

UNEP



Caribbean Environment Programme

The Science of Climate Change and Climate Change Vulnerability and Adaptation.'

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www.cep.unep.org

18 Regional Seas Programmes 143 Countries



Regional Seas



**Caribbean
Environment
Programme**

West to East: North-East Pacific South-East Pacific Wider Caribbean Upper South-West Atlantic West & Central Africa
Mediterranean Black Sea Eastern Africa Red Sea & Gulf of Aden ROPME Sea Area South Asian Seas East Asian Seas
North-West Pacific South Pacific Partner programmes: Arctic North-East Atlantic Baltic Caspian Antarctic



CEP Vision

**Sustainable Development of
Coastal & Marine resources in the
Wider Caribbean Region through
effective, integrated management that
allows for Economic Growth &
Sustainable Livelihoods**



What is an Assessment?

The Evaluation or Estimation of the nature, quality, or ability of someone or something

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What is an Integrated Assessment?

Framework for combining knowledge from a range of disciplines when conducting an Assessment

ANMIEP

Why Integrated Assessment?

- 1) Coordinated exploration of possible future trajectories of human & natural systems;
- 2) Development of insights into key questions of policy formulation;
- 3) Prioritization of research needs in order to enhance our ability to identify robust policy options;



In Simpler Terms....

1) Broader set of information;

2) Tool for understanding complex
Environmental Problems;

Leading to More Informed Decision-Making
(hopefully)



What is Climate Change?

**A Very Very Very Complex
Environmental Problem!!**



Key Features of Integrated Climate Change Assessments

Considers the social & economic factors that drive the emission of greenhouse gases, the biogeochemical cycles & atmospheric chemistry that determines the fate of those emissions, and the resultant effect of greenhouse gas emissions on climate and human welfare.



In other words.....

Seeks to provide information of use to decision makers rather than merely advancing understanding for its own sake;

Brings together a broader set of areas, methods, styles of study, or degrees of certainty;

IAMs Draw from and Serve Other Climate Science Research

IAM

Human Systems



Natural Earth Systems



Gridded GHG and SLS Emissions, Land Use

Climate Modeling and Research Include:

- Carbon cycle
- Atmospheric chemistry
- Oceans
- Climate

Models and Data

Socioeconomic States, Development Paths, Multiple Stressors

IAV Modeling and Research Include:

- Energy
- Water
- Coastal zones
- Ecosystems
- Health

Models and Data

Integrated Assessment Modelling

Tool for conducting an Integrated Assessment

Strength: Ability to calculate the consequences of different assumptions & to interrelate many factors simultaneously,

Constraints: Quality and character of the assumptions and data that underlie the model.

Major Classes of IAMs

Policy Optimization

Policy Evaluation

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Policy Optimization

Optimize key policy control variables such as carbon emissions control rates or carbon taxes, given formulated policy goals

- 1) **Cost-benefit models**, which attempt to balance the cost & benefits of climate change policies
- 2) **Target-based models**, which optimize responses, given targets for emission or climate change impacts or
- 3) **Uncertainty-based models**, which deal with decision making under conditions of uncertainty.

Policy Evaluation

Policy evaluation models project the physical, ecological, economic, & social consequences of specific policies

- 1) Deterministic projection models**, in which each input & output takes place on a single value.
- 2) Stochastic projection models**, in which at least some inputs & outputs are treated stochastically.

Policy Evaluation IAMs have helped identify critical knowledge gaps in several areas. e.g. the balancing of the carbon cycle, integrated land-use analysis, & sulphur aerosols.

