APPENDIX A:

"Hawai‘i Carbon Pricing Study: Additional Scenarios & Administrative Considerations"

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Hawai‘i Carbon Pricing Study
Additional Scenarios & Administrative Considerations

A Report to the State of Hawai‘i Tax Review Commission

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Executive Summary

This study follows up on our previous report *Carbon Pricing Assessment for Hawai'i: Economic and Greenhouse Gas Impacts* (Coffman, Bernstein, Schjervheim, Hayashida and La Croix, April 2021), which was sponsored by the Hawai'i State Energy Office (HSEO) in response to Act 122, Session Laws of Hawai'i 2019. This follow-up study is sponsored by the State of Hawai'i Tax Review Commission (TRC) via the State Department of Taxation. The study is divided into two parts. The first part uses the methods and model presented in our April 2021 report to make additional assessments of the impacts of state-level carbon pricing on Hawai'i's economy and greenhouse gas (GHG) emissions. The second part identifies and evaluates important administrative considerations for the implementation of a state-level carbon price.

Summary of Part I

The first part of this study analyzes seven additional carbon tax scenarios not previously considered in the April 2021 report. The analysis uses a comprehensive demand- and supply-side model of Hawai'i's economy and accompanying GHG emissions. It represents spending by Hawai'i households on goods and services across economic sectors, with analysis for impacts to the average household in five different slices of the income distribution (0-20%, 21-40%, 41-60%, 61-80%, 81-100%; denoted by Q1, Q2, Q3, Q4, Q5). While our April 2021 report looked at two carbon price pathways, this study focuses on the case in which the tax is set to the federal social cost of carbon (SCC). This price path is an estimate of the global damage caused by a unit of GHG emissions (IWGSCGG, 2021). The tax rate for all scenarios in this study begins at $56 per metric ton of CO_2 equivalent (MT CO_2 Eq.) in 2025 and increases to $79/MT CO_2 Eq. by 2045 ($2020). Our April 2021 report found that the average household in each of the five 20% slices of the income distribution is made economically better-off in all periods from 2025 to 2045 when carbon tax revenues, excluding aviation-related revenues, are returned to households in equal shares (herein represented as scenario S1). By contrast, model simulations show that the average household in each of the five 20% slices of the income distribution is made economically worse-off in all periods from 2025 to 2045 when carbon tax revenues are used for government spending (herein represented as scenario S2).

Additional scenarios considered in this study involve different combinations of two factors: whether aviation fuels are subject to a carbon tax and the size of the shares of carbon tax revenues returned to households and state government. Additional scenarios (S3 - S9) are represented in Table ES-1. Scenarios S3 and S4 are used to compare the economic and GHG impacts when the carbon tax does not cover aviation-related GHG emissions with the two scenarios in our prior study (S1 and S2) in which a carbon tax is imposed on aviation fuel. Aviation sector emissions amounted to 3.2 MMT CO_2 Eq. in 2019, and total emissions (excluding sources of carbon sinks) amounted to 19.6 (ICF & UHERO, 2019). Excluding

aviation-related emissions reduces the statewide coverage of the carbon tax from 81% to 64% in 2025.

Scenarios S5-S9 are motivated by the concern expressed in other studies that a poorly designed carbon tax can disproportionately hurt lower-income households and by the interest of TRC members in scenarios in which a larger share of tax revenue is dedicated to across-the-board increases in government spending. The variations in levels of allocation to government versus households, as well as among households, were incorporated in these scenarios to better understand these tradeoffs. We consider the following household/government shares: 100/0, 80/20, 50/50, and 0/100. Because of the large gap in wealth between the 60-80% slice of the income distribution (Q4) and the 81-100% slice (Q5), we consider three scenarios (S5, S6 and S8) where equal share dividend payments are only given to the lower 80% of the income distribution (Q1-Q4).

Table ES-1. Scenarios Considered in this Report

Scenario Number	*Analyzed in Prior Report?*	*Aviation Fuels Taxed?*	*Allocation for Non-Aviation Carbon Tax Revenues**	
			Share of Revenue Returned to Average Household Income Quintiles (Q1 - Q5)	***Share of Revenue to State Government Spending***
S1	Yes	Yes	100%; Equal shares given to all households	0%
S2	Yes	Yes	0%	100%
S3	No	No	100%; Equal shares given to all households	0%
S4	No	No	0%	100%
S5	No	Yes	100%; Equal shares given to Q1-Q4. No payments to households in Q5.	0%
S6	No	Yes	80%; Equal shares given to Q1-Q4. No payments to households in Q5.	20%
S7	No	Yes	80%; Equal shares given to Q1-Q5	20%
S8	No	Yes	50%; Equal shares given to Q1-Q4. No payments to households in Q5.	50%
S9	No	Yes	50%; Equal shares given to Q1-Q5	50%

*This study assumes that revenues from taxation of aviation fuels always remain with the state due to federal regulations governing the use of revenues from state-level taxes on the aviation sector.

Part I: Key Takeaways

- The impact of a carbon tax on the Hawai‘i economy and GHGs is sensitive to whether the tax is levied on aviation-related GHG emissions. GHG emissions abatement is reduced by approximately 30% when aviation-related emissions are excluded.
- Inclusion of aviation emissions under a carbon tax substantially increases carbon tax revenues. If the carbon tax covers aviation, then total revenues increase by $100 million in 2025 and $170 million in 2045.
- When the share of revenues distributed to households as dividends increases from 50% to 100%, annual revenues distributed to households increases by between $220 million and $270 million dollars, depending on the specific year.
- All households gain in scenarios where 100% or 80% of revenues are shared equally with all households (S1 and S7). When 50% of the revenues are shared across all households (S9), the average household in the highest 20% of the income distribution (Q5) experiences a small loss in 2025, which nearly disappears by 2045.
- Households are able to experience welfare gains from the imposition of a carbon tax in part because revenues generated by visitors are transferred to residents. For visitors, the carbon tax operates essentially as an indirect visitor impact fee. By 2045, visitors contribute approximately one third of carbon tax revenues, if aviation-related emissions are taxed.
- The carbon tax proportionately benefits lower-income households (on average) in the scenarios when at least 50% of the revenue is returned in equal shares to households. This progressivity occurs because higher-income households tend to consume more fossil fuels and more goods and services overall and are thus contributing directly and indirectly more of the carbon tax revenues.
- The average household welfare gain from the tax can be made more progressive by increasing the share of dividends paid to lower-income households. In scenarios (S5, S6, and S8) where revenues are returned only to households in the lower 80% of the income distribution, the average household in each 20% slice (Q1-Q4) of the lower 80% of the income distribution gains relatively more, while the average household in the highest 20% of the income distribution (Q5) experiences a loss in welfare.

Summary of Part II

The second part of this study focuses on the administration and implementation of a carbon price in Hawai‘i. This part discusses and makes recommendations on (1) how to levy the carbon price and collect the revenue, (2) ways to use the new revenue, and (3) and how to and to whom to distribute dividend payments. Key recommendations are as follows:

Levying the carbon price and collecting the revenues

- We recommend that the state government implement an upstream carbon tax by making use of the existing administrative infrastructure surrounding the barrel tax. This approach limits the administrative burdens of establishing a carbon price in Hawai‘i.
- Though a cap-and-trade program is conceptually viable, and could benefit Hawai‘i from greater market access to permits from a linked system, it requires substantially larger upfront and ongoing administrative costs to operate successfully. In addition, there are no economic or GHG abatement benefits from a standalone cap-and-trade program for Hawai‘i relative to an upstream carbon tax.
- Given the relatively nascent market for carbon offsets, we recommend that the Hawai‘i State Energy Office and other relevant state agencies monitor the growth and performance of offset markets, both inside and outside of Hawai‘i, before offsets are included in a carbon tax program for Hawai‘i. Future guidance could be developed based on the outcomes of the State's Greenhouse Gas Sequestration Task Force.

Ways to Use Carbon Tax Revenues

- Based on our findings in Part I, we recommend that the state government distribute a substantial portion of the net carbon tax revenues to eligible Hawai‘i households. Model simulations indicate that Hawai‘i households across the income distribution can realize gains in welfare despite the imposition of the tax. This distribution of revenues to Hawai‘i households is supportive of the State Climate Change Commission's goal to push forward climate change responses that are "Clean, Equitable, and Resilient."
- Under no circumstances should dividend allocations be determined by variables directly or closely associated with fossil fuel use of particular households, such as electricity or gasoline consumption or overall household spending. That is, the dividend payment must be completely independent of the household's actions, and thus it is only the tax that affects a household's behavior regarding the consumption of fossil fuel and not the dividend. This association would undermine price incentives to reduce consumption of fossil fuels and GHG emissions.
- We recommend that the State of Hawai‘i refrain from cutting labor or capital taxes to offset the carbon tax revenues. While such changes can lead to substantial overall gains

in welfare over several decades, they can also leave significant numbers of households (e.g., retired seniors who do not participate in labor markets) without any compensation for the burden of the tax.

- If the state decides to keep a portion of the net revenues from a carbon tax, we recommend that the revenues be used to fund critical environmental projects, such as climate adaptation projects. Such environmentally-oriented spending ties revenue use to the purpose of the tax, which has been shown to be important in terms of policy durability and public support.

Distribution of Dividend Payments

- To minimize administrative cost, we recommend that dividend payments leverage the existing tax system to the extent possible.
- We recommend that dividend payments be made to members of the community who are considered residents under Hawai‘i tax law, established via correct filing of a form N-11.
- We recommend that additional consideration be given to part-time residents and others that the Legislature deems to have spent a sufficient amount of time in Hawai‘i during the tax year to merit the carbon tax dividend. Pro-rated systems might also be considered, depending on their administrative burden to DOTAX.
- We recommend that an easy-to-file individual income tax form be created for those who are not required to file an N-11 but would otherwise qualify for the carbon tax dividend.
- We recommend that most revenues be returned to households as a lump-sum annual refundable tax credit. For those most economically vulnerable and unable to adjust their withholdings because they are not working, we recommend that administrators look into the feasibility of prepayments or more frequent quarterly or monthly payments. These more frequent distributions will be most relevant for individuals who file the newly created tax form for those without taxable income.
- We recommend that household dividend shares vary with household size. We recommend that allocations of dividends either be done in equal shares to all persons, or with a slightly lower payment for additional household members. Empirical studies of average household energy use suggest that households of larger size realize some economies of scale in energy use and that an additional child contributes less to energy use than an additional adult. Deep discounting of additional adults or children is not supported by empirical studies.

Introduction

This study follows up on our previous report *Carbon Pricing Assessment for Hawai'i: Economic and Greenhouse Gas Impacts* (Coffman, Bernstein, Schjervheim, Hayashida, and La Croix, April 2021). Sponsored by the Hawai'i State Energy Office (HSEO) in response to Act 122, Session Laws of Hawai'i 2019, the previous report assesses the economic and greenhouse gas (GHG) impacts of a state-level carbon price in Hawai'i. The analysis uses a comprehensive demand- and supply-side model of Hawai'i's overall economy and accompanying GHG emissions. It represents spending by Hawai'i households on goods and services across economic sectors, with separate analysis for households within different quintiles of the income distribution (i.e., 20% slices, represented as Q1 to Q5). We use the model to assess the impacts of two different levels of the carbon tax, both imposed from 2025 to 2045, as well as two alternative uses of revenue from the carbon tax. The first carbon tax pathway sets the carbon price equal to the federally-specified "social cost of carbon" (SCC), which is an estimate of the global damage caused by a metric ton of GHG emissions (IWGSCGG, 2021). The tax rate begins at $56 per metric ton of CO_2 equivalent (MT CO_2 Eq.) in 2025 and increases to $79/MT CO_2 Eq. by 2045 ($2020). The second pathway sets the carbon price using the concept of "environmental targeting." This means that the carbon price is set at a level that supports stated climate science-supported goals of deep decarbonization by mid-century (Metcalf, 2017; Kaufman et al., 2020a). This corresponds to a carbon tax rate of $275/MT CO_2 Eq. in 2025 and increases to $1,150 in 2045 ($2020).

The April 2021 report takes a "book-end" approach regarding the use of carbon tax revenues: In one scenario state government retains revenues, and uses them to increase state government spending across-the-board, while in a second scenario all tax revenues except those from aviation fuel are returned to households in equal lump-sum payments.[1] The latter scenario is often called a "tax-and-dividend" policy. Major findings of the prior April 2021 report are as follows:

- A carbon tax set at the federal SCC from 2025 to 2045 reduces Hawai'i's cumulative GHG emissions over this time period by 25 million metric tons of CO_2 equivalent (MMT CO_2 Eq.). In 2045, GHG emissions are 13% below 2045 baseline levels and 40% below actual 2019 levels.
- A carbon tax that increases to $1,150/MMT CO_2 Eq. by 2045 reduces cumulative GHG emissions in Hawai'i between 2025 and 2045 by 150 MMT CO_2 Eq. In 2045, emissions are 70% below 2045 baseline levels and 80% below 2019 levels.

[1] The study assumes that revenues from taxation of aviation fuels always remain with the state due to federal regulations governing the use of revenues from state-level taxes on the aviation sector (FAA, 2019).

