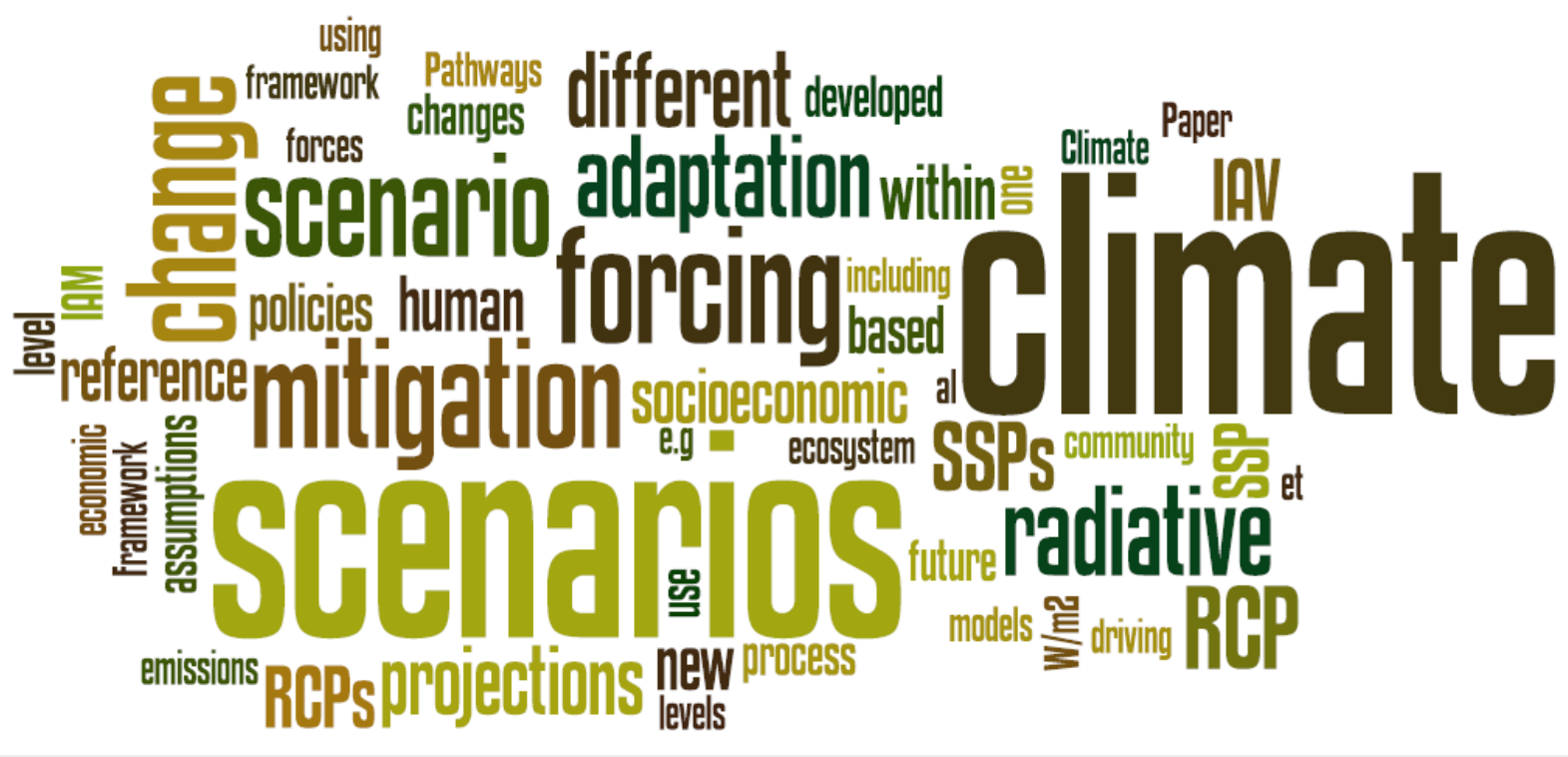
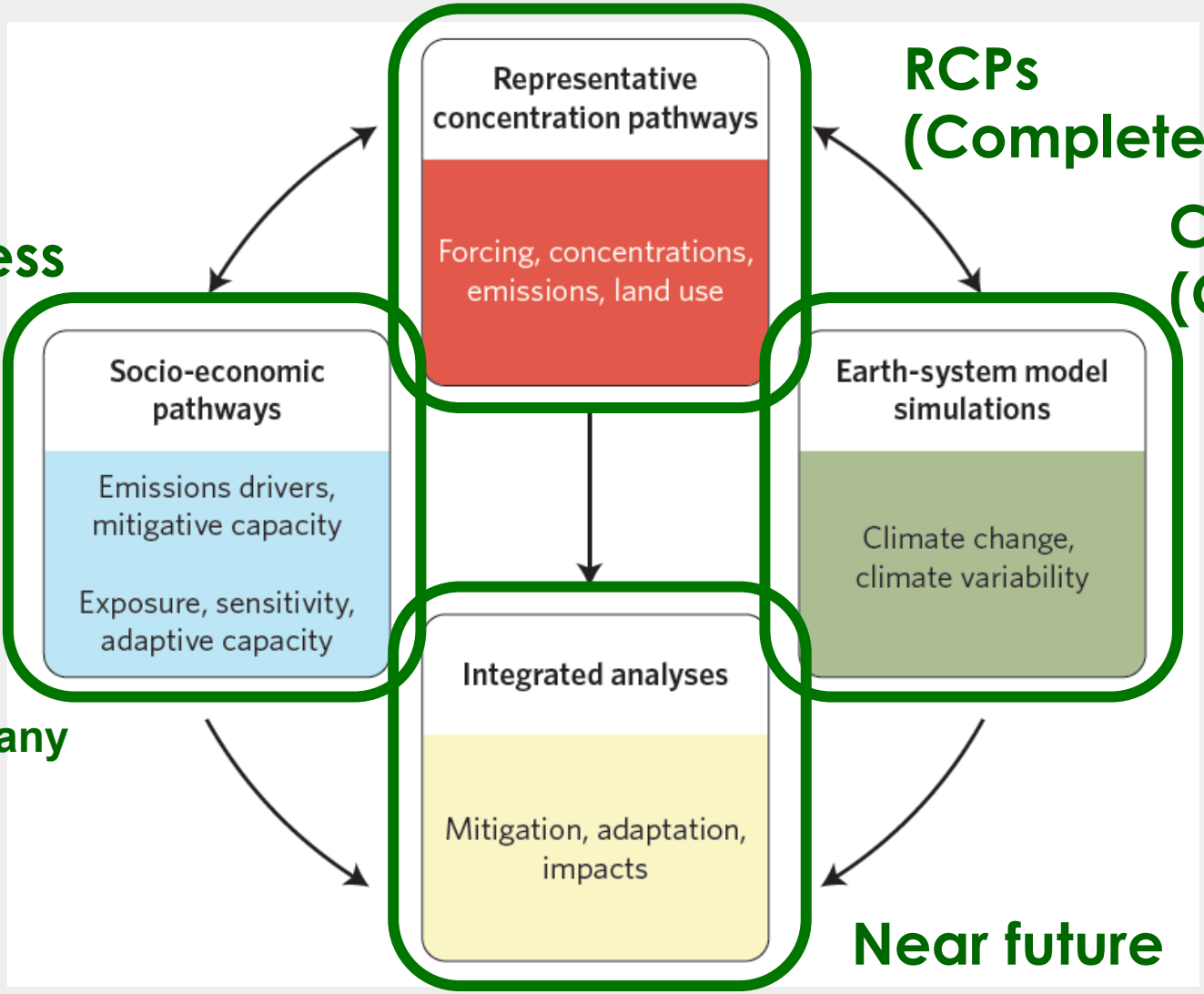
Progress Toward the Development of the Shared Socio-economic Pathways (SSPs)

