GOVERNANCE AND POLICY DESIGN IN THE PRESENCE OF UNCERTAINTY

Managing the Global Commons
April 7-8, 2022

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Challenges for Large-Scale Policy Design: Model Uncertainties

Why don't sustainability policies achieve their goals?

- Shortcomings of scenario planning
- Macro-level analysis vs micro-level implementation
  - Simplicity vs specificity
- Choice of system boundary
- Policy collision

Traditional Scenario Planning Remains Quite Popular

A small number of scenarios is useful for large-scale policy

- Provides a set of narratives for easy communication to the public and non-technical stakeholders
- Prevents duplication of effort
- Greater consistency between models studying different things
- Common set of assumptions enables comparison of competing model outputs
- Less threatening to those with different world views if scenarios are presented as narrative possibilities, not as firm predictions

Traditional Scenario Planning Remains Quite Popular

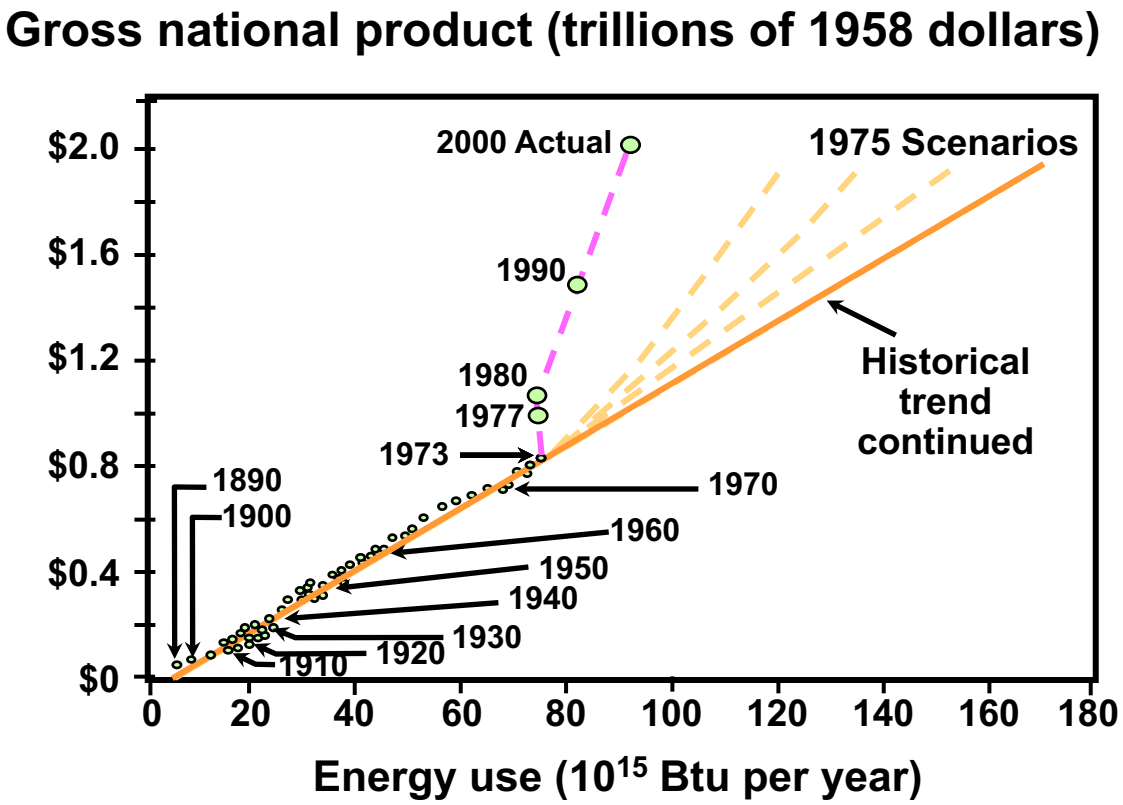
However, this is not always great for addressing deep uncertainties

- Choice of scenarios can be arbitrary, or subject to being biased by the interests of those designing them
- The meaning, interpretation, or narrative behind a scenario can be contentious
- Surprising or very rare events ("black swans") are often excluded or dismissed as quixotic
- A handful of scenarios is often unable to summarize the full breadth of uncertainty about the future
- Tendency to anchor on a "middle" scenario

