ESCWA

United Nations Economic and Social Commission for Western Asia

Integrated Assessment Models (IAMs)

Objective

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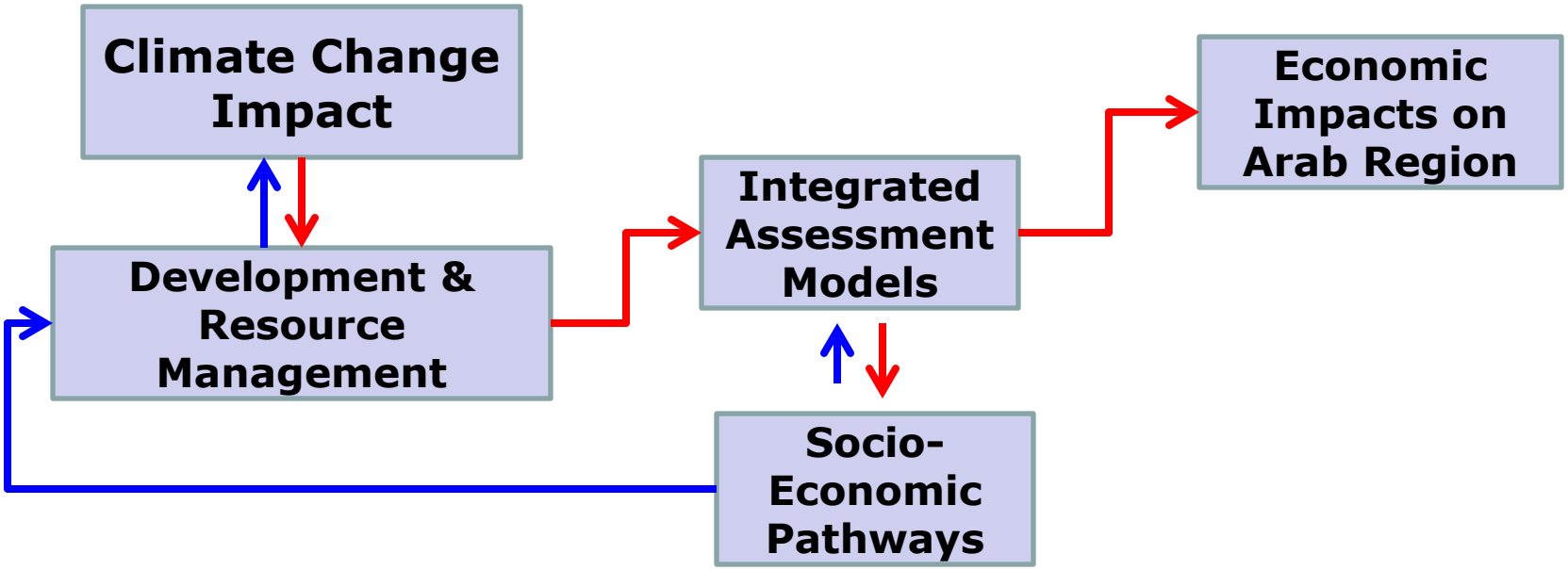


IAMs

In principle (IPCC TAR):

"interdisciplinary process of combining, interpreting, and communicating knowledge from diverse scientific disciplines in such a way that the whole set of cause-effect interactions of a problem can be evaluated"

Actual IAMs:

Grew organically from "energy models"

Before 1973: Demand = f(GDP growth rate)

Modelling approach: Minimisation of energy supply costs

After 1973: Need to incorporate accurate price interactions & feedback mechanisms

General Approaches

Statistical Approach:

- Physical effects of climate change = Related to observed variations, either across regions or within a single country.
- Backward-looking: cannot easily take into account the results of Climate Models.

Enumerative Method:

- Best adapted to support policy making in estimating the economic impacts of climate change.
- An economic cost is assigned to each of the physical effects forecasted by Climate Models:
  - Relies directly on the results from Climate Models.