Brian O'Neill, NCAR
EMF Snowmass Meeting
July 25, 2012



The Parallel Process



RCPs (Complete)

CMIP5 (Ongoing)

In Progress

- **small number**
- **"shared" across many studies**

Near future

O'Neill & Schweizer, 2011.

Process

Feb. 2010: U.S. NAS Workshop on Socioeconomic Scenarios
Washington, DC

Nov. 2010: IPCC Workshop on Socioeconomic Scenarios
Berlin, Germany

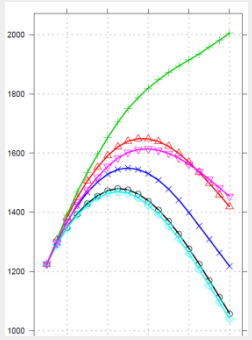
Jul. 2011: Meeting on Shared Socioeconomic Pathways
Changwon City, South Korea

Nov. 2011: Workshop on Socioeconomic Pathways
Boulder, CO

May 2012: Workshop on Shared Socioeconomic Pathways
The Hague, Netherlands

What's in an SSP

Narrative



Quantitative elements

Population
Urbanization
Rates of technological change
Income
Human Development Index
Income distribution
Etc.

Does not include:

- climate policy (mitigation or adaptation)
- not influenced by climate change
- typical model output such as emissions, land use, climate change

SSP 4: Inequality

Narrative: This pathway envisions a highly unequal world, both within and across countries. A relatively small, rich global elite is responsible for much of the emissions and is able to mitigate at low cost. This elite also emerges in developing countries, and is highly globally connected and mobile. The larger, poorer part of the population contributes little to emissions,but is vulnerable to the impacts of climate change. This vulnerable group exists in both developing and industrialized countries, and is concentrated in rural areas and large mega-cities. Those mega-cities with a large fraction of relatively poor and less educated people lack the capacity to protect themselves from extreme weather events. Access to high quality education, health services and family planning is also limited, leading to high population growth in low-income countries. In industrialized countries, economic uncertainty for most of the population leads to relatively low fertility and low population growth. Urbanization is high, induced by the large income differences, but takes place in an unorganized way that leads to large slums in developing countries.

In economic terms, this is a mixed world: as inequality increases within all regions, it is not clear beforehand how the diverging growth rates would aggregate to averages. Economic growth is probably medium/high in industrialized countries, low-income countries have low economic growth (though at the same time a rapidly rising elite) and middle-income income countries have medium growth, also driven by the increasingly rich elite groups.

This is a world with low social cohesion. Poor people have the hope, and sometimes the opportunity, to become a member of the elite, but are mostly trapped in their conditions. Governance is dominated by regulatory capture: the government works for the elite, by the elite. Challenges to adaptation are high due to the relatively low incomes and education of large proportions of the population in all regions, as well as to poorly functioning institutions for all but the elite, and lack of investment in reducing vulnerability.

With respect to energy and emissions, a main characteristic is that global elite emits very much, but is capable of changing its patterns, whereas the poor do not emit that much and, hence, there is hardly any transformation needed for them. Actions are taken to control local pollution only in the interests of the elite, likely to live largely in urban areas. As an example, power production could be moved out of city areas to reduce urban air pollution, while there would be little regard for the environmental consequences of land use in rural areas. Overall air pollution levels would thus remain relatively high compared to other SSPs. ...

SSP 4: Inequality, continued

• • • In this world, global energy corporations use investments in R&D as a hedging strategy against perceived or potential resource scarcity and the option that climate policy will be imposed. Their main aim is to remain global players in energy supply, also under changing circumstances. This leads to the development of low-cost renewables, CCS-ready power plants and energy-efficient technology. Some of these technologies, like energy efficiency or renewables, may be applied without climate policy, as a response to resource scarcity. Hence, the mitigation challenges are low due to some combination of 1) low reference emissions and/or 2) a high latent capacity to mitigate.

