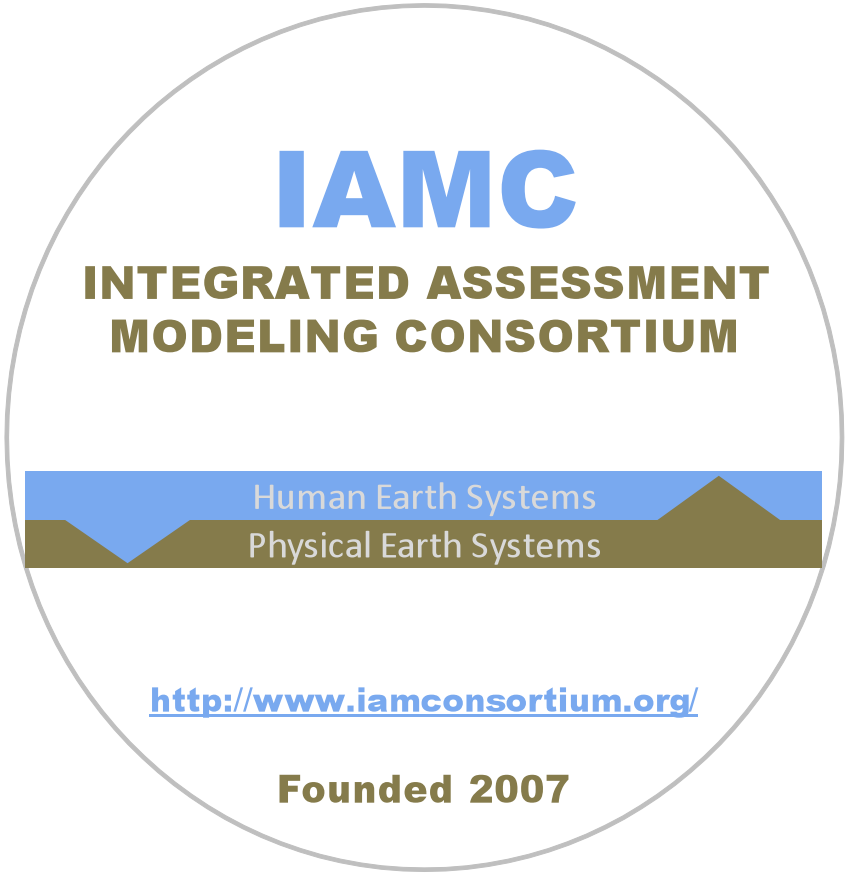
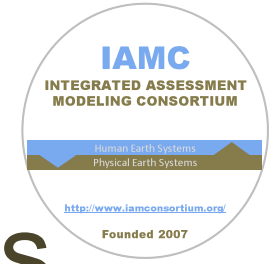
IAMC Scientific Working Group on Community Research Priorities



October 28, 2010

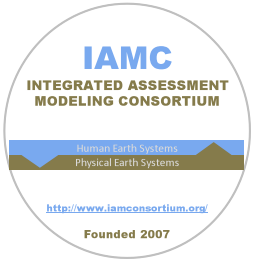
The SWG on Community Research Priorities



- Chartered at the 2009 IAMC Scientific Steering Group meeting in Tsukuba, Japan.
- Chair: Jae Edmonds
- Members:

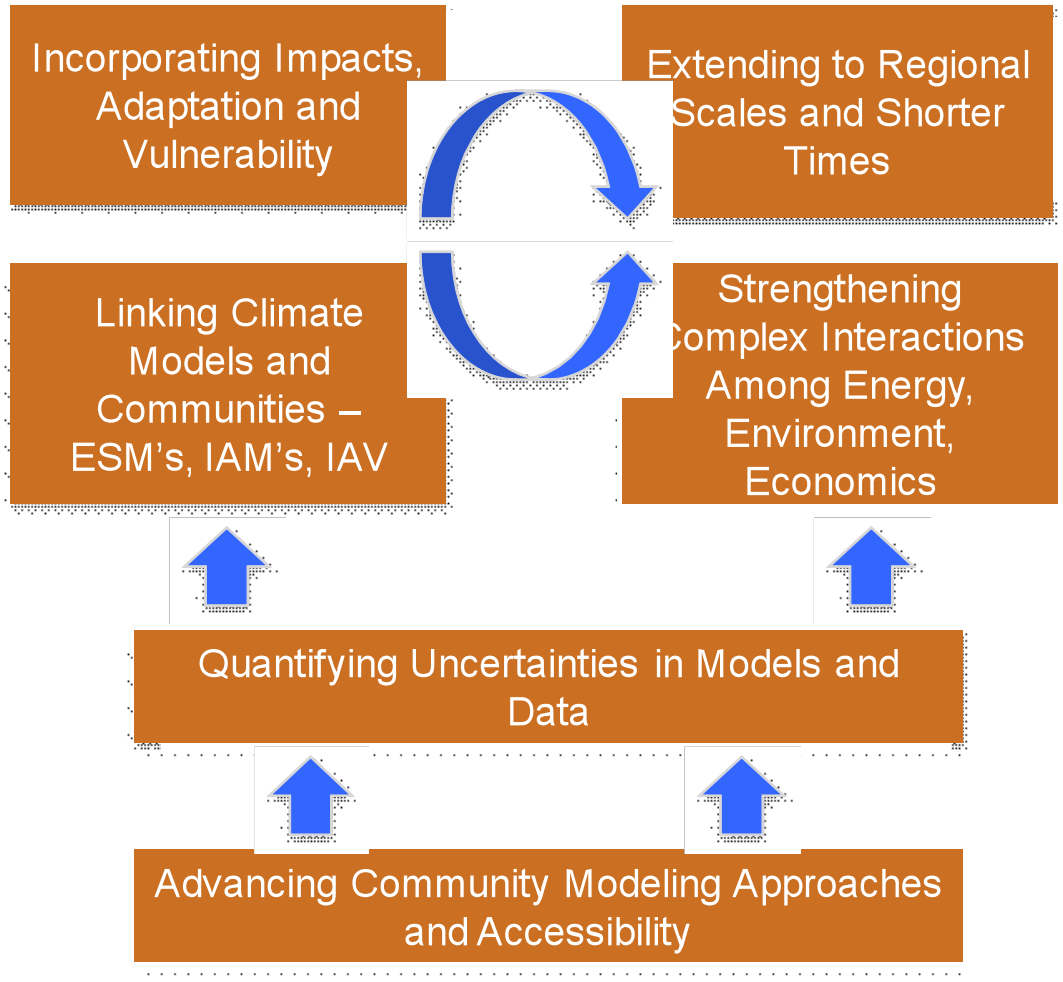
Kate Calvin	**Elmar Kriegler**
Leon Clarke	**Brian O'Neill**
Mikiko Kainuma	**Keywan Riahi**
Tom Kram	**Detlef van Vuuren**
Volker Krey	**John Weyant**

Motivation

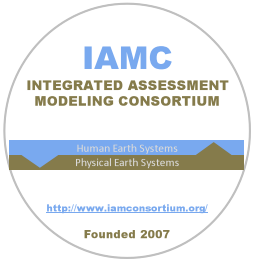


- To develop a common statement of important research directions for the community.
- The climate modeling research community has been highly successful at this task, e.g. The International Council for Science Unions (ICSU).
- The integrated assessment modeling community is just beginning to think about developing a coherent research program.

U.S. DOE IARP Research Priorities



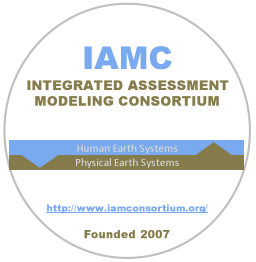
Activities for the Scientific Working Group on Research Priorities



- Catalogue of current and recent IAMC activities, including
  - Completed: EMF 22, RECIPE, ADAM,
  - Ongoing: RoSE, AME, EMF 24, CPO, AMPERE, PIAMDDI
- Identify IAMC research and capacity-building priorities
  - Take into account interests of external communities, such as the IPCC, the VIA community, governments decision makers and so forth
- Map research priorities to existing IAMC activities.
- Identify gaps in the community agenda.