- When SCC-level tax revenues are returned to households in equal shares, the policy is progressive, meaning that it proportionately benefits lower-income households more than upper-income households.
- The SCC scenario in which tax revenues are returned to households produces overall increases in welfare for the average household in each 20% slice of the income distribution (Q1-Q5) and over all time periods. Though employing the carbon tax results in a smaller increase in economic growth, the dividend payment more than offsets any negative impacts to average household welfare.
- The higher-tax scenario produces declines in welfare for households even when tax revenues are returned to households, though this effect changes over time. In 2025 there are increases to the welfare of the average household in lower- and middle-income households (Q1-Q3), and decreases to the welfare of the average household in upper income households (Q4-Q5). By 2045, average household welfare decreases across all slices of the income distribution. Higher carbon taxes cause economic growth to be lower, and these output losses outweigh other positive effects from the tax.
- Visitors to Hawai‘i pay the carbon tax through higher prices of goods and services purchased while in Hawai‘i. If a dividend accompanies the carbon tax, then tax revenues paid by tourists are redistributed to Hawai‘i households. This transfer from visitors to Hawai‘i residents leads to positive net gains in welfare for the average household in all slices of the income distribution (Q1-Q5) in the SCC scenario.

This study extends our prior analysis and focuses solely on the case in which the carbon tax is set equal to the federally-specified SCC. Based on the interest and input of the Tax Review Commission and on the availability of data for analysis, this study a) assesses different allocations of the carbon tax revenues between households and government, b) adds scenarios where the carbon tax is not levied on aviation fuels, as there are legal and regulatory questions regarding how this levy might function based on several federal statutes,[2] and c) includes a discussion and recommendations around practical considerations of administering a state-level carbon tax for Hawai‘i, with an emphasis on mechanisms used to distribute revenues from the carbon tax. Topics (a) and (b) comprise Part I of the study; topic (c), Part II.

[2] Federal regulations on state government taxation of aviation fuels require that the state use these revenues within the airport and aviation sector (FAA, 2019). The federal Anti-Head Tax Act declares that a state government or other state-affiliated entities "may not levy or collect a tax, fee, head charge, or other charge on – (1) an individual traveling in air commerce; [or] the transportation of an individual traveling in air commerce …" Whether a state-level carbon tax levied on aviation fuels, an input into the production of air travel, violates the Anti-Head Tax Act is a legal question beyond the scope of our analysis.

Part I. Additional Scenario Analysis

Using the same model of the Hawai‘i economy detailed in our April 2021 report, we run seven additional carbon tax scenarios with the tax rate set at the SCC (Figure 1). The conversion of the carbon tax rate to a barrel of fossil fuel, and million british thermal units of coal and gas, are shown in Tables 1 and 2.

Figure 1. Social Cost of Carbon ($2020), 2025-2045

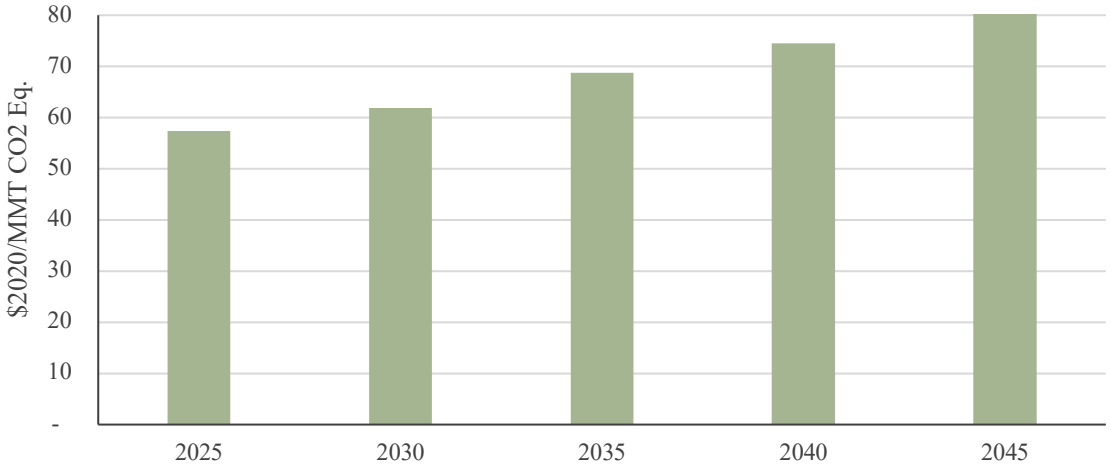


*Table 1. Federal Social Cost of Carbon Tax Rates Per Barrel of Fossil Fuel ($2020/barrel), 2025-2045**

Fuel	***2025***	***2030***	***2035***	***2040***	***2045***
Propane	13.87	14.97	16.64	18.03	19.41
Butane	16.15	17.44	19.38	21.00	22.61
Butane/propane mix	14.95	16.14	17.94	19.43	20.93
Home heating and diesel fuel (distillate)	24.46	26.41	29.35	31.79	34.24
Kerosene	23.47	25.35	28.16	30.51	32.86
Gasoline	21.40	23.11	25.68	27.82	29.96
Residual heating fuel (businesses only)	28.38	30.65	34.06	36.90	39.73
Jet fuel	23.04	24.88	27.64	29.95	32.25
Aviation gas	20.10	21.71	24.12	26.13	28.14

*Table 2. Federal Social Cost of Carbon Tax Rates Per Million British Thermal Units of Coal and Natural Gas ($2020/mmBtu), 2025-2045**

Fuel	2025	2030	2035	2040	2045
Coal (All types)	*5.46*	*5.90*	*6.56*	*7.10*	*7.65*
Natural Gas	*3.04*	*3.29*	*3.65*	*3.95*	*4.26*

** Conversions are done using EIA emissions factors available at https://www.eia.gov/environment/emissions/co2_vol_mass.php.*

The additional scenarios considered in this study involve different combinations of two factors: whether aviation fuels are subject to a carbon tax and the sharing of carbon tax revenues amongst households in different slices of the income distribution and state government. For ease of comparison, our tables and figures include the two primary scenarios from the our April 2021 report for the SCC case: a carbon tax with revenues from non-aviation emissions returned equally to all households as dividends (S1) and a carbon tax with these revenues allocated to across-the-board increases in government spending (S2). Both scenarios include a carbon tax on aviation fuels. As in the prior report, all scenarios are compared to a "baseline" counterfactual without a carbon tax.[3] Table 3 details the major assumptions underpinning each of the nine scenarios (S1-S9).

[3] For a detailed discussion of the baseline, see the April 2021 report (Coffman et al., 2021). Critically important assumptions in the baseline model are the implementation of the State's Renewable Portfolio Standard (RPS) target, the extent of electric vehicle (EV) adoption, and the change in energy efficiency over time of different economic sectors.

Table 3. Scenarios Considered (S1-S9)

Scenario Number	***Shown in Prior Report?***	***Aviation Fuels Taxed?***	***Description of Allocation for Non-Aviation Carbon Tax Revenues***	
			Share of Revenue Returned to Average Household Income Quintiles (Q1 - Q5)	***Share of Revenue to State Government Spending***
S1	Yes	Yes	100%; Equal shares given to Q1-Q5	0%
S2	Yes	Yes	0%	100%
S3	No	No	100%; Equal shares given to Q1-Q5	0%
S4	No	No	0%	100%
S5	No	Yes	100%; Equal shares given to Q1-Q4. No payments to households in Q5.	0%
S6	No	Yes	80%; Equal shares given to Q1-Q4. No payments to households in Q5.	20%
S7	No	Yes	80%; Equal shares given to Q1-Q5	20%
S8	No	Yes	50%; Equal shares given to Q1-Q4. No payments to households in Q5.	50%
S9	No	Yes	50%; Equal shares given to Q1-Q5	50%

As in our April 2021 report, this inquiry focuses on energy-related GHG emissions within the state with a few exemptions. All scenarios assume that military-related GHG emissions are beyond the jurisdiction of state tax authority, and would not be subject to the carbon tax or other state regulations.[4]

[4] For simplicity, both in terms of modeling and administration, waste incinerated for electricity generation is also excluded from the tax in our scenarios as the CO_2 output per unit of energy is more variable than that of petroleum products. GHG emissions from waste-to-energy processes as well as other non-energy-related emissions could, of course, be subject to a carbon tax.

We present the results of seven additional scenarios (S3 - S9) in this study. Scenarios S3 and S4 are used to compare the economic and GHG impacts when the carbon tax does not cover aviation-related GHG emissions with the two scenarios in our prior study (S1 and S2) in which a carbon tax is imposed on aviation fuel. Aviation sector emissions amounted to 3.2 MMT CO_2 Eq. in 2019, and total emissions (excluding sources of carbon sinks) amounted to 19.6 (ICF & UHERO, 2019). Excluding aviation-related emissions reduces the statewide emissions coverage of the carbon tax from 81% to 64% in 2025.[5]

Scenarios S5-S9 are motivated by the concern expressed in other studies that a poorly- designed carbon tax can disproportionately hurt lower-income households and by the interest of TRC members in scenarios in which a larger portion of tax revenue is dedicated to across-the-board increases in government spending. We designed the variations in levels of allocation to government versus households, as well as among households, to better understand these tradeoffs.

To assess the impact of different splits in the revenue between households and government, we consider the following household/government shares: 100/0, 80/20, 50/50, and 0/100. Because of the large wealth gap between the fourth (61-80%) and fifth (81-100%) income quintiles, we construct two household dividend scenarios for each chosen split of revenue between government and households.[6] For illustration, the average annual income in each quintile in 2019 is shown in Table 4.[7] Scenario S5 is similar to scenario S1, except that carbon tax revenues are distributed only to households in the first 80% of the income distribution (Q1-Q4), with households in the upper 20% of the income distribution (Q5) excluded from receiving the dividend. In Scenario S1 from the initial study, the average household in each quintile is made economically better-off in all periods from 2025 to 2045 when carbon tax revenues, excluding aviation-related revenues, are returned to households in equal shares. In this scenario, even the average household in the top 20% of the income distribution (Q5) is slightly better-off in 2045 compared to the baseline of no carbon tax and dividend.

[5] Based on the State's 2016 GHG Inventory (ICF & UHERO, 2019).

[6] Households in the highest income quintile, Q5, have an average income over twice that of households in the next highest income quintile, Q4 (see Coffman et al. 2021, Table 5). In scenario S5 we eliminate dividends for households in Q5 because average household incomes are much closer between Q3 and Q4, where households in Q4 earn about 50% more than households in Q3, than between households in Q4 and Q5.

Table 4. Average Annual Household Income in Each 20% of the Income Distribution (Q1-Q5) in 2019

Quintile	***Average Annual Household Income***
Q1	$18,445
Q2	$51,487
Q3	$83,525
Q4	$125,285
Q5	$252,492

Source: Census Bureau, Mean Household Income of Quintiles. American Community Survey, 2019 1-year sample. Available at https://data.census.gov/cedsci/.

Scenario S6 returns carbon tax revenues only to households in the lower 80% of the income distribution while also allocating 20% of revenues to government spending. The additional 20% allocation adds to carbon tax revenues already provided to state government from aviation fuel-related taxation.

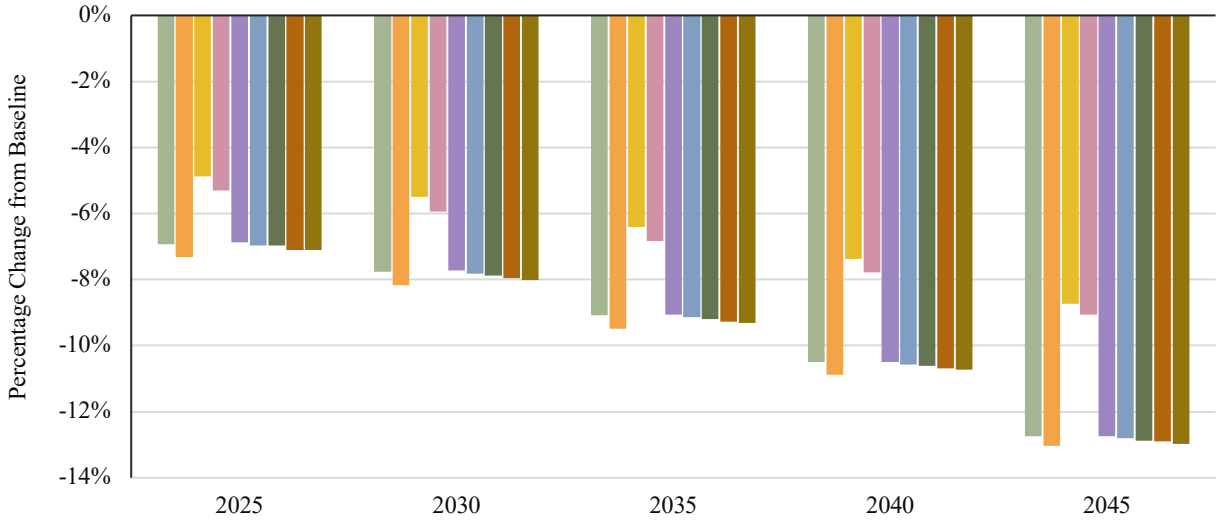
Scenario S7 is similar to scenario S6 in that 80% of revenues are allocated towards households and 20% towards government. It differs from S6 by sharing revenues equally among all households.

