

Information: What do we mean?

UNFCCC expert meeting on socio-economic information under the Nairobi work programme on impacts, vulnerability and adaptation to climate change

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Theme

- Developing appropriate socio-economic information to support impact, adaptation and vulnerability analyses is a rapidly developing set of methods, tools and institutional capacities.
- While we have some methods and studies we can rely on, there remain many areas of research and institutional development as well as practical issues where additional work is needed.



Outline

- TGICA
 - What it is and what it does
- Data, Models and Scenarios
 - What we have now
 - What is presently underway
- Some issues with current data
- Examples
 - Columbia River Basin
 - El Salvador



TGICA Technical Group on data and scenario support for Impacts and Climate Analysis

- Mandate
- is to facilitate wide availability of climate change related data and scenarios to enable research and sharing of information across the three IPCC working groups. The TGICA disseminates information in support of IPCC work. . . This includes, for example, information on:
 - anthropogenic influences on climate
 - climatological baselines and observations
 - projected future climate
 - other environmental, technological, and socio-economic factors and data relevant to impacts, adaptation, vulnerability, and mitigation research
- The TGICA does **not** develop emission, climate, or other types of scenarios for the IPCC, make decisions regarding the choice of such scenarios for use in IPCC assessments, nor undertake modeling or research.

* IPCC Intergovernmental Panel on Climate Change



The DDC (Data Distribution Center) is the mechanism the TGICA uses to make data and guidance for using the data available

- A consortium of three institutional partners whose goal is to support the mandated task of making data widely available.
 - Max Planck Institute (MPI)
 - British Atmospheric Data Centre (BADC)
 - Center for International Earth System Information Network (CIESIN)
- <http://www.ipcc-data.org/>
 - Or Google 'IPCC DDC'

DDC Data elements

- Climate baseline and model runs
 - Approximately two terabytes of AR4 model results in the form of monthly means
- Socio-Economic data and Scenarios
 - The SRES scenarios
 - Through CIESIN spatial population and other data
 - But relying much more on available web-based resources for baseline data

Present data assets

- Historical weather and climate data
- Climate model output
 - PCMDI
 - MPI
- Scenario results
 - SRES population, GDP, energy use and emissions at a four global region level
 - Twelve to Twenty regional disaggregations available
- Socio-economic data
 - UN population division
 - ILO
 - World bank on-line data resource
 - CIESIN
 - G-Econ gridded GDP data

Other TGICA activities

- The Fiji Expert Meeting: Integrating Analysis of Regional Climate Change and Response Options
 - 40 presentations
 - Summary and Recommendations
- Upcoming meeting on the use of GIS meta-data as an integrating mechanism for disparate data sets.

What is underway and relevant

- Preparation for a possible fifth IPCC Assessment
- A set of IPCC workshops and now Energy Modeling Forum (EMF) and Integrated Assessment Modeling Consortium (IAMC) meetings
- Intent is to 1) shorten the time frame and 2) move the scenario creation process outside the IPCC

Why a new paradigm for scenario development and implementation?

- The current process takes too long
- It creates a conflict of interest by having the IPCC create material and then assess it
- It creates very insufficient interchange among the relevant communities

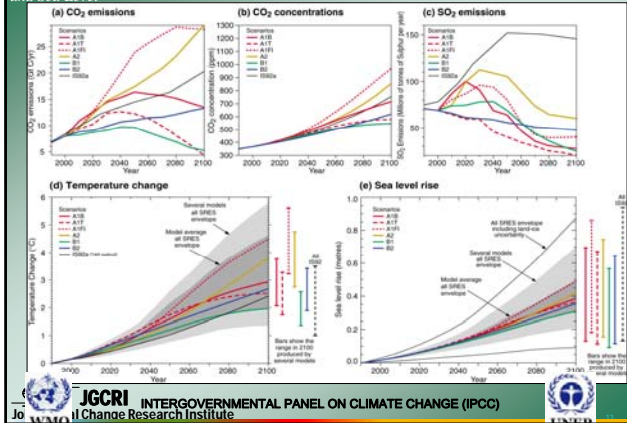
The SRES process

- A Shell scenario development process (sort of)
- Four Story lines
 - Six Marker Scenarios (A1B, A1T, A1FI, A2, B1, B2)
 - Four early scenarios so climate modelers could get started. (the curse of run time) (~A1T, A1FI)
- Requirement for income convergence
- No additional climate policy
- Missing ingredients
 - The users
 - The decision makers

