

SOCIAL COST OF CARBON – GUIDANCE DOCUMENT

City and County of Honolulu Climate Change Commission

DRAFT April 2021 – NOT FOR CITATION

PURPOSE

Pursuant to the Revised Charter of Honolulu (“RCH”) Section 6-107(h), the City & County of Honolulu Climate Change Commission (“Commission”) is charged with gathering the latest science and information on climate change impacts to Hawai‘i. It provides advice and recommendations to the mayor, City Council, and executive departments as they look to draft policy and engage in planning for future climate scenarios as well as reduce Honolulu’s contribution to global greenhouse gas emissions.

The purpose of this document is to provide guidance to the City and County of Honolulu (“City”) on operationalizing an internal carbon price. The purpose would be to enable the City to conduct more comprehensive cost-benefit assessments that incorporate the value of greenhouse gas (GHG) reduction. This document provides an overview of carbon pricing mechanisms and the “social cost of carbon,” and how this might apply to the City. This guidance was requested by the Mayor in a letter addressed to the Commission dated June 10, 2020.

RECOMMENDATIONS

The Commission has conducted research on operationalizing a carbon price to guide City decision-making that incorporates the social costs of carbon. The Commission finds the following:

1. The City should adopt an internal carbon price such that it can guide cost-benefit analyses; for example, in more comprehensive assessment of infrastructure investments, both internal to the City and in regards to O‘ahu-wide programs and policy.
2. The price should be updated based on additional research and policy adoption expected within the Biden Administration. In the interim, the carbon price should be set at the Obama Administration’s federal Interagency Working Group on Social Cost of Carbon (IWG SCC) recommendations.
3. Higher carbon price pathways, to achieve the carbon neutrality target by 2045, should be considered and assessed in collaboration with State and relevant regional entities, as a collective action problem.
4. The City should develop a methodology for estimating the internal carbon price in its direct and indirect fossil fuel purchases; for example, in transportation fuels and electricity costs. This should be coordinated, where appropriate, with the State’s Climate Commission’s efforts and conversations on this topic to align the sub-national efforts.
5. The internal carbon price would help the City to anticipate economy-wide carbon pricing programs at either the State or Federal levels and should be re-evaluated upon adoption of such an explicit carbon price.

I. INTRODUCTION

This document explores the use of an implicit carbon price for the City & County of Honolulu to guide more comprehensive decision-making as it relates to GHG reduction. Generally, the term ‘carbon pricing’ refers to market-based regulatory mechanisms that place a price on greenhouse gas (GHG) emissions for the purpose of reducing their incidence. Levying a price on GHGs has been found in numerous studies to be the most efficient way of reducing GHGs because it directly discourages GHG-intensive activities, promotes substitution to less GHG-intensive production processes and consumer behaviors.^{1,2,3,4,5,6} Implementation of carbon pricing is most effective at the national level, rather than state or sub-state.^{7,8,9,10,11} This is because the carbon price covers a broader geographic and political area. Within the U.S. context, a national rather than sub-national carbon pricing program could minimize leakage and mitigate loss of domestic competitiveness through trade adjustment mechanisms, such as a border

carbon adjustment.^{12,13} The term ‘leakage’ means the transfer of GHG emissions from one region (or sector) to another as a result of policy intervention. A border carbon adjustment would reduce emissions leakage by imposing the same carbon tax to foreign firms as domestic firms within terms of trade. Without a strong or sustained national GHG reduction policy to follow, however, U.S. states and municipalities have moved forward with important climate policies. Many of these policies, like alternative transportation strategies, are complementary to carbon pricing at either the national or state levels.¹⁴

There are several active carbon pricing programs in the U.S. For example, California’s has a Cap-and-Trade program that is administered by the California Air Resources Board. A cap-and-trade system sets up a market for permits to emit GHGs, and the allowance of permits is usually decreased over time to reach GHG reduction goals. In a cap-and-trade program, the price is determined by the market price for permits (measured in metric tons of carbon dioxide equivalent, MTCO_{2e}). California’s program is the most comprehensive among U.S. states, as it covers both electricity and ground transportation sectors. A second cap-and-trade program that only covers the electricity sector is a collaboration among Northeastern states called the Regional Greenhouse Gas Initiative (RGGI). The benefit of a more comprehensive, multi-sectoral approach is that it harmonizes GHG reductions between sectors, both lowering the cost of achieving reductions as well as mitigating leakage between sectors. The second common carbon pricing mechanism is a carbon tax – though it is as common as cap-and-trade globally, no carbon tax exists in the U.S. Several states have attempted to introduce an economy-wide carbon tax. Washington State, for example, brought a carbon tax measure to the ballot in 2016 and 2018, though both were ultimately rejected. Proposals for a carbon tax in Hawai‘i have been put forth to the State Legislature over multiple years. In North America, Canada adopted a federal minimum carbon tax of \$22/MTCO_{2e} in 2018 meant to complement existing programs administered by individual provinces. Mexico has a small, \$3/MTCO_{2e} national carbon tax that was initiated in 2014.¹⁵