Lastly, scenarios S8 and S9 are identical to scenarios S6 and S7, respectively, except that the allocation to government of non-aviation carbon tax revenues is increased from 20% to 50%.

Findings

We report results for changes in statewide GHGs, total economic activity, and household welfare. Figure 2 shows GHG emissions in scenarios S1 – S9 relative to the baseline without a carbon tax. Results show that the only notable difference in GHG emissions reductions across scenarios stems from whether the carbon tax is extended to aviation-related emissions.

Figure 2. Change in GHG Emissions under Scenarios S1-S9, in Comparison to Baseline without a Carbon Tax

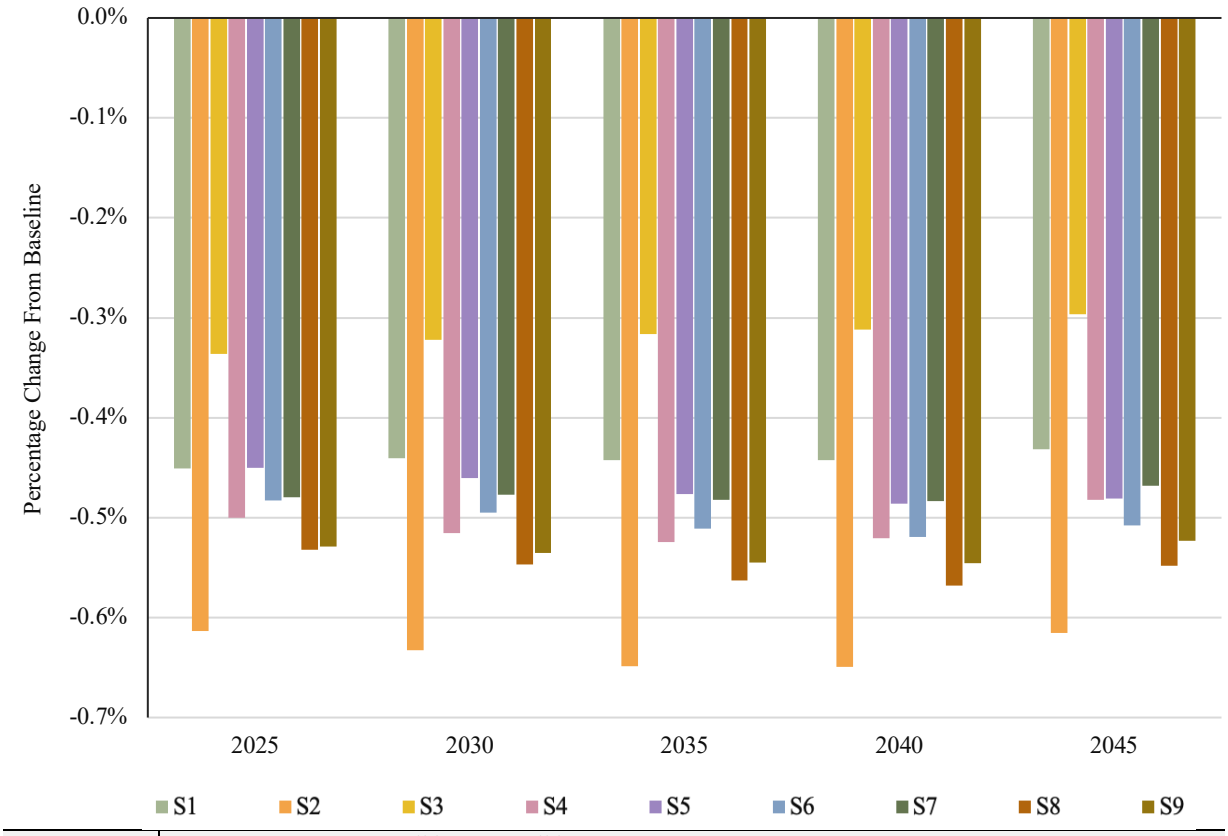


	S1	S2	S3	S4	S5	S6	S7	S8	S9
Sectors taxed	All	All	All but Aviation	All but Aviation	All	All	All	All	All
Revenue share to households	100%	0%	100%	0%	100%	80%	80%	50%	50%
Households receiving dividends	Q1-Q5	None	Q1-Q5	None	Q1-Q4	Q1-Q4	Q1-Q5	Q1-Q4	Q1-Q5

In 2025, scenarios S3 and S4, which exempt aviation fuel, show an approximate decline in GHG emissions from the no carbon tax baseline of about 5%. This reduction contrasts with a 7% decline from baseline in the scenarios where aviation fuel is taxed (S1-2 and S5-9), a two percentage point difference. By 2045 this difference becomes more pronounced because of the continued growth in emissions from air transport. In scenarios S3 and S4, emissions decline by about 9% from the baseline, while in the other scenarios declines are closer to 13%. There are minor differences in GHG emissions between different revenue use scenarios as returning revenues to households leads to higher overall consumption of all goods and services and thus a small rebound in GHG emissions. In all cases, changes in revenue use result in less than half a percentage point difference between comparable scenarios.

Figure 3 shows total output (a measure of overall economic activity) in scenarios S1-S9 relative to baseline output. Results show that a carbon tax has a contractionary effect on economic activities, resulting in less economic activity than in the baseline. For a given scenario, the loss in total output is fairly constant over time, varying by about 0.1 percentage point from 2025 through 2045. The causes for the drop in output are discussed in detail in our April 2021 report. The economy fares best in the case where aviation-related fuels are exempted from taxation.

Figure 3. Change in Total Output under Scenarios S1-S9, in Comparison to a Baseline without a Carbon Tax



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

As in our April 2021 report, the economy fares better when revenues are returned to households via dividends. The dividend payments bolster household welfare and thus household spending, which boosts the overall economy. This effect ranges between 0.1 - 0.2 percentage points across time. Differences in the impact to the overall economy among dividend-related scenarios, S1 and S5-S9, vary based on the share of dividends returned to households in each income quintile. These differences across time for a given scenario are less than 0.1 percentage points.

Figure 4 shows the share of carbon tax revenues paid by visitors, with the remainder paid by Hawai‘i residents. Visitors contribute almost a third (28-33%) of all carbon tax revenues. Their share increases over time as emissions from aviation become a larger proportion of GHG emissions. The vast majority of aviation sector emissions come from visitors, about 80%.

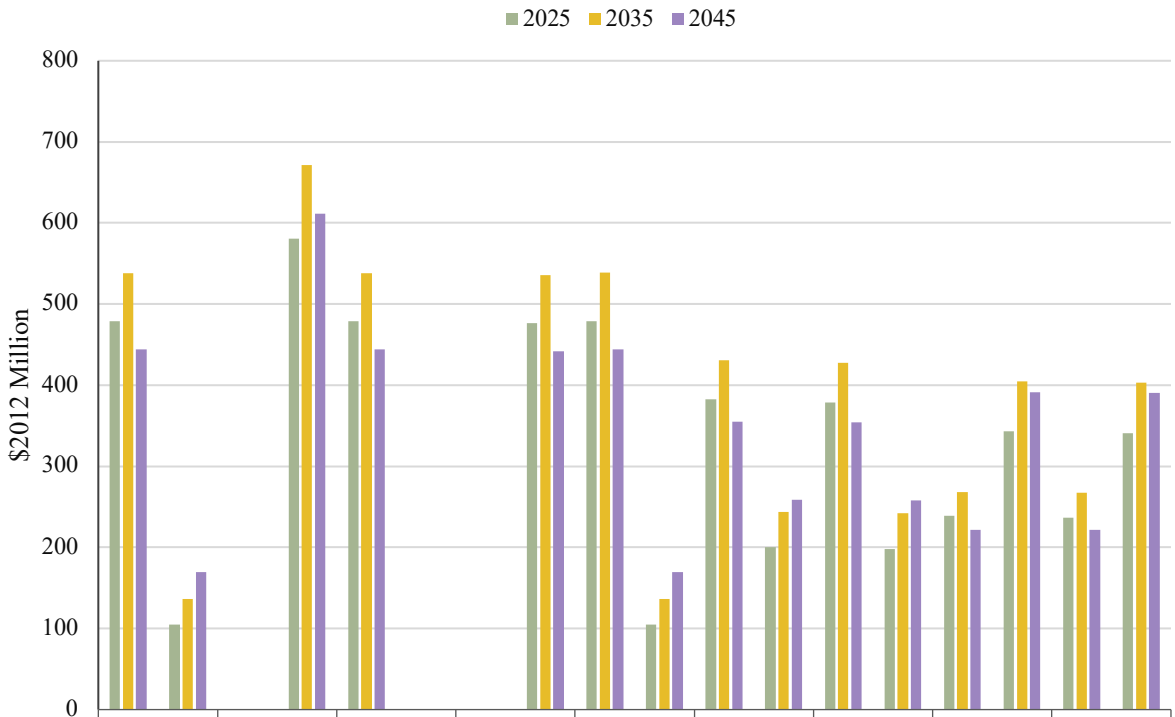
Excluding the aviation sector, visitors account for approximately 10% of all other GHG emissions in the state.

Figure 4. Share of Carbon Tax Revenues paid by Visitors within All Sectors, All Sectors but Aviation, and Aviation: 2025 – 2045

Figure 5 shows the total revenue raised and allocated to either government spending or aggregate household payments ($2012). Table 5 shows the total revenue allocated to government spending and households in each model year and Table 6 shows the annual dividend per household ($2012).[8] Total revenue raised remains relatively stable as the fuel tax base decreases with the increasing carbon tax rate. It ranges from about $580-$690 million in the economy wide-scenarios (S1-S2, S5-S9) and between $440-$540 million in the two scenarios where aviation fuels are not taxed (S3 and S4).

[8] For comparability to revenue figures shown in Coffman et al. (2021), and based on the 2012 State of Hawai‘i Input-Output Table, numbers are given in $2012. To update these numbers to $2020, multiple by a factor of 1.15 (UHERO, 2021).

Figure 5. Total Revenue Raised by Scenario and Allocation ($2012)



	S1	S2	S3	S4	S5	S6	S7	S8	S9
Sectors taxed	All	All	All but Aviation	All but Aviation	All	All	All	All	All
Revenue share to household	100%	0%	100%	0%	100%	80%	80%	50%	50%
Households receiving dividends	Q1-Q5	None	Q1-Q5	None	Q1-Q4	Q1-Q4	Q1-Q5	Q1-Q4	Q1-Q5

Table 5. Total carbon tax revenue by allocation and scenario ($2012 million), 2025-2045

Scenario	Allocation	2025	2030	2035	2040	2045
S1	Households	480	520	540	530	440
	Government	110	120	140	150	170
S2	Households	NA	NA	NA	NA	NA
	Government	580	630	670	690	610
S3	Households	480	520	540	530	440
	Government	NA	NA	NA	NA	NA
S4	Households	NA	NA	NA	NA	NA
	Government	480	510	540	530	440
S5	Households	480	520	540	540	440
	Government	110	120	140	150	170
S6	Households	380	410	430	430	360
	Government	200	220	240	260	260
S7	Households	380	410	430	430	350
	Government	200	220	240	260	260
S8	Households	240	260	270	270	220
	Government	340	380	410	420	390
S9	Households	240	260	270	270	220
	Government	340	370	400	420	390

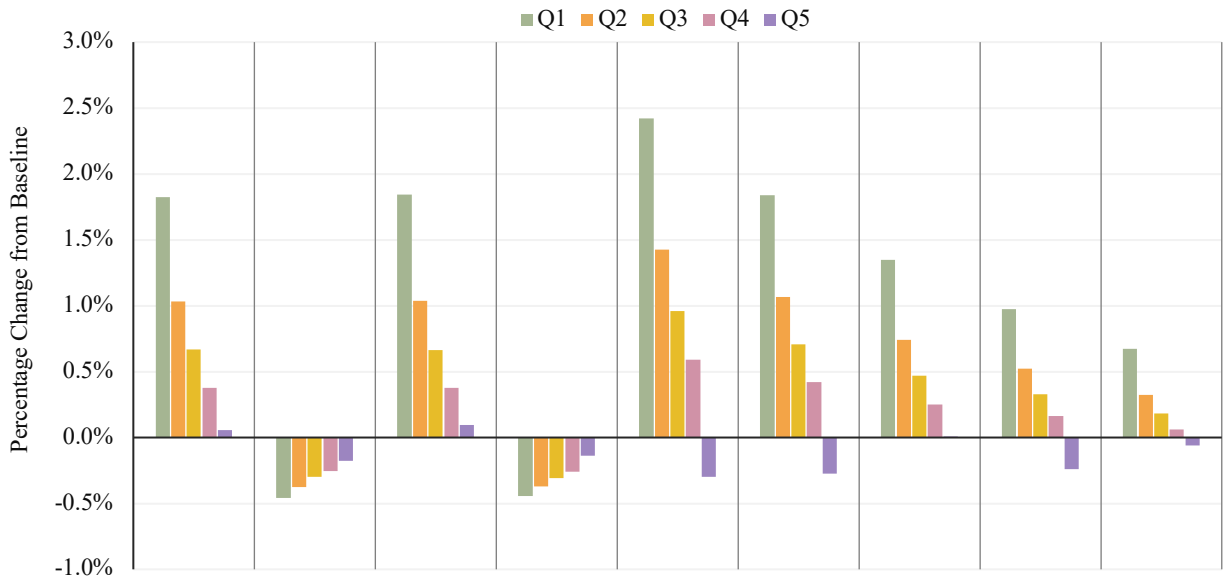
Table 6. Annual Average Household Dividend Payments in Scenarios S1, S3, and S5-S9 ($2012)

Scenario	2025	2030	2035	2040	2045
S1	980	1,000	1,100	1,000	850
S3	980	1,000	1,100	1,000	850
S5	1,200	1,300	1,300	1,300	1,100
S6	980	1,000	1,000	1,000	840
S7	770	820	830	820	670
S8	610	640	650	640	530
S9	480	510	520	510	420

In scenarios S1 and S3, where 100% of non-aviation-related tax revenues is shared by all households, an annual dividend of approximately $1,000 is allocated to each household, with the highest dividends being allocated between 2030-2040. Dividend payments drop to about $850 in 2045 ($2012). Because dividends do not include revenues from air fuels, there is nearly no difference in dividend sizes in these two scenarios (S1, S3). Dividend size shrinks as government spending increases, and there is about a 25% increase in dividend size for households in the lower 80% of the income distribution (Q1-Q4) when households in the highest 20% of the income distribution (Q5) are excluded from dividend payments (S5, S6, and S8) compared to the corresponding scenarios in which all households receive dividends (S1, S7, and S9, respectively).

