

Hawaii Greenhouse Gas (GHG) Emission Report for 2017: Summary of Key Results

Statewide carbon dioxide equivalent (CO₂e) emissions and sinks (GHG removals) were compiled for the following four (4) Intergovernmental Panel on Climate Change (IPCC) sectors:

- (1) Energy - emissions from stationary combustion, transportation, waste incineration, and oil and natural gas systems;
- (2) Industrial Processes and Product Use (IPPU) - emissions from cement production, electrical transmission and distribution, and substitution of ozone depleting substances (ODS);
- (3) Agriculture, Forestry, and other Land Use (AFOLU) - emissions and sinks from agricultural activities, land use, changes in land use, and land management practices; and
- (4) Waste - emissions from waste management and treatment activities such as landfills, composting, and wastewater treatment.

Energy sector emissions from aircraft (domestic aviation and military aviation) were quantified and subtracted from net emissions for comparison to Hawaii's CO₂e emissions limit¹ that is equal to, or below, 1990 statewide GHG emissions. Biogenic carbon dioxide (CO₂) and international bunker fuel CO₂e emissions were excluded from the statewide GHG totals in accordance with IPCC guidelines.

As of 2017, the statewide GHG emission limit of 15.28 million metric tons (MMT) CO₂e has been reached, and statewide GHG projections of 11.66 MMT, 10.96 MMT, and 8.88 MMT for 2020, 2025, and 2030, respectively, indicate Hawaii is on target to meet its statewide GHG emissions limit by 2020 and will continue to meet the limit after 2020. This finding will be reassessed and updated in the forthcoming (e.g., 2018) report.

Hawaii GHG Emissions and Sinks (MMT CO₂e) by Sector for 1990, 2007, 2010, 2015, 2016, 2017, 2020, 2025, and 2030; Reproduced from Tables ES-1 and ES-2 (Projections*) of the Report.									
Sector/Category	1990	2007	2010	2015	2016	2017	2020	2025	2030
Energy	19.30	23.12	18.15	17.58	17.66	17.64	<u>13.50</u>	<u>15.06</u>	<u>13.33</u>
IPPU	0.17	0.59	0.71	0.83	0.83	0.83	<u>0.76</u>	<u>0.76</u>	<u>0.78</u>
AFOLU (Sources)	1.60	1.35	1.28	1.30	1.29	1.26	<u>1.25</u>	<u>1.19</u>	<u>1.12</u>
AFOLU (Sinks)	-2.44	-2.58	-2.62	-2.73	-2.71	-2.69	<u>-2.68</u>	<u>-2.63</u>	<u>-2.58</u>
Waste	0.75	1.05	0.95	0.84	0.78	0.82	<u>0.81</u>	<u>0.80</u>	<u>0.80</u>
Total Emissions (Excluding Sinks)	21.83	26.11	21.10	20.55	20.56	20.56	<u>16.32</u>	<u>17.80</u>	<u>16.03</u>
Net Emissions (Including Sinks)	19.39	23.53	18.48	17.81	17.86	17.87	<u>13.64</u>	<u>15.17</u>	<u>13.44</u>
Aviation (domestic & military) **	4.11	4.46	3.40	4.20	4.22	4.10	<u>1.98</u>	<u>4.22</u>	<u>4.56</u>
Net Emissions (State Goal) ***	15.28	19.07	15.08	13.61	13.64	13.77	<u>11.66</u>	<u>10.96</u>	<u>8.88</u>

* Projected Emissions are underlined.

** Aviation (domestic & military) emissions, which are reported under the transportation source category under the Energy sector, are excluded from Hawaii's GHG emissions reduction goal established in Act 234 (2007).

*** Net Emissions (State Goal) include sinks and exclude aviation. Updated statewide limit is the 1990 GHG emissions level. Emissions beyond 1990 show Hawaii's progress relative to the statewide goal of not exceeding the 1990 GHG level.

¹ Statewide GHG emission limit excludes aviation and international bunker fuel emissions and includes carbon sinks. International bunker fuel emissions are defined as marine and aviation travel originating in Hawaii and ending in a foreign country.

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Energy: The table above provides results from the 2017 report showing that most of the emissions are from the Energy sector for all emission years. For 2017, the Energy sector's 17.64 million metric tons (MMT) CO₂e represents approximately 86% of the total statewide emissions which are equal to 20.56 MMT CO₂e.

IPPU: IPPU sector emissions for 2017 represent about 4% of statewide emissions but are seen to grow from 0.17 MMT CO₂e in 1990 to 0.83 MMT CO₂e in 2017. The growth rate in this sector is due to the way IPCC guidance considers ODS versus their substitutes. While IPCC guidance does not count the significant GHG emission reductions from the decline in use of ODS associated with the Montreal Protocol, it does count the increase in GHG emissions from the associated growth in the use of their substitutes².

AFOLU: AFOLU (Sources) emissions for 2017 represent about 6% of the statewide GHG emissions. The AFOLU (Sinks) for 2017 offset about 13% of the statewide GHG emissions.

Waste: Waste sector emissions for 2017 represent about 4% of statewide emissions.

