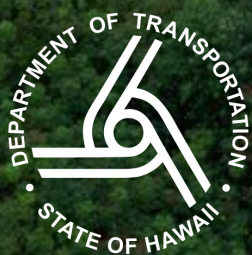


STATE OF HAWAI'I TRANSPORTATION CARBON REDUCTION STRATEGY

November 2023



Hawai'i Department of Transportation

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Introduction

The Infrastructure Investment and Jobs Act (IIJA, also known as the Bipartisan Infrastructure Law), provides the federal funding authority for transportation and other necessary infrastructure through September 20, 2026. The IIJA mandates all states create a carbon reduction strategy and allocates funding for projects designed to reduce transportation emissions.

CARBON REDUCTION STRATEGY (CRS) REQUIREMENTS

Per 23 U.S.C. 175(d)(2), each Carbon Reduction Strategy shall:

- A. Support efforts to reduce transportation emissions;
- B. Identify projects and strategies to reduce transportation emissions, which may include projects and strategies for safe, reliable, and cost-effective options—
 - i. To reduce traffic congestion by facilitating the use of alternatives to single occupant vehicle trips, including public transportation facilities, pedestrian facilities, bicycle facilities, and shared or pooled vehicle trips within the State or an area served by the applicable MPO, if any;
 - ii. To facilitate the use of vehicles or modes of travel that result in lower transportation emissions per person-mile traveled as compared to existing vehicles and modes; and
 - iii. To facilitate approaches to the construction of transportation assets that result in lower transportation emissions as compared to existing approaches;
- C. Support the reduction of transportation emissions of the State;
- D. At the discretion of the State, quantify the total carbon emissions from the production, transport, and use of materials used in the construction of transportation facilities within the State; and
- E. Be appropriate to the population density and context of the State, including any metropolitan planning organization designated within the State.

CARBON EMISSIONS IN HAWAI'I

The State of Hawai'i Department of Health complies a greenhouse gas (GHG)

emissions inventory to show progress towards statewide GHG reduction goals.¹ The April 2023 report² calculates total GHG emissions in Hawai'i for calendar year 2019 (the most recent year for which a full inventory has been developed) at 22.01 million metric tons of carbon dioxide equivalent (MMT CO₂ Eq.), of which 10.68 MMT CO₂ Eq. is attributed to transportation.

Figure 1: Hawai'i GHG Emissions by Sector/Category

Sector/Category	2019 GHG Emissions (MMT CO ₂ Eq.)
Energy	19.44
Stationary Combustion	8.32
<i>Energy Industries</i>	7.21
<i>Residential</i>	0.06
<i>Commercial</i>	0.60
<i>Industrial</i>	0.45
Transportation	10.68
<i>Ground</i>	4.03
<i>Domestic Marine</i>	0.65
<i>Domestic Aviation</i>	4.95
<i>Military Aviation</i>	0.88
<i>Military Non-Aviation</i>	0.16
Incineration of Waste	0.28
Oil and Natural Gas Systems	0.11
Non-Energy Uses	0.04
International Bunker Fuels	1.64
CO ₂ from Wood Biomass and Biofuels Consumption	1.28
IPPU	0.84
Cement Production	0.00
Substitution of Ozone Depleting Substances	0.83
Electrical Transmission and Distribution	0.01
AFOLU (Sources)	1.31
Enteric Fermentation	0.25
Manure Management	0.02
Agricultural Soil Management	0.18
Field Burning of Agricultural Residues	0.00
Urea Application	Does not exceed 0.005 MMT CO ₂ Eq.; emissions are not occurring.
Agricultural Soil Carbon	0.83
Forest Fires	0.04
AFOLU (Sinks)	(2.59)
Landfilled Yard Trimmings and Food Scraps	(0.05)
Urban Trees	(0.63)
Forest Carbon	(1.91)

¹ Hawaii Greenhouse Gas Program website, <https://health.hawaii.gov/cab/hawaii-greenhouse-gas-program/>

