**University of California**

**Implementation of a Social Cost of Carbon**

**2022**

**Background**

Global climate disruption is impacting the planet in ways never before experienced in recorded human history. Warmer temperatures are contributing to changing weather patterns, causing more intense storms and heavier rainfall in some areas, while parching the land in others. Glaciers are melting at an accelerated rate and oceans are rising.

Although a warming planet may have positive effects for some areas, overall, climate change will cause negative global economic and environmental effects. Year 2020 was the sixth consecutive year in which ten or more billion-dollar weather and climate disaster events occurred in the United States of America. “2020 was a historic year of extremes. There were 22 separate billion-dollar weather and climate disasters across the United States, shattering the previous annual record of 16 events, which occurred in 2017 and 2011…. In fact, 2020 was the most active wildfire year on record across the West.”[[1]](#footnote-1)

**What is the Social Cost of Carbon**

Some of the effects of climate change include changed rainfall patterns, drought, reduced agricultural yields, fires, severe weather (storms, hurricanes, hail, freezing temperatures, heat waves, flooding, etc.), sea level rise, coral bleaching, thawing permafrost, and increased human and wildlife mortality due to record-breaking heat. These effects have associated costs to society. **The social cost of carbon (SCC) is an estimate, in dollars, of the economic damages that result from the emission of one additional metric tonne of CO2.[[2]](#footnote-2)** The SCC frames the effects of climate change in economic terms to help decision makers understand how emissions related to policies and projects affect the economy. When policies or projects affect GHG emissions, the expected increase or decrease in emissions (in tonnes) is multiplied by the SCC dollar amount and the result is included as part of the total estimated cost or benefit of the project.

Recognizing the need to incorporate the economics of climate changes into their decisions, governments, companies, and higher education institutions around the world are implementing the social cost of carbon as a proxy price into their decision making discussions.

**Why Implement a Social Cost of Carbon**

Although some results of climate change, for example decreased agricultural productivity at the equator, can seem too remote an effect to adjust for when considering policies here in California, climate consequences will have economic impacts on the UC system over the coming decades. For example:

* Increases in health insurance costs and sick and absentee days, resulting from heat-related health problems,
* Financial companies may cease to allocate bonds for fossil fuel projects, since those projects will carry increased future regulatory risks,
* There may be changes to the SEC filing system to ensure transparency around our climate impacts,
* There will be negative impacts to the broader economy due to global and national instability caused by climate disasters.

In addition to mitigating risk, there are a variety of other benefits from implementing the use of the SCC. For example:

* Potential benefits from utility savings due to the adoption of more efficient technologies,
* We can mitigate the impact of future federal, state, and regional regulations and emission taxes,
* SCC considerations will assist us in meeting internal emissions targets,
* We will encourage innovation,
* Transparent attention to the climate crisis through the use of the SCC will improve community relations and address the concerns of stakeholders and affected communities,
* Public focus on climate through use of the SCC can improve student satisfaction and help with recruitment goals[[3]](#footnote-3).

The dire consequences of climate change have led the University of California to commit to becoming carbon neutral by 2025. In 2017, the UC’s Carbon Neutrality Finance and Management Task Force released a report on “Overcoming Barriers to Climate Neutrality''. This report outlined six top recommendations, one of them being, “accounting for the cost of carbon and integrating carbon management with utility budgets.” Employing an SCC in decision making begins to answer this top recommendation, and will be a useful step in helping the UC reach carbon neutrality.

**Identifying the Appropriate Cost**

The UC will use the most popular, public, and widely approved SCC Integrated Assessment Models (IAMs) in calculating the social cost of carbon, and apply a fairly newly developed equity weighting approach to explicitly include an element of equity in our calculations.

In 2010 the United States Interagency Working Group (IWG) on the Social Cost of Carbon, in addition to multiple other countries and institutions, used the three most popular and widely approved Integrated Assessment Models (IAMs)[[4]](#footnote-4) to determine the social cost of carbon. These three models are [DICE](https://yosemite.epa.gov/ee/epa/eerm.nsf/vwan/ee-0564-114.pdf/%24file/ee-0564-114.pdf) (Dynamic Integrated Climate-Economy model), [FUND](http://www.fund-model.org/home) (Framework for Uncertainty, Negotiation and Distribution model), and [PAGE](https://www.jbs.cam.ac.uk/wp-content/uploads/2020/08/wp1104.pdf) (Policy Analysis of the Greenhouse Effect model). Only two of these IAMs, FUND and PAGE, are regionally disaggregated, and thus allow us to implement our desired equity weighting approach as described in the next section.

This calculation of an **equity weighted social cost of carbon** came to an

**estimated $246 in USD 2020 with a 1.5% escalation rate**

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For a more detailed explanation of how the UC ascertained a specific figure, please review our [Methods and Results](https://drive.google.com/drive/folders/1X8b03ltGXbb-LvrMK-lPZtWtijHl_HNI) documents. The $246 number is an average of FUND’s $128 and PAGE’s $364 in Table 3 of the Results document.

