# RFF's Social Cost of Carbon Initiative


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# Why is the SCC important?

**SCC estimates inform government policy in the U.S. and abroad:**

- The federal government has used the SCC in the required benefit-cost analysis of over 150 proposed and finalized rules.
- The SCC was used to set the level of a federal carbon tax in legislation.
- New York and Illinois use the SCC as basis for payments to nuclear generators.
- Colorado PUC requires utilities to use the SCC for resource planning; Minnesota may follow.
- California AB 197 requires valuing social benefits of emission reductions.
- Canada adopted the US SCC methodology; Mexico agreed to take similar action.

**Businesses and other non-governmental entities are increasingly looking to value emissions:**

- 1200+ companies disclose plans or current practice of placing a price on carbon emissions as approach to managing carbon risk.
- 140+ companies embed carbon price within business strategies and operations[1].

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1. Carbon Disclosure Project, *Embedding a carbon price into business strategy, Sept. 2016.*

# Goals for RFF SCC Initiative

- Organize an effort to update the SCC estimation process in accordance with the near-term NAS recommendations within 2-3 years.
    - In addition to above near-term updates, **will include a modular framework** that is based on an open computing platform.
- Provide scientifically-based source of information on SCC for future actions by governmental and other institutions.
- Perform the update in a transparent fashion that engages stakeholders and allows for others to easily incorporate our work.
- Build a group of users of the updated SCC process and expand the scientific community engaged in relevant science.

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# RFF will implement short-term NAS recommendations

**Build a modular framework** that is based upon an open computing platform

**Socioeconomic module** using statistical methods and expert elicitation for projecting distributions of GDP, population growth and emissions into the future

**Climate module** that employs a simple Earth system model that satisfies well-defined diagnostic tests

**Damages module** that improves and updates existing damage functions drawing on recent scientific literature

**Discounting module** that incorporates the relationship between discount rates and economic growth to account for uncertainty over long time periods

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# Open computing platform

The SCC initiative will design and implement an open computing platform for SCC estimation that is **computationally efficient, accessible, and transparent.**

- The platform, modules, and programming language will all be open source.
- The platform will be comprehensively documented, including clear specifications for module inputs and outputs as well as tutorials for writing components.

The platform will accommodate **a decentralized workflow** and **provide for straightforward uncertainty analysis.**

*Platform development will be led by David Anthoff (UC Berkeley)*

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# Socioeconomic module

**The SCC initiative will implement NAS recommendations to generate a compact set of projections of GDP, population, and emissions, suitable for regulatory analysis.**

- **GDP:** Generate a probability density of average annual growth rates of global per-capita GDP with an appropriate statistical technique, informed by expert judgment**.**
- **Population:** Work with demographers to extend existing probabilistic population projections beyond 2100, informed by expert judgment.
- **Emissions:** Conduct an expert elicitation to generate a set of emissions trajectories, conditioned by the set of scenarios of future population and income.

We are currently evaluating the NAS-recommended approaches to generate regional/sectoral projections of GDP and population, along with potential approaches to extend existing statistical and probabilistic approaches to generate such products.

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# Climate module

**The SCC initiative will develop and implement a climate module that:**

- captures the relationships and between GHG emissions, atmospheric concentrations, and global mean surface temperature change over time, along with their uncertainty.
- provides a response to long-term forcing trajectories as well as a pulse of CO2 emissions that is similar to the response provided by more complex simulations.

**We are currently evaluating a number of models, including the FAIR model, to serve as the basis for further development, including the inclusion of sea level rise and surface ocean PH components.**

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# Climate damages module

**To update the damage functions used for SCC estimation and implement them as a new module, the SCC initiative will:**

- Develop scientific and transparency criteria, consistent with NAS recommendations, for evaluating the damage functions and their underlying studies.
- Conduct a detailed review of the existing set of damage functions employed by the integrated assessment models employed by the IWG, focused on the underlying studies, calibration protocols, and uncertainty quantification.
- Remove the damage functions from the updated SCC estimation process that do not meet the developed criteria.
- Update current damage functions based on eligible updates from the scientific literature as part of a new damages module.
- Provide a summary of disaggregated (incremental and total) damage projections underlying SCC calculations, including how they scale with temperature, income, and population.

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# Discounting module

The NAS recommended the implementation of a discounting module that explicitly recognizes the uncertainty surrounding discount rates, its connection to uncertainty in economic growth, and in turn to damages.

**The SCC initiative will:**

- Lead a collaborative effort to consider the implementation of the Ramsey approach highlighted by the NAS and identify relevant parameters
- Implement the approach as part of a discounting module that discounts damages at a rate based on the corresponding economic growth scenarios.

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# Process and additional work products

**Thorough scientific review:** All products will be reviewed on an ongoing basis by an expert review panel and peer-reviewed in journals as appropriate, with a final review by an independent scientific body.

**Capacity building:** We will conduct extensive outreach to the existing and potential user community to help them incorporate the SCC as appropriate.

**Stakeholder engagement:** We will regularly convene a diverse cross section of industries, NGOs, and think tanks to gather feedback.

**Regional SCC estimates**: We will conduct original research to inform the estimation of regional SCC values, particularly a domestic-only value for the United States.