For municipal governments in the U.S., comprehensive approaches to carbon pricing can be quite difficult to adopt and effectively administer due to decreasing jurisdictional influence as well as increasing opportunities for leakage. For the City & County of Honolulu, the only existing direct taxation lever on fossil fuels is on gasoline. Ideally, a carbon tax would be levied economy-wide. However, in the absence of comprehensive policy, it is possible to take a more piecemeal approach as well as to better incorporate the cost of GHGs to society within City decision-making. The latter is the concept of adopting an “implicit” carbon price – one that is not necessarily levied on fossil fuels but rather incorporated into cost-benefit analyses conducted by the City when making public policy decisions and infrastructure investments. This guidance will focus on the functioning of an implicit (or internal) carbon price for the City & County of Honolulu.

II. Determining a Carbon Price

There are two general approaches to determining an appropriate carbon price. The first is the concept of the “social cost of carbon” (SCC). The SCC in theory sets a global carbon price that maximizes net benefits to society over time.¹⁶ It addresses two market failures related to climate change. The first is to correct for negative pollution externalities, which is to set a price such that market participants consider both private and social costs associated with burning fossil fuels. The second relates to the “free-rider” problem, where actors have incentive to shirk in the provision of a global public good, which in this case is climate. This is why the SCC is set to a global carbon price, rather than domestic or regional price. National perspectives of SCC, for example, lead to key actors having the incentive to do much less than is needed for positive global outcomes.¹⁷ This logic holds for any U.S. state or sub-state specific values of SCC.¹⁸ Thus, any SCC should be based on a perspective of global rather than local damages.

In 2008, the U.S. Supreme Court ruled that government agencies must account for the costs and benefits of GHG emissions.¹⁹ In 2009, under the Obama administration, the Office of Management and Budget (OMB) and the Council

of Economic Advisers convened the Interagency Working Group on Social Cost of Carbon^I (IWG) to develop estimates to be used government-wide. The IWG included representatives of federal agencies, including the Environmental Protection Agency (EPA) and the Departments of Energy and Transportation, and initially operated between 2009 and 2017. The methodology was based on several integrated assessment models (IAMs), which are global economic models that incorporate a damage function that increases with the accumulation of GHGs in the atmosphere. The model's damage functions include, for example, changes in agricultural productivity, impacts to human health, and property/livelihood damages due to increased flood risk and extreme weather events.²⁰ The IWG released its first SCC estimates in 2010 and revised their estimates in 2013. Table 1 shows IWG SCC estimates from 2020 to 2050, using varying rates of discount. The discount rate is a rate of time preference, and the temporal dimension means that present day SCC estimates are quite sensitive to the chosen discount rate. A larger discount rate would reduce the SCC given that less weight would be put on the benefits of GHG emission reductions that occur far into the future, and vice versa. In short, the higher the discount rate, the more the burden is placed on future generations to address climate change impacts.^{21,22} The IWG adopted a baseline discount rate of 3%, shown in bold.

Table 1. IWG Social Cost of Carbon, 2020-2050 (in 2017 dollars per metric ton CO₂)²³

Year	Discount Rate and Statistic			
	5% Average	3% Average	2.5% Average	High Impact (95th pct at 3%)
2020	\$14	\$50	\$74	\$148
2025	\$17	\$55	\$82	\$166
2030	\$19	\$60	\$88	\$182
2035	\$22	\$66	\$94	\$202
2040	\$25	\$72	\$101	\$220
2045	\$28	\$77	\$107	\$236
2050	\$31	\$83	\$114	\$254

Though IAMs as tools have pioneered investigations of economic consequences of climate change, it is well recognized that they have underestimated damages because they do not include a complete assessment of physical, ecological, human, and non-market impacts.^{24,25,26, 27} This often leads to temperature pathways that climate scientists find dangerous to humanity and therefore intolerable.²⁸ Updating and improving estimates of SCC also mean better incorporating uncertainty, as this leads to substantially higher estimates of global SCC.^{29,30} Though the Trump Administration disbanded the IWG and, in Executive Order 13783, changed the calculation to consider only domestic U.S. damages and with a higher rate of discount,^{II} President Biden in his first few days in office has reversed course and re-established the cross-departmental working group to update and operationalize a more robust federal SCC. As limitations of prior IAMs are examined and improved upon, the expectation is that the estimate for the federal SCC will increase.^{31,32}

^I Later called the IWG on the Social Cost of GHG Emissions, though the “SCC” term endures in popular usage.

