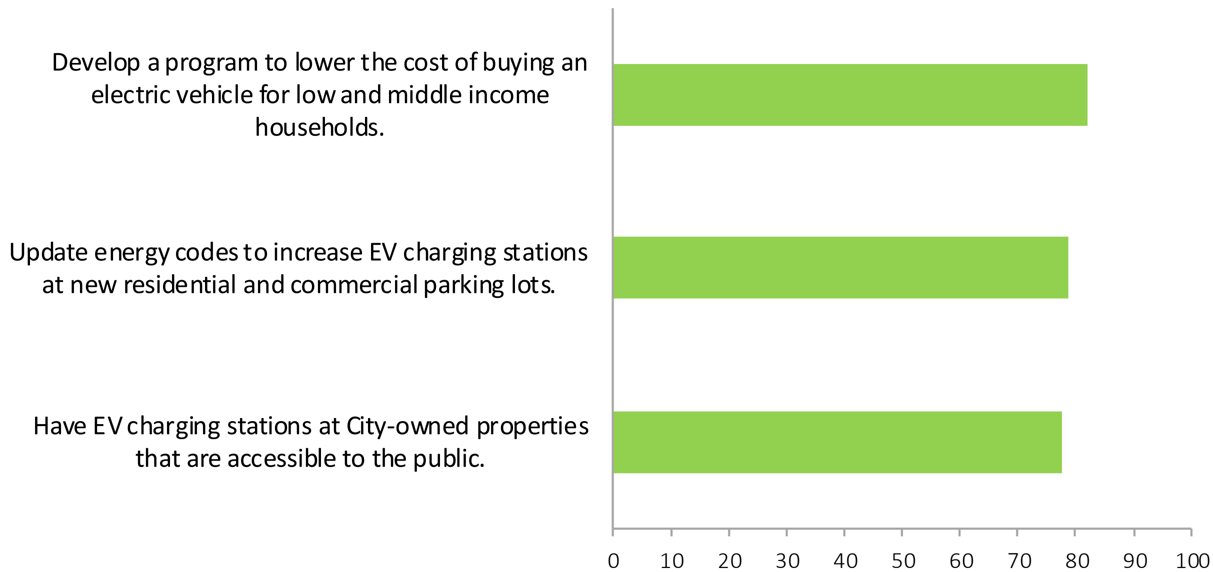

What actions do you regularly take that reduce your greenhouse gas emissions?
0%
20%
40%
60%
80%
100%
Conserve electricity at home.
Minimize air travel.
Take public transit regularly.
Walk or bike regularly, instead of drive.
Have solar electricity.
Have solar hot water.
Drive a fuel-efficient vehicle (like a hybrid or electric vehicle).
Shop from a second-hand or consignment store for clothes.
Limit meat consumption.
Other


How did you hear about this virtual open house?
0%
20%
40%
60%
80%
100%
Word of mouth
Social media (Facebook, Instagram)
Email
Online
Other

