Introduction to Integrated Environment Assessment Models

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APEIS Capacity Building Workshop on
Integrated Environment Assessment in the Asia-Pacific Region
October 24-26, 2002, Hotel Grand Inter-Continental, New Delhi

Presentation Agenda

- Why Integrated Environment Assessment?
- What is Integrated Environment Assessment?

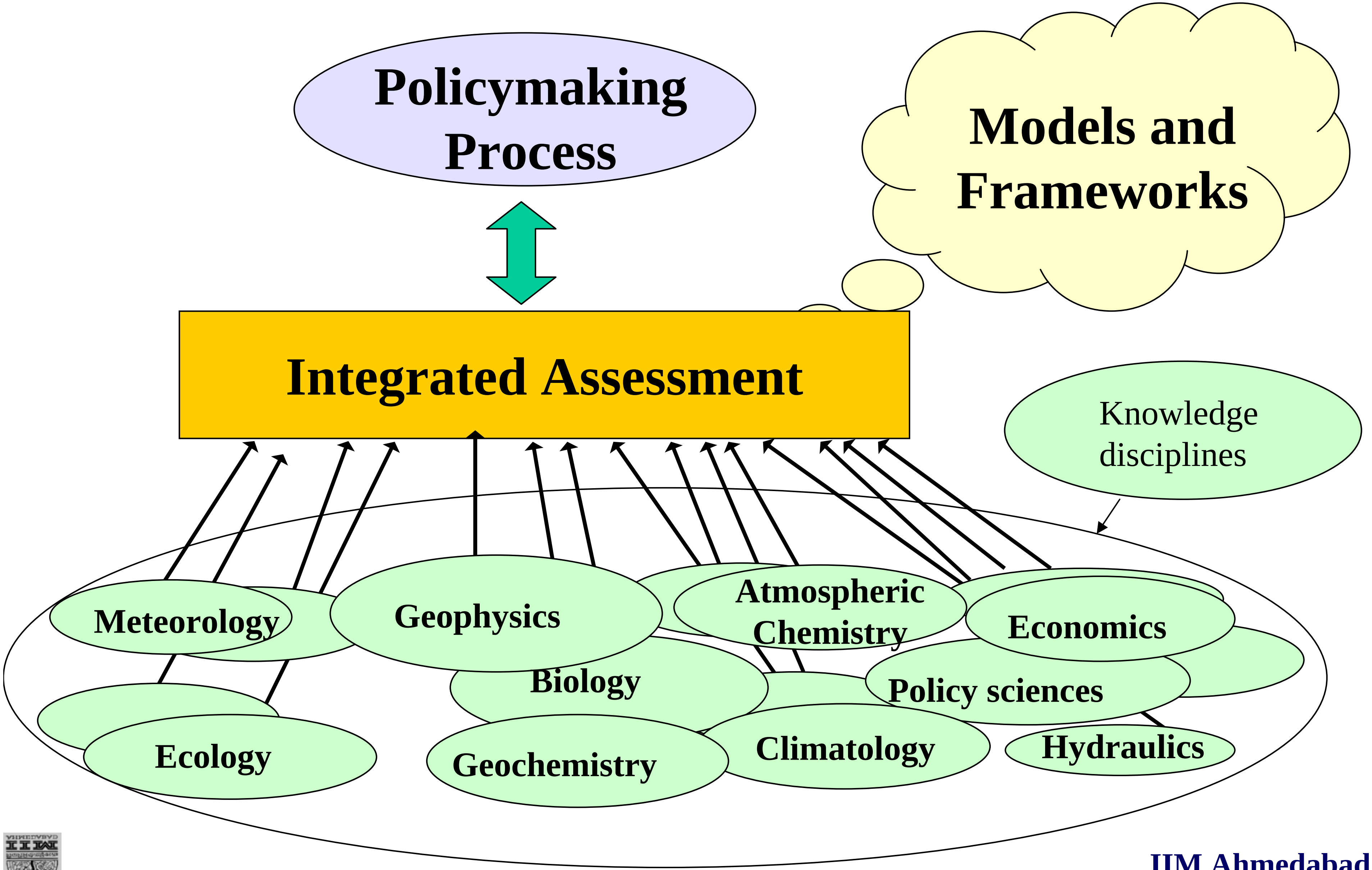
  Example: Integrated Assessment of Climate Change
- What are Integrated Assessment Models and Component Models?

