



UNIVERSITY of HAWAI'I at MĀNOA

INSTITUTE *for* SUSTAINABILITY *and* RESILIENCE

The Economic and GHG Impacts of a Carbon Tax for Hawai'i

PICHTR Webinar

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Hawaii sets ambitious goal: Carbon neutral by 2045

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By Samie Gebers, Hawaii News Now Intern CONNECT



Hawaii Governor David Ige signs bills to combat climate change Monday. (Image: Governor's Office)

HAWAII (HawaiiNewsNow) - Gov. David Ige signed three bills Monday in an effort to reduce carbon emissions, one of which set a goal of making Hawaii a zero-emissions clean economy by 2045.

House Bill 2182 aims to make Hawaii carbon neutral in just 27 years.

"It really takes the next step," Ige said. "This measure really ups the ante and commits to a carbon neutral community here on the islands."

2045 is the same year that Hawaii expects to generate 100 percent of its electricity from clean, renewable sources.

The bill also establishes the greenhouse gas sequestration task force that will look at programs and policies to help further a goal of reducing carbon emissions.

During Monday's signing, Ige added that Hawaii was the first state to adopt a law aligning with the Paris agreement to combat climate change, and HB 2182 is the next step in honoring that.

Another signed bill, HB1986, creates a structure for a carbon offset program, which aims to restore native forests by planting trees and partnering with businesses to further environmental goals.

"We see tremendous potential for restoration, protection and management of forest areas in Hawaii to offer cost-efficient climate change mitigation," the governor said. "That's why this framework for capturing carbon through reforestation and carbon farming is an important step forward."

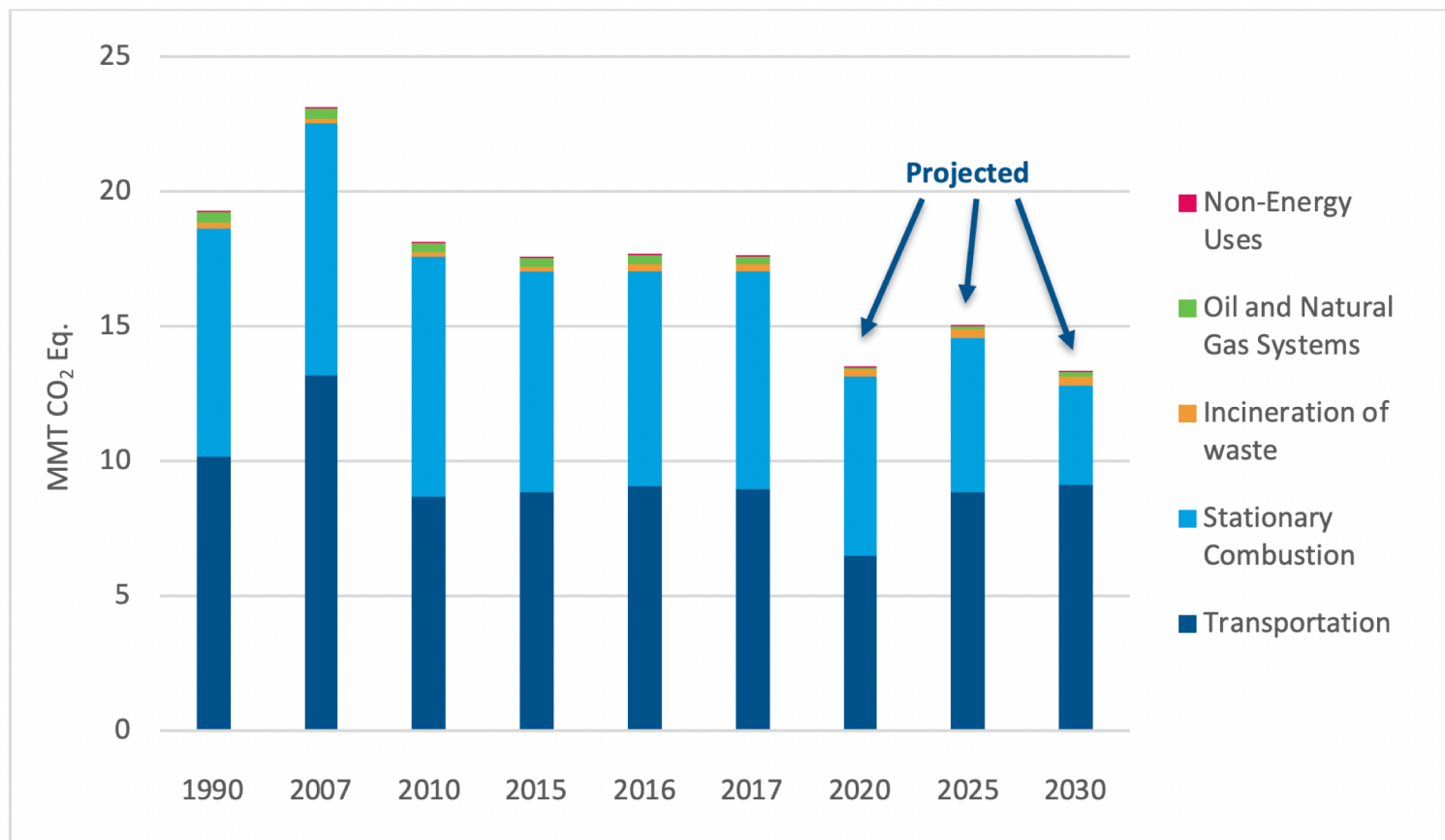
HB2106 will require sea level rise analysis in environmental impact statements before building projects. The governor said requiring the analysis is "just plain common sense," due to the oceans having impact on beaches, roadways and homes near the shoreline.

"I think, collectively, these three bills I'll be signing today continues and keeps Hawaii at the forefront in the battle in climate change and sea level rise," Ige said.

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Hawai‘i’s GHG Emissions

Figure 2-1: GHG Emissions and Projections from the Energy Sector under the Baseline Scenario



Source: Final Inventory and Projections of Statewide Greenhouse Gas Emissions for 2020, 2025 and 2030, Prepared by ICF & UHERO (2021)

Motivation

- National-level carbon pricing is shown in numerous studies to be efficient and effective, often progressive, as well as able to address leakage/competitiveness through a border carbon adjustment.
- Without a national program, how can state level carbon pricing help to achieve state decarbonization targets, and what are the economic and GHG impacts?