Because lower-income households spend less on fossil fuels both directly (e.g., gasoline) and indirectly (e.g., electricity), the carbon tax combined with the allocation of dividends across households in different slices of the income distribution results in different welfare impacts on lower-income households than on higher-income households. Figures 6 and 7 show impacts to household welfare in 2025 and 2045, respectively, relative to the baseline without a carbon tax. Household welfare is measured as the change in consumption, adjusting for price differences.[9]

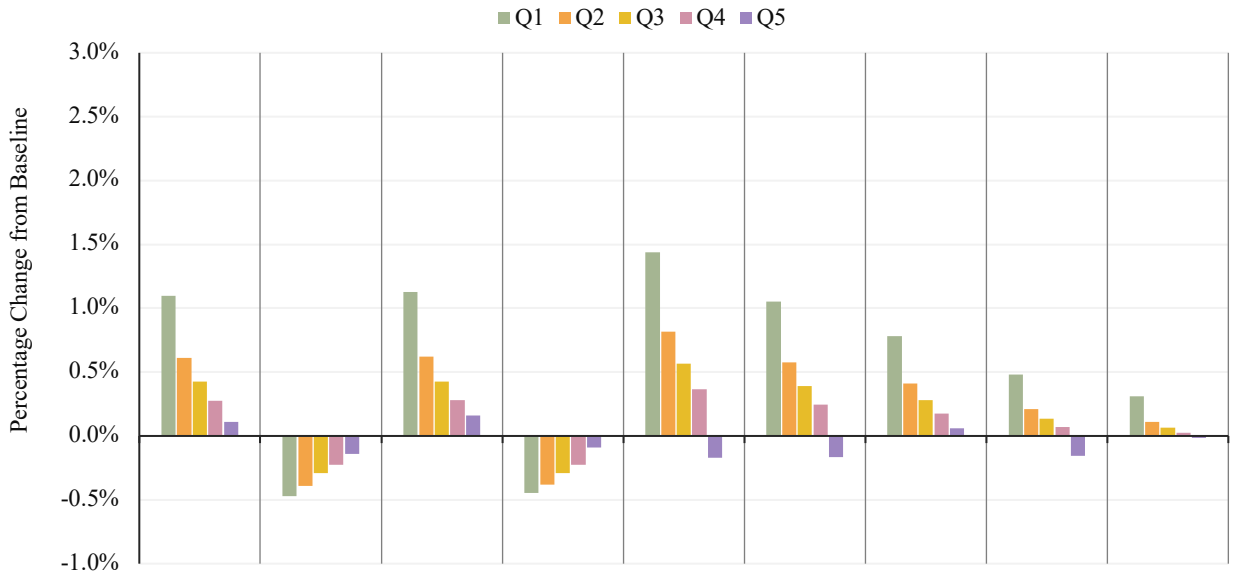
Figure 6. Change in Average Household Welfare by Income Distribution (Q1-Q5) under Scenarios S1-S9, in Comparison to Baseline without a Carbon Tax, 2025



	S1	S2	S3	S4	S5	S6	S7	S8	S9
Sectors taxed	All	All	All but Aviation	All but Aviation	All	All	All	All	All
Revenue share to households	100%	0%	100%	0%	100%	80%	80%	50%	50%
Households receiving dividends	Q1-Q5	None	Q1-Q5	None	Q1-Q4	Q1-Q4	Q1-Q5	Q1-Q4	Q1-Q5

[9] For a detailed explanation of the economic rationale for and calculation of household welfare, see Coffman et al. (2021, 101). In particular, see Appendix Equation 15.

Figure 7. Change in Average Household Welfare by Income Distribution (Q1-Q5) under Scenarios S1-S9 in Comparison to Baseline without a Carbon Tax, 2045



	S1	S2	S3	S4	S5	S6	S7	S8	S9
Sectors taxed	All	All	All but Aviation	All but Aviation	All	All	All	All	All
Revenue share to households	100%	0%	100%	0%	100%	80%	80%	50%	50%
Households receiving dividends	Q1-Q5	None	Q1-Q5	None	Q1-Q4	Q1-Q4	Q1-Q5	Q1-Q4	Q1-Q5

The overall pattern of impacts on household welfare for a given scenario is similar through time and the largest driver of differences in household welfare is whether carbon tax revenues are returned to households. Increases in welfare diminish over time because there is a decline in revenues and, therefore, dividend payments (Coffman et al., 2021, Table 13). In the scenarios where all non-aviation tax revenues are given back to all households in equal shares (S1 and S3), the average household in each slice of the income distribution experiences a gain in economic welfare. The policy design is also quite progressive, as lower-income households experience a proportionately larger benefit. This progressivity occurs because lower-income households on average consume a smaller share of the economy's energy-intensive goods and services than higher-income households and they receive the same dividend payments as higher-income households (Coffman et al. 2021, Table 5). The progressive effect is more pronounced in the scenario where aviation-related fuels are taxed (S1) because lower-income households on average consume less air transportation than higher-income households.

When carbon tax revenues are paid only to households in the lower 80% of the income distribution (Q1-Q4), the average household in each of these quintiles is made better-off while

the average household in the highest 20% of the income distribution (Q5) is made worse-off relative to the corresponding scenario where dividends are paid to all households. For example, in scenario S5, the average household in the lowest 20% of the income distribution (Q1) experiences an approximately 2% increase in spending power in 2025 and 2035 and a 1.5% gain in 2045. This represents about a 33% increase in spending power compared to scenario S1 where all households receive a dividend payment. In addition, when households in the upper 20% of the income distribution (Q5) do not receive dividends, they experience a small loss.

Consider now the other extreme, as shown in our April 2021 report, when all carbon tax revenues are allocated to government spending. In this case, the average household in all slices of the income distribution experiences a welfare loss. The distributional impacts are also regressive, an effect that is caused by the impact of the carbon tax on "use-side" effects, i.e., consumption-related effects. That is, employing a carbon tax raises prices throughout Hawai'i's economy, and these harm lower-income households disproportionately because they spend a greater share of their income on energy as well as energy-intensive goods and services. On the other hand, "source-side" impacts that arise from the supply-side tend to be progressive because higher-income households are more often the owners of energy-intensive capital.[10] In Hawai'i, use-side impacts dominate source-side impacts when dividends are not paid to households.

The intermediate scenarios that allocate 80% (S6 and S7) and 50% (S8 and S9) of non-aviation carbon tax revenues to households yield welfare results that lie roughly in the same proportion between the scenario where all non-aviation carbon tax revenues are returned to households (S5 and S1, respectively) and no revenues are returned to households (S2). For example, the welfare of the average household in the lowest 20% of the income distribution (Q1) under the 50% dividend share scenario, S9, lies roughly halfway between its welfare in scenarios S1 and S2.

Whether households receive payments equally or payments are progressively weighted to the lower 80% of the income distribution also matters. When revenues are distributed evenly across all households, then the average household in each slice of the income distribution gains except for the average household in the upper 20% of the income distribution (Q5) in the scenario with a 50% dividend share (S9). When revenues are distributed evenly to households in the lower 80% of the income distribution (Q1-Q4) and households in the upper 20% of the income distribution are excluded from dividend payments, then average households in quintiles Q1-Q4

[10] Similar computable general equilibrium models of the US economy find a carbon tax to have progressive effects, even without considering how carbon tax revenues are allocated (Goulder et al. 2019). Though these studies find the carbon tax to be progressive, they also find that a carbon tax with no return of dividends leaves all households worse off with lower levels of consumption. The difference in results from national studies to our findings for Hawai'i are primarily due to market structure, where Hawai'i has limited manufacturing.

fare between about 35% and 50% better than in the corresponding scenario where revenues are equally shared by all households.

Key Takeaways

- The impact of a carbon tax on the Hawai‘i economy and GHGs is sensitive to whether the tax is levied on aviation-related GHG emissions. GHG emissions abatement is reduced by approximately 30% when aviation-related emissions are excluded.
- Inclusion of aviation emissions under a carbon tax substantially increases carbon tax revenues. If the carbon tax covers aviation, then total revenues increase from $100 million in 2025 to $170 million in 2045.
- When the share of revenues distributed to households as dividends increases from 50% to 100%, annual revenues distributed to households increases by between $220 million and $270 million dollars, depending on the specific year.
- All households gain in scenarios where 100% or 80% of revenues are shared equally with all households (S1 and S7). When 50% of the revenues are shared across all households (scenario S9), the average household in the highest 20% of the income distribution (Q5) experiences a small loss in 2025, which nearly disappears by 2045.
- Households are able to experience welfare gains from the imposition of a carbon tax in part because revenues generated by visitors are transferred to residents. For visitors, the carbon tax operates essentially as an indirect visitor impact fee. By 2045, visitors contribute approximately one third of carbon tax revenues, if aviation-related emissions are taxed.
- The carbon tax proportionately benefits lower-income households (on average) when at least 50% of the revenue is returned in equal shares to households. This progressivity occurs because higher-income households tend to consume more fossil fuels and more goods and services overall and are thus contributing directly and indirectly more of the carbon tax revenues.
- The average household welfare gain from the tax can be made more progressive by increasing the share of dividends paid to lower-income households. In scenarios (S5, S6, and S8) where revenues are returned only to households in the lower 80% of the income distribution, the average household in each 20% slice (Q1-Q4) of the lower 80% of the income distribution gains relatively more, while the average household in the highest 20% of the income distribution (Q5) experiences a loss in welfare.

Part II. Administrative Considerations

The introduction of a carbon price to Hawai‘i’s economy motivates several important administrative considerations. They can be broadly categorized into: 1) how to levy the carbon price and collect the revenues, 2) ways to use the new revenue, and 3) how to and to whom to distribute dividend payments.

Levying the Carbon Price

If Hawai‘i decides to regulate carbon emissions by imposing a price on carbon, it must determine whether to do so via a carbon tax or a cap-and-trade system. A carbon tax sets a fixed price per unit of GHG emissions while a cap-and-trade system sets the quantity of GHG emissions allowed, with trades of emission permits determining the price per unit of GHG emission. A carbon tax provides certainty with respect to the price of abating emissions, while the resulting quantity of emissions is uncertain. This also means more certainty in regards to estimating carbon tax revenues on an on-going basis. By contrast, a cap-and-trade system provides certainty with respect to the quantity of emissions, while the price per unit of emissions permitted fluctuates.[11] If a cap-and-trade system’s cap is set at the same level of emissions achieved under a given carbon tax, then the carbon price (also called an allowance price) will have the same value as the carbon tax. On the flip side, if a carbon tax is set at the allowance price resulting from a specific cap, then the carbon tax program will achieve the same level of emissions reductions as specified by the cap. In short, the two policies can be made to be economically and environmentally similar to one another - though fundamentally they differ in their emphasis on quantity versus price, as well as their administrative procedures and costs.

Regulation of GHG Emissions by a Carbon Tax

A carbon tax for Hawai‘i could be applied as a tax per metric ton of CO_2 Eq. on all GHG emissions occurring within the boundaries of the State of Hawai‘i, or fueled within state borders in the case of aviation fuels. Three critical issues for the design of the tax are (1) which sources are covered by the tax, (2) where in the supply chain to impose the tax, i.e., which firms are the complying entities, and (3) what carbon offsets, if any, are to be credited within the tax system.

The first design issue is to establish the scope of emission sources covered and this applies equally to carbon tax and cap-and-trade systems. Generally, enhanced coverage increases the effectiveness of a carbon tax in reducing total state GHG emissions. However, there is a tradeoff

[11] Because of concern by market participants and politicians over uncertainty in permit prices, cap-and-trade systems often include price floors and ceilings to bound the range of price fluctuations. In the case where a cap-and-trade system hits either a price floor or price cap, its operation becomes much more like a fixed-price carbon tax. If a price cap becomes binding, then GHG reduction targets will not be met.

between full coverage of GHGs and administrative burden. In addition, from a broader economic perspective, excluding a limited number of sectors from carbon pricing can reduce compliance costs, particularly if the excluded sectors are likely to respond minimally to a carbon tax. However, if sectors that are likely to respond significantly (i.e., are price-sensitive) are excluded, reducing the coverage limits the range of substitution possibilities and can increase compliance costs to achieve a given level of economy-wide emission reductions (Pizer et al., 2006).