  Example: Integrated Assessment Models for Climate Change Policy Analysis
- What kind of results and insights do Integrated Assessment provide?

  Example: Results and Insights from Integrated Assessment of Climate Change
- Why and what kind of capacity building for Integrated Assessment in developing countries?

Why Integrated Environment Assessment?

Multiple Interfaces of Environment Assessment



What to Integrate?

- Diverse Scientific Disciplines
- Diverse socio-economic scenarios
- Macro and micro-economies
- Local and regional boundaries
- Short and long time horizons
- Local and global environmental concerns
- Rural and urban perspectives
- Regional emissions and impact assessment
- Probability and Decision under uncertainty
- Technology

Why Integrated Assessment?

- To assemble, summarise, organise, interpret and reconcile pieces of existing knowledge
- To add value through integration (but not to add knowledge)
- To develop full range of policy outcomes
- To enhance Communication between scientific disciplines and policy formulation

Why Integrated Assessment Models?

- Framework for conducting research ensuring consistency pointing to areas where more information is required
- IAMs are good ‘forecasting’ and ‘heuristic’ tools
- Communications tools between different sciences and between science and policy
- Insights from investigations in the domains of the sub-components

What is Integrated Environment Assessment?

<u>Example</u>

Integrated Assessment of Climate Change

Climate Issues

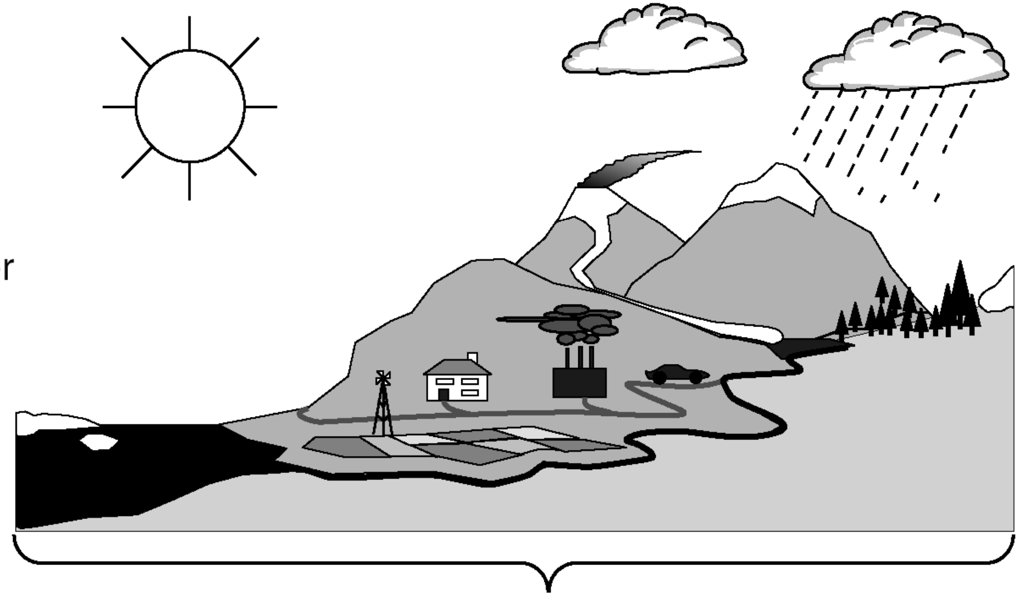
What changes have occurred?

