

Projecting economies and emissions for estimating the global economic impacts of climate change

Dominique van der Mensbrugghe (Purdue University)



TODAY: Series introduction and projecting economies and emissions for estimating the global economic impacts of climate change

SPEAKERS



Dr. John P. Weyant
Professor of Management
Science & Engineering,
Energy Science & Engineering
Director of the EMF
Stanford University



Dr. Dominique van der
Mensbrugge
Research Professor & Director of the
Center for Global Trade Analysis
Purdue University



Dr. Detlef van Vuuren
Professor of Integrated Assessment
of Global Environmental Change
Utrecht University and
PBL Netherlands Environmental
Assessment Agency



Dr. Rob Dellink
Senior Economist
Environment & Economy
Integration Division
Environment Directorate
OECD



Dr. Steven Rose
Principal Research Economist
Energy Systems and Climate
Analysis Research
EPRI

Agenda

- Series introduction: Dr. John Weyant (Stanford University)
- Topic introduction/moderator: Dr. Dominique van der Mensbrugge (Purdue University)
- Panel:
 - Dr. Detlef van Vuuren (Utrecht University and PBL Netherlands Environmental Assessment Agency)
 - Dr. Rob Dellink (OECD)
 - Dr. Steven Rose (EPRI)
- Facilitated discussion



Past history of (very) long-term scenarios

- Growth and development
 - Convergence, income distribution, poverty & other SDGs (World Bank)
 - Political economy implications (e.g., will China overtake the U.S.)
- Demographics, income growth and pension systems (various national agencies)
- Environmental sustainability & planetary boundaries (Millennium Ecosystem Assessment, OECD Environmental Outlook)
- Energy, emissions and climate change (Shell Scenarios, IPCC-related— IS92, SRES, SSP/RCP)



The first module: population, income and emissions

$$Emi_t = Pop_t \times \frac{GDP_t}{Pop_t} \times \frac{NRG_t}{GDP_t} \times \frac{EMI_t}{NRG_t}$$

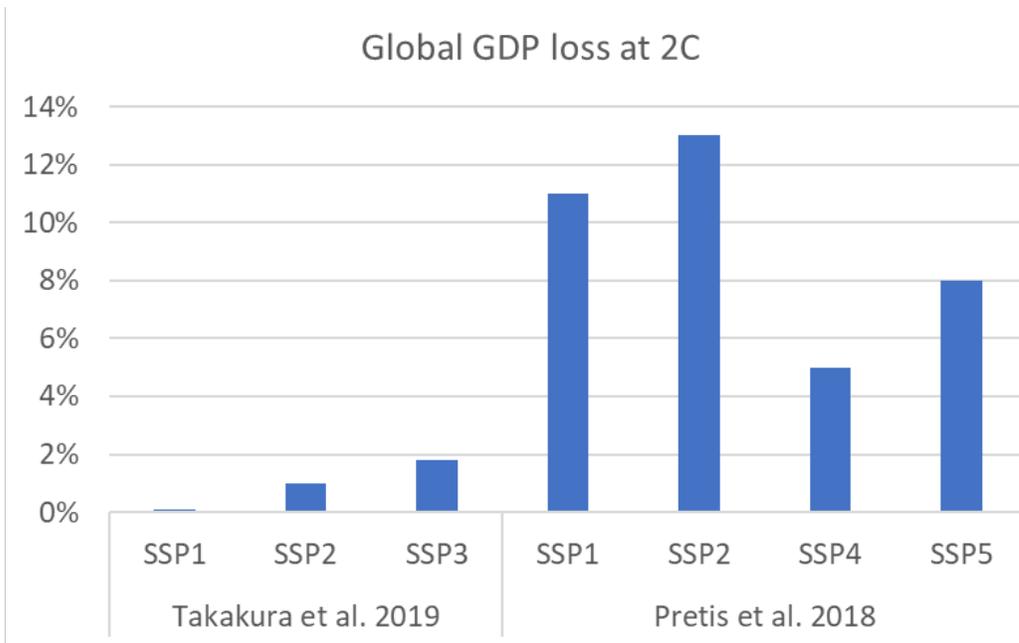
Kaya identity

- Time horizon varies—current focus on 2050 and 2100, but some scenarios push out to 2300-2500
- Ranges from the extremely simple—one (global) region and one sector such as DICE—to multi-regional/multi-sectoral with dynamic assumptions on demographic, structural, preference and technological change
- Traditionally uses ‘scenario’ analysis with 4-5 basic storylines on population, income, energy and emission growth (e.g., SSP/RCP)
- Some attempts at probabilistic scenarios (e.g., GIVE)
 - How deep to consider the uncertainty (top-level drivers versus deep drivers)?
 - How plausible are the PDFs out-of-sample?