² Hawai'i Greenhouse Gas Emissions Report for 2005, 2018, and 2019, https://health.hawaii.gov/cab/files/2023/05/2005-2018-2019-Inventory_Final-Report_rev2.pdf

Sector/Category	2019 GHG Emissions (MMT CO ₂ Eq.)
Waste	0.41
Landfills	0.30
Composting	0.03
Wastewater Treatment	0.07
Total Emissions (Excluding Sinks)	22.01
Net Emissions (Including Sinks)	19.42

The 2019 inventory may be used as a baseline for the purposes of measuring the reduction of transportation emissions in Hawai'i achieved through the projects and strategies in the CRS. Additional study and carbon emission reduction calculation methodology will be discussed in a plan expansion and socialization planned in 2024. For the purposes of this draft CRS, calculated reduction in carbon emissions in metric tons was estimated based on projected fuel savings, reduction in materials through practices such as cementitious optimization, or anticipated reduction in vehicle idling.

Carbon Reduction Strategies

In 2008, the State of Hawai'i entered into a Memorandum of Understanding (MOU) with the U.S. Department of Energy to work towards reducing Hawai'i's dependence on imported oil and creating a clean energy future. In 2014, the MOU was renewed and the goal of achieving a 100% renewable energy portfolio by the year 2045 was established.

HDOT has pursued various strategies to reduce consumption of fuel and emissions to work toward the 2045 clean energy goal. Many of these initiatives and projects align with the CRS requirement to support reduction of transportation emissions in the State. Examples organized by program are described within this section.

Reduce Emissions

Congestion & Safety

1. Transportation Demand Management

- a. HDOT operates eight *High Occupancy Vehicle* lanes totaling 44.93 miles on the island of O'ahu to incentivize ridesharing.
- b. HDOT maintains a *carpool matching* website at <https://hidot.hawaii.gov/highways/rideshare/> and is currently seeking expansion of services to include development of an app for rideshare matching. An app is being pursued due to feedback received in our 2022 rideshare survey that had over 700 respondents.
- c. Support transportation choice
 - i. Transfer of funds to county transit agencies
HDOT transferred over \$50 million in federal funds to *support the four county transit systems* and has committed to transferring \$20 million annually throughout the IIJA timeframe.
 - ii. Electric Bicycle and Electric Moped Rebates
From February 2023, HDOT has administered an *E-Bike and Electric Moped Rebate program* that provides rebates of up to \$500 or not more than 20% of the purchase price for adults meeting one of three criteria: (1) Currently eligible for an

income assistance program; (2) Willing to attest to not owning a four-wheeled vehicle; (3) Enrolled as a full-time student.

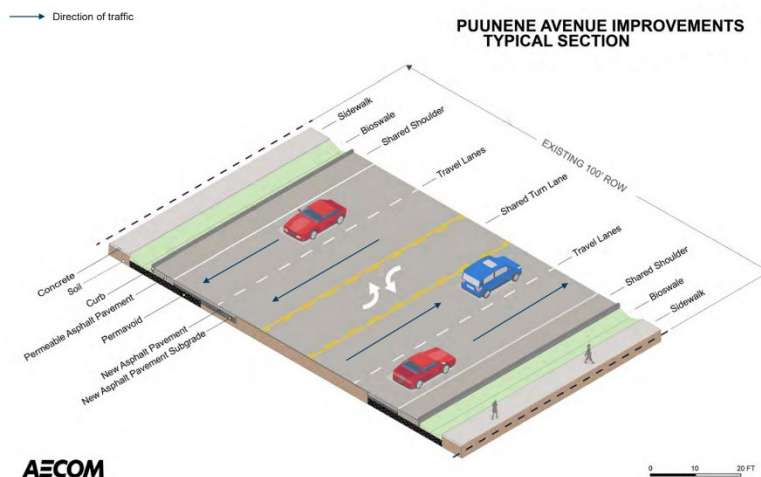
2. Laniakea Safety Improvements (Island of O‘ahu)