- **Vet this with the larger IAMC community.**
  - **Discussions at the annual meeting.**
  - **Make the draft report available for comment by all IAMC members.**

Timeline for Scientific Working Group on Research Priorities

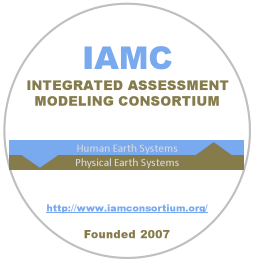


- Preparation for next IAMC meeting
  - Prepare a short paper to spur discussion
  - Prepare slides for discussion
- **Meet in DC and discuss**
- Revise the material
  - Produce material for the IAMC website
  - Write a paper for publication

Catalogue of Current IAMC Activities

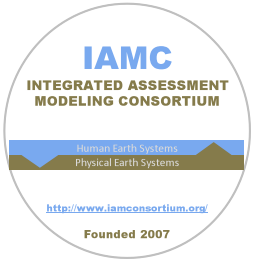
- We need short descriptions of each project, including, in slides and a one-page writeup.
  - Name of the project/program
  - Participating IAM groups
  - Period of performance
  - Goal of the program
  - Research questions
  - Approach
  - Products and deliverables

There are Two Sorts of IAMC Community Priorities



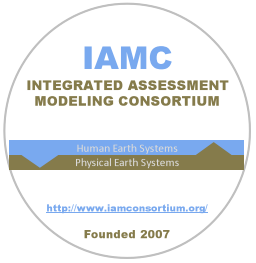
- *IAMC Community Research Priorities are priorities for community research activities and not recommendations of research directions for individual modeling teams.*
  - Individual teams will inevitably pursue their own research agendas focusing on answering specific scientific questions.
- Community Research Priorities
- Capacity-Building Priorities

The Format



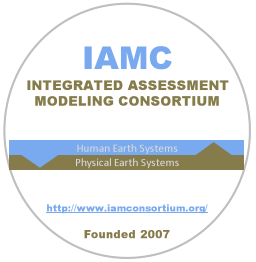
- Background—*What is this issue about?*
- Scientific Question—*What do we want to know?*
- Why This Is A Community Research Priority—*Why is this something that the community needs to address as opposed to individual modeling teams?*
- Developing A Community Activity—*How could the community organize to answer the scientific question?*

IAMC Research Priorities



- Technology and mitigation scenarios (Clarke/Riahi)
- Policy scenarios (imperfect and perfect) (Kriegler)
- Second-best worlds (Kriegler)
- Regional scenarios (Calvin)
- Development, Demographics, and Urbanization (O'Neill)
- Integration between energy, economy, land use and water (van Vuuren/Edmonds)
- Interactions between climate mitigation, climate adaptation, residual impacts (van Vuuren/Edmonds)
- RCPs, Post-RCP replication and storylines (Kram, Van Vuuren, and Edmonds)
- Uncertainty (Kriegler/Bosetti)

IAMC Capacity-Building Priorities

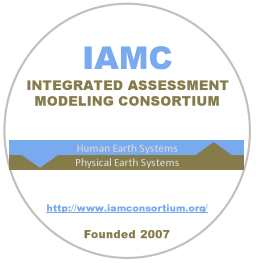


- Diagnostic scenarios (Weyant/Kriegler)
- Model Validation and Data Development (Edmonds)
- Standardized Data Template and Community Data Base (Krey/ Calvin)

Priorities in a Bit More Detail

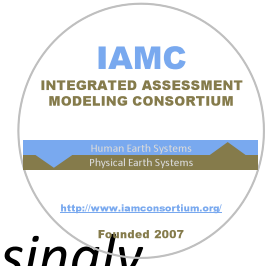
I want to go through the previous list in a bit more detail and to invite discussion as we go.