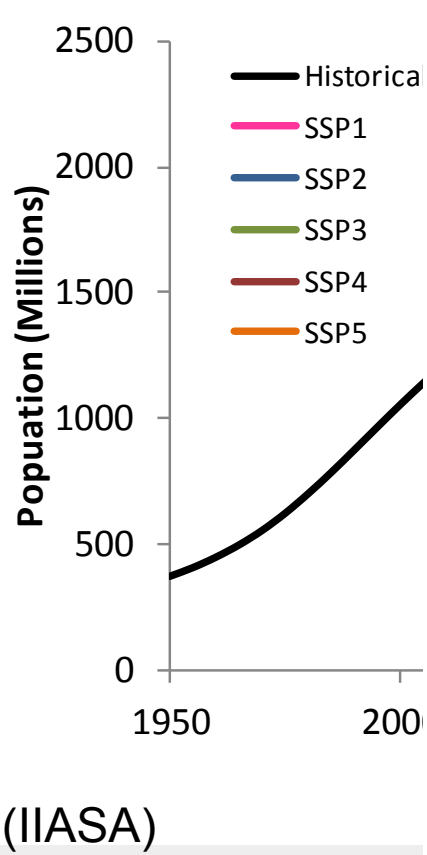
A typical example of hedging against resource scarcity could be a strong push for bio-energy by global energy corporations. In the absence of sustainability regulations, large energy corporations would acquire the necessary land-resources in developing countries to grow energy-crops, while reducing options for adaptation for local communities and for nature conservation.

Another example of a typical climate measure under this pathway could be geo-engineering, where the elite decide on this measure without concern for the potential negative effects for others. This would only be plausible, however, if the elite were able to insulate themselves against the detrimental effects of these measures.

Land ownership is unevenly distributed and land use management is also left to the global elite. Productive areas of the world would be dominated by industrialized agriculture and monocultural production. Crop yields would be typically high in large-scale industrial farming, but low for small-scale farming. Food trade is global, but access to markets is limited, increasing vulnerability for non-connected population groups.

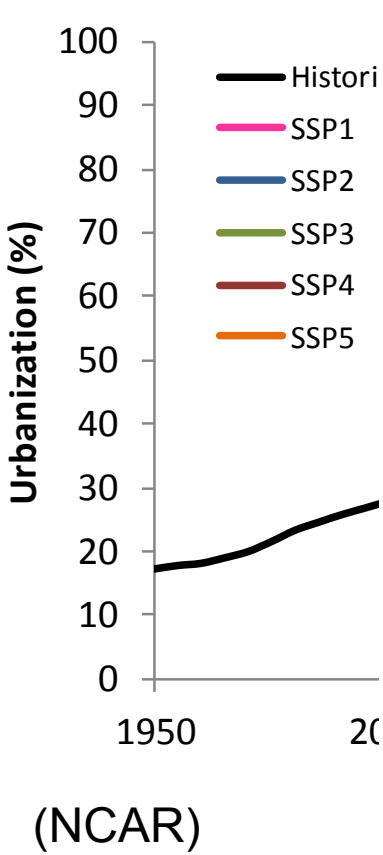
SSP Element Quantifications (e.g., India)