Believing Forecasts of the Unpredictable Can Lead to Poor Decisions

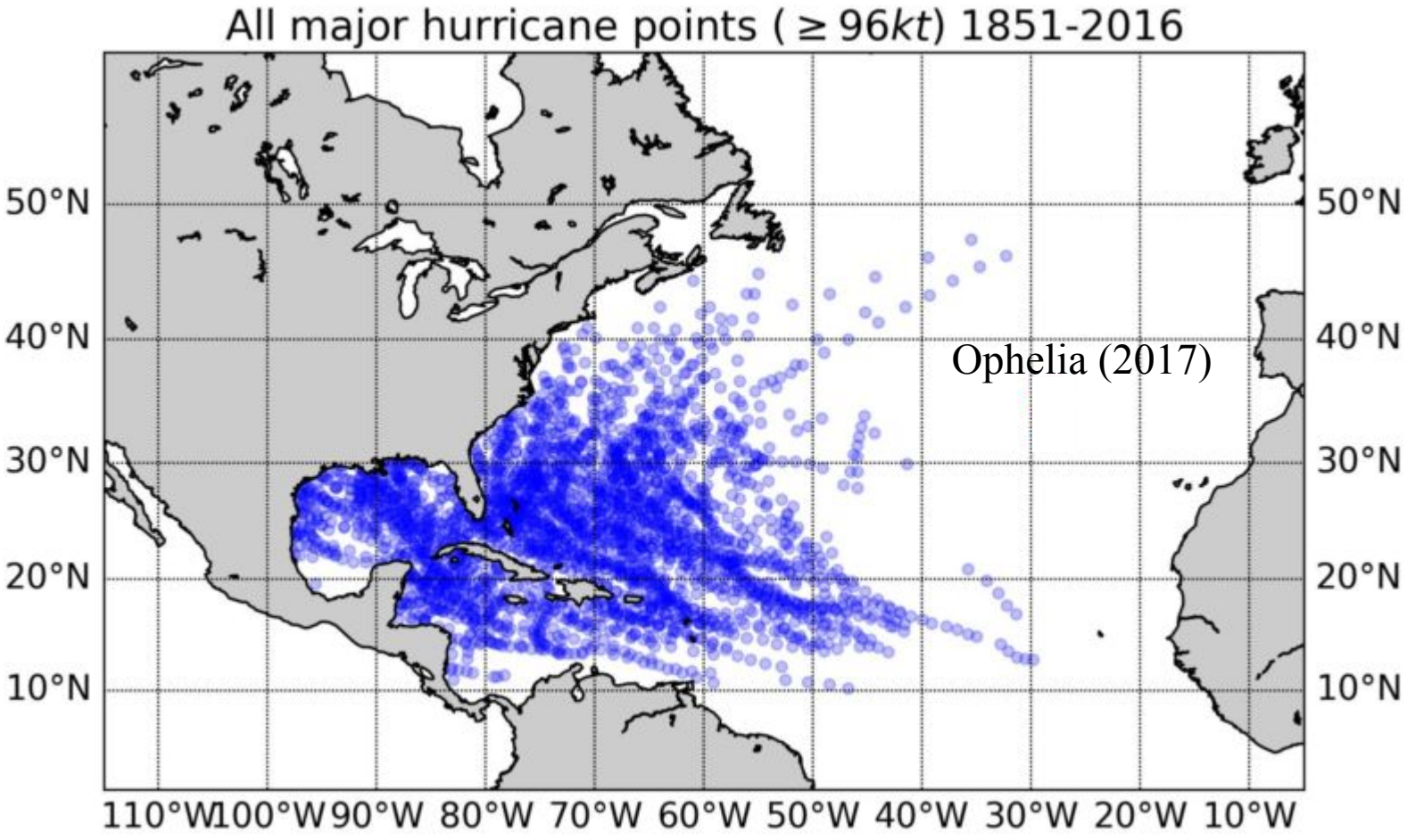
- In the early 1970s, forecasters made projections of U.S. energy use, based on a century of data