Strengths

- Good coverage of the reasonable emissions space
- Multiple models
- Varying story lines
- Varying implementations of the story lines

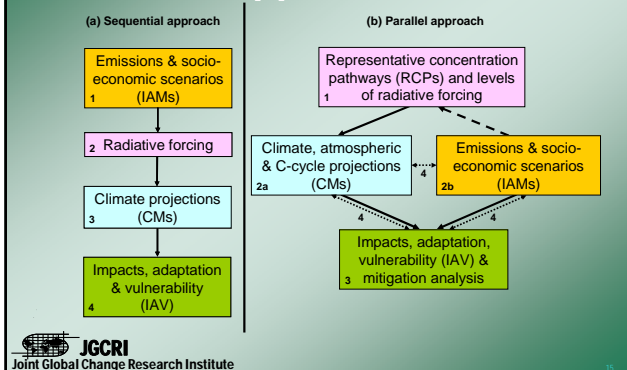
The Composition of the Atmosphere is Projected to Change Causing an Increase in Temperature and Sea Level



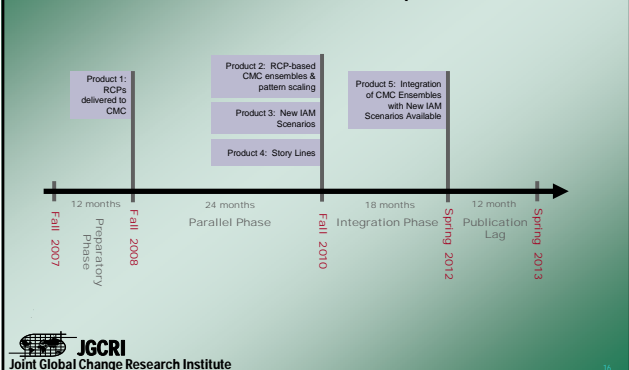
Challenges

- In the mandate
 - Convergence of per capita income
 - No additional policy
- In the implementation
 - Transitions / delayed development
 - Economic data for model inputs
 - Measurement of Output
 - Demographics
 - Downscaling
 - Land Use
- Yet to be Addressed . . .

The Sequential and Parallel Approaches



Time Line of Products for Scenario Development



Proposed RCP Pathways

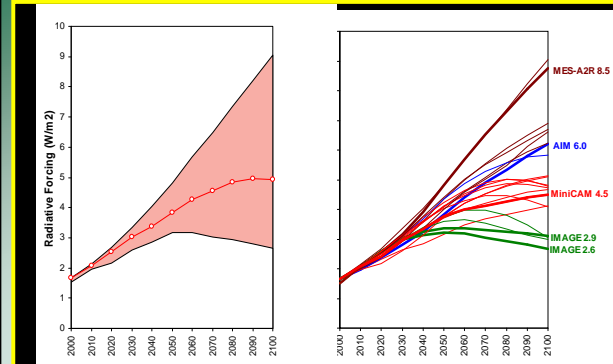
RCP	Publication – IAM
RCP8.5:	Riahi et al. (2007) – MESSAGE
RCP6:	Fujino et al. (2006) – AIM
RCP4.5:	Clarke et al. (2007) – MiniCAM
RCP3:	van Vuuren et al. (2006, 2007) – IMAGE



Joint Global Change Research Institute Source: Moss et al., 2007

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Range of 30 Scenarios and RCPs



Joint Global Change Research Institute Source: Moss et al., 2007

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Gaps in the plan

- How to select a new set of representative or marker scenarios
- How the IPCC can “catalyze” the development of new scenarios
- How to integrate all the different data streams much more effectively
- How to effectively represent the needs and interests of the Impacts, Adaptation and Vulnerability (IAV) communities**



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Some Technical Issues

- In the implementation
 - Transitions / delayed development
 - Economic data for model inputs
 - Measurement of Output
 - Demographics
 - Downscaling
 - Land Use
- Missing in Action
 - Water
 - Human Capital
 - ...