Within sub-regional programs in North America, sectoral coverage varies substantially across programs. GHG coverage ranges from approximately 10% of jurisdictional GHG emissions in Saskatchewan to 80% of jurisdictional GHG emissions in California, Québec, Nova Scotia, Northwest Territories, and British Columbia (World Bank, 2021, Figure 2.6). The California and Québec cap-and-trade program, for example, covers a wide range of GHG emissions (CO_2, CH_4, N_2O, SF_6, HFCs, PFCs, NF_3, and other fluorinated GHGs) from the industrial, power, transport, residential, and commercial sectors (World Bank, 2021). Saskatchewan's carbon tax program, on the other hand, is extremely narrow and covers only the industrial sector; however, the federal government requires additional minimum standards be met among Canadian provinces (World Bank, 2021). British Columbia's carbon tax covers 78% of provincial emissions, and ostensibly all GHG emissions from all sectors in the province, including tires combusted for heat or energy. That said, it provides exemptions for some emissions in the industrial, aviation, transport, and agriculture sectors. These exemptions are implemented by providing tax rebates and include exported fuels, fuel consumption by inter-provincial aviation and shipping, as well as some fuels purchased by farmers. The province has plans to expand the carbon tax coverage to fugitive emissions and emissions from the burning of certain forestry residues (World Bank, 2021).

Excluding certain emissions sources or economic sectors limit GHG emission reductions but can also save program administration costs by foregoing taxation in some sectors in which emissions are particularly challenging to measure. In some cases, these might be more effectively targeted by other GHG reduction strategies. Non-CO_2 emissions from the agriculture and land use sectors fall into this category because GHG accounting can be especially difficult, and these emissions are just 6% of Hawai‘i's statewide total (ICF & UHERO, 2021). For Hawai‘i, a carbon tax that targets fossil fuels distributed by the energy sector, excluding international and military sources of GHG emissions, would encompass 81% of statewide GHG emissions (Coffman et al., 2021; ICF & UHERO, 2021). Though a carbon tax would not necessarily cover non-CO2 emissions from the AFOLU (agriculture, forestry, and other land-use), waste, IPPU (industrial processes and product use) sectors, it would be incorporated into the prices of fossil fuels consumed in these sectors. As discussed in Part I, coverage declines to approximately 64% of statewide emissions if aviation-related emissions are excluded.

The second design issue is where in the supply chain to implement the carbon tax (and this can be quite different for carbon tax and cap-and-trade systems). For Hawai‘i, it would be administratively simplest to implement the tax upstream. All fossil fuels are imported through a small number of ports and pipeline facilities. The state has just two petroleum refinery

operations, both of which are currently owned by the same firm (Par Hawai‘i); a few importers, wholesalers, and distributors of gas (propane and synthetic), gasoline, diesel, and jet fuel; and just two electric utilities, both of which purchase most of their fuel supplies from Par Hawai‘i.[12] An upstream tax minimizes collection costs and makes avoidance and evasion extremely difficult.

Moreover, Hawai‘i has experience with levying and collecting an upstream fossil fuel tax. The new carbon tax could build on the administrative structure established by the state's Environmental Response, Energy, and Food Security Tax, commonly known as the "barrel" tax (HRS §243-3.5). This tax currently imposes a $1.05 tax on each "barrel or fractional part of a barrel of petroleum product sold by a distributor to any retail dealer or end user of petroleum product, other than a refiner" with the exception of jet fuel (HRS §243-3.5).[13] For non-petroleum fossil fuel products (i.e. gas), a tax of $0.19/MMBtu is imposed. Though called a "barrel" tax, the tax is not actually levied on crude oil at the point of import but rather on the refined products when distributed to retailers. Aviation fuels are exempted from the barrel tax. To make the barrel tax into a tax on carbon emissions requires several important modifications. First, a barrel tax would require extension if it is to capture GHGs emitted within Hawai‘i refineries. Second, the barrel tax currently taxes all refined petroleum products (RPPs) at the same rate on the basis of volume, but the carbon content of RPPs differs across products. Therefore, to convert a carbon tax into an equivalent barrel tax for a given RPP, one must multiply the carbon tax by the *carbon content* of the specific RPP.[14] For gas, the carbon tax could be transformed into a barrel tax by multiplying the carbon tax by the carbon content per MMBtu of the type of gas (i.e., propane or syngas). Lastly, there would need to be consideration for whether the carbon tax is extended to aviation fuels, as noted in the section above. From an administrative perspective, the barrel tax currently excludes aviation fuels and barrel tax revenues are earmarked for specific uses outside of the requirements of the federal Anti-Head Tax Act, which requires any tax revenues from

[12] Hawaiian Electric Co. (HECO) imports biofuels directly, while Kaua‘i Island Utility Cooperative does not currently use biofuels to generate electricity. Within GHG accounting protocols, bio-based GHG emissions are fully credited (ICF & UHERO, 2021) and from that perspective should be excluded from a carbon tax; however, a life cycle perspective gives substantially different outcomes for biofuels depending on their land use and production practices. These biofuel-specific issues should likely be addressed in policies and programs that would be complementary to the carbon tax, for example, through efforts to review and establish criteria for assessing lifecycle biofuel emissions within the electricity regulatory process.

[13] Specifically, the language of (HRS §243-3.5) reads: "In addition to any other taxes provided by law, subject to the exemptions set forth in section 243-7, there is hereby imposed a state environmental response, energy, and food security tax on each barrel or fractional part of a barrel of petroleum product sold by a distributor to any retail dealer or end user of petroleum product, other than a refiner. The tax shall be $1.05 on each barrel or fractional part of a barrel of petroleum product that is not aviation fuel…"

[14] A carbon tax in concept should also be levied on all sources of fossil fuels equally, and the barrel tax is currently not imposed on existing uses of coal. However, this exemption should be a moot point since the state's single coal-fired power plant is scheduled to be shuttered in September 2022 and coal is further banned from use in generating power.

aviation fuels be used within the sector. A separate fuel tax (HRS §243-4) in the amount of 1 cent per gallon is levied on non-bonded (i.e. excluding international) aviation fuel and proceeds are allocated to the aviation sector per HRS §261-5a.[15] [16]Any taxation of aviation fuels for the purposes of a carbon tax would similarly have to be consistent with federal regulations.

Following current arrangements for collection of the barrel tax, tax collection could be administered by the State Department of Taxation. Collaboration with the Hawai‘i State Energy Office, Department of Business, Economic Development and Tourism, and State Department of Health Clean Air Branch would be needed to verify fossil fuel flows and GHG emissions for the purposes of auditing tax compliance.

The last major design decision regarding a carbon tax is whether Hawai‘i’s targeted GHG emitters can receive credits that can be used to offset their carbon tax liability if they invest in GHG offsets. GHG offsets are verifiable reductions in GHG emissions undertaken by new projects. Offset projects could be undertaken inside or outside Hawai‘i as the atmosphere is a global communal good. Use of such rights can be welfare-enhancing if the offsets are purchased for less than the cost of making the same reduction in carbon emissions in a particular Hawai‘i activity. It can, however, be difficult to determine whether the offset project would have been undertaken in any case and whether the project is actually accomplishing its stated emission reduction objectives (Cames et al., 2016). Existing markets vary considerably in structure and efficiency, and could benefit from greater standardization (World Bank, 2021). For Hawai‘i, a report commissioned by the State Office of Planning concludes that it is unlikely the state government could generate substantial revenue through the production of offsets (AECOM, 2019). Also, any trading of offset credits produced within Hawai‘i would need to be limited because there is an “inherent conflict of interest between these roles as one role provides credibility to offset credits generated, while the other can generate revenue” (AECOM, 2019). Improved and substantially enhanced management of agriculture, forestry and other land use (AFOLU) sinks could be made a policy priority that would complement a carbon tax, even without the offset market mechanisms.

Regulation of GHG Emissions by a Cap-and-Trade System

The other way to impose a price on GHG emissions is to establish a cap-and-trade system.[17] Several administrative elements of a cap-and-trade system are similar to a carbon tax; specifically, determining the scope of coverage and whether to include carbon offsets. A cap-

[15] Coffman et al. (2021) reported that bonded sources of jet fuel in 2018 comprised 27% of total jet fuel (DoTax, 2019).

[16] For a full description of fuel taxes in Hawai‘i, see Tax Facts 99-1 (DOTAX, 2021).

[17] A cap-and-trade system entails setting the number of permits (also called allowances, linked to GHG emissions quantities) to be sold or given out annually. If permits are sold, the sale is executed via an auction platform. Permits can also be bought and sold post-auction.

and-trade program is administratively far more burdensome than a carbon tax and would require careful design to overcome market issues related to Hawai‘i’s small economy.

Hawai‘i has a small number of upstream firms that could be regulated with compliance obligations (i.e. regulatory requirements to participate in the market for GHG emissions at specified amounts) within the market for tradable GHG permits. To limit market power, compliance obligations would have to target more downstream entities; for example, facilities that reach a 25,000 MT CO_2 Eq. threshold annually, as is done in California’s market. Sources currently regulated and reported on by the State Department of Health Clean Air Branch are greater than 100,000 MT CO_2 Eq. and there are currently twenty identified facilities (HAR Chapter 11-60.1; ICF & UHERO, 2021, p. 165), though owned by fewer entities. Pushing compliance obligations further downstream means increasing the complexity of GHG accounting to ensure that both upstream and downstream entities are not accountable for the same GHGs. Even with more players in the market for permits, additional market safeguards within the auction would have to be put in place to limit the ability of larger firms or speculators from manipulating market clearing prices.[18] There is also constant pressure by industry groups to allocate free allowances, as is done for 80% of compliance obligations for fuel distributors in Nova Scotia.[19] Doing so reduces the cost burden on polluters but does not change the resulting allowance prices and hence does not change the use-side cost impacts to consumers. Moreover, it negates the potential positive source-side benefits from returning revenues to households.

Operating a cap-and-trade system requires ongoing administrative capacity. Many administrative hurdles can be resolved if the state were to join the Western Climate Initiative (WCI). WCI coordinates administrative services, including the market registry, holds permit auctions four times annually, creates offset standards and verification, and distributes auction revenue back to participating jurisdictions. WCI is a contractor of participating state and provincial governments and assesses administrative fees on participating jurisdictions. The administrative challenges facing the state would still be formidable as WCI does not make policy decisions, including establishment of permits, or enforcement against non-compliance.[20] To administer a cap-and-trade program via WCI would require, likely, the State Department of Health Clean Air Branch to identify targeted entities, establish the permit system, coordinate with WCI on the auction platform, and address non-compliance. Other state agencies, including the Department of Taxation and Department of Budget and Finance would be involved depending on decisions on the use of revenues.

[18] Specifically, through tighter purchasing and holding limits within the auction platform, as well as deciding whether entities without compliance obligations can even participate in the market.

[19] Andrew Webber, Senior Policy Analyst, Nova Scotia Climate Change Unit, personal communication, November 15, 2021.

[20] Greg Tamblyn, Executive Director WCI, personal communications, October 27, 2021.

The WCI currently consists of California and the Canadian Provinces of Québec and Nova Scotia.[21] California and Québec work together in a linked market, meaning that there is one auction where permits are entirely interchangeable and market terms, such as price floors, are harmonized between the regions. Nova Scotia operates a standalone market and, given it is also a reasonably small jurisdiction, has had to put in place a number of additional market safeguards to limit market power.[22] If Hawai‘i were to link with California and Québec, Hawai‘i could benefit from greater market access and emissions reduction opportunities. Hawai‘i's small size means that it would effectively be a price-taker within the market for permits.

Recommendations

- We recommend that the state government implement an upstream carbon tax by making use of the existing administrative infrastructure surrounding the barrel tax. This approach limits the administrative burdens of establishing a carbon price in Hawai‘i.
- Though a cap-and-trade program is conceptually viable, and could benefit Hawai‘i from greater market access to permits from a linked system, it requires substantially larger upfront and ongoing administrative costs to operate successfully. In addition, there are no economic or GHG abatement benefits from a standalone cap-and-trade program for Hawai‘i relative to an upstream carbon tax.
- Given the relatively nascent market for carbon offsets (AECOM, 2019; World Bank, 2021), we recommend that the Hawai‘i State Energy Office and other relevant state agencies monitor the growth and performance of offset markets, both inside and outside of Hawai‘i, before offsets are included in a carbon tax program for Hawai‘i. Future guidance could be developed based on the outcomes of the State's Greenhouse Gas Sequestration Task Force (HRS §225P-4).