A Two-Part Inquiry

- Part I: Economic and GHG Impacts of a Carbon Tax for Hawai‘i
 - Via the Hawai‘i State Energy Office (Act 122, 2019)
 - Full study available at: <https://energy.hawaii.gov/carbon-pricing-study>
- Part II: Additional scenario analysis pertaining to how to use carbon tax revenues & administrative considerations regarding ways to levy and collect the carbon price/tax, use and distribute the revenue.
 - Full study available at: <https://tax.hawaii.gov/stats/tax-review-commission/>

Project Team

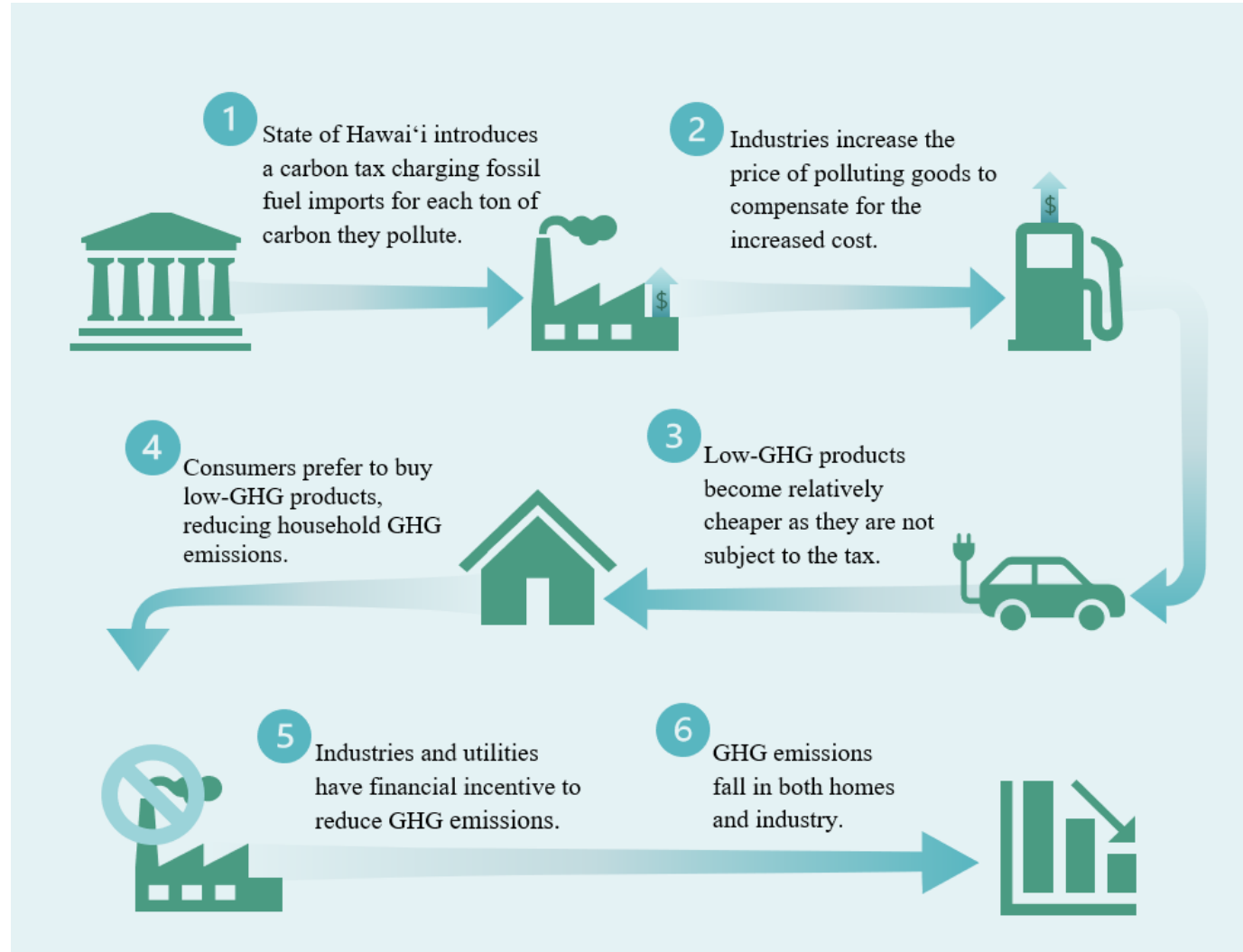


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 - Formerly Assistant Specialist, UHM Public Policy Center (Part I Study)

How would a carbon tax work in Hawai'i?



Source: Adapted from Spraggon (2013).

Data & Methods

- Computable General Equilibrium Model of Hawai‘i’s Economy
 - Recursive Dynamic Model, calibrated in 2012, solving for 2016, 2019, 2025-2045 in 5-year increments with Gross State Product and Visitor Spending Forecasts
 - GAMS/MPSGE
- State 2012 Input-Output Study + National Consumer Expenditure Survey + 2016 State GHG Inventory
- Important Baseline Assumptions:
 - Renewable Portfolio Standard (RPS) requires Hawai‘i to reach 100% of net electricity sales from renewable sources by 2045 (HRS §269-92). Estimated renewable energy generation =72% by 2045.
 - Electric Vehicle (EV) Adoption =34% EVs on the road by 2045.
 - Energy Efficiency improvements (Based on AEO 2020).

Sector Demand by Household Income Quintile

	Lowest 20 percent	Second 20 percent	Middle 20 percent	Fourth 20 percent	Highest 20 percent	Sum
Petroleum	9.6%	15%	19%	24%	32%	100%
Electricity	14%	18%	20%	22%	26%	100%
Gas	12%	16%	19%	22%	31%	100%
Water						
Transportation	0.9%	1.7%	4.8%	34%	58%	100%
Air Transportation	4.8%	9.8%	13%	21%	52%	100%
Ground Transportation						
Services	10%	14%	17%	20%	39%	100%
Water & Other Utilities	11%	17%	19%	23%	30%	100%
Waste Management	11%	17%	19%	23%	30%	100%
Agriculture & Forestry	12%	16%	18%	23%	31%	100%
Construction	7.1%	11%	16%	23%	43%	100%
Wholesale and Retail Trade	7.8%	14%	17%	22%	39%	100%
Real Estate and Rentals	11%	14%	17%	22%	36%	100%
Other Manufacturing	9.0%	17%	18%	22%	33%	100%
Other Services	7.1%	11%	16%	23%	43%	100%
Federal Government	20%	20%	20%	20%	20%	100%
State & Local Government	20%	20%	20%	20%	20%	100%
Imports	7.8%	14%	17%	22%	39%	100%