Population, Education



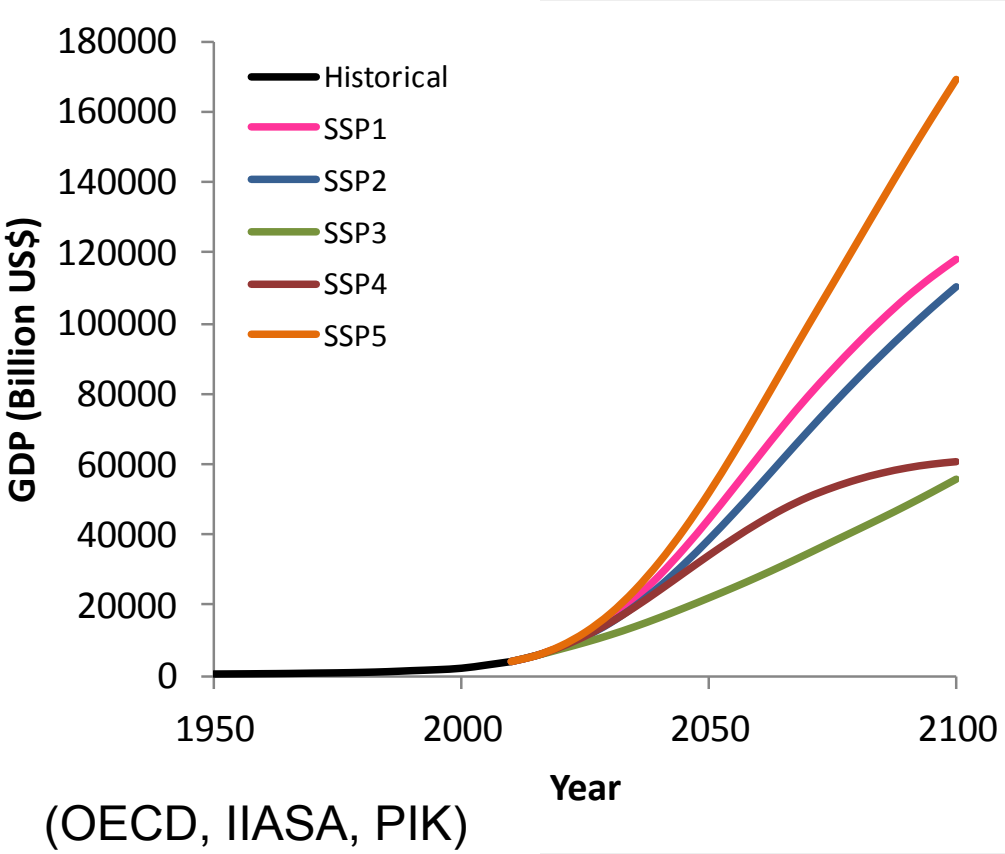
(IIASA)

Urbanization



(NCAR)

GDP



(OECD, IIASA, PIK)

Preliminary data available for review at
https://secure.iiasa.ac.at/web-apps/ene/SspDb

Joint IAV-IAM Committee

https://www.isp.ucar.edu/joint-iav-iam-committee

Working Groups:

- Narratives for SSPs
  Chairs: Brian O'Neill, Elmar Kriegler
- IAV-IAM handshake document
  Chair: Jae Edmonds
- IAM quantitative drivers and IAM scenarios for SSPs
  Chairs: Detlef van Vuuren, Keywan Riahi
- IAV quantitative elements and evaluation metrics
  Co-chairs: Marc Levy, Bas van Ruijven
- Nested scenarios across geographies and time
  Co-chairs: Kate Calvin, Linda Mearns
- Roadmap for future IAV–IAM collaboration on scenarios
  Co-chairs: Stephane Hallegatte

Goals for the IAM-session

Detlef van Vuuren, Brian O'Neill

NCAR is sponsored by the National Science Foundation

Goals

- Update on current progress regarding development of new scenarios for climate research(SSPs)
- Discussion on possible additional work; suggestions for changes in intended way forward

Topics

- Overview of the current status and plans
  - (Detlef)

- Overview of activities of different model groups
  - PIK (Elmar)
  - PNNL (Jae)
  - AIM (Shinichiro)
  - IMAGE (Detlef)