^{II} Taking a domestic-only approach substantially lowered the estimate. At the same 3% rate of discount, this brought the federal SCC to just \$11 in 2050 (\$2018). A higher rate of discount erodes it even further. However, this domestic-only U.S. estimate is substantially lower than independently derived values; for example, see the article, “Country-level social cost of carbon” published by Ricke et al. in 2019.

The second method to determine a carbon price is through target-setting.^{33,34} The idea here is that once a jurisdiction has determined its GHG reduction target, the carbon price it adopts should be set such that it puts the jurisdiction on the path to achieving that target. The price can be set in the near-term and updated through iteration.³⁵ Established by Bill 65 (2020), the City & County of Honolulu’s GHG reduction target is to achieve carbon neutrality by the year 2045. A recent study on carbon pricing for Hawai‘i, across the State, finds that a carbon price pathway that starts at \$240/MTCO_{2e} in 2025 and rises to \$1,000/MTCO_{2e} (\$2012) by 2045 would result in Hawai‘i’s GHG emissions being 80% below 2019 levels of GHG emissions. This is 70% below estimated baseline emissions levels in 2045.^{36,III}

II. APPLICATIONS OF SUB-STATE CARBON PRICES

In addition to the two active regional cap-and-trade programs for GHG reduction in the U.S. (California’s and RGGI), there are numerous examples of sub-national application of the IWG SCC, mainly as an implicit/internal carbon price. This means that the price is not explicitly levied, but rather used in analysis to guide decision-making. Below is a summary of how select U.S. states have, in various areas of government, implemented a SCC into decision-making processes.

Table 2. Examples of How SCC has been used by State and Municipal Decision-makers in the U.S.

STATE	HOW THE SCC IS BEING APPLIED
California	<ul style="list-style-type: none"> - In 2017, the California Air Resources Board used the IWG SCC with a range of discount rates (from 2.5-percent to 5-percent) in their scoping plan to assess climate change policies.³⁷ For each policy option in the plan, such as a statewide emissions trading system, the board used the SCC to estimate the monetary benefits of avoided emissions.³⁸ - The California Public Utilities Commission adopted the IWG estimates of a 3-percent discount rate on a trial basis for potential use in integrated resource planning, particularly as it applies to distributed energy resources to help meet the state’s carbon reduction objectives.³⁹
Colorado	<ul style="list-style-type: none"> - In 2017, the Colorado Public Utilities Commission mandated that the electric utility company, Public Service Company of Colorado (Xcel Energy), include the IWG’s SCC in its Energy Resource Plan (ERP).⁴⁰
Illinois	<ul style="list-style-type: none"> - In 2016, Illinois passed an energy bill, also known as the “zero emissions credit” (ZEC) policy, that uses the IWG SCC estimates to calculate the social benefits of energy from zero-emissions facilities.⁴¹
Maine	<ul style="list-style-type: none"> - In 2014, Maine passed legislation that includes calculating “the societal value of the reduced environmental impacts of the energy” to determine the value of distributed solar energy using the federal SCC estimate of a 3-percent discount rate.⁴²
Minnesota	<ul style="list-style-type: none"> - In 2018, the Minnesota Public Utility Commission developed SCC estimates for utility resource planning and requires utilities to use these estimates in their

^{III} In comparison, a carbon pricing pathway that follows the Obama Administration’s IWG recommendation for SCC would result in 2045 levels of GHG 40% below 2019 levels. This is 13% below baseline estimates for 2045.

	resource plans to account for the cost of carbon dioxide emissions. Their SCC estimates are based on the IWG estimates but with modifications, including shortening the time period for projected climate damages. ⁴³
Nevada	<ul style="list-style-type: none"> - In 2018, the Nevada Public Utility Commission (PUC) identified the IWG's SCC estimates as an example that utilities may use to meet state requirements of accounting for the environmental costs of carbon dioxide emissions when submitting energy resource plans. After workshops that spanned over a year, the commission decided that utilities have the flexibility to use estimates other than the federal estimate to represent the environmental cost of carbon dioxide emissions, as long as they justify why the estimates they use are representative of the best available science and economics.⁴⁴
New York	<ul style="list-style-type: none"> - In 2016, the New York State Public Service Commission first used an SCC in a cost-benefit analysis of a resource portfolio to monetize marginal climate damage costs. The commission adopted the federal SCC of 3-percent discount rate in 2017, which was adjusted to the 2-percent estimate in 2020.⁴⁵ New York's Clean Energy Standard and Zero Emissions Credit also uses the SCC to compare the values of emission-free nuclear power and carbon-emitting fossil fuel power.⁴⁶ - The New York State Energy Research and Development Authority uses the SCC estimates to conduct studies that inform state energy policy and program investment decisions, to determine if energy policies will benefit the state, and to consider whether the energy resources considered are feasible. An example study is the analysis for New York's 2018 Offshore Wind Master Plan.⁴⁷ - The Department of Environmental Conservation has also used the SCC estimates to account for avoided emissions in internal policy analyses.⁴⁸
Washington	<ul style="list-style-type: none"> - In 2014, Governor Inslee issued Executive Order 14-04 which requires state agencies to "ensure the cost-benefit tests for energy-efficiency improvements include full accounting for the external cost of GHG emissions." As a result, the Washington State Energy Office recommended that all state agencies use federal SCC estimates that have been reduced to a 2.5-percent discount rate to capture the total cost of future climate damages.⁴⁹