**Equity Weighting**

The UC’s work to remediate climate injustice includes a commitment to recognizing and addressing current and future inequities which leave under-resourced communities most vulnerable to climate disasters. Although the most common approach to SCC calculations weights the same absolute consumption change to a low income individual or high income individual equally, the impacts on respective well-being differ. An equity weighting approach uses a social welfare framework, consistent with the standard utilitarian social welfare function, to “capture that a dollar is `worth` more to a person with a lower income than a person with a high income”.[[5]](#footnote-5) The suggestion that damages to people with different wealth levels should be weighted differently in the context of climate change impacts was proposed in the 1995 second assessment report of the IPCC.

The fundamental idea of an equity weighted social cost of carbon can be best explained by this example: For a household with an above average global annual income, $60,000 USD per year, $500 in flood damage should be manageable. For a household more closely aligned with the global average income, say $10,000[[6]](#footnote-6) USD, $500 would take a significant bite from their living standard. Using an equity weighted model enables equitable comparison of monetary damages that accrue to regions with very different income levels.

The equity weighted SCC is an evolving number that will change regularly as the science advances and regional data becomes more granular. The UC will continue to monitor its development and update the figures as needed.

**Implementation**

The University of California system, a known leader in the climate justice arena, believes that all major capital expenditures should be analyzed with consideration of the equitable social cost of carbon. Therefore they are working to include the equity weighted SCC as a shadow/proxy price in two high-level, capital project decision making tools employed by the UC system:

1. The UC Operational Carbon and Energy Assessment for New Construction (OCEAN) tool: All capital projects proposed for approval through the Regental, or delegated approval process, report the project’s associated carbon and energy performance metrics through this reporting tool. The tool currently includes a line item for the integration of a SCC.
2. The Fovea tool: Is a climate action planning financial modeling tool that considers the impacts of diverse climate solutions on (1) capital expenditures, (2) operational expenditures, (3) purchased commodities, and (4) carbon pricing to identify the most cost effective and impactful climate solutions at each UC campus. The equity weighted SCC will be entered into each campuses’ Fovea models to provide better accounting for their suite of diverse climate solutions.

Graphic examples of these tools can be found in this document: [UC Utilization of an Equity Weighted Social Cost of Carbon](https://docs.google.com/document/d/143fTmWOgenfzTceKIU9juOniYZ6obzYf1J8vpt6nW40/edit)

Although the SCC is only used as a shadow price for discussion making, multiple higher education institutions have confirmed that adding the SCC to capital expenditure conversations up front, has significantly impacted their decisions to invest in more sustainable projects.

**References:**

[Social Cost of Carbon](https://www.gao.gov/assets/gao-20-254.pdf): Identifying a Federal Entity to Address the National Academies’ Recommendations Could Strengthen Regulatory Analysis, United States Government Accountability Office, Report to Congressional Requesters. June 2020

[Carbon pricing approaches for climate decisions in U.S. higher education](https://online.ucpress.edu/elementa/article/doi/10.1525/elementa.443/114479/Carbon-pricing-approaches-for-climate-decisions-in): Proxy carbon prices for deep decarbonization. Elem Sci Anth, 8: 42. DOI, Darron, AR, et al. 2020

[Valuing Climate Damages](https://www.nap.edu/download/24651): Updating Estimation of the Social Cost of Carbon Dioxide, National Academies Press. 2017

[Selecting an Internal Carbon Price for Academic Institutions](https://secondnature.org/wp-content/uploads/SMITH-Selecting-an-Internal-Carbon-Price-for-Academic-Institutions.pdf), Working paper, Alexander Richard Barron and Breanna Jane Parker, Smith College. September 5, 2018

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**Equity Weighting:**

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[Equity weighting and the marginal damage costs of climate change](https://www.sciencedirect.com/science/article/abs/pii/S0921800908002991?via%3Dihub), [David Anthoff, Cameron Hepburnd, Richard S.J.Tolacef](https://www.sciencedirect.com/science/article/abs/pii/S0921800908002991?via%3Dihub#!), [Ecological Economics](https://www.sciencedirect.com/journal/ecological-economics), [Volume 68, Issue 3](https://www.sciencedirect.com/journal/ecological-economics/vol/68/issue/3), Pages 836-849. January 15, 2009

[Equity is more important for the social cost of methane than climate uncertainty](https://www.nature.com/articles/s41586-021-03386-6). Errickson, F.C., Keller, K., Collins, W.D. et al. Nature 592, 564–570. April 21, 2021

1. CPI-adjusted, NOAA’s National Centers for Environmental Information (NCEI), 2021 [↑](#footnote-ref-1)
2. Resources for the Future, [www.rff.org](http://www.rff.org), 2021 [↑](#footnote-ref-2)
3. [Princeton Review’s](https://www.princetonreview.com/college-rankings/college-hopes-worries) 2020 annual poll found that 75% of incoming students say a college's environmental commitment would affect their decision to attend a university. [↑](#footnote-ref-3)
4. Integrated Assessment Models (IAMs) are computer models that analyze a broad range of data – e.g. physical, economic and social – to produce information that can be used to help decision-making. [↑](#footnote-ref-4)
5. Errickson, F. C., Keller, K., Collins, W. D., Srikrishnan, V., & Anthoff, D. (2021). Equity is more important for the social cost of methane than climate uncertainty. *Nature*, *592*(7855), 564-570. [↑](#footnote-ref-5)
6. World Bank, <https://data.worldbank.org/>, 2021 [↑](#footnote-ref-6)