Laniakea Beach is a popular destination along Kamehameha Highway, a two-lane facility with no pedestrian or bicycle facilities. The Laniakea Safety Improvements will address safety and congestion concerns by creating an area that

could be used for beach access on the makai (oceanside) of the highway, removing the conflict between Kamehameha Highway operations and the approximately 300 pedestrians crossing the highway each hour at peak. Assuming a reduction in the current 25-minute travel delay in the 3.68-mile section and a savings of 690 grams of CO₂ per minute idling, HDOT anticipates a reduction of 97.75 metric tons of CO₂ per day through this project.

3. Puunene Avenue Improvements, Wakea Avenue to Kuihelani Highway (Island of Maui)



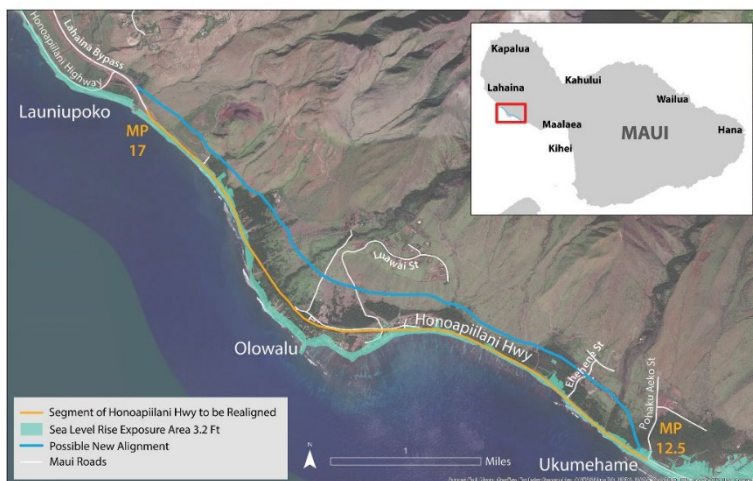
This design build project seeks to improve operations and safety for all highway users through addition of a shared use shoulder, construction of a continuous concrete sidewalk, improved street lighting, and upgraded traffic signals along a 0.6-

mile section of the main throughfare between the airport, harbor, commercial and industrial center of Kahului and the economic and tourism center of South Maui. Through the addition of multimodal facilities

promoting use by pedestrians and bicyclists and improvements to reduce vehicles idling in congestion, this project meets CRS goals.

Reliability

- 1. Intersection Improvements: Traffic Signal Controller Installation & Adaptive Traffic Signal Control Technology at Various Locations, O'ahu**
 Within the upcoming calendar year, HDOT is planning to begin traffic signal modernization of the approximately 280 state owned signals on the Island of Oahu. This modernization will allow for adaptive signal control, which has been shown to reduce carbon emissions by 16.1% on the vehicle to everything test corridor (Route 92) through decreases in vehicle delay and fuel consumption.
- 2. Honoapiilani Highway Realignment, Vicinity of Ukumehame to Vicinity of Olowalu (Island of Maui)**



Honoapiilani Highway is the principal arterial to West Maui. The Honoapiilani Highway Realignment, Vicinity of Ukumehame to Vicinity of Olowalu will move a 4.5-mile segment of this arterial away from the ocean, increasing the

reliability of the road by moving it beyond the reach of frequent high wave action. HDOT projects a benefit of \$299.1 million in 2019 undiscounted dollars due to improved throughput and travel time reliability and reduced fuel consumption by \$5.6 million in 2019 undiscounted dollars over the life of the project.

- 3. Freeway Service Patrol (Island of O'ahu)**
 Since 2009, the Freeway Service Patrol (FSP) has operated on the majority of Interstate H-1, H-201, and parts of the H-2 to reduce the occurrence of secondary incidents and improve travel time reliability. In

Calendar Year 2022, FSP drivers made 9,111 assists for reasons ranging from flat tires and dead batteries to crashes and load adjustment.