There are numerous motivating factors for sub-national actors to operationalize an implicit carbon price. The first is that, without a federal carbon pricing program, sub-national carbon pricing (both explicit and implicit) can serve to internalize GHG externalities that are otherwise being unaccounted for within markets, regulatory processes and decisions affecting government operations. This is particularly important within state regulatory processes governing electricity generation, as this is squarely within state and municipal jurisdiction. A second motivation is to benefit from being a first-mover in GHG reduction. If there is an expectation that there will be a federal carbon price, there can be early advantages from firms, households and the government having already made some of these adjustments. This is particularly important in sectors with long-lasting durable goods; for example, transportation infrastructure and building capital. Overall, adopting an implicit/internal carbon price can also help guide regional GHG reduction goals in a cost-effective way.

III. IMPLICATIONS OF SCC FOR THE CITY & COUNTY OF HONOLULU

The City has limited direct taxation authority over fossil fuels other than the gasoline tax. Although it is certainly possible for the City to pursue an increase in the gasoline tax, an economy-wide approach provides greater benefits as it harmonizes sectoral interactions and therefore achieves reductions more cost-effectively. In addition, a State and/or Federal approach could pair an explicit carbon price with payments back to residents, making it a more equitable decarbonization policy.⁵⁰ For these reasons, the Commission focuses its recommendations on the City operationalizing an implicit carbon price.

An internal carbon price can be used for cost-benefit analysis for City operations and investments, as well as incorporated into decision-making that guide O'ahu-wide policies and programs. An internal carbon price for the City should be set, at a minimum, at the recommended 2016 federal IWG SCC and updated based on additional research and policy adoption expected within the Biden Administration. Higher carbon price pathways, to achieve the State's carbon net negative target before 2045, should be assessed in collaboration with State and other regional entities. To do this, the City would need to develop and adopt a methodology for estimating how the carbon price would be experienced by key sectors. For fossil fuel purchases like gasoline and diesel for City fleets, the Commission suggests taking the current fuel price net of taxes and to assume that there is pure price pass-through of the carbon price (i.e. a competitive market assumption) in order to calculate a new fuel price. This would allow the City to do an ownership and operating cost comparison between fossil fuel vehicles and alternative fuel vehicles, a cost comparison that would better reflect holistic societal costs. The electric sector is more complex because of the interaction with the regulatory and contracting process. The simplest way for the City to proceed would be to assume that the carbon price passes through the fossil-based generation mix, using the current generation mix as a baseline and projecting forward in time based on the State's Renewable Portfolio Standard goal. The City could, for example then better assess the cost-benefit of investing in on-site renewable energy generation.

Lastly, GHG's are an important consideration within City decision-making – one that could be better internalized through a carbon price. There are also other non-market co-benefits of GHG reduction that should also be considered to achieve more comprehensive cost-benefit analysis and overall approaches to decision-making. Examples include co-benefits related to human health from mitigating exhaust emissions, where PM 2.5 and PM 10 have been well documented to have numerous deleterious effects on human health.⁵¹ By reducing vehicle miles traveled^{IV} as well as moving to “zero emissions vehicles,” multiple benefits from mitigating climate change to improving health outcomes can potentially be achieved.^{52 53} Another example is the multiple benefits of urban trees, which serve as a carbon sink but also can slow down stormwater and mitigate urban water runoff, as well as provide urban cooling benefits.⁵⁴ Overall, adopting an internal carbon price is one step towards enabling more long-term, comprehensive decision-making by the City that incorporates a multi-view of values.

Acknowledgements

The Commission thanks Rachael Han and Layla Kilolu for their research assistance, Anukriti Hittle and Maja Schjervheim for their helpful comments and feedback, and members of the public for their feedback during Commission meetings.

^{IV} Reduction of vehicle miles traveled also reduces exhaust and non-exhaust emissions, where non-exhaust emissions can account for the vast majority of total emissions.

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