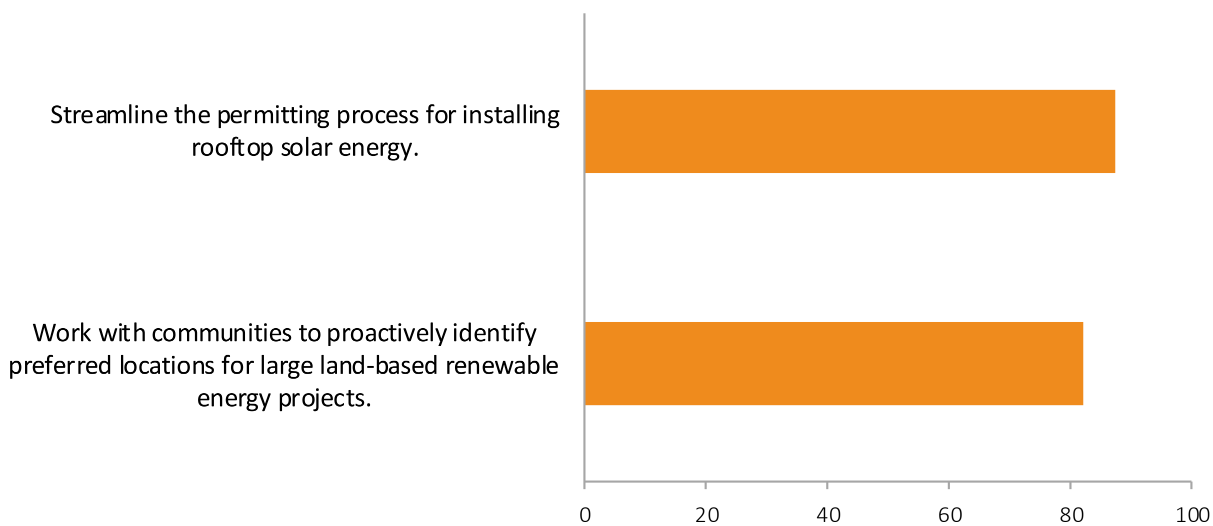

How the City Can Reduce Emissions From Its Internal Operations
Develop a work-from-home policy for City employees where viable.
Develop a low-waste purchasing policy.
Electrify the City bus-fleet and other City vehicles.
Maximize methane capture at landfills and wastewater treatment plants to offset other City energy demand.
Increase solar energy installations on City-owned buildings and parking lots.
0
10
20
30
40
50
60
70
80
90
100