How well are the past and present climates understood?

What changes could lie ahead?

Observations:

- temperatures
- precipitation
- snow / ice cover
- sea level
- circulation
- extremes



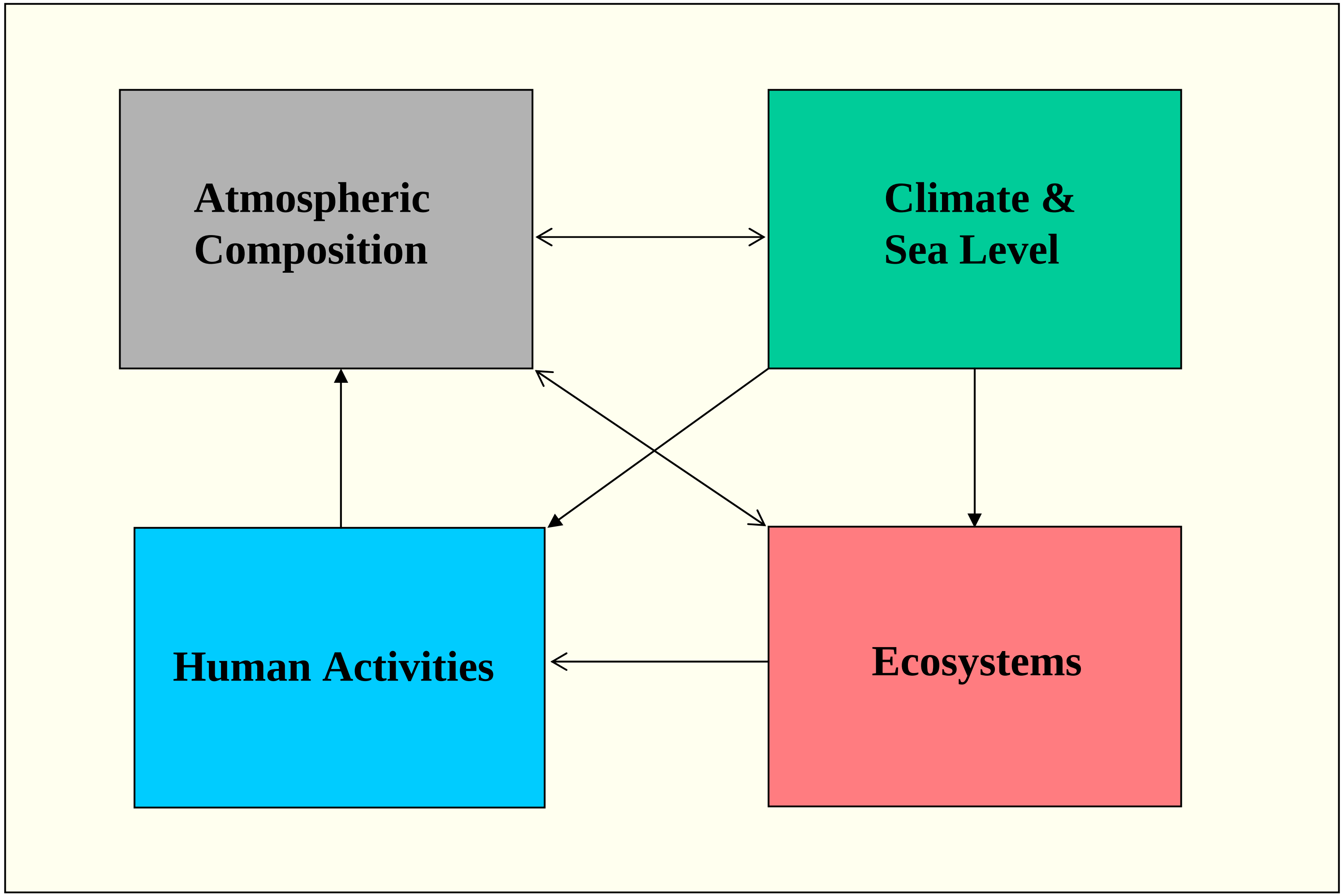
Simulations:

- natural variation
- forcing agents
- global climate
- regional climate
- high impact events
- stabilisation

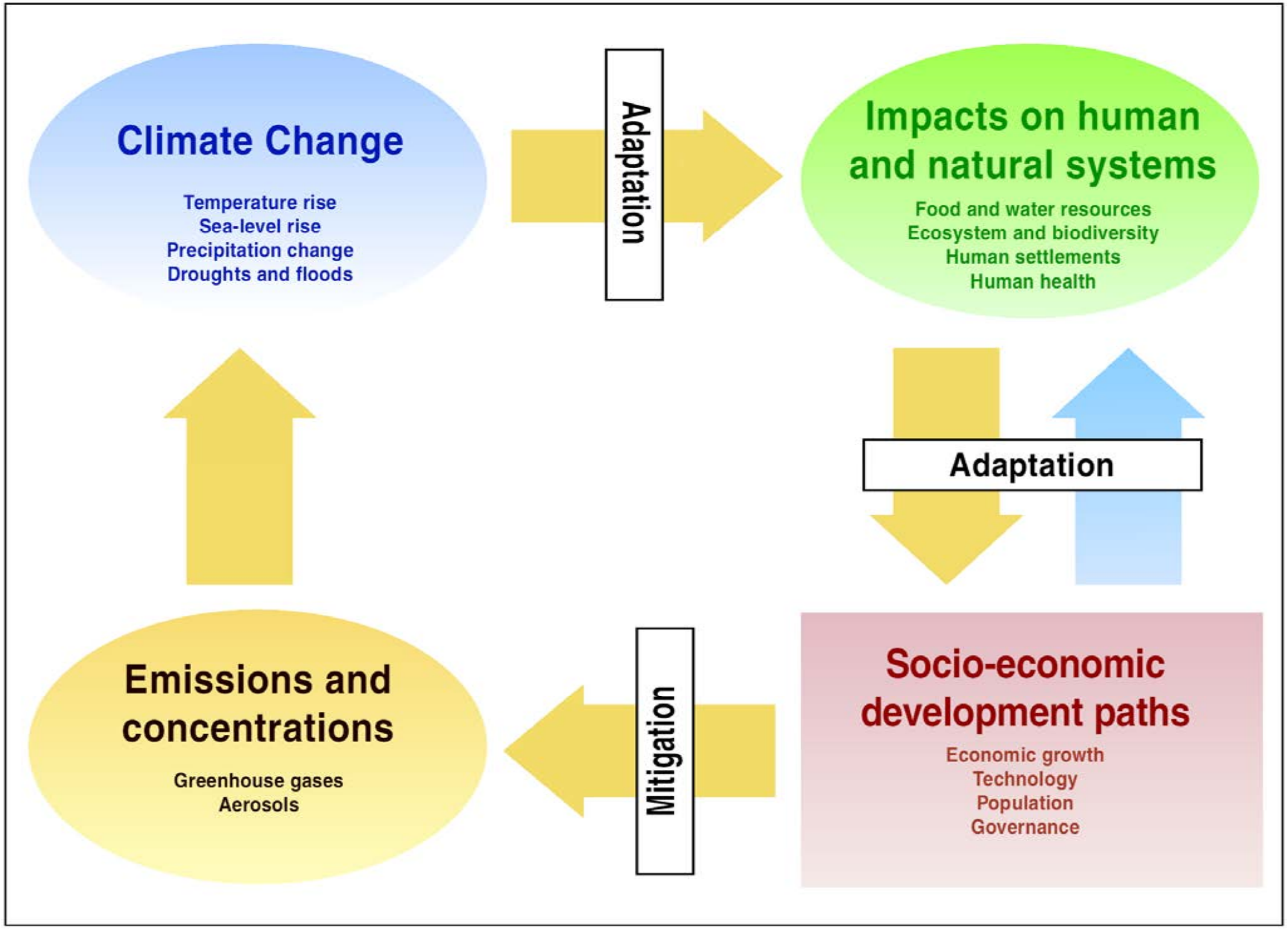
Observations vis-à-vis Simulations

Understanding "Climate" versus "Climate Change"

Integrated Climate Change Dimensions



Integrated Framework for Climate Change



What are Integrated Assessment Models?