Household Expenditures by Sector by Income Quintile

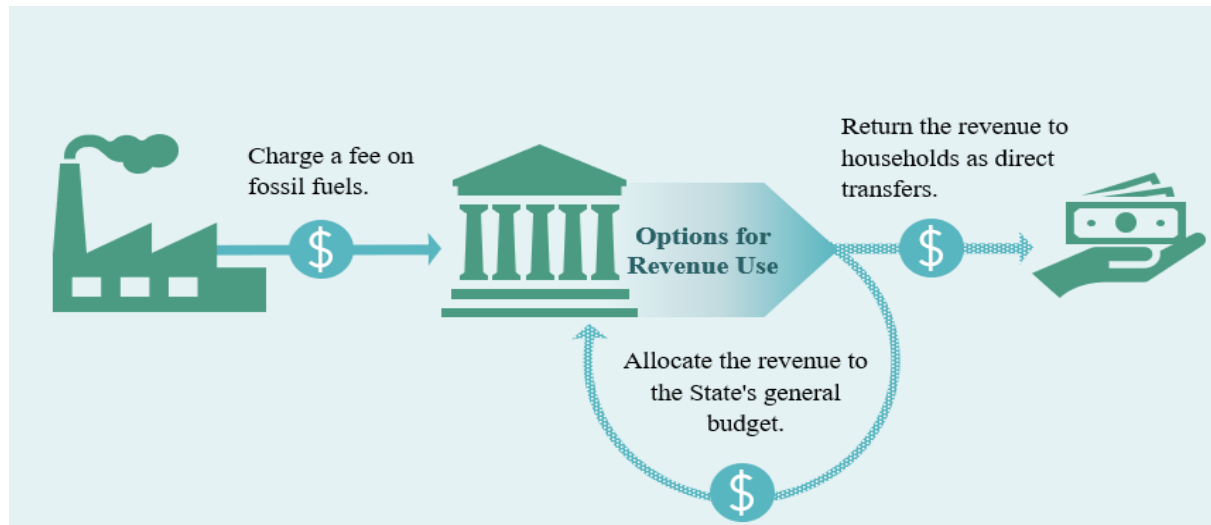
	Lowest 20 percent	Second 20 percent	Middle 20 percent	Fourth 20 percent	Highest 20 percent
Petroleum	4.3%	4.5%	4.5%	4.2%	3.1%
Electricity	4.6%	4.0%	3.3%	2.7%	1.9%
Gas	0.3%	0.3%	0.2%	0.2%	0.2%
Water Transportation	0.0%	0.1%	0.1%	0.7%	0.6%
Air Transportation	0.6%	0.8%	0.8%	1.0%	1.4%
Ground Transportation Services	0.8%	0.8%	0.7%	0.6%	0.7%
Water & Other Utilities	0.0%	0.0%	0.0%	0.0%	0.0%
Waste Management	0.0%	0.0%	0.0%	0.0%	0.0%
Agriculture & Forestry	0.9%	0.8%	0.7%	0.7%	0.5%
Construction	0.0%	0.0%	0.0%	0.0%	0.0%
Wholesale and Retail Trade	11%	14%	13%	13%	13%
Real Estate and Rentals	25%	22%	21%	20%	18%
Other Manufacturing	1.9%	2.5%	2.1%	1.9%	1.6%
Other Services	29%	31%	34%	36%	39%
Federal Government	3.8%	2.5%	2.0%	1.5%	0.8%
State & Local Government	4.2%	2.8%	2.2%	1.6%	0.9%
Imports	13%	14%	16%	16%	18%
Sum	100%	100%	100%	100%	100%

Four Core Scenarios Included in the Part I Study

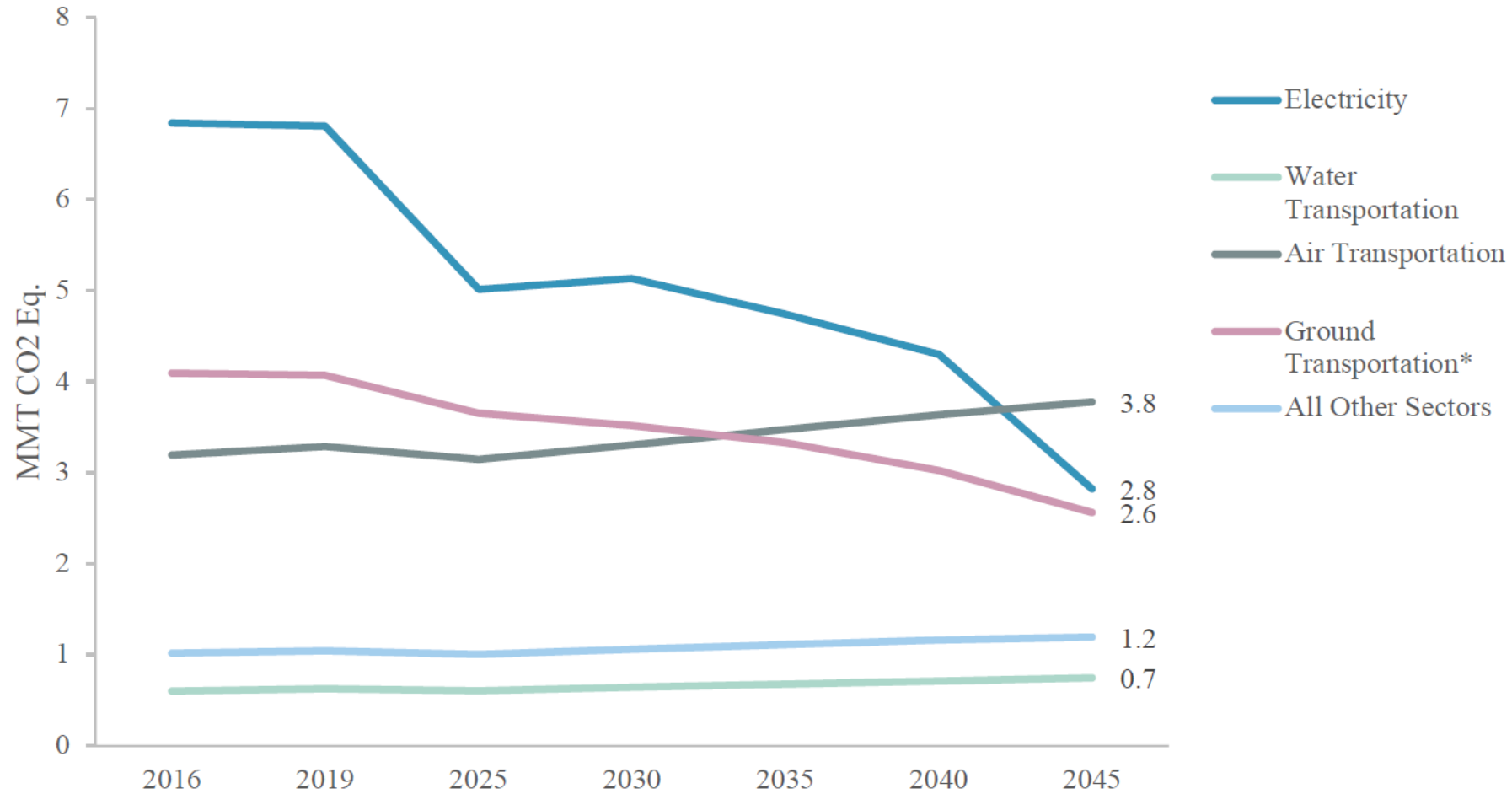
Two Carbon Tax Levels (\$2012/MT CO₂ Eq.)