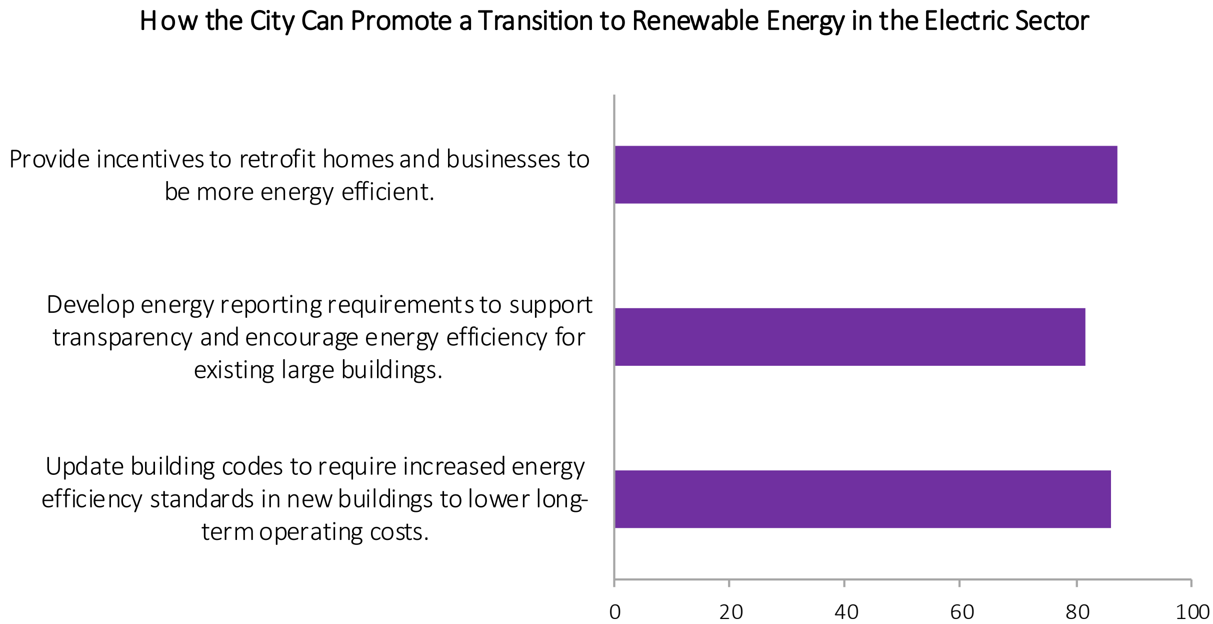

How the City Can Expand Transportation Options
Increase the City gasoline tax (currently $0.16 per gallon) to reduce the use of fossil fuels and fund cleaner transportation options.
Expand dedicated bike lanes in urban areas, even if it means giving up street parking.
Provide more flexibility for people to determine how much parking they want to pay for when renting or buying an apartment.
In urban areas near transit routes, remove the current requirement to build a minimum number of parking spaces with housing units.
Create live/work/play communities with supportive pedestrian and bicycle infrastructure that reduce travel distances and commute times.
Allow for more dense development to increase housing access near transit.
Plant more trees for shade over sidewalks and bike lanes.
Enable expansion of bike sharing programs (like Biki) to more areas.
Enable expansion of car sharing programs (like Hui) to more areas.
Improve public transportation scheduling and efficiency.
Increase pedestrian safety through improved sidewalks, crosswalks and traffic calming measures (like speed bumps).
0
20
40
60
80
100

How the City Can Promote EVs as a Viable Transportation Option

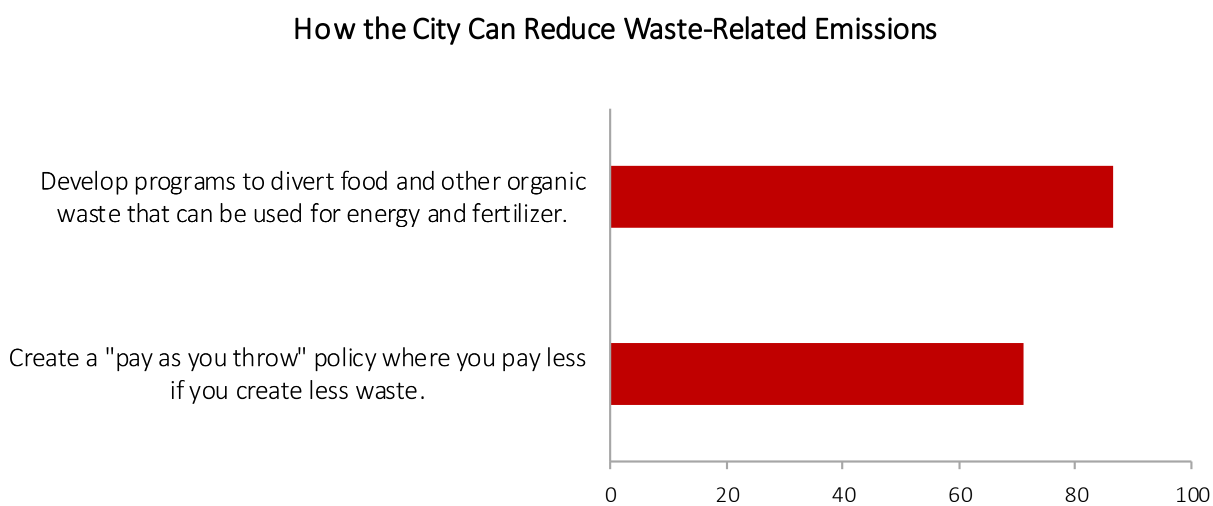


How the City Can Promote a Transition to Renewable Energy in the Electric Sector





How the City Can Promote a Transition to Renewable Energy in the Electric Sector
Provide incentives to retrofit homes and businesses to be more energy efficient.
Develop energy reporting requirements to support transparency and encourage energy efficiency for existing large buildings.
Update building codes to require increased energy efficiency standards in new buildings to lower long-term operating costs.
0
20
40
60
80
100



How the City Can Reduce Waste-Related Emissions
Develop programs to divert food and other organic waste that can be used for energy and fertilizer.
Create a "pay as you throw" policy where you pay less if you create less waste.
0
20
40
60
80
100

PUBLIC MEETING SERIES

Between September, 2018 and January, 2019, CCSR held a series of community engagement meetings in partnership with Honolulu City Councilmembers, Hawaiʻi Pacific University, University of Hawaiʻi at Manoa, and the Chamber of Commerce Hawaiʻi. A total of 672 people participated. These community meetings discussed climate change impacts and sought citizen input about how to reduce GHG emissions through a "game" designed to foster conversation. Participants chose from a pool of actions (tiles) and determined, based on the number of tiles available in each of the years (2025, 2035, and 2045) related to reductions targets, where emission reductions could come from. Actions included:

- Eliminate Coal
- Rooftop Solar
- Large Solar Farms
- On-shore Wind
- Off-shore Wind
- Biofuel Electricity
- Building Energy Efficiency
- Walk & Bike
- Bus & Rail
- Electric Cars
- Renewable Fuel Cars
- Electric & Biogas Cars (C)
- Aviation Renewable. Fuel
- Carbon Offsets
- On-site Renewable Energy
- Zero Waste
- Marine/Off-Road Renewable Fuel

APPENDIX IV. RELEVANT NATIONAL AND STATE GHG POLICIES

FEDERAL POLICIES

<u>*Buildings/Other*</u>

Business Energy Investment Tax Credit (ITC)

Solar, fuel cells, and small wind projects that start construction prior to December 31, 2020 are eligible for a 26% tax credit; for geothermal, microturbines, and CHP, the tax credit is 10%. The business ITC continues to phase out through 2022, at which point the tax credit (10%) only applies to solar and geothermal electric technologies (DSIRE, 2020a).

Business Renewable Electricity Production Tax Credit (PTC)

The renewable electricity PTC is an inflation-adjusted per-kilowatt-hour (kWh) tax credit for electricity generated by qualified energy. The credit applies for 10 years after the date the facility is placed in service for all facilities placed in service after August 8, 2005. Wind facilities that start construction by December 31, 2019 are eligible for the PTC, though it phases out by 20% each year beginning in 2017. The tax credit expired for other technologies commencing construction after December 31, 2016 (DSIRE, 2020b).

Residential Renewable Energy Tax Credit

A taxpayer may claim a credit of 26% for qualified expenditures (labor, assembly/installation, piping, wiring) for a solar, fuel-cell, small wind, and geothermal heat pumps placed in service before December 31, 2020. The personal tax credit falls to 22% if placed in service before December 31, 2021. The tax credit is allowed to rollover to the next taxable year if the tax credit exceeds tax liability. The maximum allowable credit, equipment requirements, and other details vary by technology (DSIRE, 2020c). Energy storage is also eligible for the tax credit if installed with a renewable energy system and if the battery is charged by the renewable energy system for more than 75% of the time (NREL, 2018).

Low Income Home Energy Assistance Program (LIHEAP)

LIHEAP provides resources to assist families with energy costs. States, federally recognized tribes and tribal organizations, and territories may apply for direct LIHEAP funding. For households to then receive assistance, income must be no more than the greater of 150% of the Federal Poverty Guidelines (FPG) or 60% of the State Median Income, and no less than 100% of the FPG (Office of Community Services, 2020).

Appliance Standards

The U.S. Department of Energy is mandated to set minimum efficiency standards for appliances, taking technology and cost into consideration. There are more than 60 types of appliances and equipment such as clothes washers, dishwashers, refrigerators/freezers, dehumidifiers, ceiling fans, water heaters, lighting, furnaces, boilers, heat pumps, air conditioners, and motors (DSIRE, 2020d; U.S. DOE, 2017).

Modified Accelerated Cost-Recovery System (MACRS)

Businesses may recover investments in certain property through depreciation deductions. The MACRS establishes a set of class lives for various types of property, ranging from three to 50 years, over which the property may be depreciated. Such property currently includes: solar-electric and solar-thermal technologies; fuel cells and microturbines; geothermal electric direct-use geothermal and geothermal heat pumps; small wind (100 kW or less); and combined heat and power (CHP).Under the Tax Cuts and Job Acts of 2017, bonus depreciation increased to 100% for qualified property acquired and placed in service after September 27, 2017 and before January 1, 2023 (DSIRE, 2020e).

Transportation

Corporate Average Fuel Economy (CAFE) Standards

Enacted in 1975, CAFE standards were designed to reduce fuel consumption by increasing the efficiency of vehicles over time. Beginning in 1978 and each year thereafter, automakers had to meet fleet-wide averages for its car and light truck fleet. These fuel economy standards developed by the NHTSA were harmonized in 2012 with GHG emissions standards set by the EPA (Federal Register, 2010 and 2012). The CAFE standards allow for trading credits across manufacturers over the years.

