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A Quiz and a Challenge to Energy-Environment Modelers

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Q: Why do we care about energy sources?

- A: Externalities
  - Energy security
  - Environmental Impacts
    - Air, water, land, climate, ecosystem, etc.

Q: What do we want to know about the externalities?

- A: Extent and Incidence of Damage
- A: Routes to Internalize the Externalities
  - Benefits and Costs of Different Options
  - Information to Recommend Best or Logical Policy Actions

Q: What is our mental model?

- A: Source-Receptor relationships
- A: Damage functions
  - Economic
  - Dose-response
  - Environmental loading
  - Etc.

Q: How much do we *really* know, even within reasonable (actionable) confidence intervals, to describe source-receptor relationships?

- A: Not so much
  - Uncertainty about the mix of technologies and future energy demands
  - Uncertainty about emissions (varies by technology and pollutant)
  - Great uncertainty about geography of future emissions
  - Deep uncertainty about dispersion of plumes
    - Irrelevant for "well mixed" gases
  - Uncertainty about population geography and demographics

Q: How much do we *really* know, even within reasonable (actionable) confidence intervals, to describe dose-response relationships?

- A: Some, but not a lot
  - Uncertainty and ethical/moral debates over VSL/ QALY, etc.
  - Uncertainty about CV, revealed preference, hedonics, etc.
  - Some greater certainty about biological dose-response
    - varies by pollutant
    - robustness of translation from animal-to-human studies or from epidemiological to environmental health studies
  - Variation and uncertainty in ecosystem response
    - Great heterogeneity defies gross generalizations

Q: What is the resolution of the energy forecasting models?

- A: Gross
  - National models or regional models with plants at centroids
  - Some exceptions, but
    - forecasting emissions from lat-long of individual plants out to 2030 or even 2050 is extremely uncertain
    - Overlaying uncertain aerodynamics and plume dispersion results in deep uncertainty

Q: What is the resolution needed for good environmental or environmental health assessments?

- A: Fine
  - Must describe the existing demographic mix and/or ecosystem biota, including stressor and biodiversity, buffering capacity, etc. of *a specific receptor*

Grading Method

- You pass if you recognize that:
  - There is a gap between what we want/need to be able to describe and what we can actually say with great confidence
  - Simply linking source models to receptor models is not accurate, because it masks deep uncertainty

Grading on a Curve

- You get an "A+," if :
  - You have a good alternative method

The Challenge:

- How do we get past this problem?
  - Better data; only partially helpful
  - Better communication of big picture?
  - Shifting terms of debate away from BCA?
  - Stopping to make models stretch to give answers?
  - Doing uncertainty analysis?