Ways to Use Carbon Tax Revenues

The introduction of a carbon tax in Hawai‘i will create a new stream of government revenue. We emphasize that the objective of a carbon tax is to reduce GHG emissions and not to create a new revenue source. Tax revenue is therefore a byproduct of the main objective. With that context in mind, the World Bank (2019) recommends that decisions on the use of carbon tax revenues be made as a part of a broader fiscal framework rather than in isolation. It identifies three very

[21] WCI provides administrative services to Nova Scotia's emissions trading market, which is separate from the linked markets of Quebec and California. Nova Scotia's limited participation in the system comes at a relatively low annual fee ($325,000 in first year and $225,000 in subsequent years) and could be an option worth pursuing by the Hawai‘i state government if it decided to join WCI.

[22] A reason to start in a standalone market was to speed implementation of the cap-and-trade system to meet federal regulations in Canada that became effective in 2019. Andrew Webber, Senior Policy Analyst, Nova Scotia Climate Change Unit, personal communication, November 15, 2021

general objectives when determining the use of revenues: maximizing efficiency, generating long-term economic growth, and promoting equity.[23]

Kauffman et al. (2019) document national deliberations for proposed uses of carbon tax revenues, comparing the Energy Innovation and Carbon Dividend Act (EICDA) proposal to other legislative proposals. The EICDA proposes that all carbon tax revenues, net of administrative costs, be returned to households via dividend payments. Other proposals have a majority going to households via dividends, about 20% going to infrastructure, and 5% going to "innovation" (Coons Bill); the majority going to infrastructure, a quarter going to the general fund, 10% going to adaptation and related climate change R&D, and about 8% going to low-income assistance (Fitzpatrick Bill); an approximately even split between payments to low-and middle-income households and infrastructure, with much smaller amounts going to transition assistance and adaptation needs (Larson Bill); an almost full allocation to cuts in payroll taxes, with a small (about 5%) allocation to low-income assistance and 10% to social security payments (Lipinski Bill); approximately half to cuts in payroll taxes, about 8% each to low-income assistance, adaptation needs and social security payments, with the rest (about a quarter) to the general fund (Rooney Bill); and a proposal where the majority goes to payroll tax credits and social security payments, approximately 15-20% to veterans benefits, and about 10% to grants to states (Whitehouse Bill).

As Kaufman et al. (2019)'s comparison shows, there are many plausible combinations of uses of carbon tax revenues. In terms of the impacts on households, however, the research is fairly clear: Dividend payments (lump sum payments to households) are the most progressive means of offsetting the burden of the carbon pricing intervention (Metcalf, 2019). Goulder et al. (2019) and Beck et al. (2015) use a similar modeling approach that we do for Hawai'i. Goulder et al. (2019) compare the welfare impacts of using US federal carbon tax revenues to give direct payments back to US households (dividends) in equal shares, cut payroll taxes, individual income taxes, or corporate taxes.[24] The study concludes that direct payments to households have substantially larger benefits for lower-income households than alternative uses of the revenues. Beck et al. (2015) estimate a combination of welfare impacts including giving payments to households (via a low-income tax credit and a homeowners benefit program), and reducing income and business taxes to mirror British Columbia's use of carbon tax revenues. They similarly conclude that recycling carbon tax revenues can ameliorate the small contractionary

[23] General objectives of fiscal policy as it relates to efficiency are to increase positive externality benefits, reduce negative externality costs, reduce market distortions and administrative costs (World Bank, 2021). There are also investment decisions as they relate to innovation and growth, as well as considerations for redistribution of impacts and benefits to ameliorate negative impacts of the carbon price intervention, as well as address existing inequities in economic systems (World Bank, 2021).

[24] Our model does not have sufficiently disaggregated tax data to explore whether carbon tax revenues might be best allocated to reducing other state taxes.

effects of the carbon tax on household welfare and that payments to households are the most important way to help lower-income households to cope with the carbon tax.

There are two main normative arguments for directly sharing carbon tax revenues with Hawai‘i residents, i.e. permanently domiciled people, with each argument having different implications for the design of the dividend program. The first argument holds that the atmosphere should be considered communal property and therefore revenues from the use thereof should be shared equally among all members of the Hawai‘i community. Revenues from Alaska's Permanent fund as well as income from gaming and certain other businesses owned by Native American Tribes are distributed according to this rationale (Jorgensen and Morris, 2010). A second argument, presented implicitly above, holds that carbon tax revenues should be distributed to Hawai‘i households as a means to alleviate financial burdens from the tax. Investments in specific goods and government services tend to benefit more narrowly defined groups, whereas a dividend payment provides households with the ability to decide the best use of the additional resources within their household. Our simulations in Part I show that if a portion of the dividends from a carbon tax set at the SCC are shared equally by all households (scenarios S1 (100% of dividends), S7 (80% of dividends), and S9 (50% of dividends)), the welfare of the average household in each of the lower four slices (Q1-Q4) of the income distribution increases. Notably, this result holds true even in the scenario (S9) where half of non-aviation carbon tax revenues are allocated to government spending (in addition to aviation-related carbon tax revenues) - though benefits are relatively smaller. If all revenues except those from aviation fuel are returned to households in equal shares (scenario S1), then the average household in all five slices of the income distribution experiences an increase in welfare. Scenario S3 shares all non-aviation tax revenues equally among households in the lower 80% of the income distribution. An argument for this sharing rule is that low- and moderate-income households are less likely than high-income households to have the resources to transition to technologies with reduced carbon emissions. Allocating more of the tax revenue to these households provides them with additional resources to invest in technology such as energy-efficient household appliances that will allow them to save on utility bills. This allocation method can be implemented by using income thresholds for dividend payments, as is done in British Columbia (British Columbia, 2021).

In addition to the equity arguments for providing a household dividend, economists and political scientists have also argued that dividends are a politically durable policy tool (Klenert et. al, 2018; Fried et al., 2018)[25] as well as a more popular policy tool than reductions in distortionary capital and labor taxes (Kallbekken and Aasen, 2010; Bourgeois et al., 2021; Bachus et al., 2019; Douenne and Fabre, 2020). Fried et al. (2018a; 2018b) argue that using the carbon tax revenue to pay lump-sum dividends rather than fund reductions in payroll taxes will increase political

[25] A 1999 proposal in Alaska to divert dividend payments from the Alaska Permanent Fund to cover temporary budget deficits was resoundingly rejected by voters in an advisory referendum. The duration of an earmark for government spending is always uncertain, though the example of Alaska shows potential political durability of direct payment systems.

support for the carbon tax from older voters who are no longer participating in the labor market and would not benefit directly from a reduction in distortionary labor tax rates.

Some studies of carbon taxes have advocated using a portion of the carbon tax revenues for R&D activities focused on decarbonization to maximize long-term economic growth amidst decarbonization (National Academy of Sciences Engineering Medicine, 2019; Rengs et al., 2020). Several of the national carbon tax proposals advocate this use. The R&D recommendation, however, is more appropriate for a carbon tax imposed by the federal government rather than the state government because R&D benefit spillovers are more likely to be captured at the federal level than at the state level. Another possibility is to dedicate carbon tax revenues to government and utility programs that subsidize the purchase and use of more energy-efficient and low-GHG goods and services, as is done with the majority of revenues from California's cap-and-trade program (C2ES, 2021). Evidence on the efficacy of these programs, however, is mixed (Houde and Aldy, 2017; Wee, Coffman, and La Croix, 2018; Jacobsen, 2018; Datta and Gulati, 2014; Borenstein and Davis, 2015; Jenn et al, 2018; Sheldon and Dua, 2019). Federal government subsidies for purchases and leases of new electric vehicles (EVs), for example, are shown to accrue primarily to the top income decile (10%) of households (Borenstein and Davis, 2015). While EV sales are shown to increase as a result of state-level subsidies (Wee, Coffman and La Croix, 2018; Jenn et al. 2018), benefits primarily accrue to inframarginal buyers. As shown in our April 2021 report, a carbon price for Hawai‘i serves to harmonize interactions between sectors such that the transition to renewable energy sources will also prompt a transition to electrified forms of transport.

There are no efficiency or equity arguments as to why revenues from carbon taxation should be reinvested in climate change-related sectors; however, survey work has shown this to be a popular use of funds (Fitzpatrick et al., 2018). Additional investment in climate-related sectors could also be complementary to driving down GHG emissions (Gundlach et al., 2019). A World Bank report (2019) shows that the majority of carbon tax revenues globally are allocated to environmental projects as well as the general government budget. Kallbekken and Aasen (2010) find that participants in a focus group in Norway were "very skeptical" about using carbon tax revenues to reduce other distortionary taxes, in particular the payroll tax (p. 2183). They expressed a "strong preference for earmarking the revenues for environmental purposes." Participants were more supportive of a carbon tax when they had more information about how carbon taxes actually functioned and how the money was being spent. Baranzini and Carattini (2017) also find that earmarking revenues from environmental taxes to environmental purposes raised public support for the taxes. Most importantly, they conclude that public support was contingent on public understanding of the primary and ancillary benefits from the carbon tax.

Recommendations

- Based on our findings in Part I, we recommend that the state government distribute a substantial portion of the net carbon tax revenues to eligible Hawai‘i households. [26] Model simulations indicate that Hawai‘i households across the income distribution realize gains in welfare despite the imposition of the tax. This distribution of revenues to Hawai‘i households is supportive of the State Climate Change Commission's goal to push forward climate change responses that are "Clean, Equitable, and Resilient" (Hawai‘i Climate Commission, 2021).
- Under no circumstances should dividend allocations be determined by variables directly or closely associated with fossil fuel use of particular households, such as electricity or gasoline consumption or overall household spending. That is, the dividend payment must be completely independent of the household's actions, and thus it is only the tax that affects a household's behavior regarding the consumption of fossil fuel and not the dividend. This association would undermine price incentives to reduce consumption of fossil fuels and GHG emissions.
- We recommend that the State of Hawai‘i refrain from cutting labor or capital taxes to offset the carbon tax revenues. While such changes can lead to substantial overall gains in welfare over several decades, they can also leave significant numbers of households (e.g., retired seniors who do not participate in labor markets) without any compensation for the burden of the tax.
- If the state decides to keep a portion of the net revenues from a carbon tax, we recommend that the revenues be used to fund critical environmental projects, such as climate adaptation projects. Such environmentally-oriented spending ties revenue use to the purpose of the tax, which has been shown to be important in terms of policy durability and public support.

Distribution of Dividend Payments

Who should receive a dividend payment?

Once a policy decision is made to return revenues from carbon taxes directly to Hawai‘i residents, the legislature should next specify criteria for eligibility. Typically, residents of the community in which the carbon tax is implemented would be eligible to receive dividend payments. The term "resident" could be defined inclusively or narrowly. An inclusive definition

[26] A simple definition of net carbon tax revenues is the gross receipts from the carbon tax less a specified amount for program administration to be added to the DOTAX budget. An alternative definition also subtracts an estimate of the burden to the state from the carbon tax. The burden would be equal to the negative changes in tax revenues related to factor payments (primarily wages) plus the changes in the amount paid for goods and services purchased by the state.

would encompass people who reside in Hawai‘i permanently as well as people who reside temporarily in Hawai‘i for work, school, or military service. A more narrow definition would exclude those who reside in Hawai‘i temporarily. More inclusive eligibility criteria would reduce dividend payments per recipient as more people become classified as eligible residents. By contrast, more narrow eligibility criteria would increase dividend payments per recipient but would also impose a greater tax burden on temporary residents who are ineligible to receive the dividend.

A somewhat narrow and administratively simple definition of a resident eligible for dividend payments is that the person files a Hawai‘i Resident Income Tax Return or is included as a spouse or dependent on a Hawaii Resident Income Tax Return or would have been eligible to file a resident return if the person had earned sufficient income.[27] A central advantage to tying eligibility for dividend payments to Hawai‘i resident status as determined by Hawai‘i DOTAX is that the State of Hawai‘i can rely on an already existing set of residency rules that DOTAX staff has experience administering and enforcing. This would help to speed and smooth implementation of the carbon tax. In addition, a separate set of rules would be laborious and contentious to develop and implement. A second set of rules would substantially increase administrative and enforcement costs for DOTAX which would then be required to administer two separate sets of rules: one set for filing a resident tax return and a second set for qualifying for a dividend payment.

Hawai‘i DOTAX defines a Hawai‘i resident as follows:[28]

> (1) Every individual domiciled in Hawai‘i, and (2) Every other individual whether domiciled in Hawai‘i or not, who resides in Hawai‘i for other than a temporary or transitory purpose. An individual domiciled outside Hawai‘i is presumed to be a resident if he or she spends more than 200 days in Hawai‘i during the taxable year. This presumption may be overcome by evidence satisfactory to the Department that the individual maintained a permanent place of abode outside the State and was in the State for a temporary or transitory purpose. No person shall be deemed to have gained or lost a residence simply because of his or her presence or absence in compliance with military or naval orders of the United States, while engaged in aviation or navigation, or while a student at any institution of learning.

There are several categories of people who live in Hawai‘i for extended periods and would pay substantial amounts in carbon taxes (in the form of higher prices) but would not be covered by

[27] Hawai‘i DOTAX does not require Hawai‘i residents with earnings less than a specified level of income to file an income tax return. Specified income levels vary depending on an individual's marital status, whether the individual is filing separately or jointly, whether the individual is a qualifying widow, and whether the individual is the head of household.