Safer Affordable Fuel Efficient (SAFE) Rule

In December 2019, part one of the SAFE Rule withdrew the waiver previously provided to California for their state greenhouse gas and zero emission vehicle programs under Section 209 of the Clean Air Act (Federal Register, 2019). In April 2020, the EPA and NHTSA amended carbon dioxide and fuel economy standards for model years 2021 and set new standards for model years 2022 – 2026 (Federal Register, 2020a). Compared to previous standards set in 2012 which would have required roughly 5% annual increases, the SAFE rule increases standards by 1.5% each year (U.S. EPA, 2020a).

Renewable Fuel Standard (RFS)

Created under the Energy Policy Act of 2005 and effective in 2007, the RFS requires a certain volume of renewable fuel (categorized as biomass-based diesel, cellulosic biofuel, advanced biofuel, and total renewable fuel) to replace or reduce the quantity of petroleum-based transportation fuel, heating oil and jet fuel. The standard increased and expanded under the Energy Independence and Security Act (EISA) of 2007. By 2022, 36 billion gallons of renewable fuel must be blended into transportation fuels each year (U.S. EPA, 2017). Entities that produce gasoline (i.e. refiners, importers, and blenders) for consumption in the U.S. are obligated to participate in the RFS program. Renewable identification numbers (RINs) are used to track compliance (AFDC, 2020).

Plug-In Electric Drive Vehicle Credit

New vehicles purchased or leased after December 31, 2009 are eligible for a tax credit ranging from $2,500 to $7,500, based on battery capacity. The credit phases out over one year once each manufacturer has sold 200,000 vehicles for use in the United States (50% in the first two quarters and 25% in the third or fourth quarter) (IRS, 2020).

Waste

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Municipal Solid Waste (MSW) Landfills

The NESHAP for MSW landfills was promulgated in 2003 to regulated hazardous air pollutants (HAP) from the formation of landfill gas (LFG) emissions which contain methane, carbon dioxide, and more than 100 different non-methane organic compounds (NMOC). It requires that MSW landfills that exceed the size and emissions thresholds to install and operate a landfill gas collection and control system (GCCS) (Federal Register, 2020b; U.S. EPA, 2020b). State Policies[9]

Climate Change

Hawaii Greenhouse Gas Law (Act 234, 2007)

Establishes as state policy statewide greenhouse gas emissions limits at or below the statewide greenhouse gas emissions levels in 1990 to be achieved by January 1, 2020. Establishes greenhouse gas emissions reduction task force to prepare a work plan and regulatory scheme to achieve the statewide greenhouse gas emissions limits.

Environmental response, energy, and food security tax - "Barrel Tax" (Act 185, 2015; originally Act 73, 2010)

Extended the $1.05 per barrel tax on petroleum products (excludes aviation fuel) through 2030. Also includes tax of 19 cents/mmbtu on non-petroleum fossil fuels (e.g. natural gas). The monies are deposited into the following funds: 5 cents to the environmental response revolving fund; 15 cents to the energy security special fund, 10 cents to the energy systems development special fund, 15 cents to the agricultural development and food security fund, and the remaining 60 cents to the general fund.

Paris Agreement (Act 32, 2017)

Commits the State to reduce greenhouse gas emissions statewide in alignment with the some of the principles and goals adopted in the Paris Agreement, including limiting global average temperature increase to 1.5 degree Celsius above pre-industrial levels

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[9] For more information and links to the Hawaii Revised Statutes and Acts, see HEPF's Act Database 1999 – 2019: http://manoa.hawaii.edu/hepf/?smd_process_download=1&download_id=2237

Carbon Net-Negative Target (Act 15, 2018)

Established statewide target to sequester more atmospheric carbon and greenhouse gases than emitted by no later than 2045.

Buildings/Other

Net Energy Metering (Act 272, 2001)

Contract or tariff for the supply of electricity generated from residential and commercial customer-sited systems to offset the electricity consumed from the grid over a monthly billing period

Solar Energy Facility in Agricultural District (Act 31, 2008)

Makes solar energy facilities a permitted use in the agricultural district on class D or E land.

Residential Solar Water Mandate (Act 204, 2008)

From January 1, 2010 on, requires new single family dwellings to include a solar water system for a building permit to be issued, but allows the Hawaii State Energy Office to grant variances (based on poor solar resources, cost-prohibitive, substituted with another renewable energy system for heating water, or installation of a gas-tankless instantaneous water heater).