Advantages of IAM

- 1. Allow the setting up of simulations based on scenarios for the future;**
- 2. Incorporate mechanisms governing the complex link between economy & environment;**
- 3. Can deal with uncertainty about the future evolution of economic & environmental parameters;**
- 4. Can be used to isolate the effects of a particular parameter on other mechanisms governing economic & environmental processes;**
- 5. Provide a large amount of information about the path of significant policy variables over time.**

Disadvantages of IAM

- 1. Do not provide forecasts, but only simulations and as such can only provide ‘hypothetical data’;**
- 2. Sometimes offer contrasting results depending on different assumptions;**
- 3. Implementation of IAMs & their use can be time-consuming for practitioners, & research centres therefore tend to use their own models;**
- 4. IAM codes are not always available for the scientific community & results may at times appear quite cryptic;**
- 5. Trade-off between complexity of models & comprehension of results.**

Models, Models Everywhere

Over 20 twenty climate change IAMs:

**Economic issues; physical models; global focus;
regional focus;**

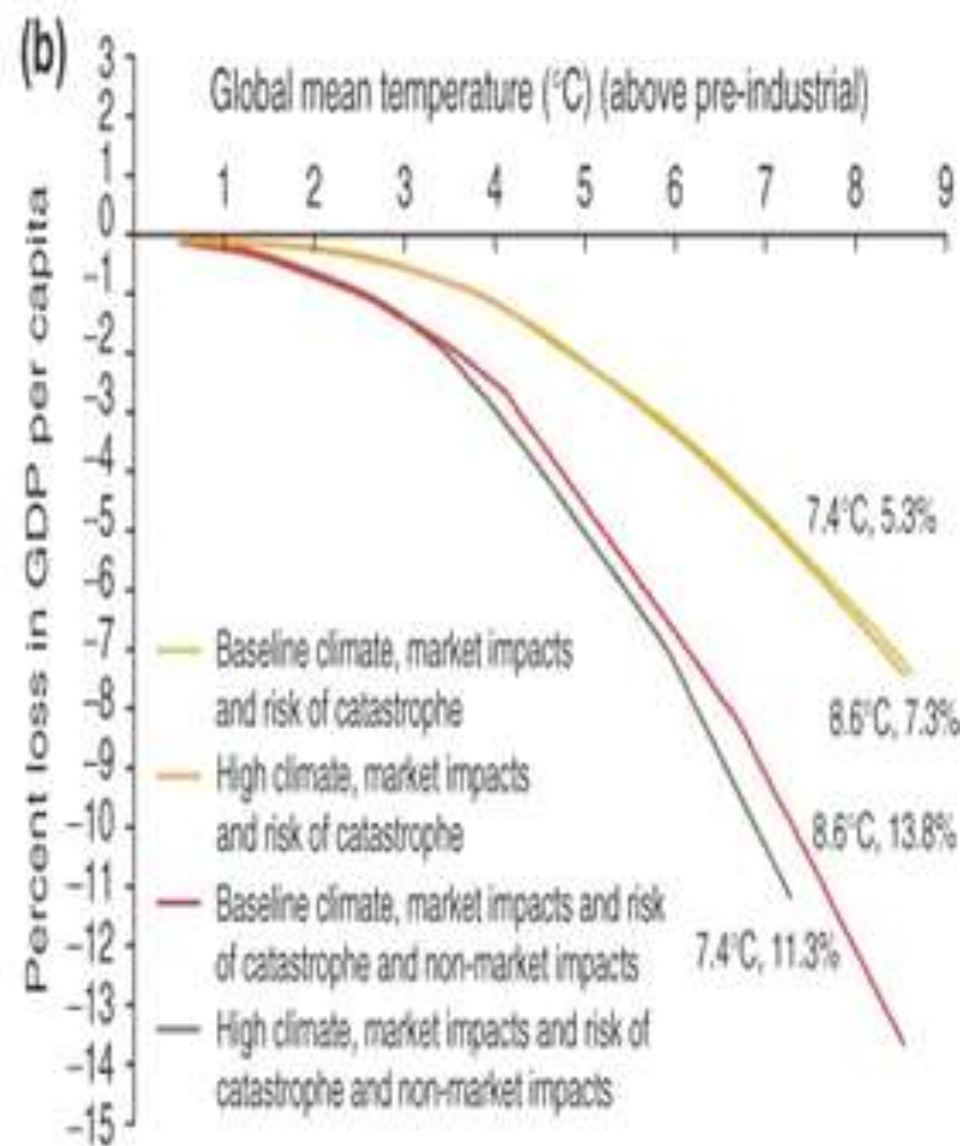
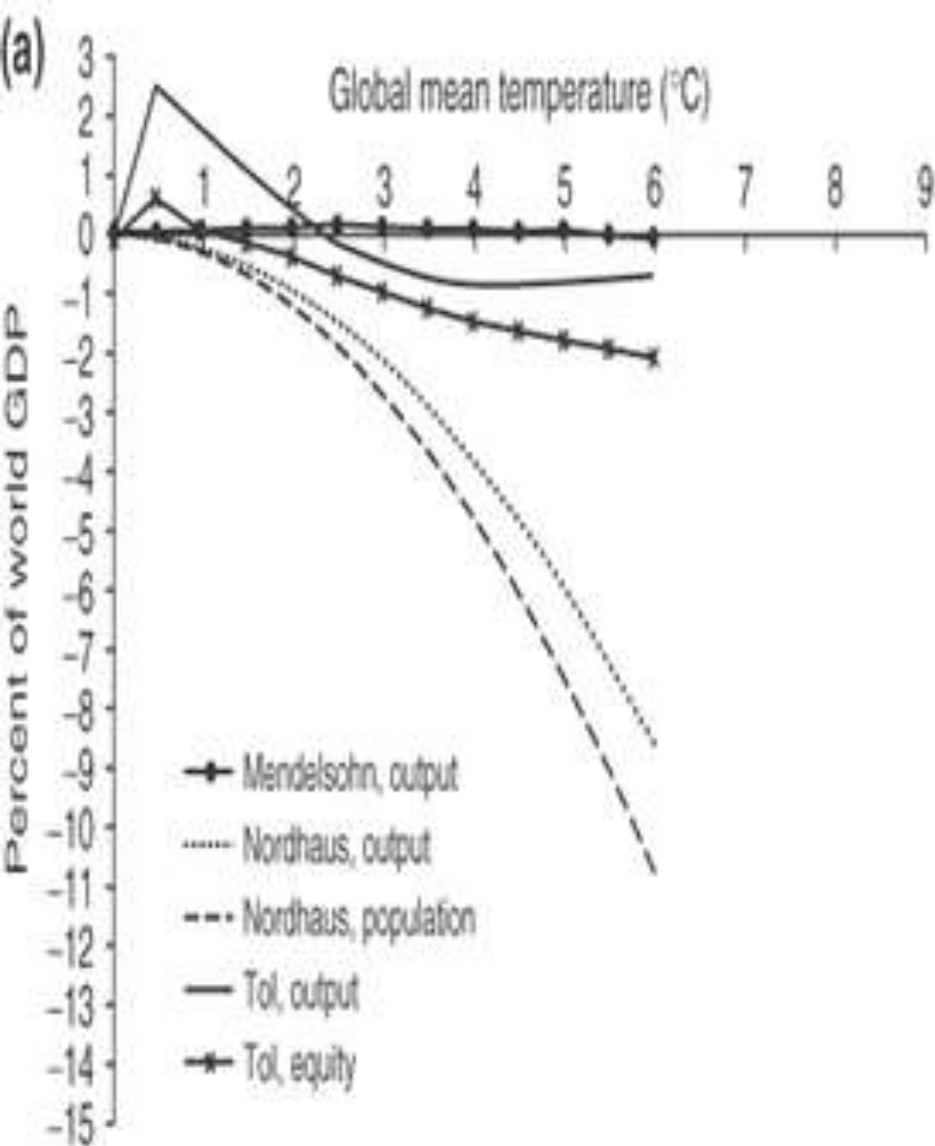
What are the assumptions of any model?

What is its intended use?

What Model do I use?

The one that answers the questions you need answered and/or fulfills the task you need done!