… they all were wrong



Historical Trends Do Not Guarantee Future Results

Formation points for north Atlantic cyclones



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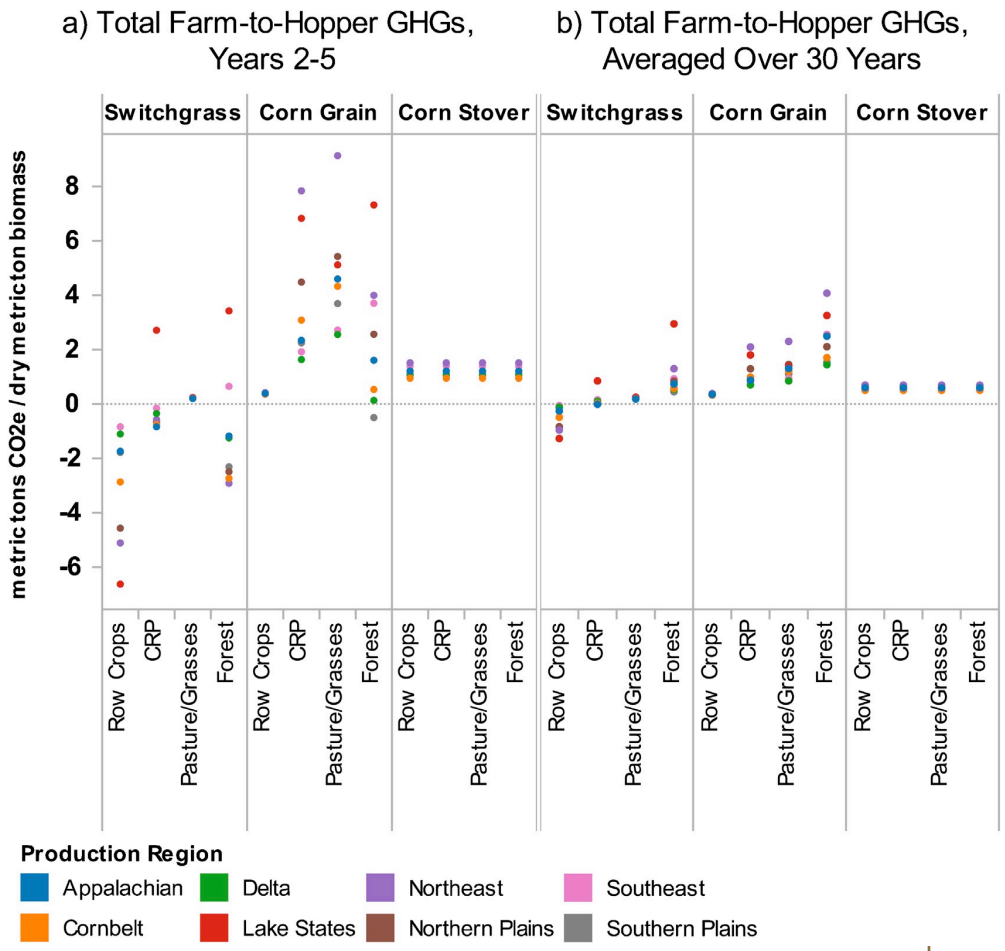
Example 1: US Renewable Fuel Standards

RFS2 mandates 20.8B gallons of production in 2022

- Over half expected to come from corn starch-based ethanol and other conventional biofuels
- Policy intended to reduce GHG intensity of energy sector
- Does not explicitly incentivize or reward emissions reductions