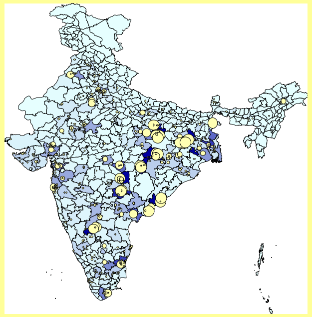
Example

Integrated Assessment Models for Climate Change Policy Analysis

AIM Model System

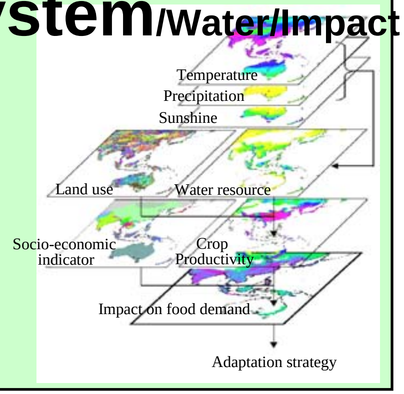
AIM/Energy/Technology/Country

A bottom-up technology selection model of energy use and emissions at country and local level



AIM/Ecosystem/Water/Impact

A set of ecosystem models, including a vegetation dynamics model, a water resource model, an agricultural productivity model and a health impact model



AIM/Bottom-up

A bottom-up technology & land use model for Asia-Pacific region

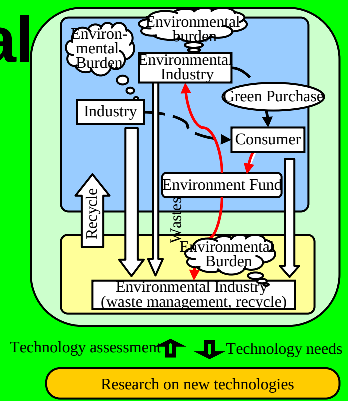
AIM Family

AIM/Top-down

A general-equilibrium-type world economic model

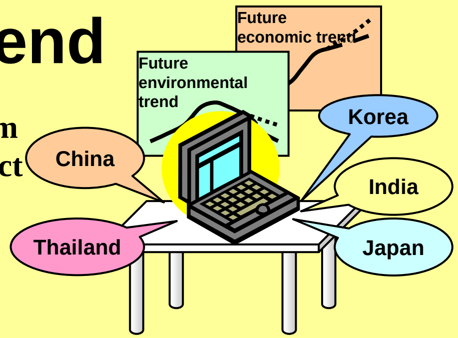
AIM/Material

A environment-economy integrated model with material balance and recycling process modules