Building Energy Efficiency Revolving Loan Fund (Act 155, 2009)

Establishes building energy efficiency revolving loan fund, where moneys shall be used to provide low or no interest loans or other authorized financial assistance to eligible public, private, and nonprofit borrowers to make energy efficiency improvements.

Energy Efficiency Portfolio Standard (Act 155, 2009)

4,300 gigawatt-hours of electricity savings by 2030 (with renewable displacement and offset technologies such as solar water heating to count towards this standard beginning in 2015)

Renewable Energy Income Tax Credit (Act 97, 2004)

Non-refundable 35% income tax credit based on the total cost of solar systems (20% for wind systems), subject to a cap based on entity level. For single-family residential properties, the income tax credit for solar water systems is $2,250 per system and $5,000 per system for solar photovoltaic. The tax credit is refundable for individuals with less than an adjusted gross income of less than $20,000 ($40,000 if married filing jointly).

Preferential Rates for Agricultural Activities (Act 185, 2009)

Authorizes preferential rates for the purchase of renewable energy produced in conjunction with agricultural activities.

Renewable Portfolio Standards (Act 97, 2015; originally Act 272, 2001 with amendments in Act 10, 2011; Act 155, 2009; Act 95, 2004)

100% net electricity sales to come from renewable energy by 2045, with interim targets of 70% by 2040; 40% by 2030; and 30% by 2020.

PUC Cost Reasonableness Determinations (Act 109, 2011)

Allows the Public Utilities Commission (PUC) to consider the benefits of capital improvements for renewable energy and energy efficiency despite the short-term expense. Requires the PUC to consider the need to reduce the State's reliance on fossil fuels.

Renewable Energy Subdivision Requirements Exemption (Act 201, 2011)

Extends the repeal date of Act 173 (2009), which exempts renewable energy projects from subdivision requirements on State agricultural or conservation lands from July 1, 2013, to July 1, 2020. Clarifies that wind energy projects are included in the exemption. Makes conforming amendments to section 201N-13, HRS.

Green Infrastructure Loan Program (Act 211, 2013)

Establishes a regulatory financing structure that authorizes the PUC and DBEDT to provide low-cost loans for green infrastructure equipment to achieve measurable cost savings and Hawaii's clean energy goals. Appropriates funds. Requires a report by DBEDT to the legislature. Requires a report by the Hawaii green infrastructure authority to the Legislature.

Renewable Fuels Production Tax Credit (Act 202, 2016)

Establishes a 5-year renewable fuels production tax credit applicable to taxable years beginning after 12/31/2016; 20 cents per 76,000 British thermal units for production of at least 15 billion British thermal units of renewable fuels per year, capped at $3M per taxable year. Repeals the ethanol facility tax credit.

Building Codes (Act 141, 2017)

Requires the State Building Code Council to adopt codes or standards within two years of official publication, otherwise automatic adoption into Hawaii State Building Code will occur until such adoption is effectuated. Deletes requirement for Council adoption of new model building codes within 18 months of official publication date. Authorizes Council to receive private funds for code adoption. Appropriates funds to Council.

Hawaii Ratepayer Protection Act (Act 5, 2018)

On or before January 1, 2020, requires the PUC to establish performance incentive and penalty mechanisms that directly tie electric utility revenues to the utility's achievement on performance metrics. Exempts member-owned cooperative electric utilities.

Green Energy Market Securitization Energy Efficiency Appropriation (Act 121, 2018)

Creates a revolving line of credit sub-fund within the Hawaii green infrastructure special fund for a state agency to finance cost-effective energy-efficiency measures.

Microgrid Services Tariff (Act 200, 2018)

Directs the Public Utilities Commission to establish a microgrid services tariff to encourage and facilitate the development and use of energy resilient microgrids. Takes effect on 7/1/2018.