Year	“\$70/MT CO ₂ Eq.”	“\$1,000/MT CO ₂ Eq.”
2025	\$50	\$240
2030	\$54	\$430
2035	\$60	\$620
2040	\$65	\$810
2045	\$70	\$1,000

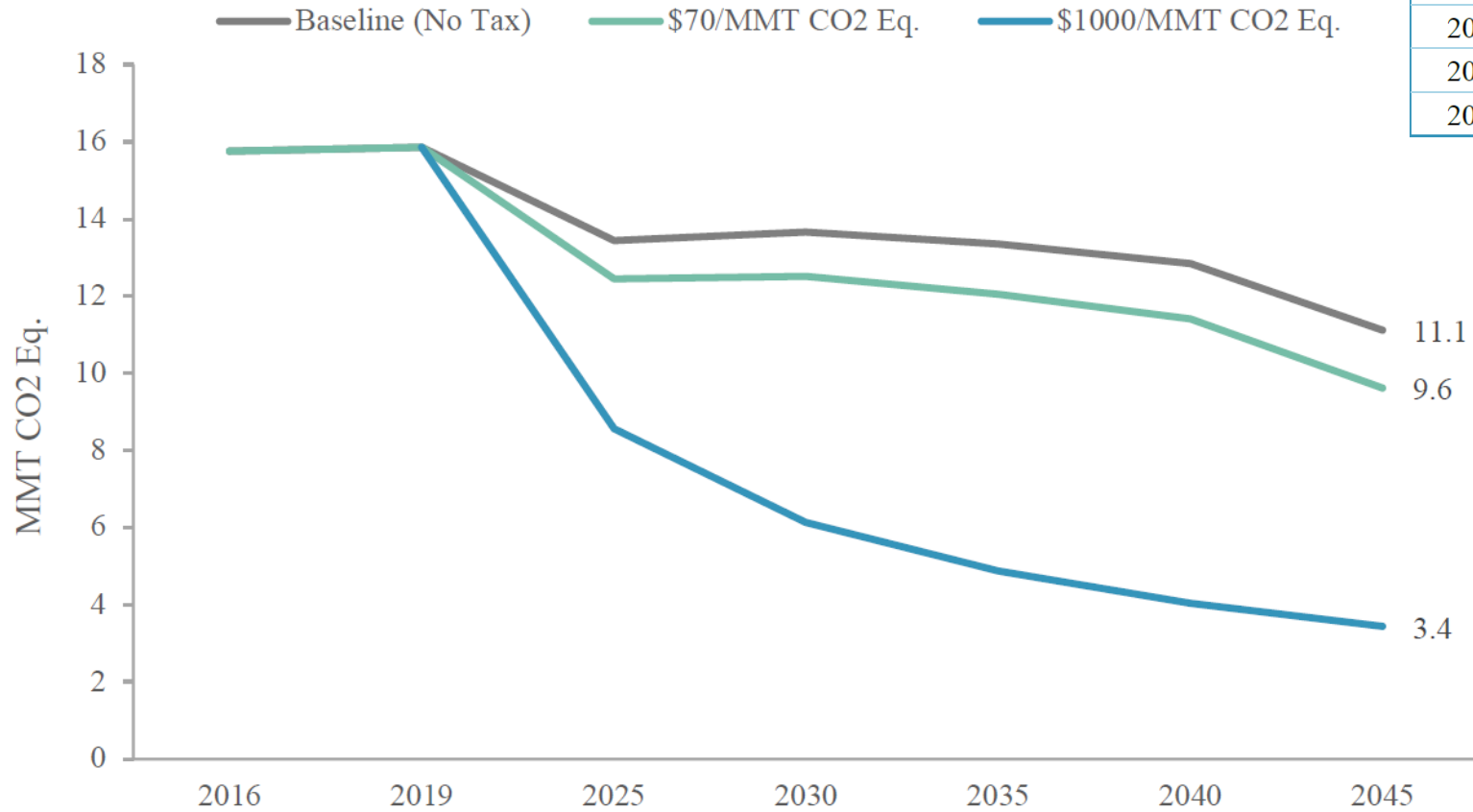
Two Revenue Uses



Baseline GHG Emissions by Sector 2016-2045

