

In Memoriam



Stephen Schneider

SCENARIO DEVELOPMENT AND IAV/ IAM INTERACTIONS: Summary of National Academy of Sciences Meeting

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Institute

ENERGY MODELING FORUM
Workshop on Climate Change Impacts and Integrated
Assessment (CCI/IA)
Snowmass, Colorado
July 27, 2010
PNNL-SA-74234

Describing Socio-Economic and Environmental Futures for Climate Change Research and Assessment

February 4-5, 2010

Washington, DC



Organized by...

- National Research Council: (Committees on Human Dimensions and Climate Research)
- Organizing Committee: Kristie Ebi, Kathy Hibbard, Anthony Janetos, Mikiko Kainuma, Ritu Mathur, Richard Moss, Nebojsa Nakicenovic, Thomas Wilbanks
- Additional Organizers: Ottmar Edenhoffer, Chris Field, Tom Kram, Patrick Matschoss, Linda Mearns, Paul Stern, Detlef VanVuuren, Timm Zwickel
- Sponsors: DOE, NSF, NOAA, and NIES (Japan)

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- Frans Berkhout
- Thomas Buettner
- Kristie Ebi
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- Michael Replogle
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- Leigh Welling
- John Weyant
- Tom Wilbanks
- Gary Yohe
- Timm Zwickel