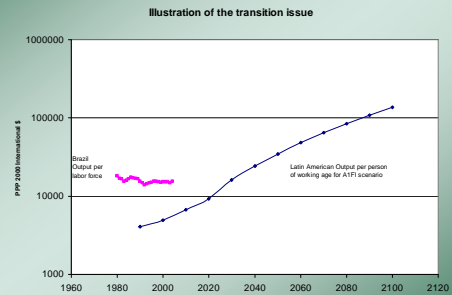
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Transitions

- If: A scenario foresees strong economic growth ala A1 worlds
- Then: We need plausible regional or national level logics to motivate changes in current trends
- E.g.
 - Brazil
 - Africa
- No long term delay in achieving fairly rapid economic growth in any region

Brazil – static to declining labor productivity but A1FI assumes rapid growth beginning in 1990

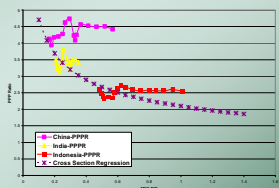


Data and measurement issues

- Data is a constant issue.
 - GTAP is a recommended data source
 - Many IO tables in GTAP date from the early 90's.
- Measurement:
 - PPP/MER is neither well understood nor well represented in existing data sets
 - Properly measured PPP growth rates will be less than properly measured real local currency growth rates
 - Yet, most data sets assume the two growth rates are equal.

PPP Cross Section Regression and Country Level PPP history are not consistent

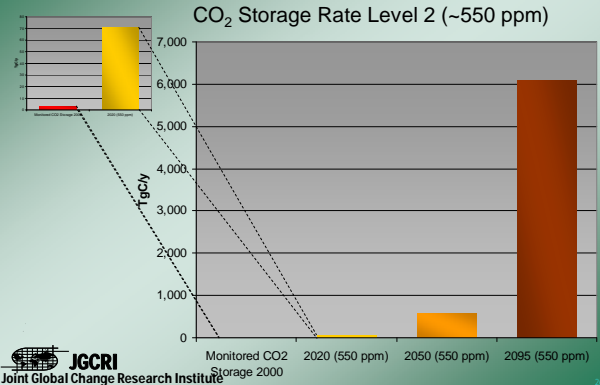
- The PPP/MER issue is but one aspect of a complex set of issues surrounding economic growth
- Conditional Convergence
- Limits on long term growth
 - Natural resources
 - Health
 - ...



Intangible Capital

- The changes coming under mitigation and climate change will force us to learn how to do new things.
- Knowing how to do things is a major component of intangible capital
- Zero order: Intangible Capital = Tangible Capital
- There may be some bumps in the road as we learn how to make rapid large scale changes
- Intangible Capital and Economic Growth
- <http://www.bsos.umd.edu/econ/hulten/IntCapital.pdf>

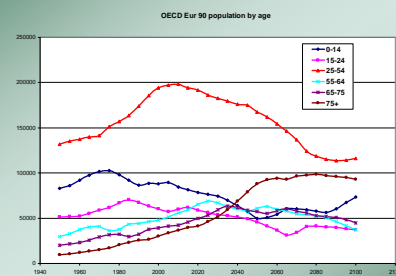
In the long-term the scale challenge grows exponentially



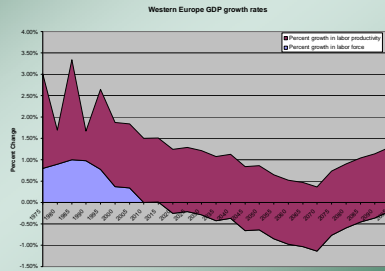
Demographic Issues

- Age Structure: Populations will become older but no consensus on long term life expectancy
- Labor Force growth will decline and perhaps become negative
- Consistency of story line implications for key drivers of fertility and life expectancy with demographic scenarios

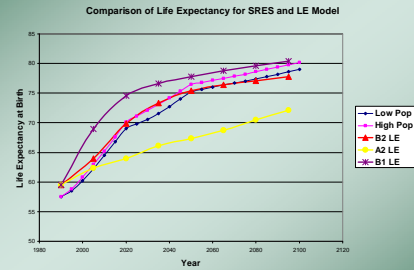
Demographics: Age composition will be novel and will not stabilize until late in the century if then