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Global damage functions, as a percentage of global gross domestic product (GDP), derived from different integrated assessment models (IAMs). Source: (Reprinted with permission from Ref73. Copyright 2007 Cambridge University Press)

General Guidelines for IAMs

Most closely addresses the question

Produces results at the spatial scale that is most appropriate for the task

Most appropriate for addressing the key sectors

Appropriate for the target audience

Well documented with explicit assumptions

Uncertainties are specified in model inputs and reflected in model outputs

Exposed to careful peer review

Not so complex that it cannot be understood

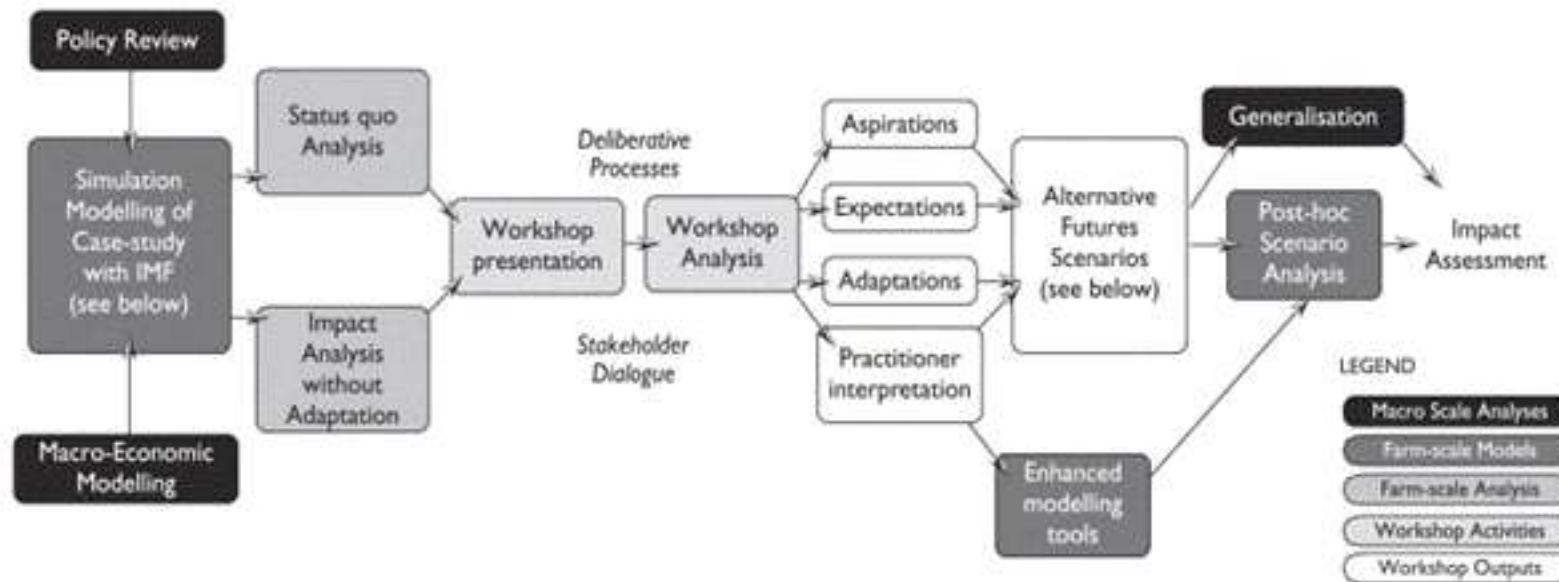
Developed by a team of experts with the background and expertise appropriate for addressing the question