[28] Hawai‘i DOTAX (2020). Hawaii Resident Income Tax Instructions, 2020 N-11. Available: https://files.hawaii.gov/tax/forms/2020/n11ins.pdf Accessed on 23 Nov. 2021.

this definition. One group consists of non-resident US and foreign students who are attending Hawai‘i universities and high schools. Hawai‘i DOTAX considers foreign students who are in Hawai‘i on F-1 or J-1 visas to be nonresidents for tax purposes. Many study in Hawai‘i for up to six years and some students will bear a high burden of carbon taxes in the form of higher consumer prices. Students from other US states attending a Hawai‘i high school, college, or university are also classified by DOTAX as non-residents because it is presumed that these students do not intend to be permanently domiciled in Hawai‘i.

A second group consists of some of the Compact of Free Association (COFA) migrants and their children. Many COFA migrants intend to be permanently domiciled in Hawai‘i, and therefore will file resident individual income tax returns for the State of Hawai‘i. Some will meet residency criteria and will be able to claim the dividend. Other COFA migrants domiciled in Hawai‘i do not intend to make a permanent residence in Hawai‘i and will choose to file non-resident tax returns. Based on the eligibility to file an N-11, they would be ineligible for a dividend payment despite living year-round in Hawai‘i and paying tax-inclusive prices of goods and services.

A third group consists of military personnel stationed in Hawai‘i who are tax residents of other states. Some military members and their families will pay higher prices due to the imposition of a carbon tax but would also be ineligible for a dividend.

A fourth group consists of persons who establish their domicile in Hawai‘i during the tax year. These persons are automatically classified by DOTAX as “Part-Year” residents, who are taxed only on Hawai‘i income during their “period of nonresidency” and on income from all sources (inside and outside Hawai‘i) during the period of residency in Hawai‘i.

There are at least two categories of people who are defined as Hawai‘i residents for tax purposes but either are not living in Hawai‘i for most of the year or are confined in state institutions. One group consists of Hawai‘i residents who attend high school, college, or university outside of Hawai‘i, spend most of their time outside Hawai‘i, and yet continue to be treated as a Hawai‘i resident. The presumption is that these people will return to Hawai‘i after completing their schooling to establish a domicile. Lastly, another group to consider consists of Hawai‘i residents who are confined to state and federal prisons or state hospitals and are often treated separately for tax purposes.[29] In the case that they are not allowed to receive a dividend, their spouses and child dependents could still be eligible to receive dividend payments by filing a separate (rather than a joint) Hawai‘i income tax return.

Whether some or all of these categories of persons who reside in Hawai‘i but are not captured under the Hawai‘i Resident Income Tax Return should be eligible for a dividend payment is a matter to be decided by the State Legislature. A potential treatment of part-year residents, for

[29] As an example, see form N-311 Refundable Food/Excise Tax Credit.

example, would be to allow them to receive a carbon tax dividend prorated by the period of their residency.

Capturing Eligible Recipients who do not File Income Taxes

Though relying on the existing system of tax returns minimizes the administrative burden for the state, it will fail to capture people who do not file income taxes yet reside in Hawai‘i for a sufficient period of time to be considered an eligible recipient. According to Hawai‘i form N-11, people who perform personal services as an employee and make less than the threshold amounts specified under their filing status are not required to file a tax return.[30] As the highest income threshold for this exemption is less than $5,000 per person, it is important to create a separate resident taxpayer form so as not to exclude very low-income households from receiving dividend shares. The form should (1) allow individuals to declare they are exempt from filing due to insufficient income and (2) allow them to claim dividend payments for themselves and eligible members of their household who do not file separately. For individuals without on-line access to this form, paper applications should be made available at the same locations currently used to distribute paper DOTAX tax forms: DOTAX offices in downtown Honolulu, Wailuku, Kaunakakai, Hilo, Captain Cook, and Lihue; all US post offices; and all Hawai‘i public libraries. Forms and assistance with filling them out will surely be available from private tax providers (H&R Block, independent accountants, etc.) for a fee and several for-profit firms and non-profit organizations (Walmart, Volunteer Income Tax Assistance Program (VITA), Legal Aid Society of Hawai‘i, etc.) for free.

For individuals who would ordinarily file state income tax returns in the absence of the dividend tax credit, the take-up rate for the dividend should be close to 100 percent given that the dividend credit will be automatically computed by standard tax preparation software programs and should be easy to claim when paper short forms are used. Though the payment of carbon dividend shares via state income tax returns should increase the number of households filing state income tax returns, it is unclear how large this effect may be. Some individuals will find the sizable carbon tax dividend to be sufficient incentive to file a return, while others will continue to abstain from filing either because they face language, literacy or other capacity barriers to making such claims, or they will not want to face the chance of hidden income or past tax liabilities being identified if they file a return.

[30] People who need to report additional tax through the filing of the following forms are not exempt regardless of income: Distribution from an Individual Housing Account; Form N-103, Sale of Your Home; Form N-152, Tax on Lump-Sum Distributions; Form N-312, Recapture of Capital Goods Excise Tax Credit; Form N-338, Recapture of Tax Credit for Flood Victims; Form N-344, Recapture of Important Agricultural Land Qualified Agricultural Cost Tax Credit; Form N-348, Recapture of Capital Infrastructure Tax Credit; Form N-405, Tax on Accumulation Distribution of Trusts; Form N-586, Recapture of Tax Credit for Low-Income Housing; or Form N-814, Parent’s Election to Report Child’s Interest and Dividends.

Economists have conducted several experiments to determine whether additional information or small behavioral incentives ("nudges") would increase the up-take rate of tax credits. Results have not been very supportive regarding the ability of nudges or more information to increase up-take.[31] For example, Cranor et al. (2019) show that information provided by employers to employees about the availability of tax credits has little effect on the take-up rate of the Earned Income Tax Credit (EITC). Linos et al. (2020) ran experiments using six different types of information outreaches designed to increase EITC uptake. They conclude that none of the six interventions were effective in increasing uptake. Despite the lack of positive evidence regarding informational nudges, we urge DOTAX to be alert to future research evaluating nudges and uptake of tax credits. New nudges may be devised that turn out to be effective in increasing up-take. We note that it may be useful for DOTAX, other state agencies, and non-profit organizations to experiment with advertisements declaring that a resident can claim the (sizable) dividend even if the person does not owe any state income tax. Experiments with new employer-based nudges, such as form distribution to part-time employees, could be devised and tried out.

Mechanism for Dividend Payments to Hawai'i Households

There are three relatively simple methods by which DOTAX could credit dividends owed to Hawai'i residents: A tax deduction, a non-refundable tax credit, or a refundable tax credit. A tax deduction, which reduces the taxable income of the taxpayer by the amount of the deduction, has two big flaws. First, it provides bigger dividends to taxpayers with higher marginal tax rates, i.e., upper-income taxpayers. Second, it excludes taxpayers who do not itemize deductions. A non-refundable tax credit provides a fixed sum to be credited against tax liabilities owed to the state. While a non-refundable tax credit is much more equitable than a tax deduction, it still largely skews payments toward higher-income groups. It excludes residents who do not owe income taxes or owe less income tax than the amount of the tax credit. Both the tax deduction and non-refundable tax credit schemes are regressive, benefiting higher-income residents more than lower-income residents. A refundable tax credit is by far the best of the three schemes from an equity lens, as it provides the same change in state tax liabilities to each and every taxpayer, and is therefore most consistent with the two main normative arguments for directly sharing carbon tax revenues with permanently domiciled residents. Tying annual dividend payments to the filing of Hawaii State Individual Income Tax Returns in the winter/spring following the calendar tax year is the most administratively simple scheme for dividend payment. This is because it would involve minimal changes in DOTAX's current procedures.

Hawai'i DOTAX already has substantial experience with refundable tax credits. Such credits include the child and dependent care tax credit, the tax credit for research activities, the food excise tax credit, the tax credit for low-income household renters, the tax credit for child

[31] Linos et al. (2020, 2) define nudges as "small changes to the choice architecture surrounding a decision that aim to alter people's behavior without meaningfully changing incentives."

passenger restraint systems, and the important agricultural land qualified agricultural cost tax credit. The addition of one more tax credit to be claimed by all individual income taxpayers would be relatively easy to incorporate into tax forms and to pay via the same mechanism by which tax refunds are paid. There is, however, some potential for fraud by non-residents who claim to be residents without income. As the potential dividend payout to an ineligible individual increases, the incentive for fraud also rises. Hawai‘i DOTAX and Hawai‘i DOAG will need to incur additional enforcement expenses to identify and prosecute ineligible individuals claiming the credit. In addition, penalties for individuals convicted of fraudulently claiming residency to claim the dividend will need to be carefully set in order to deter most violations. The Legislature should consider how administrative expenses for enforcement by DOTAX and DOAG will be funded, whether from carbon tax revenues or general revenues.

If a taxpayer's dividend payment exceeds outstanding state income tax liabilities, there are numerous already-existing options that DOTAX could use to pay the balance to the taxpayer. First, taxpayers could direct a refund of the dividend to the following year's tax payments. Second, the taxpayers could direct that the refund be deposited into the taxpayer's bank account. Third, the taxpayer could direct that the refund be mailed as a check to their Hawai‘i home address. Finally, DOTAX could add money to a taxpayer's pre-paid debit card. Houseless individuals and households who are Hawaii residents will qualify for dividend payments and could receive payments via pre-paid debit cards.

Timing of Dividend Payments to Hawai‘i Households

Though our results show that returning revenues to households via an annual dividend will make an average household within each 20% slice of the income distribution better off, some of the most economically vulnerable households may suffer hardships because they do not have the financial flexibility to offset the ongoing carbon tax burden between annual dividend share payments. This problem could be resolved by either increasing the frequency of dividend allocation to quarterly or monthly payments, or by prepaying dividends starting at the beginning of year one of implementation.

For Hawai‘i's working populations whose tax liabilities exceed the dividend payment, a simple way to buffer the tax burden is for individuals to reduce the amount withheld per paycheck for state taxes or, for self-employed workers, to reduce quarterly estimated tax payments. For non-working populations, such as retired people living solely on social security benefits, or for working populations whose tax withholdings are less than the annual dividend, buffering is more difficult. One possibility is that individuals without tax obligations in the previous year could request more frequent quarterly payments based on last year's dividend payments. For the first year of implementation, revenue estimates could be made based on the most up-to-date emissions estimate in the State GHG Inventory (see UHERO & ICF, 2021). While this could require some ex-post settling up if overall carbon tax revenues turned out to be unexpectedly low, it would allow low-income households to be paid dividends as they incur additional carbon

tax obligations. While increasing the frequency of payments is a good option from an equity lens, the additional administrative obligations could be substantial as DOTAX is not used to managing monthly and quarterly payments. The ongoing administrative issues attached to them, e.g., death of the beneficiary, address changes, name changes, moves out-of-state during the tax year, etc., could also be substantial. The IRS system used to pay lump-sum benefits under the CARES Act provides a good example of the type of system that could be implemented in Hawai'i.[32] DOTAX should carefully assess the additional administrative burden that would be imposed as well as the number of additional taxpayers that would be helped by more frequent payments.

Variation in Dividend Shares by Size and Composition of Household

In the scenarios presented in Part I, households in the five 20% slices of the income distribution receive the same dividend payment (other than the cases where the top 20% of the income distribution of households (Q5) is excluded). This equates in the model as equal payments per capita, assuming households of equal size and composition. In reality, households vary substantially in their composition and this should also be accounted for in the administration of a dividend. A larger household, for example, should get a larger payment. There can also be consideration of other household-level issues such as economies of scale in energy usage (and GHG emissions) related to household size. From this perspective, the dividend payment could be crafted to be roughly proportional to the energy consumption of an average household of the same size and composition. However, we strongly emphasize that the design of the dividend should not be conceptualized as direct compensation for the burden of the carbon tax. If the dividend were to be tied to actual household-level GHG emissions, this would undermine the effect of price signals generated by the carbon tax and severely reduce its effectiveness.

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[32]To qualify for advance payments of the US Child Tax Credit, a person (and spouse, if a joint return was filed) must have:

Filed a 2019 or 2020 tax return and claimed the Child Tax Credit on the return or

Given the IRS their information in 2020 to receive the Economic Impact Payment with the Non-Filer payment tool or

Given the IRS their information in 2021 with the Non-Filer payment tool and

Lived in a main home in the United States for more than half the year (the 50 states and the District of Columbia) or filed a joint return with a spouse who has a main home in the United States for more than half the year; and

A qualifying child who is under age 18 at the end of 2021 and who has a valid Social Security number; and

Earned less than $24,800 as a married couple, $18,650 as a Head of Household, or $12,400 as a single filer, certain income limits.