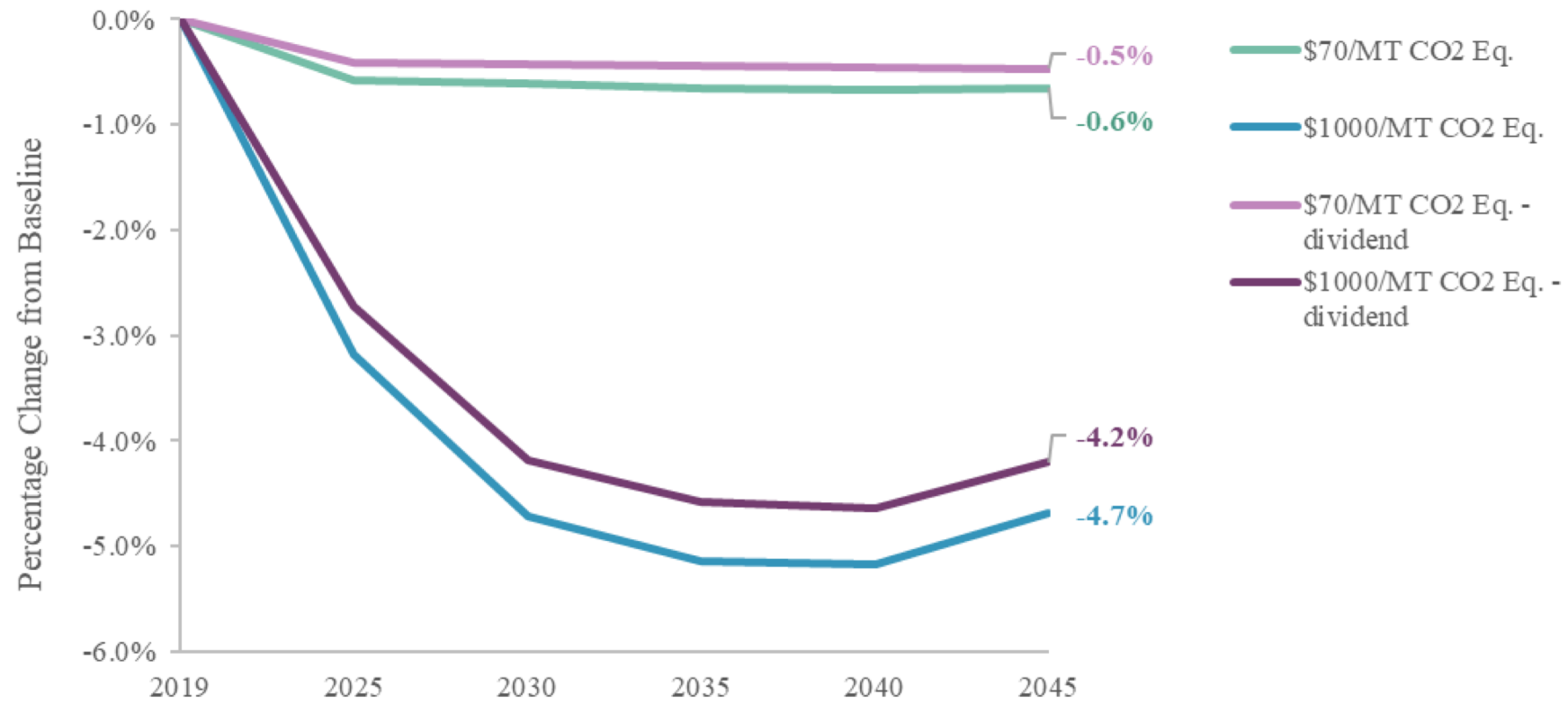


GHG Emissions in Baseline and Carbon Tax Scenarios, 2016-2045

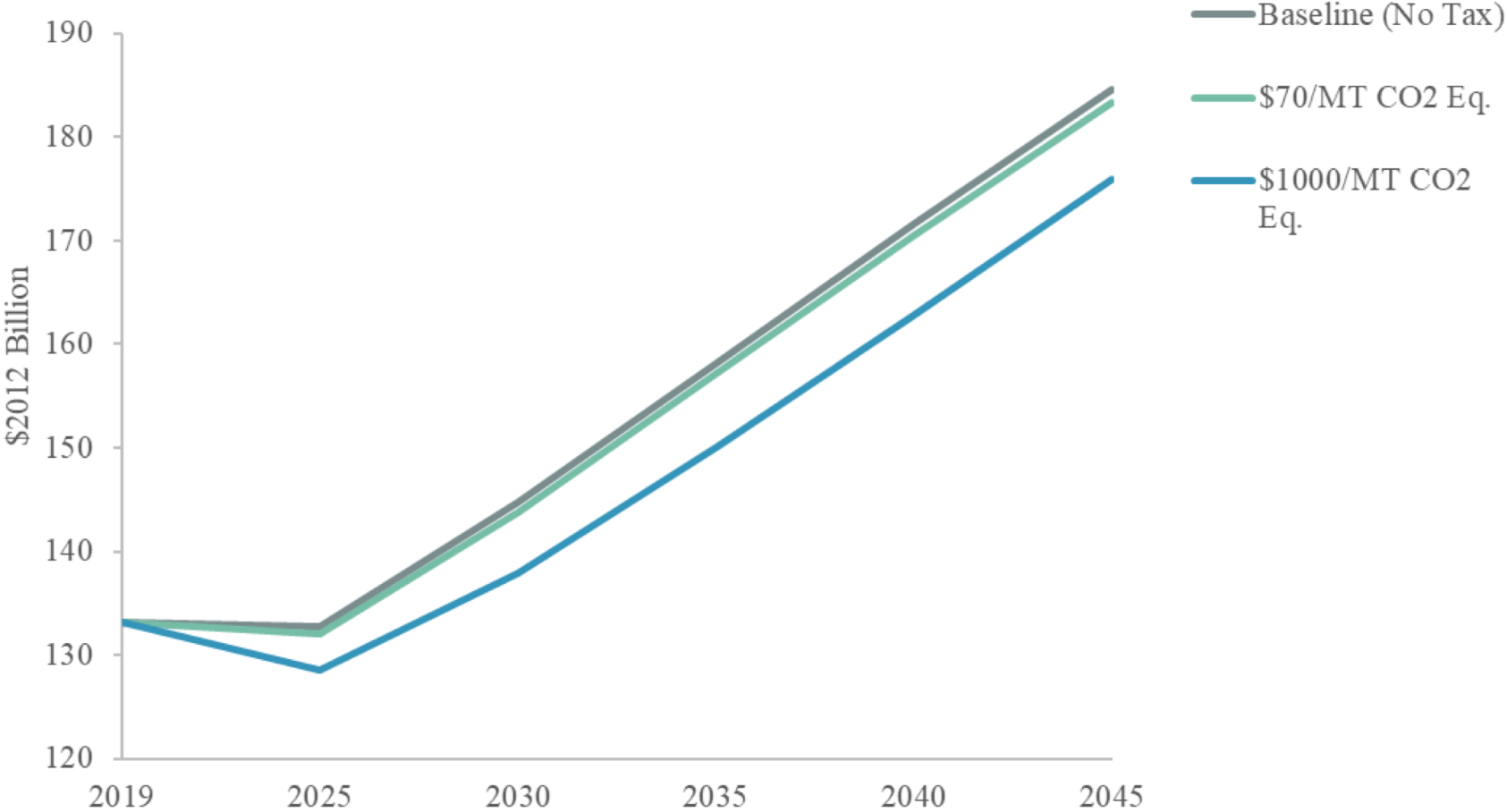


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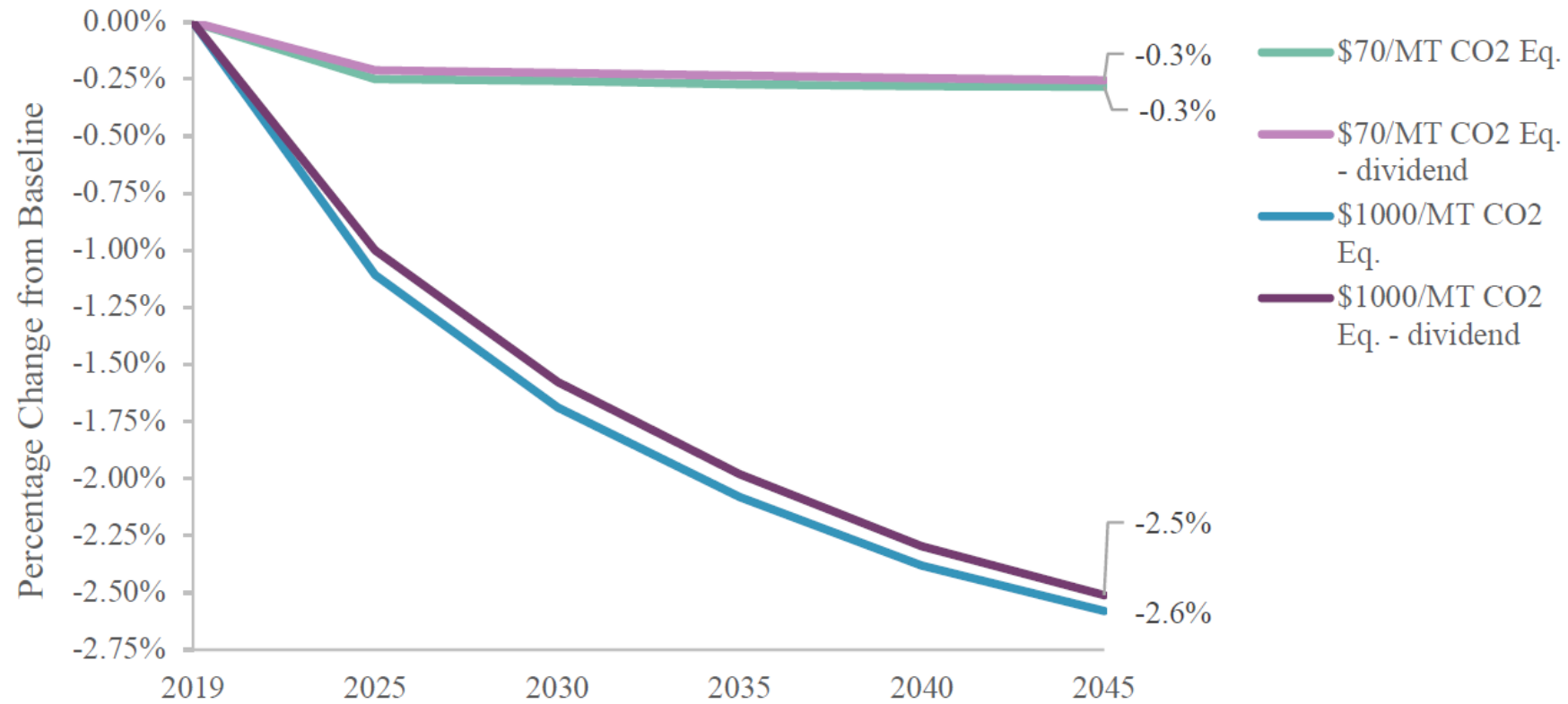