IAM Model Types

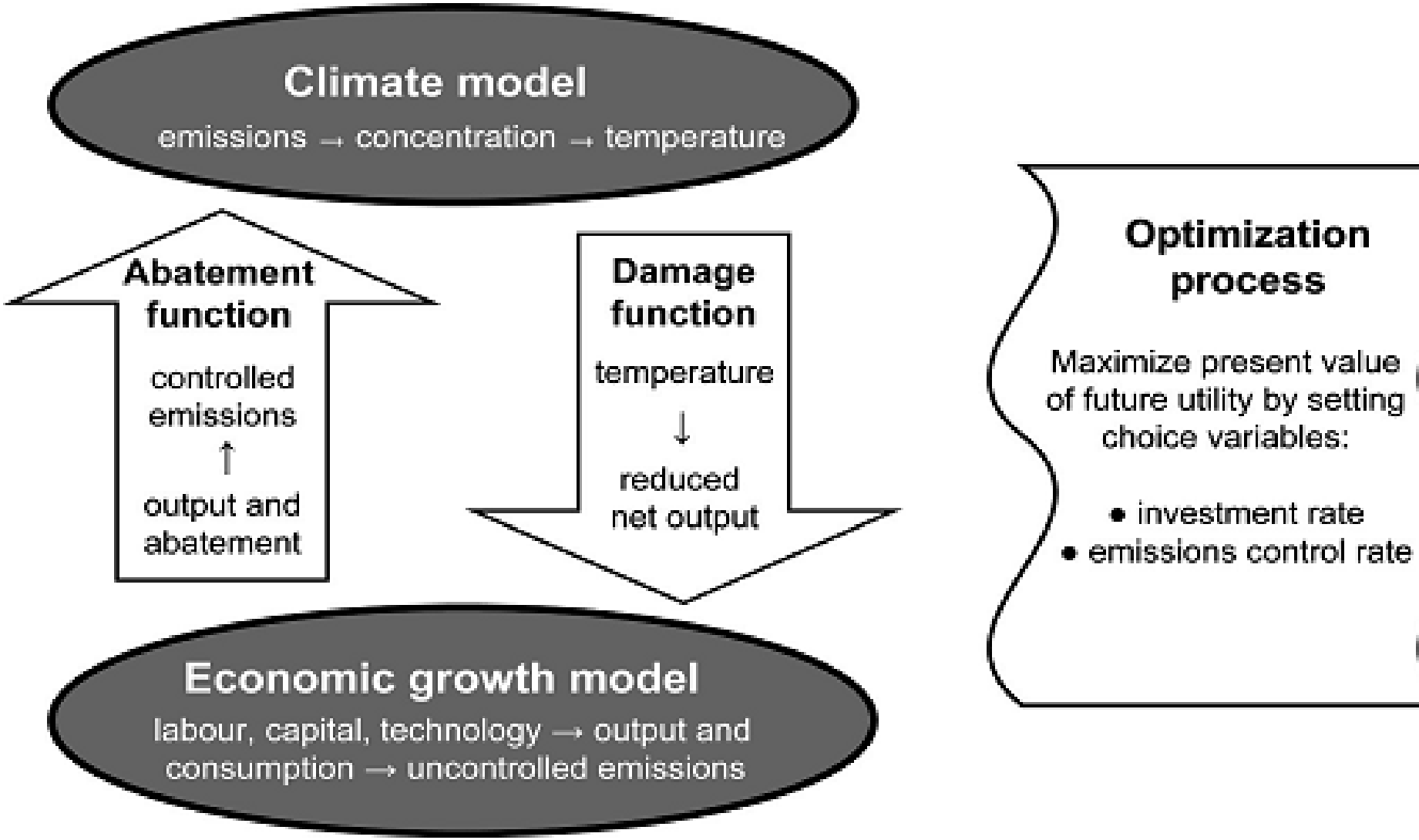
1. **Equilibrium** models: the most complex
   - The economy is as a system of linked economic sectors that they try to "solve" by searching for a set of prices that will reach an equilibrium.
   - They can grow to become extremely complex and intricate, without this resulting in enhanced performance;

2. **Simulation** models:
   - based on forecasts about future emissions and climate conditions,
   - Try to link climate outcomes to economic model of production, damages, consumption, investment and abatement costs.
   - Primarily used in mitigation studies to estimate the cost of various likely future emission paths, and not generally well suited for adaptation studies;

3. **Cost Minimization** models:
   - focus on identifying the most cost-effective solution that would be most compatible with a specific objective;
   - Recent versions of those models link to a computer Climate Model (CM);

4. **Welfare optimization** models; the simplest
   - Link to computer Climate Model (CM) and use climate parameters to estimate, via a "damage function", the socio-economic impacts of climate change.
   - They may allow for speculative values to be assigned to non-market "goods";
   - Useful for purposes of adaptation analysis,

IAM: Welfare optimization models



Potential Disadvantages of IAMs

1. "damage function":
   - Relates temperature variations to either Gross Domestic Product (GDP) or its growth rate;
   - IAM developers appear to "simply make up arbitrary functional forms and corresponding parameter values".