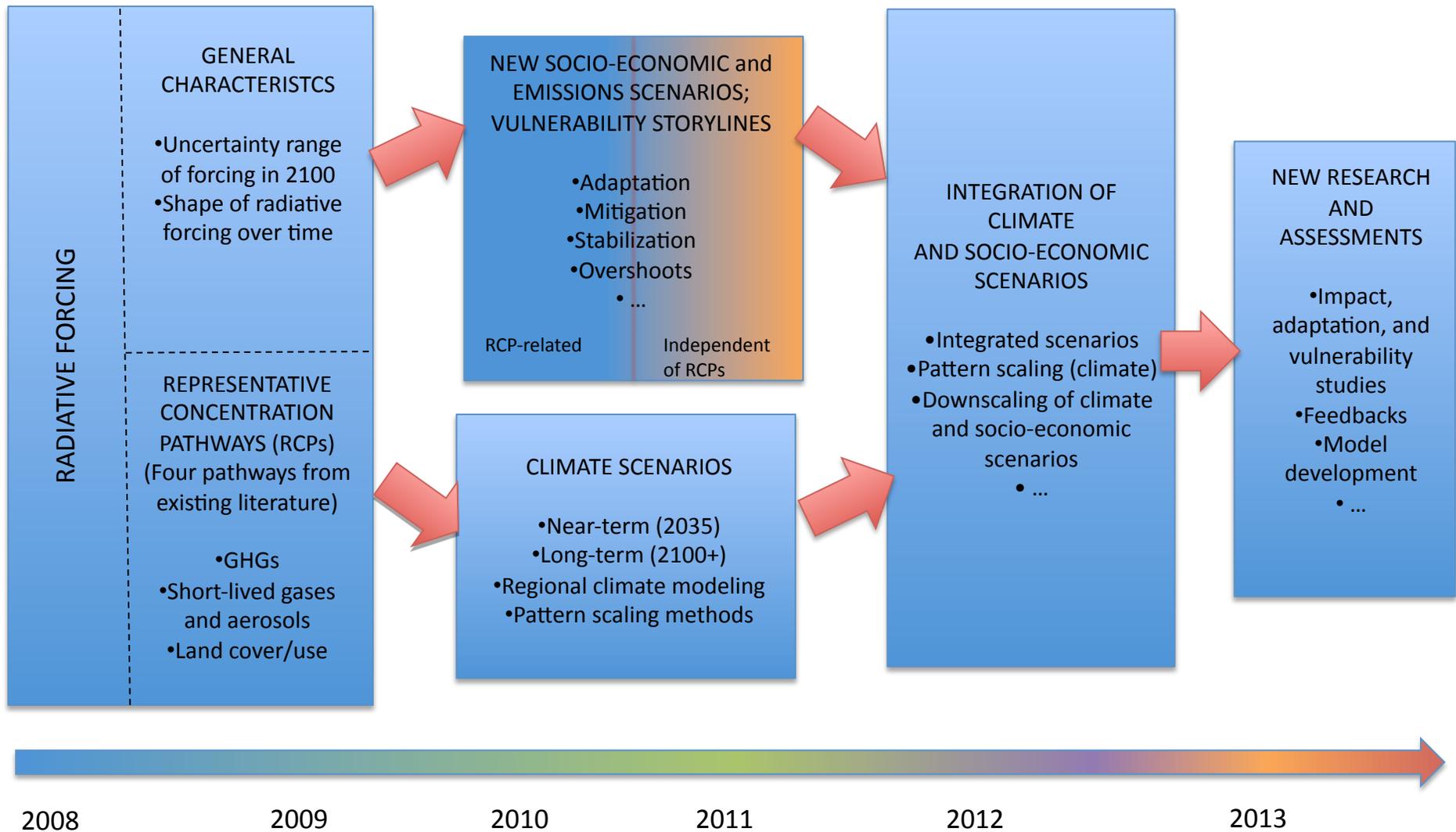
Objectives

1. Assess the state of scenario science
(incorporating insights from core social science?)
Approaches for stakeholder engagement?
2. Support the IPCC and other assessments by
advancing the framework for creating new
socio-economic scenarios
3. Brainstorm about what factors to address in
scenarios to assess vulnerability, adaptation, and
mitigation potential
4. Promote dialogue across research communities

Agenda

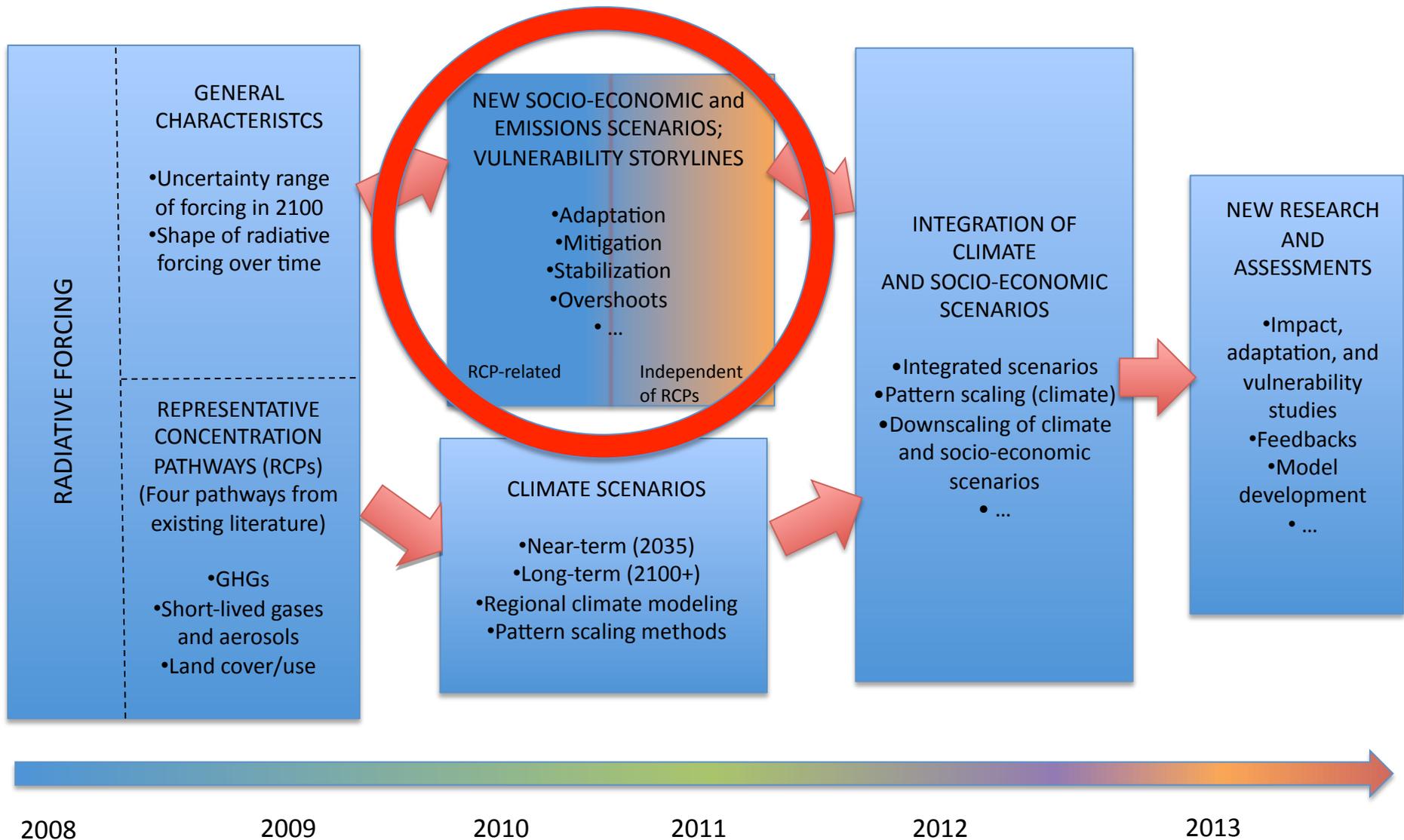
- New Scenarios for Climate Change Research and Assessment
- Evolving Methods and Approaches
- Driving Forces and Critical Uncertainties
- Representative Concentration Pathways (RCPs) and Socio-economic Scenarios and Narratives
- Prior Experience (e.g., SRES, MEA, UKCIP, USNA, private sector, Asia Low Carbon Society Project)
- Breakout Groups: Mitigation and adaptation to 2050 and 2100; Possible products to support the AR5; and ideas for VIA and IAM joint research