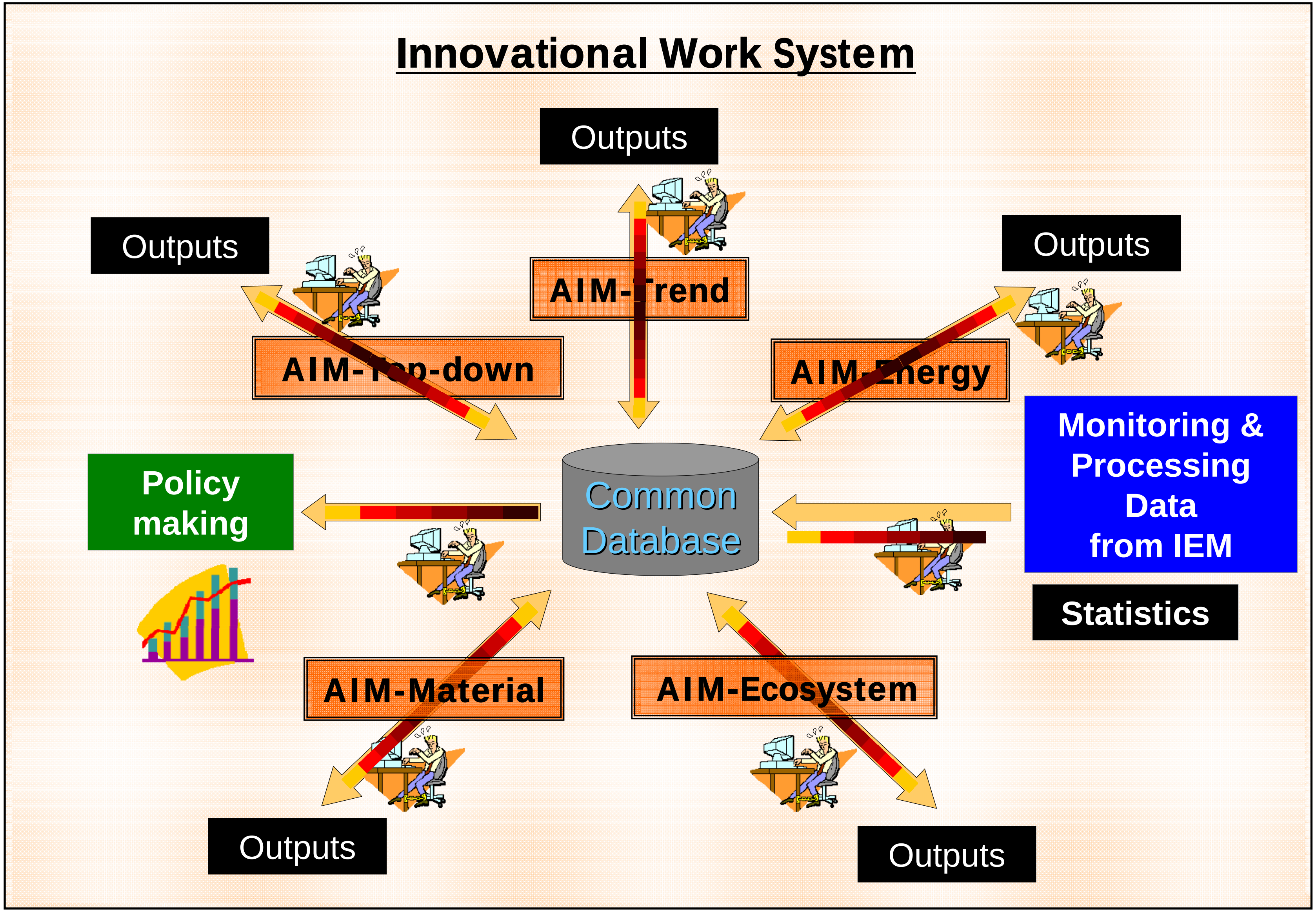


AIM/Trend

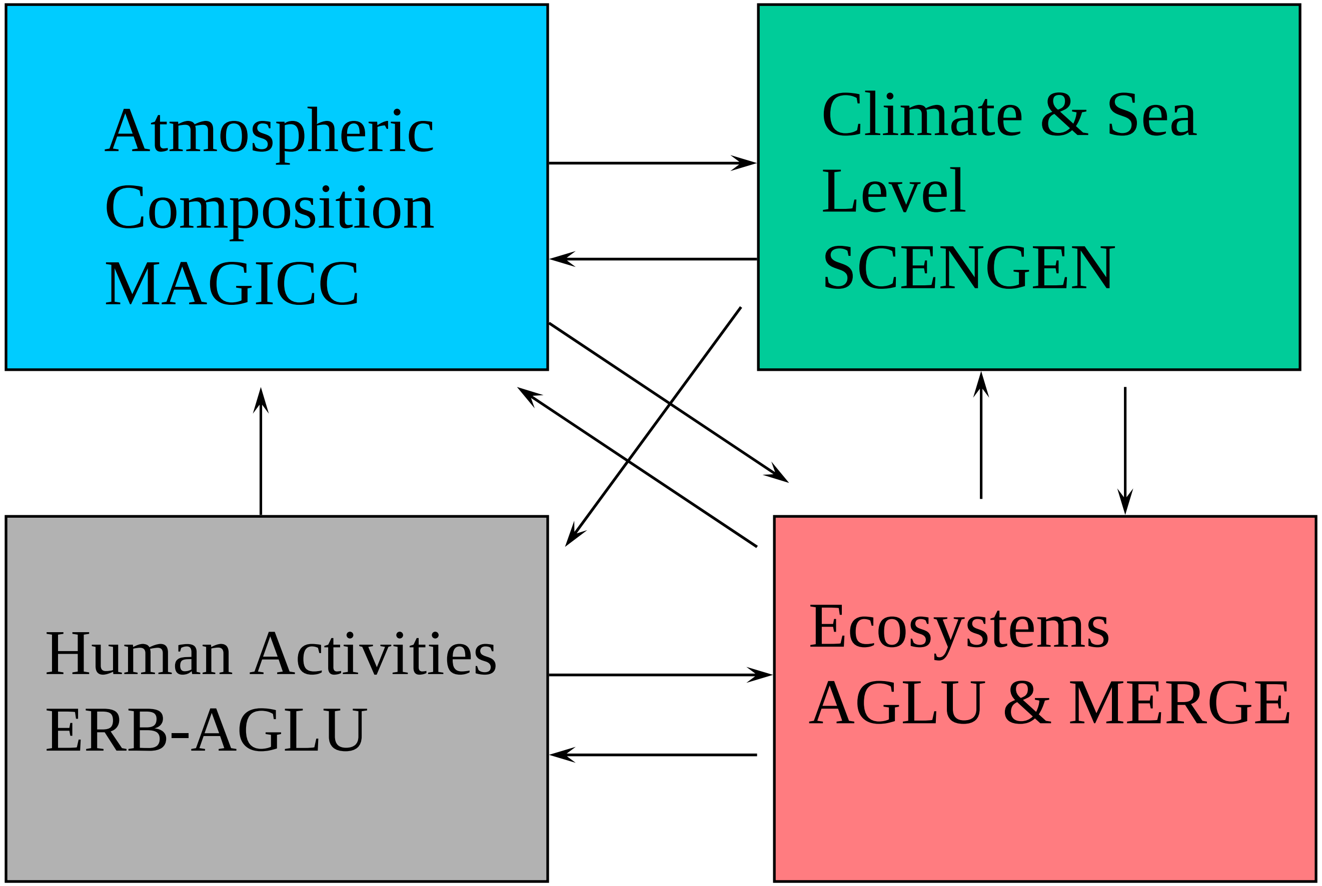
A reduced-form model to project future socio-economic trends and environmental change for all 42 countries



