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Assessing the Value of Climate Policy: The Decision Maker's Dilemma

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Climate Change Economics

"Even though substantial uncertainties persist … knowledge [of climate change] is sufficient to establish the need to respond in the near-term…"

"It then follows from simple economics that this near-term action should begin immediately if we are to minimize the expected cost of meeting any long-term objective."

(Gary Yohe, 2009)

Climate Change Economics

However…

"[T]here is such a thing as dangerous climate policy – adaptive or mitigative programs that retard economic growth and thereby undercut the ability to develop sustainably."

(Gary Yohe, 2009)

Decision Maker's Perspective

The key question every decision maker has for you:

Is a proposed climate policy worth its cost?

- Cost of inaction does not answer this question.
- Affordability also does not answer this question.
- The cost of policy is worth it if it is both affordable and the cost of inaction is at least as high as the cost of the policy – cost-benefit analysis.

Climate Change Economics

But…

"[P]ervasive uncertainty about the physical and economic consequences of climate change undermines the credibility of economically optimal policies that emerge from traditional benefit-cost calculations."

(Gary Yohe, 2009)

Political Reality

- Federal agencies are already considering climate change
  - EPA acknowledges its authority to regulate CO_2
  - California vehicle emissions waiver
  - Several regulatory decisions considered SCC in setting efficiency standards (EPA, NHSTA, DOE)
- Federal actions may influence future Congressional actions
- Decision makers need analytical guidance today.

Pew Benefits Workshop

Pew Center Workshop on Analyzing
The Economic Benefits of Avoided Climate Change

- 75 experts discuss the science, risks, and economics of climate change
- Keynote addresses by Dina Kruger and Gary Yohe
- 16 presentations on climate change impacts and economics

http://www.pewclimate.org/events/2009/benefitsworkshop

Pew Benefits Workshop

Panel 1: *Perspectives on Government Decision Making*

Summary Findings

- **Martha Roberts/Chris Pyke:** Incorporating climate-related benefits into rulemaking and impact assessments increases overall societal benefits from individual government decisions.
- **James Lester/Paul Watkiss:** Considerations beyond the quantified climate-related benefits, including uncertainty and non-market impacts, have been invoked by some governments to justify for more stringent mitigation goals.

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Panel 2: *Challenges to Quantifying CC Damages*

Summary Findings

- **Mike MacCracken:** Complexities/interconnectedness of physical and social systems present many challenges to quantifying impacts/costs.
- **Kris Ebi:** Variations of social vulnerability are as important as exposure. Methods that average out unacceptable local impacts through aggregation hide intolerable social risks.
- **Tony Janetos:** Uncertainties about the effects of climate change on ecosystems and the difficulty of monetizing non-market impacts, make ecosystems and their goods and services difficult to value.
- **Jon O'Riordan:** British Columbia eschews CBA in favor of a sustainability principle that emphasizes existence value and presumes that ecosystem goods and services are irreplaceable.

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Panel 3: *The Role of Uncertainty and Risk in Assessing Benefits*

Summary Findings

- **Brian O'Neill:** Waiting to learn is likely to make policy more costly. Since prospects for learning about abrupt climate change in time to avert it are dim, risk management requires near-term mitigation.
- **Joel Smith:** New information about climate change and vulnerability acquired over the past decade has led experts to perceive greater risk from lower levels of global warming than perceived previously.
- **Mike Mastrandrea:** The damage functions in IAMs used for CBA are largely based on decade-old science, omit many categories of impacts, and likely underestimate climate impacts.
- **Chris Hope:** Uncertainty in ~30 IAM parameters produce a wide range of SCC. This uncertainty should be considered in decisions.

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Panel 4: *Advances in the Economic Analysis of Benefits*

Summary Findings

- **Steve Rose:** Non-incremental climate change mitigation goals are economically and analytically distinct from incremental regulatory decisions.
- **David Anthoff:** Equity-weighting produces a different SCC for each region according to its income level and can be used to scale up the external benefit in national cost-benefit analysis.

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Panel 4: *Advances in the Economic Analysis of Benefits (Cont.)*

Summary Findings

- **Richard Howarth:** Financial markets place value on assets that pay out when income is low, thus increasing the value policies that decrease the likelihood of catastrophic outcomes. Standard discounting practice does not capture this attitude toward risk.
- **Steve Newbold:** Within the utility framework, risk-adjusted measures of willingness-to-pay to reduce the risk of catastrophe can greatly exceed their deterministic counterparts, underscoring the need to value risk reduction in any estimate of benefits of climate policy.

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Key Insight

"[S]ociety values reductions in risk, as reflected in different rates of return for high and low risk financial assets. However, deterministic estimates of the value of climate change impacts do not reflect the uncertainty and risk related to climate change, or attitudes towards risk, and therefore … underestimate the benefits of emissions reductions…"

Steve Rose

The Long View – Gary Yohe's Keynote

"Since there is good evidence to suggest that getting the 'optimal policy' wrong could be extremely expensive, it follows from straight-forward economics that a complementary approach aimed at managing/reducing risk is required."