Appliance Standard (Act 141, 2019)

Establishes minimum appliance efficiency standards for certain products sold or installed in the State that are substantially equivalent to existing appliance efficiency standards established in California and by the federal government. Effective January 1, 2021, no new computers and computer monitors, faucets, high color rendering index fluorescent lamps, showerheads, and spray sprinkler bodies may be sold or offered for sale, lease, or rent in the State.

Transportation

Electric Vehicle Parking and HOV Lane Exemptions (Act 290, 1997)

Exempts electric vehicles from parking fees including those collected through parking meters and those charged by any state or county authority. Limits parking time to two and one-half hours for metered parking and parking fees assessed in increments longer than a single twenty-four hour day, including weekly, monthly, or annual parking permits. Exempts electric vehicle from high occupancy vehicle lane restrictions. Sunsets on June 30, 2020.

Alternative Fuel Vehicle Fleet Procurement (Act 216, 2005)

Requires state agencies to procure alternative fuel vehicles when purchasing motor vehicle fleets. Permits agencies to offset purchasing requirements by demonstrating percentage improvements in overall light duty vehicle fleet mileage economy.

State Highway Fund Bikeways Allocation (Act 166, 2006)

Earmarks a two percent of federally allocated moneys from the state highway fund for bikeways.

Alternate Fuel Standard (Act 175, 2010; previously Act 240, 2006)

Calls for the State to facilitate the development of alternate fuels and support the attainment of a statewide alternate fuel standard for highway fuel demand: 10% 2010, 15% by 2015, 20% by 2020, and 30% by 2030.

State Highway Fund Use for Bikeways (Act 286, 2007)

Clarifies use of moneys in state highway fund for bicycle lanes, bicycle paths, bicycle routes, and bikeways. Requires department of transportation to involve representatives of the bicycle community in decision making process.

Electric Vehicle Parking Requirement (Act 89, 2012; originally Act 156, 2009)

Clarifies the electric vehicle parking requirement such that places of public accommodation with at least one hundred parking spaces available for use by the general public must have at least one parking space exclusively for electric vehicles and be equipped with a Level 2 charging station anywhere in the parking lot or structure. Prohibits parking spaces designated for electric vehicles from displacing or reducing accessible stalls required by the Americans with Disabilities Act Accessibility Guidelines. Changes warning on any person who parks a non-electric vehicle in a space designated for electric vehicles to begin on January 1, 2013 (with penalties between $50 to 100 beginning July 1, 2013 for parking a nonelectric vehicle in reserved spaces).

Placement of Electric Vehicle Charging System (Act 186, 2010)

Prohibits prevention of installing an electric vehicle charging station on or near the parking stall of any multi-family residence or townhouse.

Car-Sharing Vehicle Surcharge Tax (Act 110, 2014)

Establishes car-sharing vehicle surcharge tax of 25 cents per half-hour, or any portion of a half-hour that a rental motor vehicle is rented or leased by a car-sharing organization. For each rental of six hours or more, the tax shall be assessed in a manner provided in section 251-2.

Electric Vehicle Charging System Rebate (Act 142, 2019)

Applicable to commercial facilities or multi-dwelling units. Provides $4,500 rebate for the installation of new or Level 2 (with two or more ports) stations and $35,000 for Level 3 charging stations. Provides $3,000 for the upgrade of Level 2 stations (with two or more ports) and $28,000 for Level 3 stations. Capped at $500,000 for each fiscal year.

Electric Vehicle Energy Performance Contract (Act 143, 2019)

Grants procurement priority for fuel cell electric vehicles for state and county vehicle purchases, and includes fuel cell electric vehicles in the definition of "electric vehicles" for purposes of parking fee exemption, high occupancy vehicle lane use, registration, and required public parking spaces.

Annual EV Registration Surcharge Fee (Act 280, 2019)

Establishes an annual vehicle registration surcharge fee of $50 for electric vehicles and alternative fuel vehicles to be deposited into the State Highway Fund effective January 1, 2020.

Waste

Hawaii Integrated Solid Waste Management Act (Act 324, 1991)

(1) Requires that residential and commercial solid waste be separated by source to be processed at appropriate facilities; (2) requires counties to update their integrated solid waste management plans; (3) establish a new waste stream reduction goal of 80% by 2030; and (4) appropriates funds to each county to help subsidize their waste management programs.

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