Change in Total Output from Baseline under Carbon Tax and Revenue Scenarios, 2019-2045



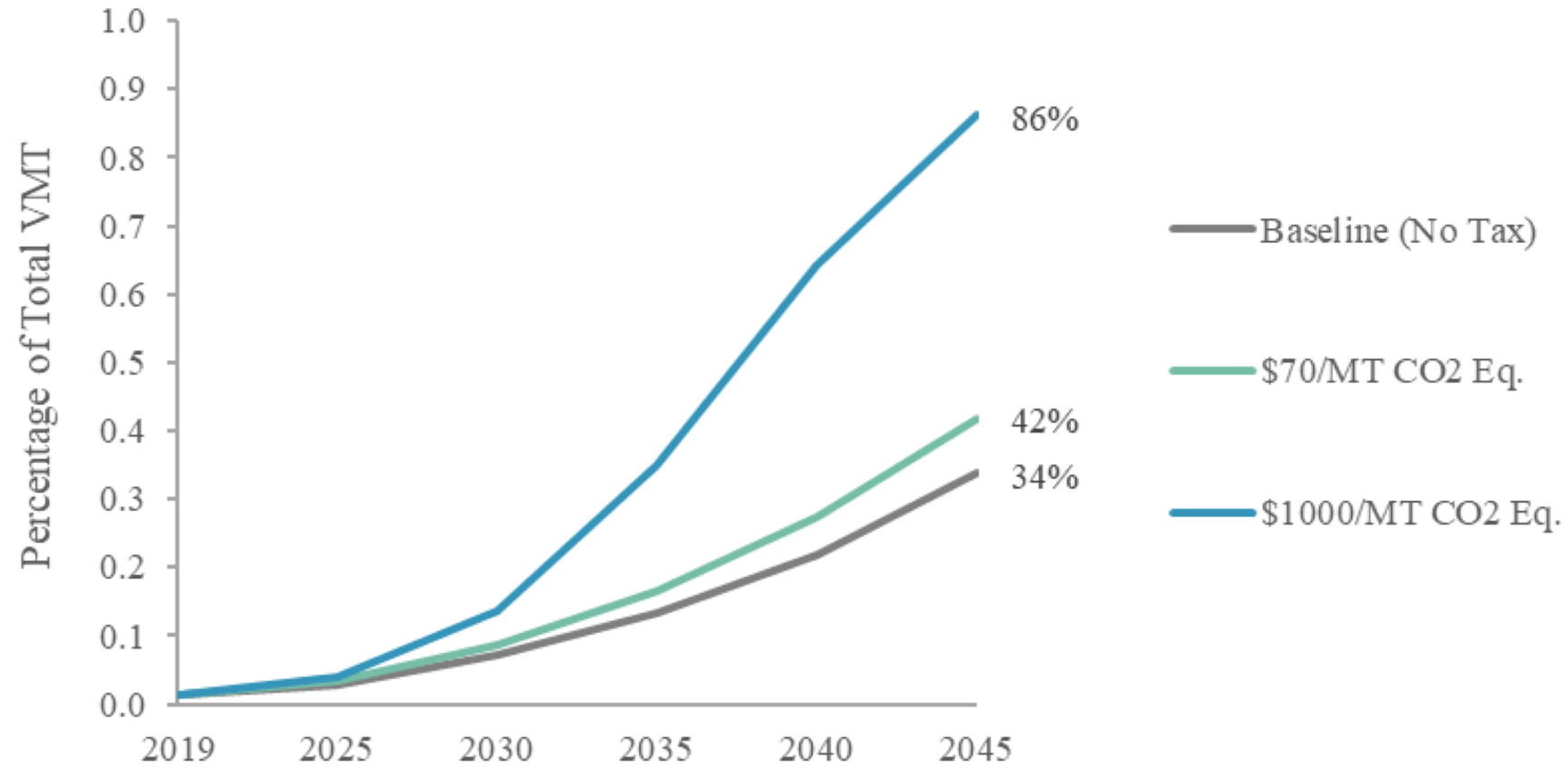
Total Output in the Baseline and Carbon Tax Scenarios, 2019-2045