Example 1: US Renewable Fuel Standards

National policy does not account for local variability



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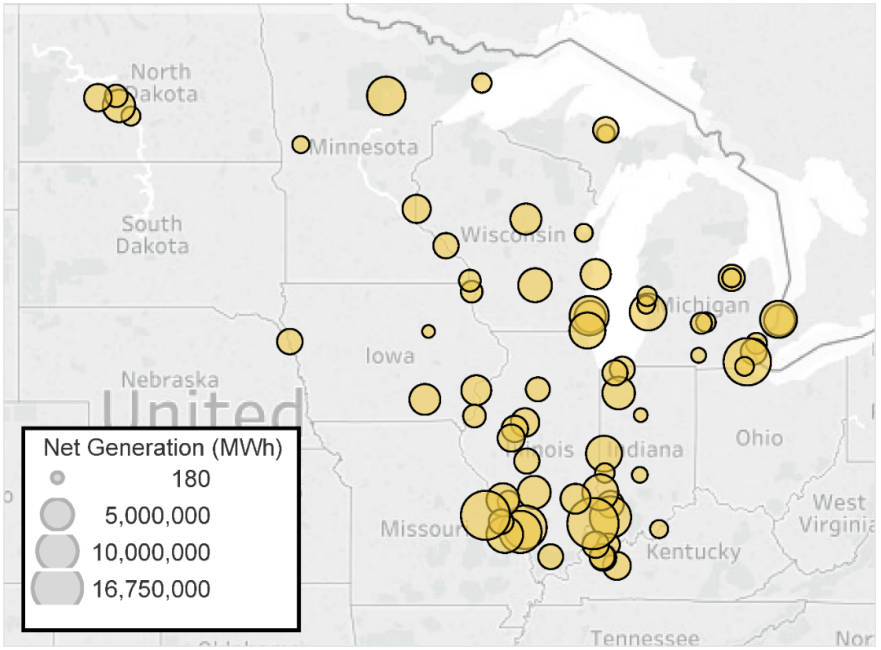
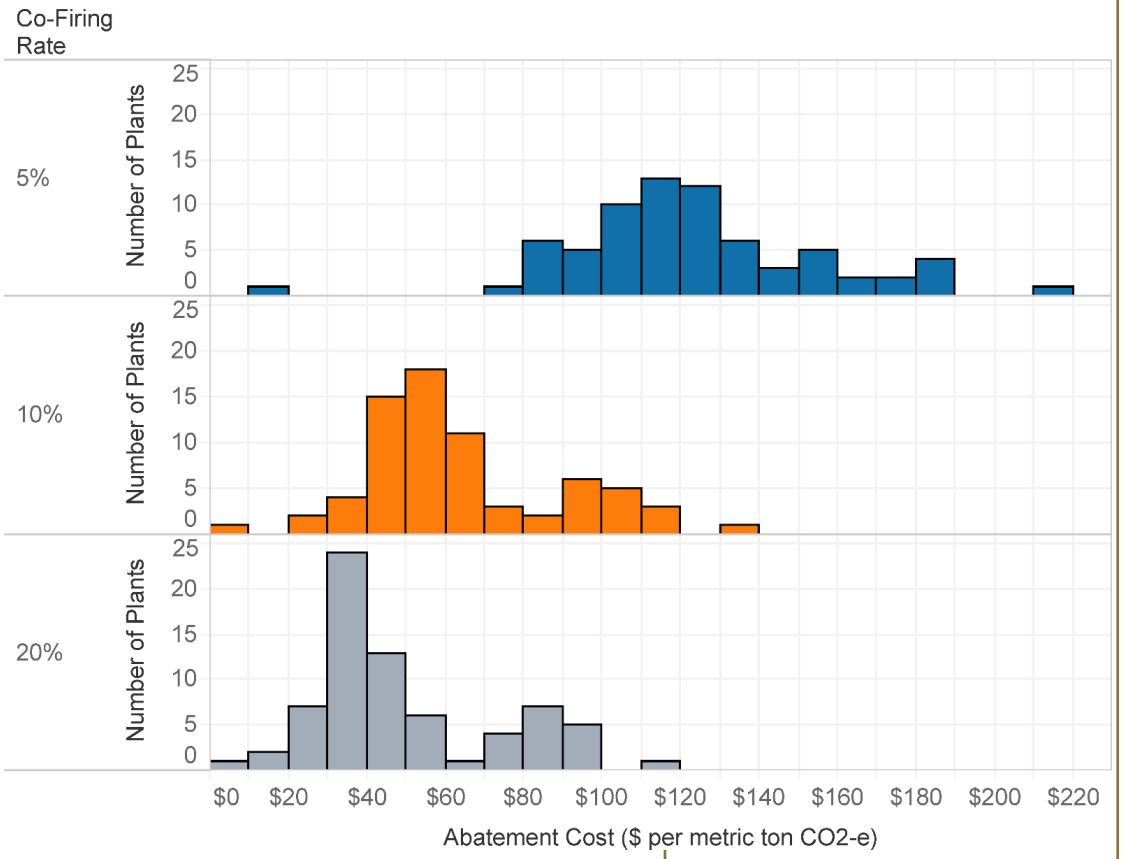
Source: Johnson, *et al*. 2013. "Identifying Key Drivers of GHG Emissions from Biomass Feedstocks for Energy Production." *ES&P* **33**, 109-119.