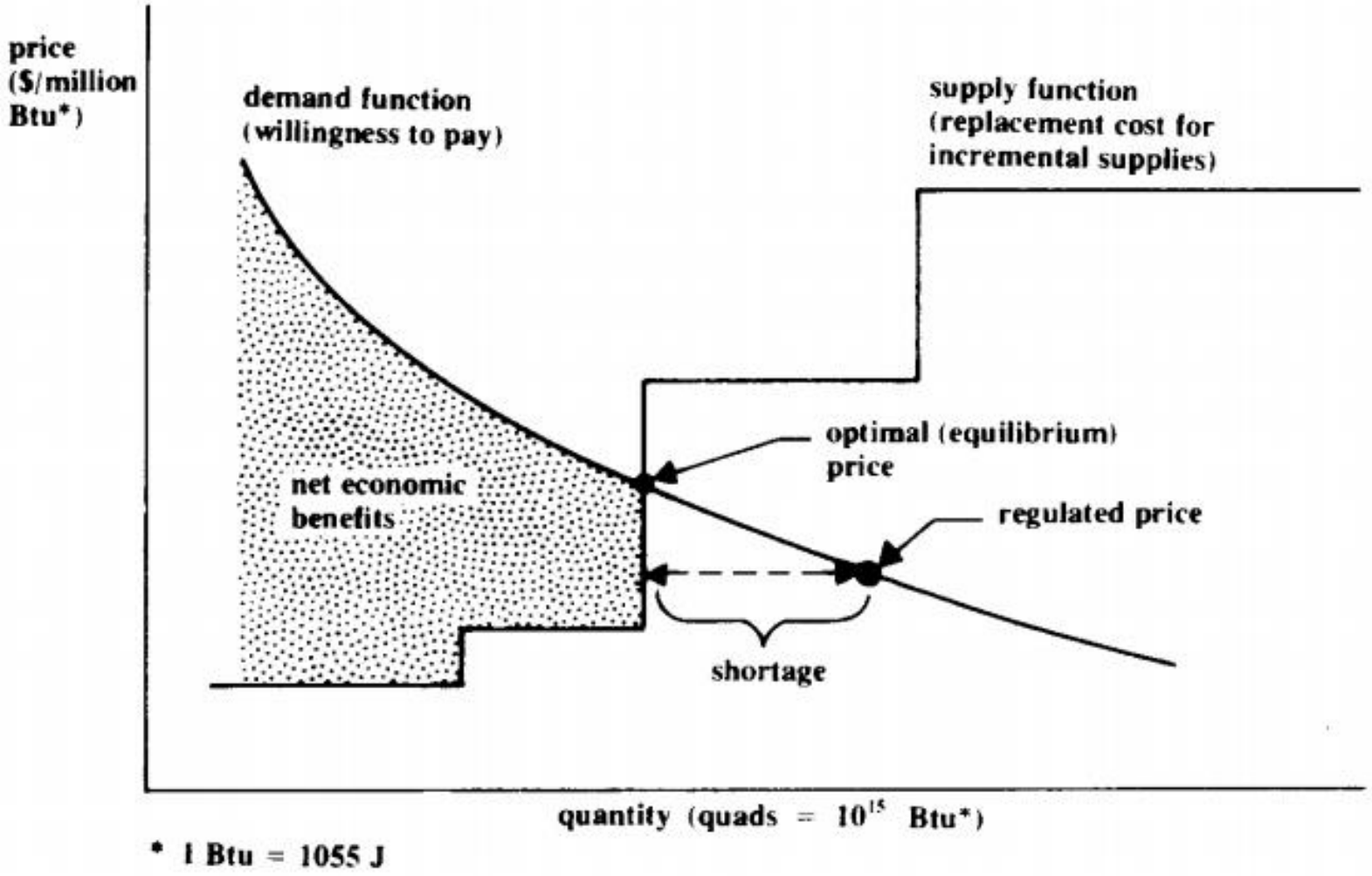
2. The probability distributions of various socio-economic parameters remain still poorly understood.
   - Different distributions can yield very different results;

3. Ns full integration with Climate Models:
   - Simplified representations of climate system;
   - Calibrated against Climate Models;

"Willingness to Pay"

Damage Function:

Estimate socio-economic costs of climate change impacts.



Discount Rate

Climate change is a cross-generational issue;

- Emissions of past generations contributed to today's climate change;
- Today's mitigation actions will affect the welfare of future generations.

- The necessary investments will therefore depend the relative value of **present benefits** (money today) over **future costs** (money in the future).
  - If you fear catastrophic climate change:
    - **low discount rate** (0.1%)
  - If not:
    - A **higher discount rate** (3%)

Extreme Events

- Cataclysmic disasters:
  - Infrequent;
  - Frequently succeeded by higher growth rates;
  - Temporary disruption of the development process" with no long-term impacts.
- Extreme weather events:
  - Extreme events more protracted, or persistent;
  - Shorter lived, but come with increased frequency;
  - Can last multi-years, have lasting impacts;