Context: “Parallel Process”



Source: Moss et al. 2010

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RCP-Related Scenarios and Narratives

- IAMC, EMF, RECIPE, ADAM, RoSE, Asia Modeling Exercise, EU framework projects are encouraging work in this area
- Need narratives and scenarios to explore a wide range of futures (especially related to VIA)
- Many questions:
 - What does it mean to be “consistent with” or “related to” an RCP?
 - What factors to include?
 - Relationship of global and regional/local conditions for VIA?
 - How detailed?
 - Time scales?
 - “Top-down” and “bottom-up” scaling?
 - For IPCC, how to identify a workable number of socio-economic narratives and scenarios?
 - ...

New Scenarios Independent of the RCPs

- Alternative stabilization levels, including higher overshoot pathways
- Alternative demographic, socioeconomic, land use, and technology scenarios
- Regionally based scenarios exploring issues for low and middle income countries
- ...

RCP-Based Climate Scenarios

- Long term scenarios to 2100+
 - For all RCPs
 - 1° to 2° resolution
- Near-term scenarios to 2035
 - “Decadal prediction” (research issue)
 - Higher resolution (0.5° to 1°)
 - Additional information on extremes
 - RCP4.5
- Pattern scaling using simple models forced with different scenarios (research issue)

Key Themes and Suggestions*

- An array of different scenario methods are used for many different purposes
- Literature on effectiveness emphasizes the importance of process (not just products) and of close coupling with decision makers
- RCPs and related data provide context (bounding analysis) for global (or large regional-scale) developments but should not over-specify finer-scale scenarios for specific decision makers
- In addition to developing schematic global narratives and scenarios, guidelines and resources for developing IAV and mitigation scenarios in context of RCPs are needed

*Personal interpretation, not committee “consensus”

Driving Forces

- General observation: Not a strong record of success predicting basic parameters; consider model switching, bounding analysis, working the problem backwards
- Need to explore complementarity or conflict between VIA futures and mitigation future