Example 2: Co-Firing Corn Stover with Coal

Cost of emissions abatements from co-firing are highly variable

- Analysis of 71 utility-scale power plants in MISO region





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Source: Johnson, *et al*. 2021. *IJEST*. https://doi.org/10.1007/s13762-021-03493-x

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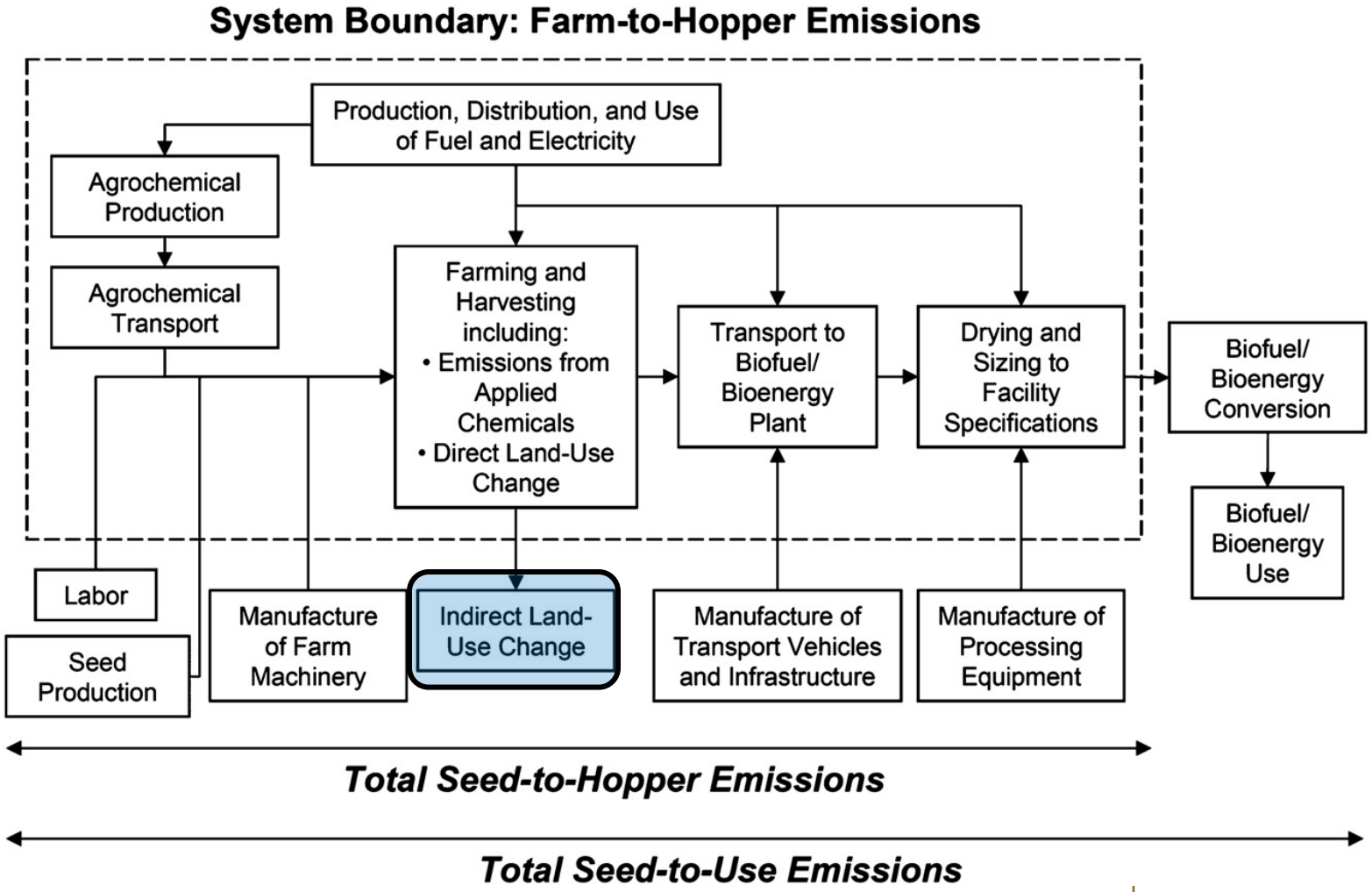
Many Policies Only Consider the Local and Intended Objectives

Practical system boundaries ignore spillover effects



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Policies That Target Different Objectives Or Locations May Collide

Stakeholders with different goals are frequently at odds

- Questions of scale:
  - Greenhouse gas emissions, food security, water quality and scarcity, biodiversity, etc.
- Coordination is needed to keep policies from falling short

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