Advance payment amounts are reduced at specific income thresholds. (Language is an edited version of IRS, Advance Child Tax Credit Payments, which is available at: https://www.irs.gov/credits-deductions/advance-child-tax-credit-payments-in-2021

Existing carbon dividend programs in North America, all of which are run by provincial governments in Canada, vary in how they consider household size and composition in their dividend schemes. Provinces subject to the minimal standards set by the federal government (Ontario, Alberta, Manitoba, and Saskatchewan) give the first child and second adult in a couple 50% of the first adult, and any additional children 25% (Canada Department of Finance, 2021). New Brunswick follows a similar structure, with the dividend share for the first child reduced to 25%. The "cost of living offset" offered by the Northwest Territories provides slightly higher rewards to children than additional adults (Canada Revenue Agency, 2021). Yukon provides equal shares to all children and adults in the household, and increases the household dividend by 10% for each adult and child living in households located in remote areas (Yukon Provincial Government, 2019). In sum, the Canadian provinces are notable for the wide variation in the dividend shares provided to additional adults and children in households. All employ much larger discounts than are estimated in recent studies of economies of scale in energy use and emissions from adding more adults or children to a household.[33]

Several empirical studies conducted since 2010 have focused on identifying how household carbon emissions change with size and demographic composition. Almost all studies find at least some economies of scale in household energy use with respect to household size, and more so with respect to children (Brounen et al., 2012; Büchs and Schnep, 2013; Christis et al., 2019; Fremstad et al., 2018; 2015; Schröder et al., 2015; Wu et al., 2021). Fremstad et al. (2018) use detailed 2012-2014 data from the US Consumer Expenditure Survey on household emissions, and find that adding a second adult to a household with one adult decreases household per capita emissions by 6% while adding a child to the household decreases household per capita emissions by an additional 8%. A two-adult, one-child household therefore would have per capita carbon emissions 14% lower than a one-adult household. Underwood and Zaharan (2015) find that per capita emissions of a one-adult household are 23% higher than those of a multi-person household. Similarly, Wu et al. (2021) using 2010-2016 household survey data for China find that adding a household member reduces household per capita emissions by 18%. Contrary to other studies, they find this effect is slightly larger for adults than children.[34] In sum, a survey of the literature shows consistently that there are economies of scale in energy use from adding additional household members, with different effects for children whose incremental

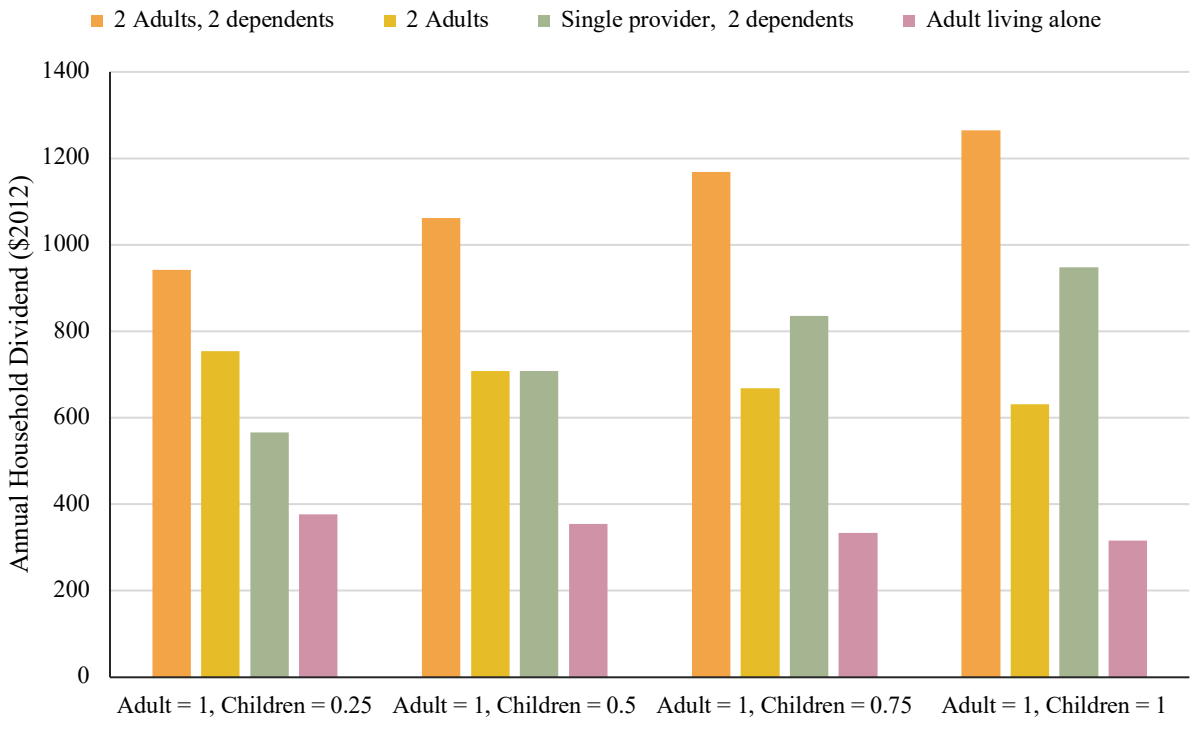
[33] British Columbia is the only province that sets dividend payments based on household income. For households with income above the threshold amount, the credit is reduced by 2% of the adjusted family net income above the threshold. Households earning more than CAD$67,215 do not receive a dividend. Income thresholds vary based on household composition (BC Ministry of Finance, 2021).

[34] Studies that focus on individual sectors show that economies of scale from household size tends to be larger for electricity and gas (Longhi, 2015, Schröder et al., 2015; Brounen et al., 2012) than for transportation (Büchs & Schnepf, 2013). There is, to our knowledge, only one published study that uses Hawai'i-specific data and looks at the relationship between household size and electricity usage (Yalcintas and Kaya, 2017). While they conclude that household size influences household electricity demand based on goodness-of-fit summary statistics, their results are difficult to evaluate because they do not report estimated regression coefficients.

consumption of energy is usually smaller than adults. It also suggests that existing carbon dividend policies in Canada's provinces likely over-discount additional household members and children.

For illustration purposes, Figure 8 shows our estimate of the annual dividend that would be received in 2025 under scenario S1, differentiated by household composition and examples of dividend shares to children in intervals of 25% (adult = 1, children = 1, 0.75, .05, or .25). The example showing equal shares to all individuals is in line with the public good perspective on revenue use, whereas the 25% and 50% shares correspond to several existing and proposed carbon tax policies, including in Hawai'i, which allocate a substantially reduced amount to dependent minors (Canada Department of Finance, 2021; Canada Revenue Agency, 2021; HB 1390, 2021). The 75% share for children provides a midpoint between existing policies that is roughly consistent with empirical studies of household energy use. As examples, we apply these design decisions to households comprising of a single adult and two child dependents; two adults and two child dependents and two adults, and a single adult.

Figure 8. Annual Household Dividend by Policy Design and Household Composition (Based on S1 in 2025, $2012)



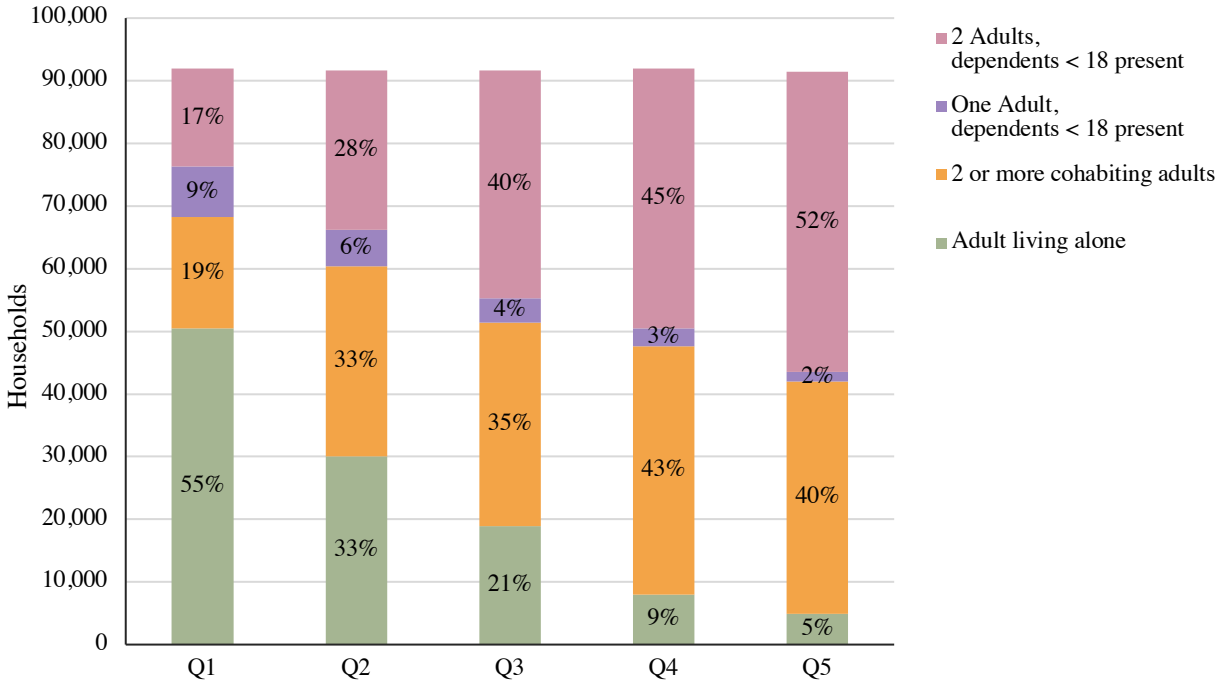
Note: Dividend amounts are based on total revenue to households in each scenario and population projections for each age group from DBEDT (2016). The share of married residents is the 2018 share (DBEDT,2019b) and is assumed to stay constant through 2045.

The variations in the dividend share allocated to children changes the household dividend considerably for households with children, and has implications for households without children

because it alters the value of each individual share. As an example, compared to the case of equal dividend shares, a single-adult household with two children would receive almost $250 ($2012) less (25%) in 2025 if children receive a 50% share, the same amount as a two-adult household without children. In the more extreme case in which children receive a 25% share, a single-adult household with two children receives $200 less than a two-person household without children.

Figure 9 shows Hawai‘i-specific data on the breakdown of household composition by average household income in each quintile slice of the income distribution (DBEDT, 2021). It shows that household composition differs considerably across income groups.

Figure 9. Hawai‘i Household Composition by Average Household Income Quintile



Source: Recreated using WebPlotDigitizer.io based on Figure 1 in "Analyzing the Income Distribution of Hawai‘i," DBEDT (2021) US Census Bureau, Current Population Survey, 2021 Annual Social and Economic Supplement (CPS ASEC).

As such, design features that are based on household composition can also affect the overall distribution of dividend shares across income groups. For example, there are more than eleven times as many single-adult households in the lowest 20% of the income distribution (55%) than in the highest 20% (5%). Married or cohabiting couple households constitute just 19% of the households in the lowest 20% of the income distribution but are 33-40% of households in the top 80% of the income distribution. Strikingly, there are three times as many two-adult households with children (52%) in the highest 20% than in the lowest 20% of the income distribution (17%).

Will Dividend Payments be Taxed as Income by Federal and State Tax Authorities?

If the dividend is paid as a refundable income tax credit, DOTAX does not tax it regardless of whether the credit reduces current tax liabilities or is refunded. At the federal level, the answer is more complex. If the taxpayer is below the minimum income floors required to file a federal tax return or does not itemize deductions or itemized deductions using the option to deduct GET taxes rather than income taxes, then the dividend refund is not taxed. If, however, the taxpayer itemizes deductions using the option to deduct state income taxes, then the IRS could consider the state refund of the dividend to be taxable income.

A legislative solution to the uncertain tax status of federal taxation of state dividend payments could occur if members of the Hawai‘i congressional delegation introduce legislation that directs the IRS to exempt dividends paid from state-level carbon tax revenues from counting towards taxable income on US individual income tax returns. The rationale for the exemption is that individuals pay carbon taxes from their after-tax income and should not be double taxed on a payment.

Though the State does not have influence over federally means-tested programs, the carbon dividend should not be treated as income for means-tested state-local benefits. Since the dividend is paid to smooth the transition to higher prices paid for carbon-intensive goods and services, particularly for lower-income residents, counting the dividend as income would be at cross purposes to the rationale for the dividend. Consider that the State of Alaska does not count dividends from the Alaska Permanent Fund program towards maximum income limits to qualify for senior housing (Alaska Department of Health and Social Services, 2014).

Recommendations

- To minimize administrative cost, we recommend dividend payments leverage the existing tax system to the extent possible.
- We recommend that dividend payments be made to members of the community who are considered residents under Hawai‘i tax law, established via correct filing of a form N-11.
- We recommend that additional consideration be given to part-time residents and others that the Legislature deems to have spent a sufficient amount of time in Hawai‘i during the tax year to merit the carbon tax dividend. Pro-rated systems might also be considered, depending on their administrative burden to DOTAX.
- We recommend that an easy-to-file individual income tax form be created for those who are not required to file an N-11 but would otherwise qualify for the carbon tax dividend.
- We recommend that most revenues be returned to households as a lump-sum annual refundable tax credit. For those most economically vulnerable and unable to adjust their withholdings because they are not working, we recommend that administrators look into

the feasibility of prepayments or more frequent quarterly or monthly payments. These more frequent distributions will be most relevant for individuals who file the newly created tax form for those without taxable income.

- We recommend that household dividend shares vary with household size. We recommend that allocations of dividends either be done in equal shares to all persons, or with a slightly lower payment for additional household members. Empirical studies of average household energy use suggest that households of larger size realize some economies of scale in energy use and that an additional child contributes less to energy use than an additional adult. Deep discounting of additional adults or children is not supported by empirical studies.

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