Goals for the IAV-quantification session

Bas van Ruijven, Marc Levy

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Goals

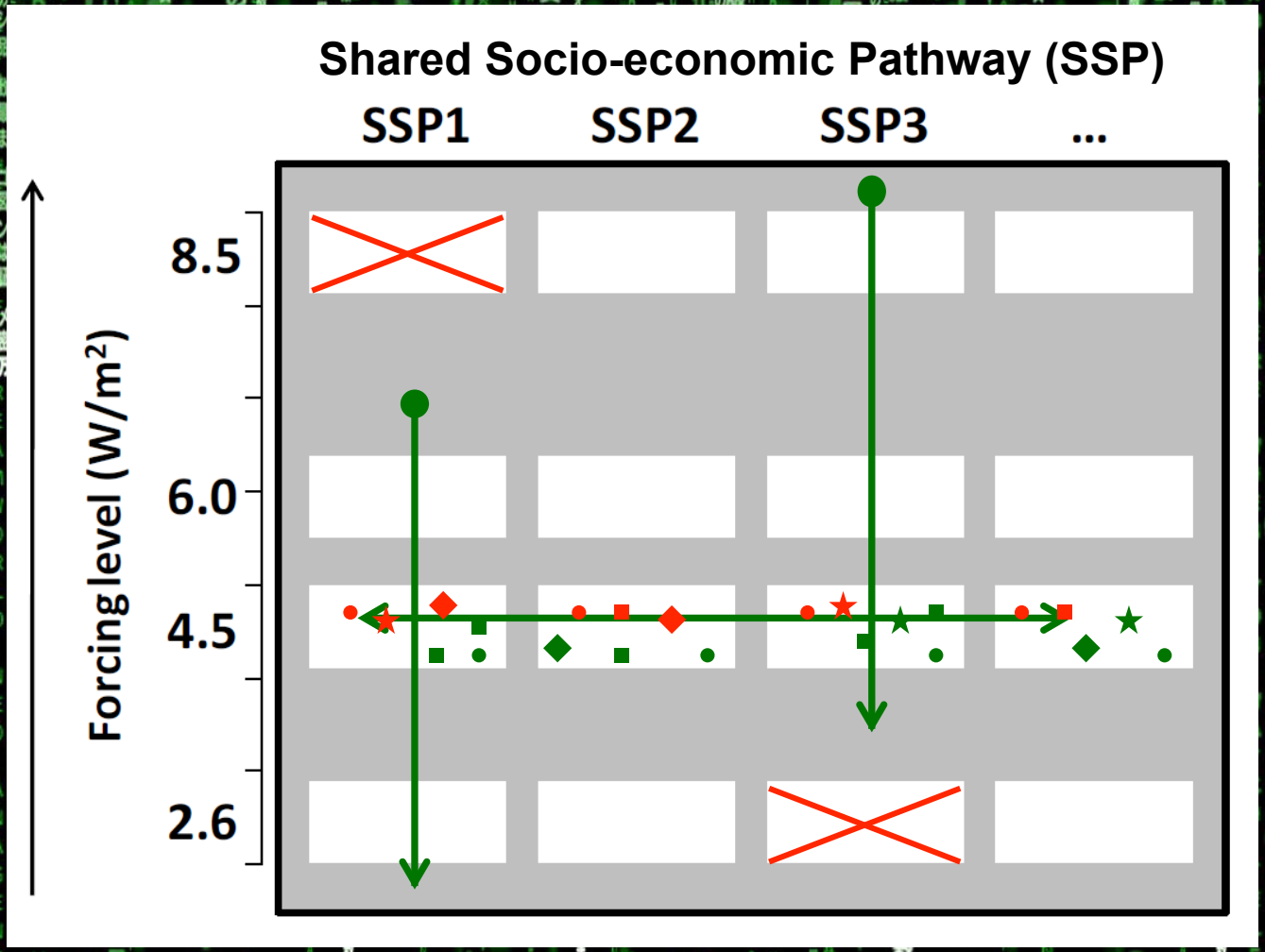
- Update on defining challenges to mitigation and adaptation and classifying existing work
- Introduction to the process of creating extended indicator sets for SSP's, to make them more useful to IAV-research
- First look at three types of indicators and discuss the process of generating scenarios related to the SSP's