Capacity

For the purposes of the Carbon Reduction Strategy, capacity projects are included if they: (1) Promote development of jobs and industry outside the urban core; therefore, decreasing trip generators to a central location; or (2) Improve operations safety by eliminating conflicts and reducing emissions factors such as hard braking.

1. Interstate Route H-1 East Bound Improvements, Ola Lane to Likelike Highway Off-Ramp (Island of O‘ahu)

The Interstate Route H-1 East Bound Improvements, Ola Lane to Likelike Highway Off-Ramp is set to begin construction in early 2024. This capacity project would improve a 0.76-mile section of the east bound Interstate H-1 to eliminate a bottle neck resulting from merge condition when the H-201 joins the H-1. HDOT expects a 2.5-to-3-minute reduction in morning and afternoon travel times resulting from elimination of this merge.

2. Farrington Highway Widening, Helelua Street to Mohihi Street (Island of O‘ahu)



HDOT is currently in the planning process for the extension of the 5th turning lane on Farrington Highway in Nanakuli from Helelua Street to Mohihi Street. This estimated \$45 million widening project will add capacity for the underserved communities that

commute from Nanakuli and Waianae daily. The previous Farrington Highway 5th lane project between Haleakala Avenue and Nanakuli Avenue opened in January 2018 and reduced the westbound PM peak travel through the area by an average of 12 minutes. Extension of a shared use path on the makai (ocean) side of the highway and upgrade of the mauka (mountain) side sidewalk is also planned under the Farrington Highway Widening, Helelua Street to Mohihi Street.

Pedestrian

1. Ala Moana Boulevard Elevated Pedestrian Walkway (Island of O‘ahu)



The Ala Moana Elevated Pedestrian Walkway is a \$17.8 million project to construct a mauka-to-makai oriented bridge over Ala Moana Boulevard. An estimated 2,100 pedestrians and bicyclists are expected to use the walkway daily

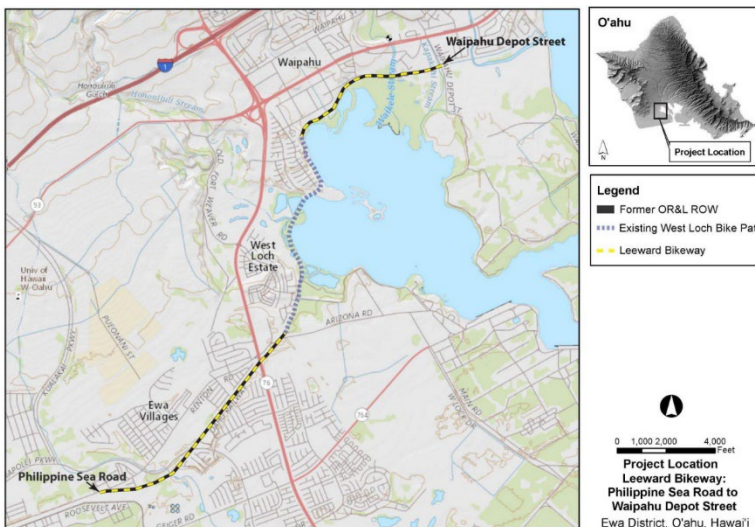
when it is completed in 2024. This will separate these vulnerable highway users from the approximately 40,000 vehicles that travel on the corridor daily.

2. Conversion of climbing lane on Rice Street (Island of Kaua‘i)

Following a time trial survey in September 2022, HDOT made the decision to convert the north bound climbing lane on Rice Street between the Royal Sonseta Kauai Resort and Mokoī Street to a shared use path to connect “upper” Rice Street to Nawiliwili. This project is currently in the planning phase.