The report provides new 2017 GHG estimates, updates emission estimates³ for 1990, 2007, 2010, 2015, 2016 from those provided by ICF in the 2016 annual report as shown in the table below, updates prior 2020 and 2025 projections, and provides a new projection for 2030⁴. The change to the 1990 net statewide GHG emissions (including sinks and excluding aviation) also updates the 1990 statewide GHG emissions limit. As found in ICF's Hawaii Greenhouse Gas Emissions Report for 2017, "Changes in emission estimates from the 2016 inventory report estimates are largely due to:

- (1) updates to the forest carbon net sequestration rates based on new data from United States Geological Survey (USGS) (Selmants 2020);
- (2) updates to the method used to allocate aircraft aviation fuel consumption into domestic and international consumption;
- (3) inclusion of naphtha consumption by energy industries;
- (4) inclusion of emissions from hydrogen production in the oil and natural gas systems estimates;
- (5) updates to agricultural soil carbon emissions based on estimates obtained from the U.S. Inventory (EPA 2020a); and
- (6) updates to the net carbon sequestration factor per area of tree cover based on state-specific values obtained from the U.S. Inventory (EPA 2020a)."

² *Appendix I: ODS Emissions* documents the reduction in ODS emissions and growth in ODS substitutes from 1990 to 2017. The ICF estimates for ODS emissions were 11.01 MMT CO₂e in 1990, 2.19 MMT CO₂e in 2007, 1.79 MMT CO₂e in 2010, 1.40 MMT CO₂e in 2015, 1.34 MMT CO₂e in 2016, and 1.28 MMT CO₂e in 2017.

³ See discussions in the *Changes in Estimates since the previous Inventory Report* subsections within the body of the report, and *Appendix B: Updates to the Historical Emission Estimates Presented in the 2016 Inventory Report*.

⁴ Prior 2020 and 2025 projections, prepared by ICF and the University of Hawaii Economic Research Organization (UHRO) for the Hawaii Department of Health, "Hawaii Greenhouse Gas Emissions Report for 2016", December 2019; https://health.hawaii.gov/cab/files/2019/12/2016-Inventory_Final-Report_December2019-1.pdf. Updates to prior projections and new 2030 projection is provided in this 2017 annual report.

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Change in Emissions Relative to the 2016 Report by Sector (MMT CO ₂ e); Reproduced from Table B-1 of the Report.						
Inventory Year	1990			2007		
Sector	2016 Report	2017 Report	Percent Change	2016 Report	2017 Report	Percent Change
Energy	19.09	19.3	1.1%	22.65	23.12	2.1%
IPPU	0.17	0.17	+	0.55	0.59	6.1%
AFOLU (Sources)	1.31	1.6	21.9%	1.12	1.35	21.1%
AFOLU (Sinks)	-6.7	-2.44	-63.6%	-6.52	-2.58	-60.4%
Waste	0.75	0.75	0.0%	1.05	1.05	0.0%
Total Emissions (Excluding Sinks)	21.33	21.83	2.3%	25.37	26.11	2.9%
Net Emissions (Including Sinks)	14.63	19.39	32.5%	18.85	23.53	24.8%
Aviation (domestic & military) *	3.79	4.11	8.5%	4.11	4.46	8.4%
Net Emissions (State Goal) **	10.84	15.28	40.9%	14.73	19.07	29.4%
Inventory Year	2010			2015		
Sector	2016 Report	2017 Report	Percent Change	2016 Report	2017 Report	Percent Change
Energy	17.62	18.15	3.0%	16.97	17.58	3.6%
IPPU	0.66	0.71	7.3%	0.77	0.83	8.2%
AFOLU (Sources)	1.02	1.28	25.8%	1.03	1.30	26.6%
AFOLU (Sinks)	-6.55	-2.62	-60.1%	-6.5	-2.73	-58.0%
Waste	0.92	0.95	3.6%	0.77	0.84	8.5%
Total Emissions (Excluding Sinks)	20.22	21.1	4.3%	19.54	20.55	5.1%
Net Emissions (Including Sinks)	13.67	18.48	35.1%	13.04	17.82	36.6%
Aviation (domestic & military) *	3.16	3.4	7.6%	3.99	4.20	5.2%
Net Emissions (State Goal) **	10.51	15.08	43.4%	9.04	13.61	50.5%
Inventory Year	2016					
Sector	2016 Report	2017 Report	Percent Change			
Energy	16.94	17.66	4.3%			
IPPU	0.78	0.83	7.4%			
AFOLU (Sources)	1.08	1.30	19.4%			
AFOLU (Sinks)	-6.51	-2.71	-58.4%			
Waste	0.78	0.78	+			
Total Emissions (Excluding Sinks)	19.58	20.57	5.1%			
Net Emissions (Including Sinks)	13.07	17.86	36.7%			
Aviation (domestic & military) *	3.84	4.22	10.0%			
Net Emissions (State Goal) **	9.23	13.65	47.8%			

+ Does not exceed 0.005 MMT CO₂e or 0.05%.

* Identified as "Energy (Aviation)" in Table B-1, of the report. Aviation (domestic & military) emissions, which are reported under the Energy sector, are excluded from Hawaii's GHG emission reduction goal established in Act 234 (2007).

** Identified as "Net Emissions (Including Sinks, Excluding Aviation)" in Table B-1, of the report. GHG emissions from international bunker fuel and biogenic CO₂ are excluded from statewide GHG totals in accordance with IPCC guidance.