Technology and Mitigation Scenarios



- **Background**: *Technology and policy are the two largest determinants of feasibility and cost.*
- **Scientific Question**: *Are there any essential technologies, e.g. nuclear or CCS? Are present technologies sufficient?*
- **Why This Is A Community Research Priority?** *While any individual modeling team can explore these questions, results from a community activity help determine the generality of findings.*
- **Developing A Community Activity**: *We have begun this investigation in EMF 24 and AME and other community activities e.g. RoSE. Potential to do more.*

Policy scenarios

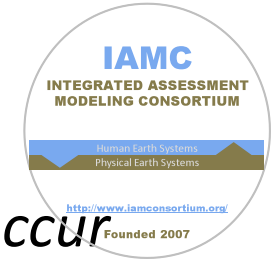


- **Background**: *Analyzing "realistic" policy scenarios is increasingly called for. Investigation of long-term climate policy require policy specifications across all regions out to 2050-2100.*
- **Scientific Question**: *How can generic, but still regionally differentiated scenarios be identified? How can different types of policy scenarios be characterized (including a discussion of policies included in the baseline)?.*
- **Why This Is A Community Research Priority?** *Individual modeling teams and projects are all confronted with the request for more policy realism. Exchanging experience and establishing a set of useful policy scenarios improve results and help determine generality of findings.*
- **Developing A Community Activity**: *We have begun this investigation in EMF 22, 24 and other community activities such as RoSE. Potential to do more.*

Second-best Worlds

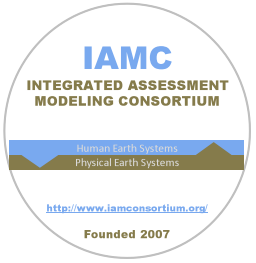
- **Background**: *Second best worlds include imperfect markets. GHG pricing in isolation is sub-optimal. Can have a large impact on feasibility and mitigation costs*
- **Scientific Question**: *What type of market failures are key factors and how can they be tackled in IAMs. What are the implications for costs and feasibility of mitigation policies?*
- **Why This Is A Community Research Priority?** *Richer description of real world situation. Large implications on mitigation strategy and costs need to be considered. IPCC WGIII calls for deeper investigation of 2nd best worlds.*
- **Developing A Community Activity**: *Exchange experience on existing 2nd best analyses. Build common understanding which and how 2nd best situations can be studied. We have begun this investigation in EMF 22, 24 and other community activities such as RoSE. Potential to do more.*

Regional Scenarios



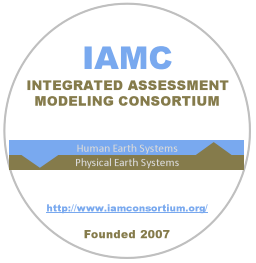
- **Background**: *Emissions mitigation and climate change occur at regional scales. We use the term region in two different contexts—elements of IAMs and geographic areas at finer spatial scales than in IAMs.*
- **Scientific Question**: *What is the role of individual regions in shaping emissions and emissions mitigation? How does climate mitigation and adaptation take place at local scales consistent with larger global forces?*
- **Why This Is A Community Research Priority?** *Community activities that link regional experts with global modelers can improve both regional and global modeling results.*
- **Developing A Community Activity**: *This has begun with the Asia Modeling Exercise (AME). There is potential to expand on this model. Individual IAM teams are working to develop high-resolution disaggregations—regional integrated models.*

Development, Demographics, and Urbanization



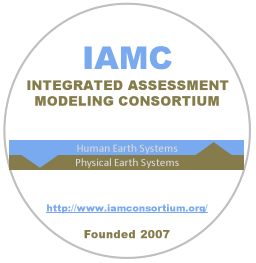
- **Background**: *Most analysis use limited demographic information.*
- **Scientific Question**: *What difference does varying demographic assumptions make? How are demographics, urbanization and economic development related?*
- **Why This Is A Community Research Priority?** *Community activities could improve the quality of analysis in the community.*
- **Developing A Community Activity**: *Model intercomparison on alternative demographic tracks, urbanization and development (e.g. AME), development of community demographic tools.*