Bicycle

1. Leeward Bikeway, Philippine Sea Road to Waipahu Depot Street (Island of O‘ahu)



The Leeward Bikeway, which is 65% complete as of November 2023, is a \$11.6 million investment to safely connect the existing West Loch Bike Path to the Historic Pearl Harbor Bike Trail. The Historic Pearl Harbor Bike Trail runs through Pearl

City and 'Aiea and is connected to parks, numerous offices, restaurants, retail shops, and healthcare centers. This shared use path will provide a non-motorized transportation facility between Ewa and Central Oahu and will increase pedestrian and cyclist comfort with non-motorized travel between regions.

2. Waimea Roadway Improvements (Island of Hawai'i)



This estimated \$20 million project to improve safety and relieve congestion within Waimea Town includes multimodal improvements such as: installation of a roundabout at the Kawaihae Road and Lindsey Road

Intersection, bicycle and pedestrian treatments along Kawaihae Road between Lindsey Road and Opelo Road, intersection improvements at Mamalahoa Highway and Lindsey Road, restriping to include a shared shoulder and bike lane between Waimea School and Kaomoloa Road, and bicycle and pedestrian treatments along Mamalahoa Highway between Waimea School and Pukalani Road. The final environmental assessment for this project was published in June 2023. Anticipated advertisement for bid is December 2025.

System Preservation

HDOT is taking the following steps with its pavement program that align with the CRS goal to facilitate approaches to the construction of transportation assets that result in lower transportation emissions as compared to existing approaches.

1. Use of materials with longer design life in pavement program.



HDOT uses a variety of asphalt and concrete pavements. We began using Stone Matrix Asphalt (SMA) in earnest with the first phase of Pali Highway Improvement between Castle Junction and Waokanaka. SMA is ideal for roads with high

travel volume and minimal utilities because of its resistance to rutting. Roads built with SMA have an average lifespan of 19-years vs. the 14-years normally seen with dense-graded mixes. Unfortunately, the same qualities that make this mix so durable also make it difficult to access utilities under the road, so we do not use this mix in areas where there are a lot of utilities to maintain.

In areas with utilities that may require access beneath the road, HDOT is using Polymer-Modified Asphalt (PMA) to provide more durability and crack resistance as compared to our previous asphalt Mix IV. This is the same mix we use on our runways.

2. Microsurfacing pilot to extend pavement life.



In partnership with the County of Maui, HDOT began testing microsurfacing as a pavement preservation strategy in July 2022. For the purposes of the pilot, County of Maui crew applied microsurfacing to Kula Highway between

mile post 15.5 and 16. Microsurfacing is a protective seal coat made of asphalt emulsion blended with finely crushed stone for traction. Initial field monitoring indicates this is a cost-effective method to renew the road surface and seal minor cracks and other irregularities.

Electrification & Equipment

1. Energy Savings Performance Contract



Beginning in 2014, HDOT entered an energy savings performance contract (EPC) with Johnson Controls to deliver energy saving improvements at State airports, harbors, and highways. The total contract amount for the HDOT project exceeded

\$309 million with guaranteed energy savings of \$795 million. It is the largest single-state EPC in the nation.

2. Electrification as a Service Contract



HDOT obtained a 10-year service contract in 2020 to replace light duty vehicles in its fleet with electric vehicles (EVs). The contract allows HDOT and other State and County agencies to obtain EVs and charging infrastructure as a service on a per mile cost basis, reducing the upfront costs of electrifying fleet

vehicles and reducing fuel and maintenance costs.

Key points and assumptions for the electrification as a service contract:

1. All state/county agencies, the Hawai'i Department of Education, and the University of Hawai'i can participate in the contract.
2. Terms include monthly charge based on per mile usage (including maintenance costs) and kWh usage (for charging infrastructure).

- a. Estimated fuel savings of \$287 per ICE vehicle replaced (fuel savings includes cost of fuel used to generate electricity)
- b. Annual reduction in CO₂ emissions (based on 40 ICE vehicles replaced) is 348,000 pounds or 157 metric tons.
- c. Being able to transition older vehicles to EVs saves in maintenance costs. In the first year of the contract our maintenance costs were \$0.00. Whereas, previously, we spent an average of \$2,500/year to maintain our ICE vehicles.