Drivers/Uncertainties for Vulnerability, Impacts, and Adaptation

- VIA is site-specific and path-dependent
- Drivers of adaptation capacity difficult to specify but include:
 - availability of adaptation options;
 - availability and distribution of resources;
 - human and social capital;
 - governance responsibility and authority;
 - ability to separate signal from noise; and
 - access to risk-spreading mechanisms
- For scenarios, need to explore global/international influences on local adaptive capacity (e.g., commodity prices, aid availability, migration patterns)

Demographic Drivers/Uncertainties

- Information on current population is uncertain: half the world's people have no vital records and decennial censuses are rare
- Future trends?
 - Half the world's population has reached the end of the demographic transition, and demographers do not have a theory for what happens after that
 - The demographic transition is stalling in some low-income countries—the low-fertility, low-mortality equilibrium predicted by transition theory is elusive
 - Population aging
 - In projections, wide ranges of population can be associated with a wide range of emissions, with possible exception that high population may not be consistent with low emissions
 - Expected population growth in the next 40 years will be largely urban and located in low-income countries; projections relative to vulnerable areas are particularly challenging

Technology Drivers/Uncertainties

- Technology is a driver of change that reflects transformations in culture, governance, etc. (Raskin)
- Greatest impacts of technology change on future emissions will depend on changes in places with high population and low current levels of development
- Changes in systems (in which the convergence of technologies is a major unknown) are more important than changes in individual technologies
- Two big gaps in knowledge and analysis:
 - technological change for adaptation
 - the relationships between change in mitigation technology and adaptation technology

Other Drivers/Uncertainties (I)

- Economics: Growth rates? Investment patterns? Labor productivity? Sectoral composition of economy (and especially energy)? Economic takeoff?
- Transportation, including regional planning: Modal change with rising income? Urban development patterns?
- Policy and institutions: Relative roles of governments and of businesses and other actors? Roles of knowledge, transparency, and accountability? Interdependence, including learning across places? Cultural norms on the value of nature and attitudes to risk?

Other Drivers/Uncertainties (II)

- 1st and 2nd best policies: Market failures? Prohibitions on types of technology? Fragmented participation?
- Ecosystems and water resources: Urbanization? Trade? Population growth and migration? Land use? Resource use? Conflict? ...
- Food, nutrition, and bioenergy: Population? Income effects on demand? Change in technologies to meet demand?
- Health : Change in access to simple medical care, education, and clean water? Responses of institutions, including public health organizations, WHO, and private nongovernment organizations?

Ideas from the BOGs for Socioeconomic Scenarios

- Nonclimate events will be more important than climate events in the short term; for climate in the short term, focus on extremes
- For longer timescales, examine factors with large inertia such as education levels, income distributions, and urbanization
- There are too many drivers to include—focus on a few key drivers: governance and institutions, access to public-sector services, ecosystem services, urbanization, and globalization and trade
- Pursuing both adaptation and mitigation will create constraints—water and land use need to be examined
- Use non-governmental character of process to explore “worst-case” alternative baselines and policy narratives
- Identifying desired end points and developing scenarios by working backward from those states holds promise

Framework for Nested Scenarios

- The RCPs are consistent with a very broad range of socioeconomic futures
- There is a need for a few “light touch” narratives and scenarios as a bounding framework onto which more focused narratives can be added for particular sectors, regions, or decisions
 - Bound key uncertainties at scale of globe and large regions
 - Should not attempt to determine regional/local conditions/trends with global data sets or models
 - Consider what processes are tightly and loosely coupled across scales
- Technical guidelines and methods for developing local scenarios for testing out specific decisions nested within the RCPs and RSPs would also be useful
 - E.g., are there combinations of socioeconomic factors unlikely to occur under specific RCPs?
 - Encourage application of diverse methods and approaches
- It was questioned whether the community is organized to do all of what is needed on timescales needed by the AR5