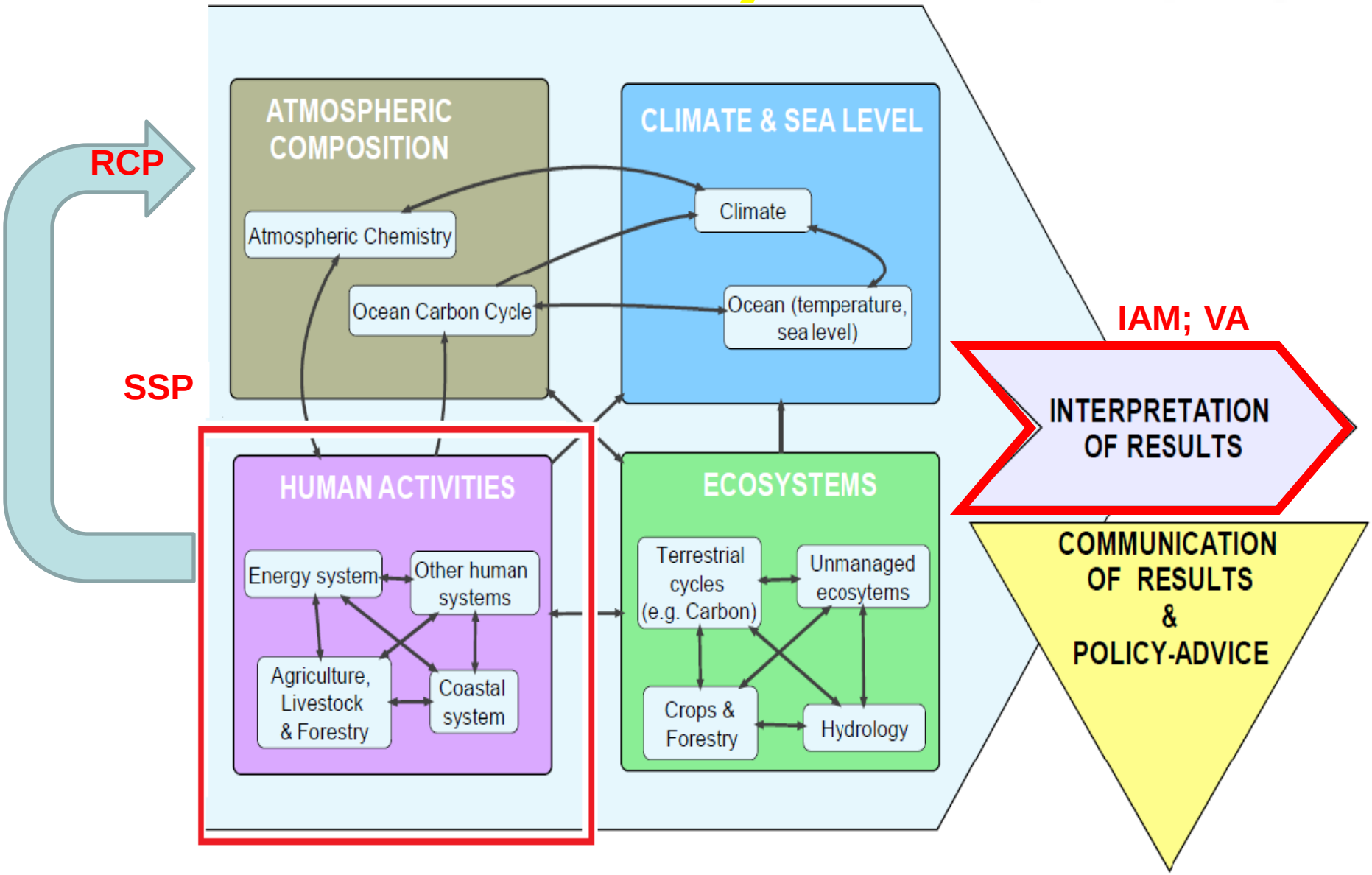
Methods

Enumerative Method:

- Best adapted to support policy making in estimating the economic impacts of climate change.

- An economic cost is assigned to each of the physical effects forecasted by Climate Models:
  - Relies directly on the results from Climate Models.
  - Risks misestimating the cost of climate change:
    - From one sector into another;
    - From one region into another;
    - From one time (the past) period into another (the future).

Thank you


RCP
SSP
ATMOSPHERIC COMPOSITION
Atmospheric Chemistry
Ocean Carbon Cycle
CLIMATE & SEA LEVEL
Climate
Ocean (temperature, sea level)
HUMAN ACTIVITIES
Energy system
Other human systems
Agriculture, Livestock & Forestry
Coastal system
ECOSYSTEMS
Terrestrial cycles (e.g. Carbon)
Unmanaged ecosytems
Crops & Forestry
Hydrology
IAM; VA
INTERPRETATION OF RESULTS
COMMUNICATION OF RESULTS & POLICY-ADVICE