Figure 2: Electric Vehicles procured or ordered through the electrification as a service contract from the first order in 2021 to November 2023.

Agency	Existing	Planned
Highways	43 SUVs (model Y) 60 Pickup Trucks 2 autonomous shuttle buses 32 NEVI Level 3 (DC Fast) Chargers 103 level 2 chargers 2 level 2 chargers for shuttle buses	83 Pickup Trucks, 83 level 2 chargers 24 SUVs and 24 Level 2 chargers 12 Level 3 (DC Fast) chargers
Airports	HNL - 3 SUVs, 1 Sweeper, 9 Pickup Trucks KOA - 4 SUVs, 5 pickups, 1 sweeper ITO - 2 SUVs, 5 pickups, 1 sweeper HNL - 5 DC Fast chargers HNL - 13 level 2 chargers KOA - 10 level 2 chargers ITO - 8 level 2 chargers	HNL - 4 addl Wiki Wiki shuttle buses, 6 pickup trucks, 10 level 2 chargers, HNL - 125 Level I charging stations in parking structure and rides share area OGG - 5 SUV, 6 Pickup Trucks, 1 Sweeper and 11 Level II, 2 DC Fast chargers
Harbors		Maui - Truck, Van, 2 SUVs, and 4 Level II chargers Kauai - 1 Truck, 2 Cargo Vans, and 3 Level II chargers Hawaii Island - 3 Trucks and 3 Level II chargers Oahu - 3 Sedans, 1 Truck, and 4 Level II chargers
Hawaii State Energy Office	1	
State Dept. of Agriculture		12 pickup trucks
City & County Honolulu		17 total vehicles (SUVs, sedans, pickup trucks, garbage trucks)

Agency	Existing	Planned
Dept. of Public Safety		3
State Libraries		12 vans
Kona Community Hospital		2 sedans
Hawaii Community College		2 sedans, 1 van
Dept. of Land and Natural Resources		12 SUVs
Dept. of Accounting and General Services		400 cars
Hawaii County Dept. of Research and Development		8 sedans
Hawaii County Transit		5 heavy duty buses

Remove CO₂

Pilot materials with less environmental impact.

Carbon-injected concrete was tested on an access road as part of a pilot to develop specifications for use of a more sustainable concrete mix in infrastructure construction. The mix was approved for use in flat work and structures and will be used in the Laieloa Bridge Replacement, Kaluanui Bridge Replacement, Waipilopilo Bridge Replacement, Waiahole Bridge Replacement, and the Farrington



Highway Widening, Kapolei Golf Course to Fort Weaver Road. More information on carbon-injected concrete, which could reduce embodied carbon by 25 lbs. per cubic yard used, can be found at <https://hidot.hawaii.gov/highways/hdot-tests-sustainable-concrete-mix-designed-to-reduce-carbon-footprint-of-road-construction/>

HDOT is also conducting a plastic pavement pilot to reuse waste plastic in road construction. More information on this ongoing pilot can be found at <https://hidot.hawaii.gov/blog/2022/10/11/hdot-testing-asphalt-mixes-designed-to-improve-pavement-and-the-environment/>

Next Steps

The initial CRS draft was circulated to the O‘ahu Metropolitan Planning Organization and the Maui Metropolitan Planning Organization for review and consultation.

HDOT is currently procuring a consultant to expand its Carbon Reduction Strategy and conduct in depth stakeholder engagement with the two metropolitan planning organizations within the State and other interested parties. Anticipated stakeholder engagement would begin in January 2024.

CRS Review and Maintenance

Per 23 U.S.C. 175(d)(2), the CRS shall be updated not less frequently than every 4 years. HDOT’s planned updates would be on the schedule below.

Initial draft.....	November 2023
Plan expansion.....	June 2024
Update.....	November 2027