**Communications:** We will create a web site with SCC resources (FAQ, podcasts, blog posts), and conduct public webinars to disseminate products as they are completed.

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For further information, please visit
www.rff.org/SCC

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# Extra slides

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# Over-arching criteria for SCC estimation (NAS Rec. 2-2)

**Scientific basis:** Modules should be consistent with scientific knowledge in the current, peer-reviewed literature.

**Uncertainty characterization:** Key uncertainties—including functional form, parameter assumptions, and data inputs—should be adequately represented. Uncertainties not quantified should be identified.

**Transparency:** Documentation should allow people to understand and assess the modules, including which features are evidence-based or judgment-based. Model code should be available to researchers.

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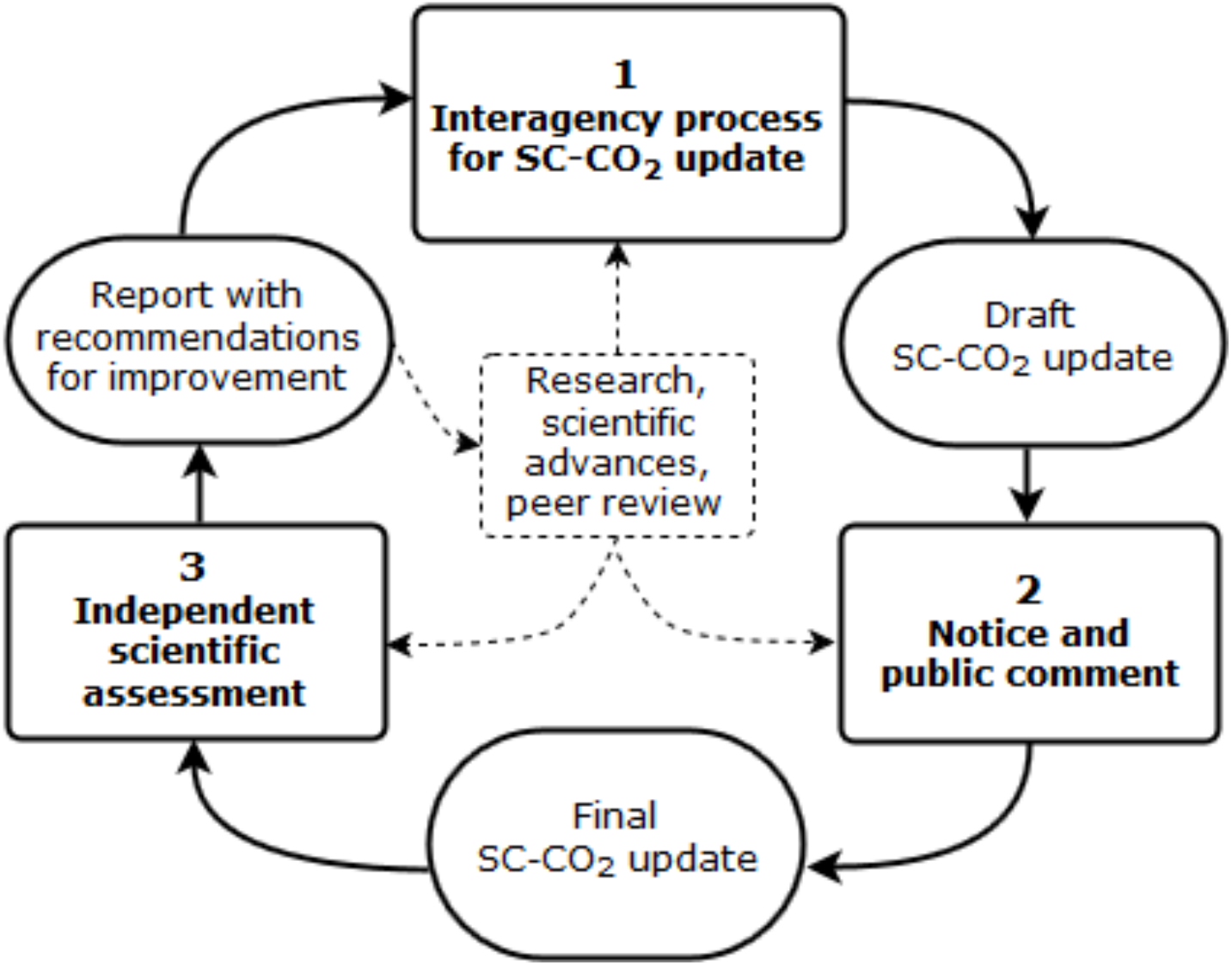
# Regularized process for SCC updates (NAS Fig. 2-2)

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# A regularized process to update SCC estimates (NAS Rec. 2-4)

An update cycle of roughly **5 years balances the need to respond to evolving research with the need for a thorough and predictable process.**

The IWG should establish a **three-step process** for updating the SCC estimates.

1. Estimates should be revised drawing on internal and external technical expertise and incorporating scientific peer review.
2. Draft revisions to the SCC methods and estimates should be subject to public notice and comment.
3. The government's approach to estimating the SCC should be reviewed by an independent scientific assessment panel to identify improvements in future updates and research needs.

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