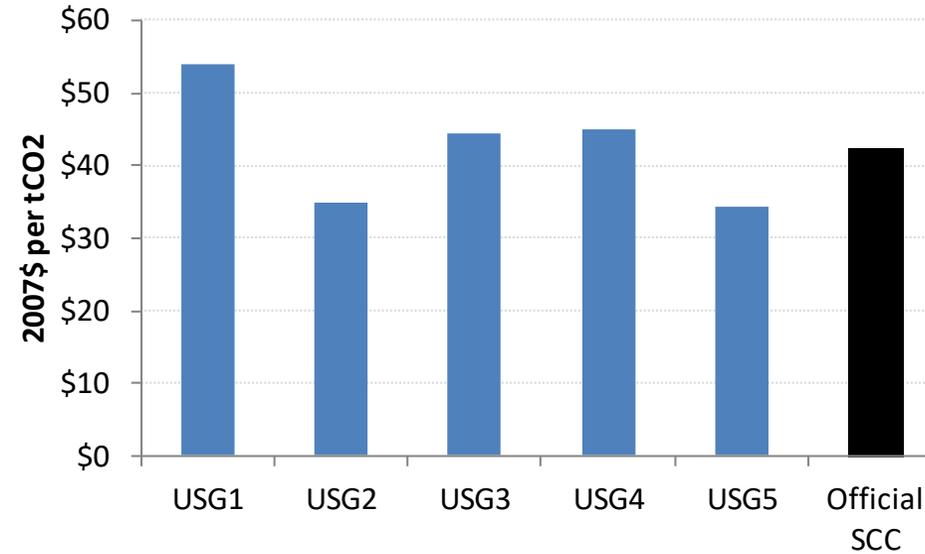


The future society assumed matters when estimating future potential economic impacts of climate change

Sample estimates of global GDP loss at 2°C



Biden Administration “interim” social costs of carbon (SCC) (model average by scenario for 2020, discount rate 3%, \$2007)



Rose and Bistline (2016)

- Determines future climate, societies exposed and responsive to that climate, AND discounting
- Future climate economic impacts are a function of more than just the future climate
- However, how much of the relevant uncertainty is currently being captured?



Critical issues

- Which mitigation/adaptation policies and/or autonomous decisions to include in the baseline scenario
- The role of expectations
- Increasing attention on equity issues—who loses/gains in baseline and policy scenarios



Three speakers

- Detlef van Vuuren (PBL): Integrated assessment modeling (IAM), Shared Socioeconomic Pathway (SSP), IPCC scenarios projections perspective
- Rob Dellink (OECD): Computable general equilibrium (CGE) modeling projections perspective
- Steven Rose (EPRI): Probabilistic structural economy projections perspective, and ideas for evaluating projection alternatives



If you have questions?

- Questions will be taken during the discussion
- Please submit your questions via the Zoom Q&A feature (bottom of screen)
- We will be monitoring the Q&A and sequence and group questions
- We may not get to all the questions. We will do the best we can.



Thank you for participating today!

A banner for the Public Educational Webcast Series. It features a central image of the Earth from space. To the left of the Earth are the logos for Stanford Engineering Energy Modeling Forum and EPRI. To the right of the Earth, the title 'Public Educational Webcast Series' is written in large white font, with the subtitle 'Options for Estimating the Global Economic Impacts of Climate Change and the Social Cost of Carbon Module-by-Module' in smaller blue font below it.

Stanford
ENGINEERING | Energy Modeling Forum

EPRI

**Public Educational
Webcast Series**

Options for Estimating the Global Economic
Impacts of Climate Change and the Social
Cost of Carbon Module-by-Module

Next webcast in the series

Estimating the global economic impacts response to a future climate

Date TBD

Series information, including slides, bios, recordings:

<https://emf.stanford.edu/stanford-epri-public-educational-webcast-series>

Comments and questions: weyant@stanford.edu, rosose@epri.edu