**Growth in output will decline as Labor Force growth declines.
Declines in Labor Force relative to Population will cause growth in per capita incomes to fall faster**



Drivers for a simple health model give a significantly different long term evolution of life expectancy



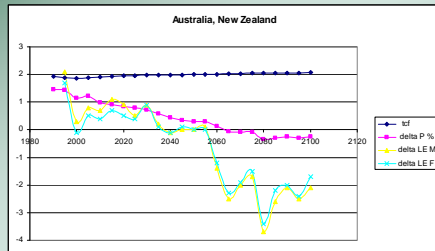
Long run demand for energy services is critical

- Will China look like the US or Europe when per capita income reaches 20K PPP?
- How will the demand for transportation grow—especially air travel?

Downscaling

- Good impacts analysis requires climate and socio-economic data at a much finer scale than either climate models or IA tools provide
- Simple algorithms have been shown to produce 'stupid model results', creating credibility issues.
- Current generation is much better but still does not incorporate such things as the trend of US population to move 1) south and west and 2) toward the coast.

Downscaling that does not reflect underlying structure of the problem is likely to be problematic



Land Use

- A major identified area needing development in the SRES
- Still an area needing further work
 - Historical patterns
 - Current carbon content of soils
 - Impact of land conversion on emissions
- Dietary evolution as incomes grow in less developed regions

MIA's

- Water
 - Already a critical factor in many areas
 - Even with an increase in precipitation, stream flow and soil moisture may decline due to increased evapotranspiration and less snowpack
 - Critical to both existing and many potential new energy technologies
 - Irrigation requires careful management and maintenance if it is to be a long term success
 - Hard to model as even an economist cannot maintain it is allocated by a market ;>)))

MIA's II

- Human Capital
 - Education is a critical determinant of behavior
 - Women in the highest education group in a society typically have half the number of children of the lowest educational group
 - In the US education is more important than either gender or ethnic origin in determining labor force participation
 - Many critical societal functions require education e.g. health care, infrastructure design and investment, regulation, ...
 - It is not sufficient to track literacy alone

Example 1 Water—the Columbia River

- In the Northwestern US and Canada
- Three way competition for water between salmon, hydroelectric generation, and irrigation
- The hydro generation capacity is limited by total annual stream flow
- The system provides peak load capacity to California
- Peak water demands occur when natural flow is lowest
- Fifty percent of the system water storage is provided by snowpack, which is estimated to decline by 50 percent by 2050.

Water II

- Water allocation is done by multiple mechanisms
- Salmon is by regulation but system water temperatures are near maximum levels for survival
- Factors driving survival at sea are not understood
- Irrigation is by water rights (and sometimes by market mechanisms)
- There are multiple unresolved American Indian claims
- Some dams are apt to be removed

Water III

- Some Questions
 - How much does the value of water differ across its major uses?
 - Should additional water storage investments be made? If so where since the river is almost entirely managed already?
 - Aluminum smelting is already declining fast. Should this continue?
 - Should biomass be considered for this area – if so should irrigation be allowed?
 - The system can withstand a two but not a three year drought. Should contingency planning include a three year drought?

El Salvador Central Coastal Plain Study

- A nice example of what we call an “end to end” study within the TGICA
- Developed in consultation with stakeholders
- Downscaled both socio-economic and climate data for historical and projected periods
- Worked with local institutions to develop recommendations for adaptation

El Salvador study II

- Illustrates the need for coordinated response across multiple political and institutional scales
- The importance of the basic socio-economic context in determining available options
- Short time frame (2015) eases the projection problem but makes the socio-economic framework more critical

Conclusions

- Data becomes information in the context of an analytic framework
- Understanding these analytic frameworks is critical if data is to be properly understood
- Critical data is supplied by others who need to understand the needs of the IAV users as they create the data
- Much of the data needed for IAV analysis is inherently local and cannot be provided by outside groups
- Good data is inherently resource intensive both in people and monetary terms
- The IAV community needs to create a framework which can represent their data/information needs broadly construed to the outside