Integration Between Energy, Economy, Land Use and Water



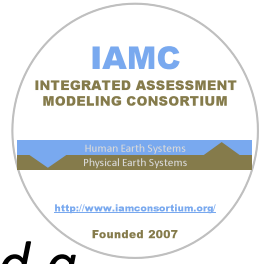
- **Background**: *IAMs do not presently include water, yet water could be an important constraint on energy systems.*
- **Scientific Question**: *Do emissions mitigation results change when water is explicitly included. This could be particularly important for bioenergy, and power plants which need cooling.*
- **Why This Is A Community Research Priority?** *The community would benefit from coordinated activities to assemble models and data.*
- **Developing A Community Activity**: *Individual teams have begun to develop research efforts. No present activities have been developed yet.*

Interactions Between Climate Mitigation, Climate Adaptation, Residual Impacts



- **Background**: *Emissions, climate change and impacts-adaptation occur concurrently.*
- **Scientific Question**: *How are climate mitigation and adaptation affected by the presence of the other?*
- **Why This Is A Community Research Priority?** *Large investments will need to be made to link state of the art human systems models with state of the art climate models, but coordination would benefit all.*
- **Developing A Community Activity**: *Several modeling teams have begun working on this problem. Coordination would be beneficial.*

RCPs, Post-RCP replication and storylines



- **Background**: *The Noordwijkerhout plan calls for RCPs and a jump start to the next assessment cycle, but needs to be followed by replications and efforts to develop scenarios that would be useful to the IAV community.*
- **Scientific Question**: *Can these RCPs be replicated by other teams? Can we better organize linkages between the IAM and VIA community? How can the information resulting from the climate modeling experiments be used to enrich the representation of the climate system and carbon cycle in IAMs?*
- **Why This Is A Community Research Priority?** *RCPs are a core mission of the IAMC.*
- **Developing A Community Activity**: *RCPs are complete. Replication and new scenarios for IAV use under development.*

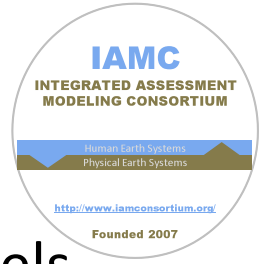
Uncertainty

- **Background**: *"Prediction is difficult, particularly about the future"—attributed to various sources. Most work is deterministic.*
- **Scientific Question**: *How do results change when uncertainty is treated explicitly?*
- **Why This Is A Community Research Priority?** *Researchers have traditionally developed uncertainty as individual teams, but no coordinated project has been organized since early EMF work.*
- **Developing A Community Activity**: *This would require a lead organization.*

Diagnostic Scenarios

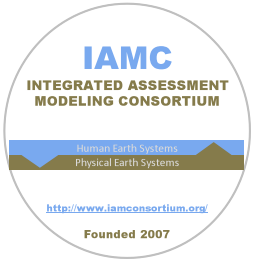
- **Background**: *IAMs are complex, but contain modules that perform common functions.*
- **Scientific Question**: *How well do individual model components perform?*
- **Why This Is A Community Research Priority?** *The IAM community could benefit from comparing component performance.*
- **Developing A Community Activity**: *This would require a lead organization.*

Model Validation and Data Development



- **Background**: Models use a variety of data sources. Models also have, in general not gone through any formal validation process.
- **Scientific Question**: *How well would IAMs do, if they were given the challenge of predicting the present starting 50 to 100 years in the past?*
- **Why This Is A Community Research Priority?** *IA models have been criticized for not back casting or validating. The community would benefit if it could put this issue to rest.*
- **Developing A Community Activity**: *Would require development of data bases for the models, consistent with the long-term nature of the models. Procedures and protocols would need to be developed. Diagnostic work. Who would sponsor?*

Standardized Data Template and Community Data Base



- **Background:** *Each modeling team has traditionally developed its own reporting conventions.*
- **Why This Is A Community Research Priority?** *Use of a common format for community activities would greatly improve model comparability.*
- **Developing A Community Activity:** *Work is currently underway through the IAMC SWG on Working Group on Data Protocols and Management.*

Where Are We Going From Here?

- "One-page" summaries
  - On each of the priorities.
  - On existing community activities.
- Summaries will be put up on the IAMC web site for information and comment.
- Summaries will be used to identify "gaps" in existing community activities.
- Summaries will be used as the basis for an IAMC research priorities document.