Topics

- Metrics for challenges to adaptation and mitigation (Jae)
  - "binning" existing scenarios

- Quantitative indicators for IAV-research
  - Overview, governance (Marc)
  - Income distribution (Bas, Eric)
  - Spatial population (Bryan)

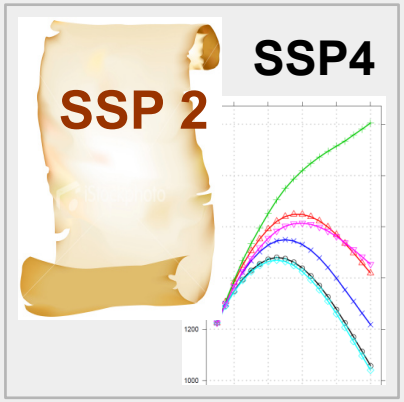
The Matrix
The Scenario Matrix Architecture



Framework paper posted on NCAR website: http://www.isp.ucar.edu/socio-economic-pathways

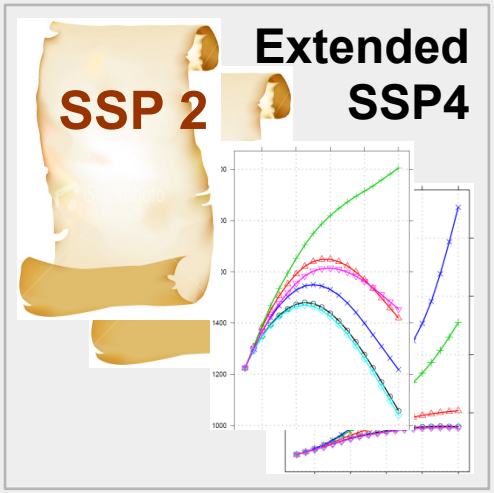
Basic vs Extended SSPs

Basic

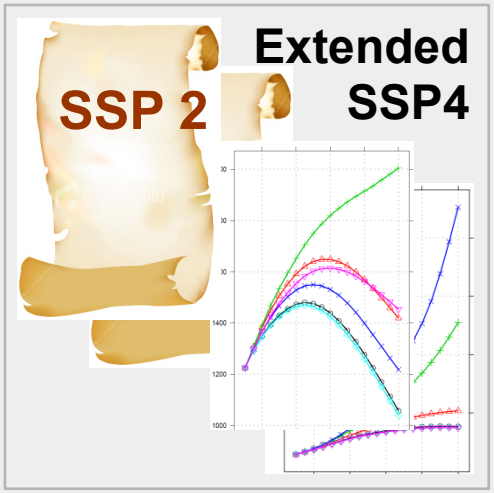


Information sufficient to locate SSP in Domain 4 of the challenges space

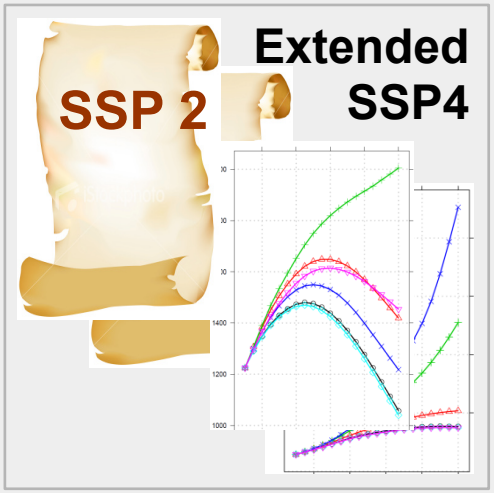
Regional Extension



Sectoral Extension



Global Extension



Boulder Meeting Report containing SSP descriptions

http://www.isp.ucar.edu/socio-economic-pathways

SSP quantitative element database

https://secure.iiasa.ac.at/web-apps/ene/SspDb