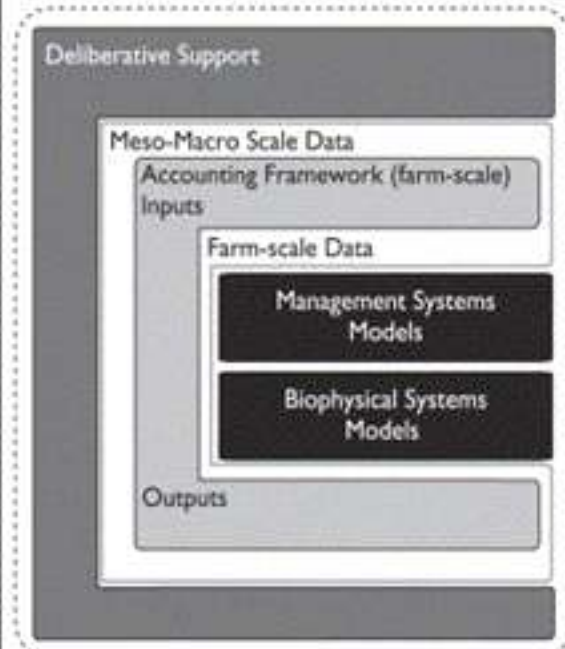
How can IAS support Vulnerability & Adaptation?

- 1. Climate (or Earth system(ESM)):** focus on the consequences of changes to the composition of Earth's atmosphere, oceans, ice, and lands.
- 2. Impacts, adaptation, and vulnerability (IAV):** study the consequences of changes to Earth's climate for humans and nature.
- 3. IA modelers** study the range of human activities & the intersection of human & natural systems.

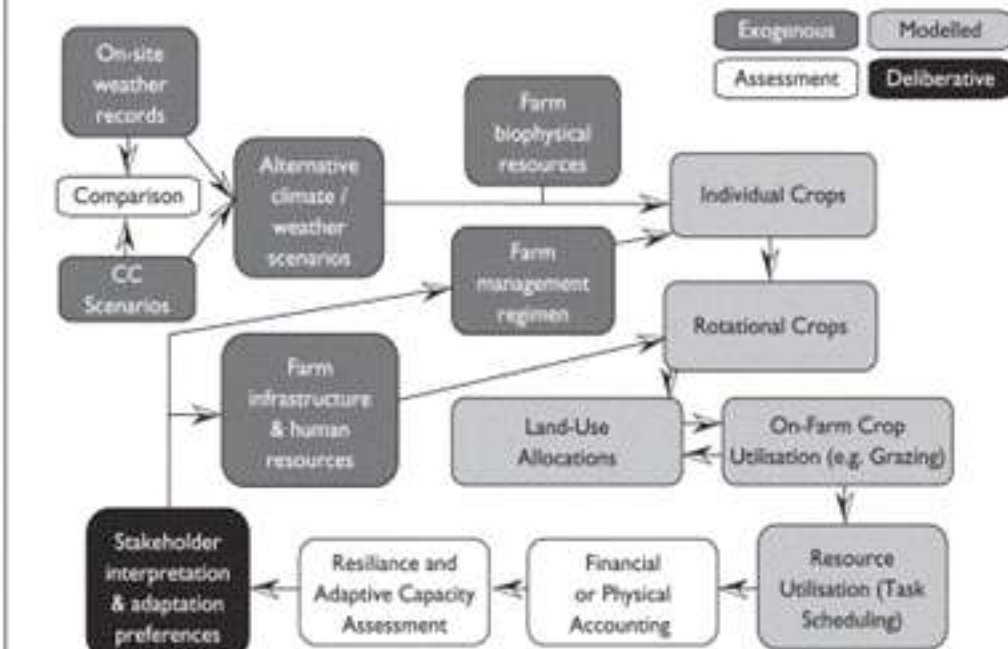
(a) Integrated Assessment using simulation modelling and deliberative processes



(b) Integrated Modelling Framework



(c) Assessing Resilience and Adaptive Capacity under Climate Change



The future of IAS - Sustainable Development

Collaboration among climate modelers, experts on technological innovation & diffusion, & experts in IAV will provide important new insights to those who are wrestling with simultaneous mitigation and adaptation decisions.

More sophisticated merging of IAMs with other climate research models will yield new scientific insights into the magnitude and dynamics of human decisions on both the Earth system & on other human systems



THANK YOU

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