Tools of the Trade: Social Cost of Carbon

Social cost of carbon (SCC) is a very important concept in energy and climate policy. It quantifies the economic damages from one extra ton of carbon dioxide.

Read more about social cost of carbon here: Social Cost of Carbon 101

How SCC are calculated

Estimates of the SCC are calculated in four steps using Integraed Assessment Models (IAMs).

Step 1: Predict future emissions based on population, economic growth, and other factors (CO2 emissions). Step 2: Model future climate responses, such as temperature increase and sea level rise (CO2 concentrations). Step 3: Assess the economic impact that these climatic changes will have on agriculture, health, energy use, and other aspects of the economy (Damage function). Step 4: Convert future damages into their present-day value and add them up to determine total damages (Discounting).

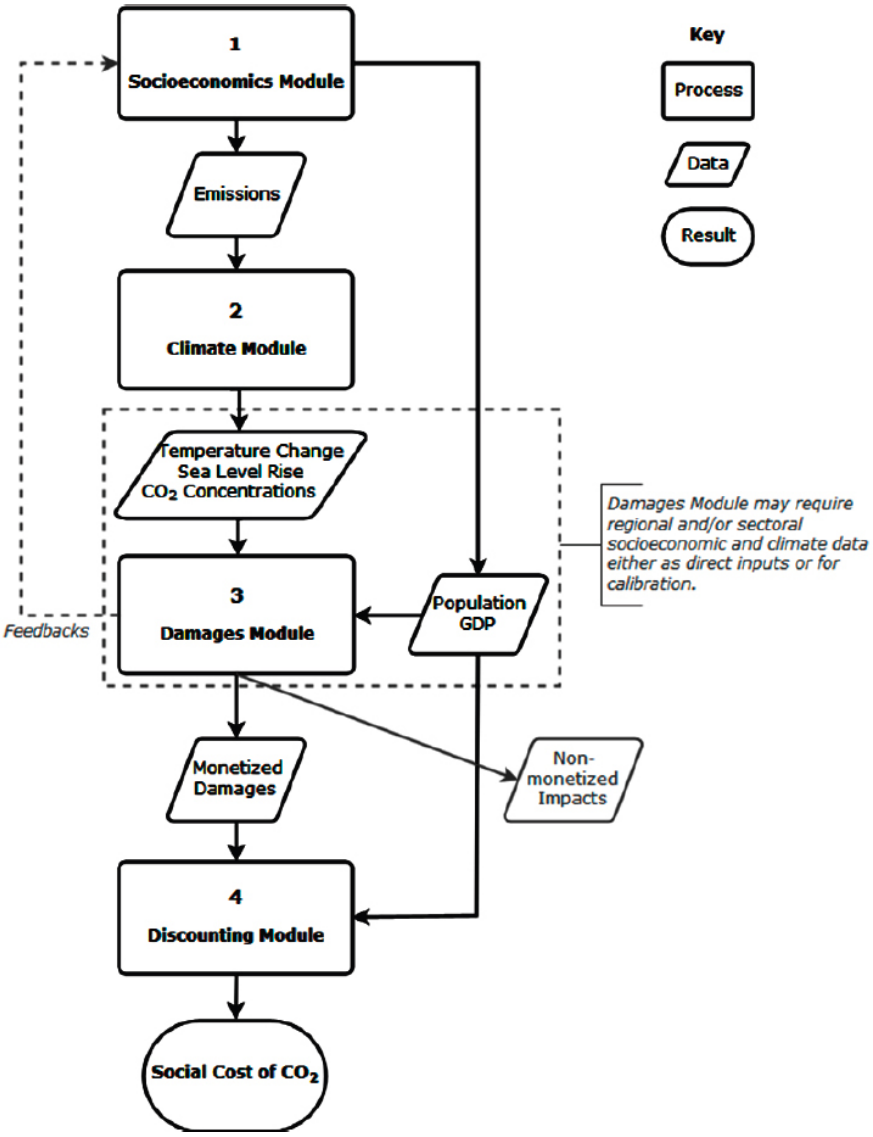

Figure 1: An integrated, modular framework for estimating the social cost of carbon (SC-CO2)[1]

Social Cost of Carbon Explorer

There are quite some models and tools are available. We will use the open-source RFF-Berkeley Greenhouse Gas Impact Value Estimator (GIVE) model as an example to play with SCC, key assumption, and how those parameters would impact the value of SCC.

Key factors:

- CO2 emissions
- CO2 concentrations
- Damage function
- Discounting

[1]National Academies of Sciences, Engineering, and Medicine. 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. Washington, DC: The National Academies Press. https://doi.org/10.17226/24651.

Other models

- Dynamic Integrated Climate-Economy model RISE/DICE 2023
- Framework for Uncertainty, Negotiation and Distribution model FUND
- Policy Analysis of the Greenhouse Effect model PAGE

SCC in policy

- New York ($51/ton → $125/ton)
- EPA ($51/ton → $190/ton)

Further readings

- Valuing Climate Changes: Updating Estimation of the Social Cost of Carbon Dioxide. 2017. Washington, D.C.: National Academies Press. https://doi.org/10.17226/24651.
- Ricke, Katharine, Laurent Drouet, Ken Caldeira, and Massimo Tavoni. 2018. "Country-Level Social Cost of Carbon." Nature Climate Change 8 (10): 895–900. https://doi.org/10.1038/s41558-018-0282-y.