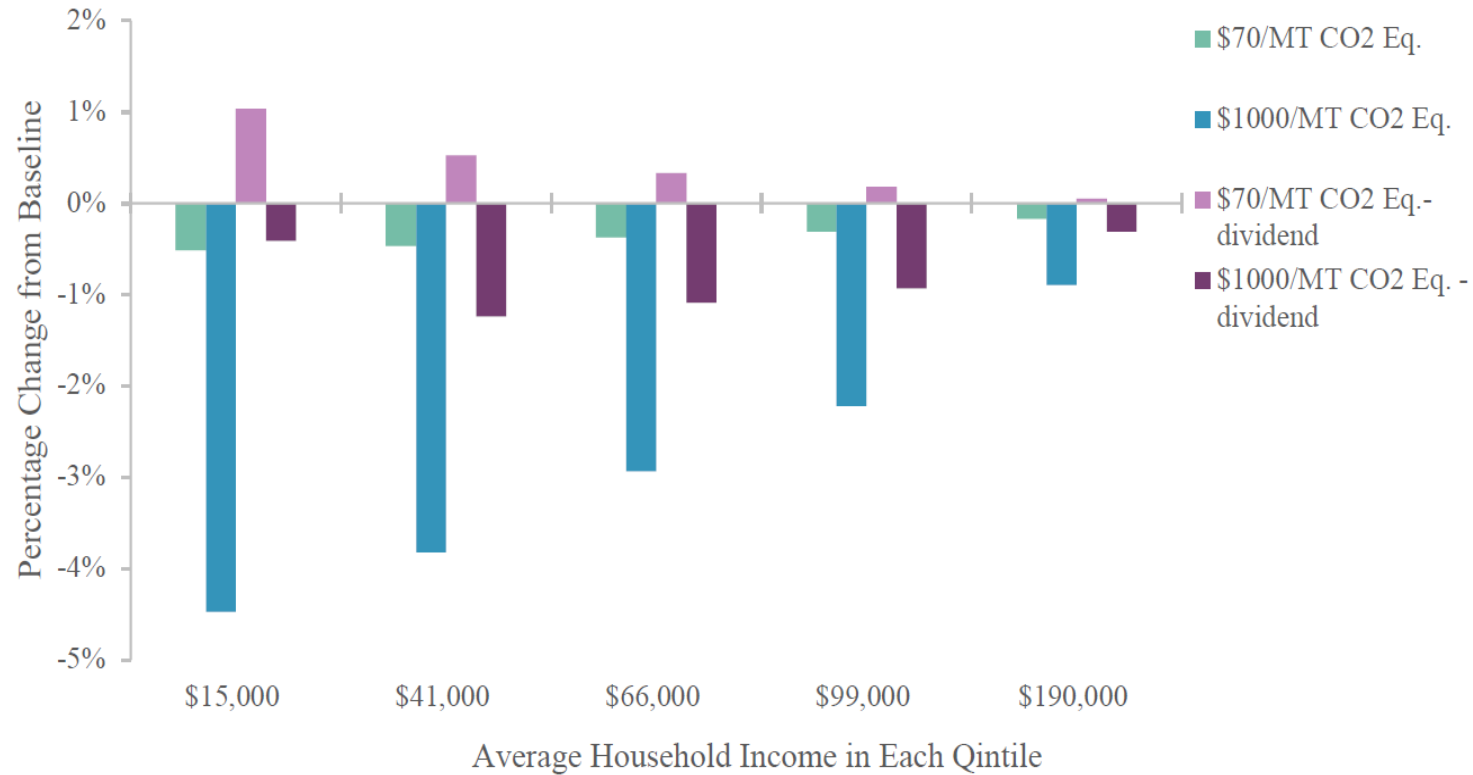
Change in Visitor Spending from Baseline under Carbon Tax and Revenue Scenarios, 2019-2045



Share of Vehicle Miles Travelled by Electric Vehicles

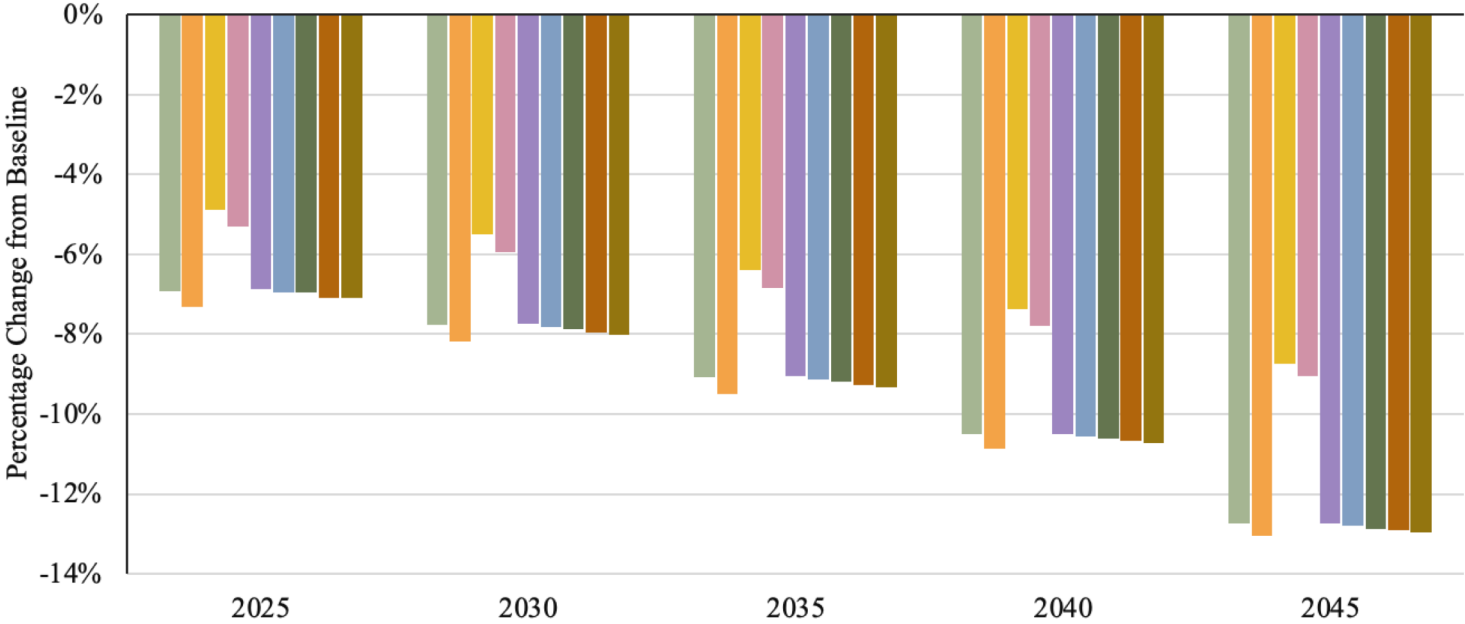


Change in Household Welfare from Baseline under Carbon Tax and Revenue Scenarios, 2045



A third of carbon tax revenues are paid by visitors to Hawai'i by 2045

Change in GHG Emissions under Scenarios S1-9 in Comparison to a No Carbon Tax Baseline