Gary Yohe

The Long View – Gary Yohe's Keynote

Alternative/complement to CBA?

- Ultimately, new methods must be developed to provide a risk-reduction strategy that respects uncertainty and considers multiple generations.

"Responding to climate change involves an iterative risk management process that includes both adaptation and mitigation, and takes into account climate change damages, co-benefits, sustainability, equity and attitudes to risk."

Yohe/IPCC 2007

How Do We Decide Now?

What is the best way to answer the key question now?

- Can damage estimates improve quickly?
  - Yes? great! Let's get moving on that.
  - No? Are existing estimates useful at all? If so, how?
    - Consider existing estimates to be lower bounds?
    - Give upper half/end of range special weight?
    - Can we increase transparency to clarify risks?
- Ideally we should monetize, but if that cannot capture the essential risks, what alternative metrics will decision makers find simple and meaningful in relation to the cost of policy?

Framework for Improved Benefits Analysis (S. Rose)

Framework principles

- Internalize global & generational externalities
- Contend with significant uncertainty
  - Uncertainty **and** sensitivity analyses
- Characterize and value risk
- Treat incremental and non-incremental policies differently
- Develop consistency
  - Climate, ecosystem, & socioeconomic
  - More robust comprehensive picture and avoided impacts analysis
- Account for the extraordinarily long investment horizon
- Use non-monetary impacts information
- Use qualitative (proxy) impacts information
  - Climate variables proxy for all impacts (monetized, quantified, yet to be quantified, difficult to quantify)

Framework components

- Structured modeling needed
- Risk management for non-incremental policies
  - Policy-makers define a level of "acceptable" risk, with respect to some metric
  - Learn from today's actions, revise course in the future.
  - Risk management can accommodate economic, non-economic (e.g., biophysical), and non-scientific (e.g., equity, political) inputs.
- Marginal values for incremental analyses
  - Shadow price on acceptable risk or SCC (and SC of non-CO_2 gases)
- Combine multiple models and scales
  - Large models calibrate to detailed models and then provide changes in scale effects
  - Coordination! Common assumptions, connect to literature (SRES to RCPs and beyond). Natl assessment, international coordination.
- Strategic analysis

How Do We Decide Now?

What is the best way to answer the key question now?

- If damage estimates are not sufficient, what alternative metrics will decision makers understand easily and accept in comparison to the cost of policy?
- Is the risk management framework ready to roll?
  - What are the implications of uncertainty about impacts for the timing and stringency of action?
  - Do we have actionable risk profiles that can inform global mitigation goals?
  - Can risks be quantified in metrics that can be related to the cost of policy?

How Do We Decide Now?

How do we use risk thresholds to inform decisions?

- Perfect for local decision making (adaptation)!
- Equally useful for global decision making (mitigation)?
  - How does well-characterized risk to a given city inform global mitigation goals? Globally coordinated risk profiling effort?
  - Perhaps for large-scale, high-consequence thresholds with internationally shared risk
  - But uncertainty tends to be large for globally significant discontinuities, like GIS, WAIS, THC, etc.

Next Steps for Pew Benefits Work

Incremental decision-making (enhanced policy optimization incorporating more impacts and uncertainty)

- Compare/contrast assumptions embedded in newest generation of simplified IAMs
- Clarify for policymakers the debate surrounding discounting for climate policy analysis
  - Subjectivity of competing philosophies
  - Validation / falsification of competing analytical models
  - Analytical approaches to valuing risk in discounting formulae

Next Steps for Pew Benefits Work

- Evaluate potential to improve IAM damage functions and encourage and/or facilitate improvements

Incomplete impacts inventory		**Uncertainty in Valuation of Impacts →**		
		Market	**Non-Market**	**Socially Contingent**
Uncertainty in Predicting Climate Change ↓	**Projection** (e.g., mean sea level Rise; mean temperature change)	**I** • Coastal protection • Loss of dryland • Energy for heating and cooling	**IV** • Heat stress • Wetland loss	**VII** • Regional costs • Investment
	Bounded Risks (e.g. droughts, floods, storms)	**II** • Agriculture • Water Variability	**V** • Ecosystem change • Biodiversity • Loss of life • Secondary social effects	**VIII** • Comparative advantage • Market structures
	System change & surprises (e.g. major events)	**III** • Above, plus • Significant loss of land and resources • Non-marginal effects	**VI** • Higher order • Social effects • Regional collapse	**IX** • Regional collapse

Yohe & Tirpak, *IA Journal*, 2008

Next Steps for Pew Benefits Work

Non-incremental decision-making (New/complementary risk-based framework that emphasizes multiple metrics)

- **Precaution:** Set political targets based on scientific risk assessment; evaluate policies for cost effectiveness (e.g., Sheeran et al.).
- **Risk profiling:** Develop multiple risk metrics/ profiles tailored to decision makers (e.g., Rose; Yohe).
- **Valuing risk within discounted utility framework:**
  - Willingness to pay (e.g., Newbold & Daigneault)
  - Certainty equivalence
  - Insurance premium