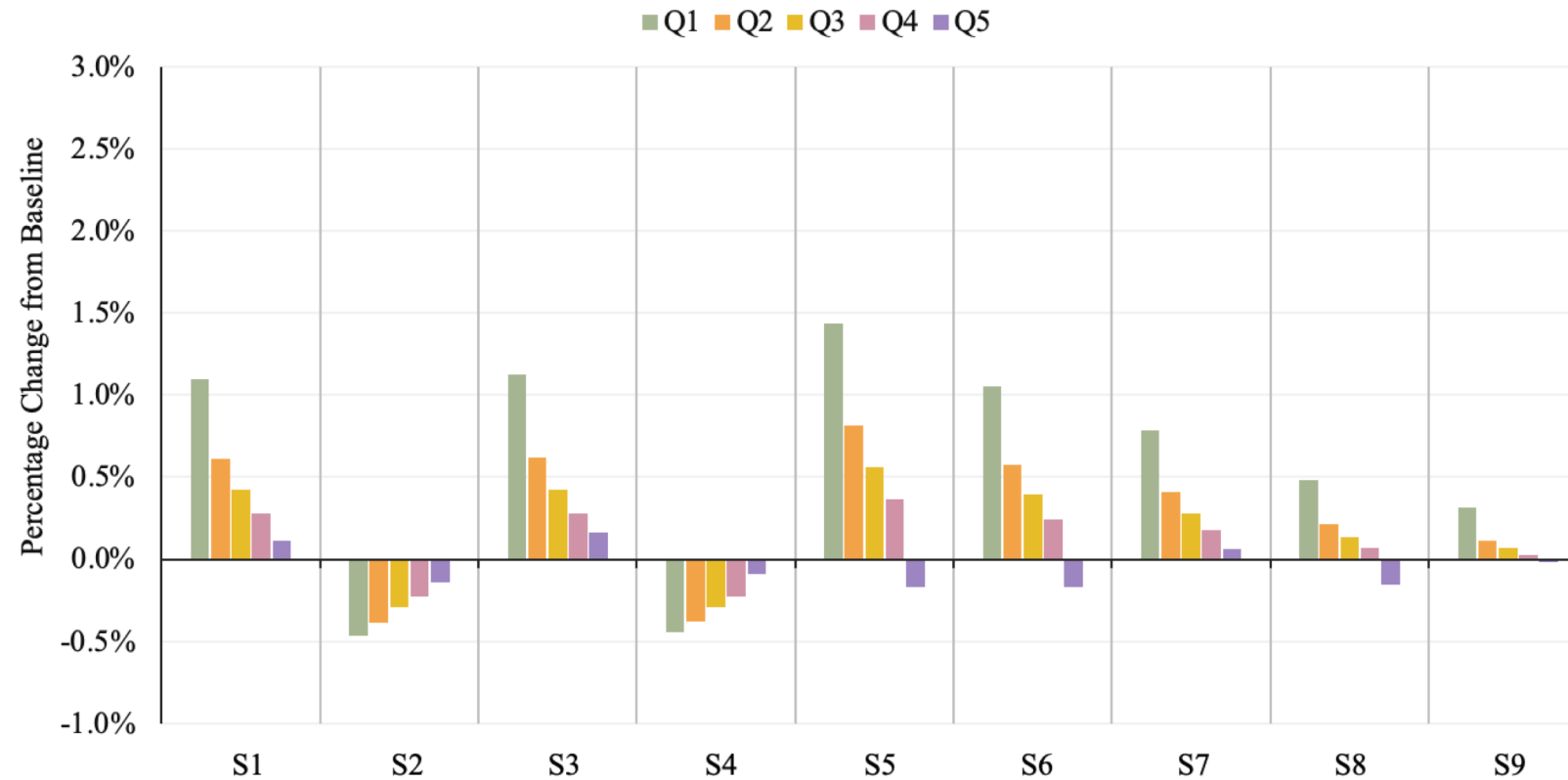


TRC Additional Scenarios

Year	“\$70/MT CO ₂ Eq.”
2025	\$50
2030	\$54
2035	\$60
2040	\$65
2045	\$70

Scenario	S1	S2	S3	S4	S5	S6	S7	S8	S9
Sectors taxed	All	All	All but Aviation	All but Aviation	All	All	All	All	All
Share to Households	100%	0%	100%	0%	100%	80%	80%	50%	50%
Households	Q1-Q5	None	Q1-Q5	None	Q1-Q4	Q1-Q4	Q1-Q5	Q1-Q4	Q1-Q5

Change in Household Welfare under Scenarios S1-9 in Comparison to a No Carbon Tax Baseline, for 2045



Sectors taxed	All	All	All but Aviation	All but Aviation	All	All	All	All	All
Share to HH	100%	0%	100%	0%	100%	80%	80%	50%	50%
HH	Q1-Q5	None	Q1-Q5	None	Q1-Q4	Q1-Q4	Q1-Q5	Q1-Q4	Q1-Q5

Carbon Tax Revenues to Government and Households by Scenario (S1 & S2, i.e. Part I)

	2025	2030	2035	2040	2045
State Government Revenue (\$2012 Million)					
\$70/MT CO ₂ Eq.	\$580	\$630	\$670	\$690	\$610
\$1,000/MT CO ₂ Eq.	\$1,900	\$2,400	\$2,600	\$2,800	\$2,800
\$70/MT CO ₂ Eq. - dividend	\$110	\$120	\$140	\$150	\$170
\$1,000/MT CO ₂ Eq. - dividend	\$410	\$690	\$980	\$1,300	\$1,600
Household Revenue (\$2012/household)					
\$70/MT CO ₂ Eq. - dividend	\$980	\$1,000	\$1,100	\$1,000	\$850
\$1,000/MT CO ₂ Eq. - dividend	\$3,000	\$3,400	\$3,300	\$2,900	\$2,400

Key Takeaways

1. A carbon tax plus dividend in Hawai‘i is progressive.
2. A very high carbon tax can result in overall welfare declines.
3. Meeting Hawai‘i’s goal of net negative emissions (Act 15, 2018) requires new technologies to be cost effective.
4. Visitors pay into the carbon tax and these revenues would be directly transferred by a dividend to Hawai‘i’s households.

Administrative Considerations

- Carbon tax – strongly recommend levying “upstream” carbon tax
- Cap-and-trade offers little additional benefit
 - Via the Western Climate Initiative (WCI)
 - Considerations for market size, harmonized regional price (linked market), upstream v. downstream (affects number of entities), regulatory burden/authority for Hawai‘i lead agency
- Sectoral coverage – fossil fuel emissions in Hawai‘i (excluding military and international fuels) approximately 80%, reduces to approximately 60% if aviation is excluded
 - Additional legal assessment of taxation of aviation fuels is needed

Questions?