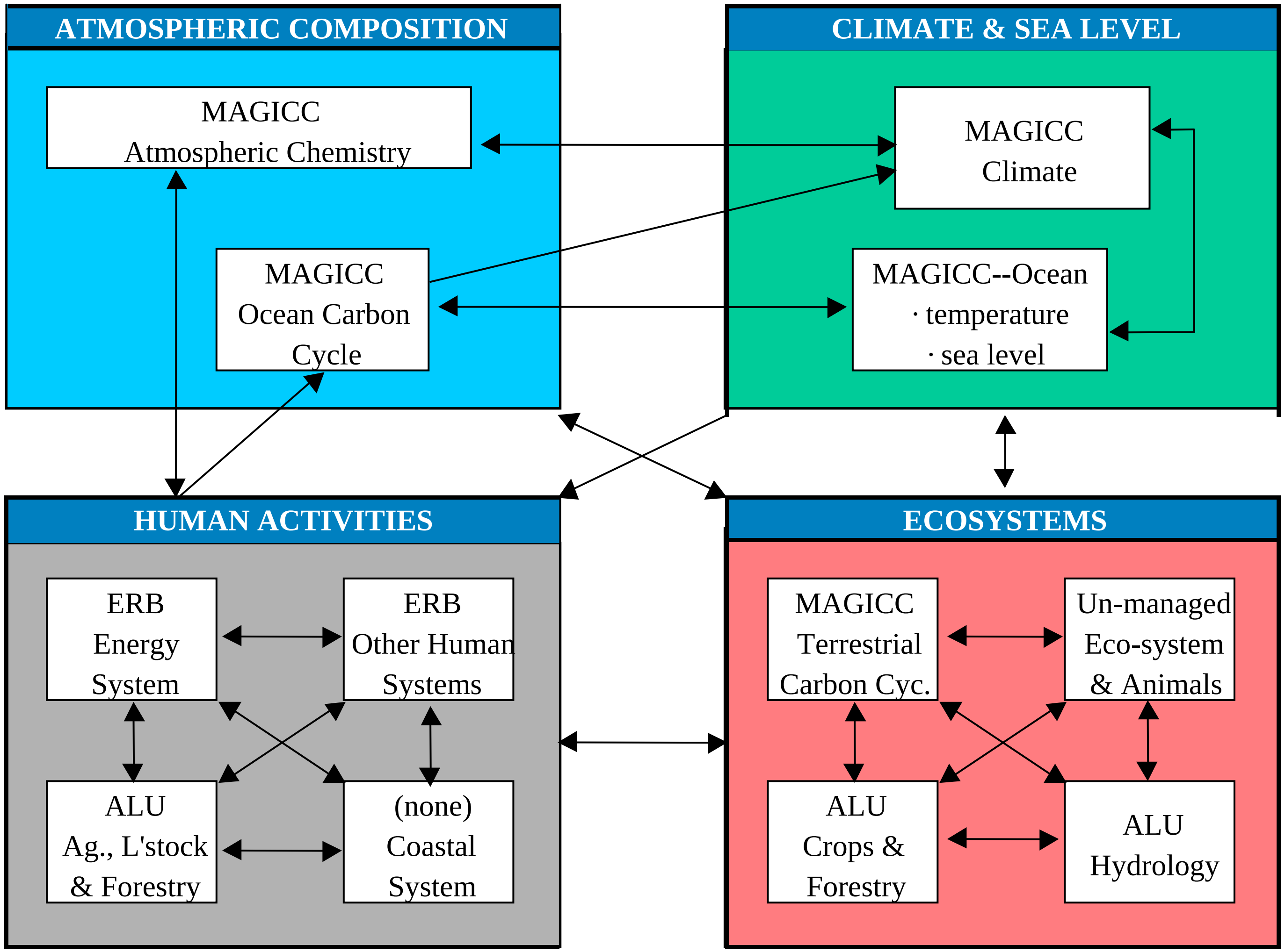
Strategic Database



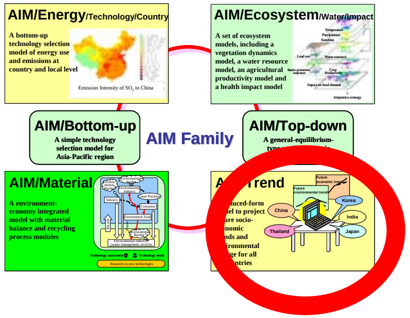
MiniCAM
An Integrated Modelling Framework



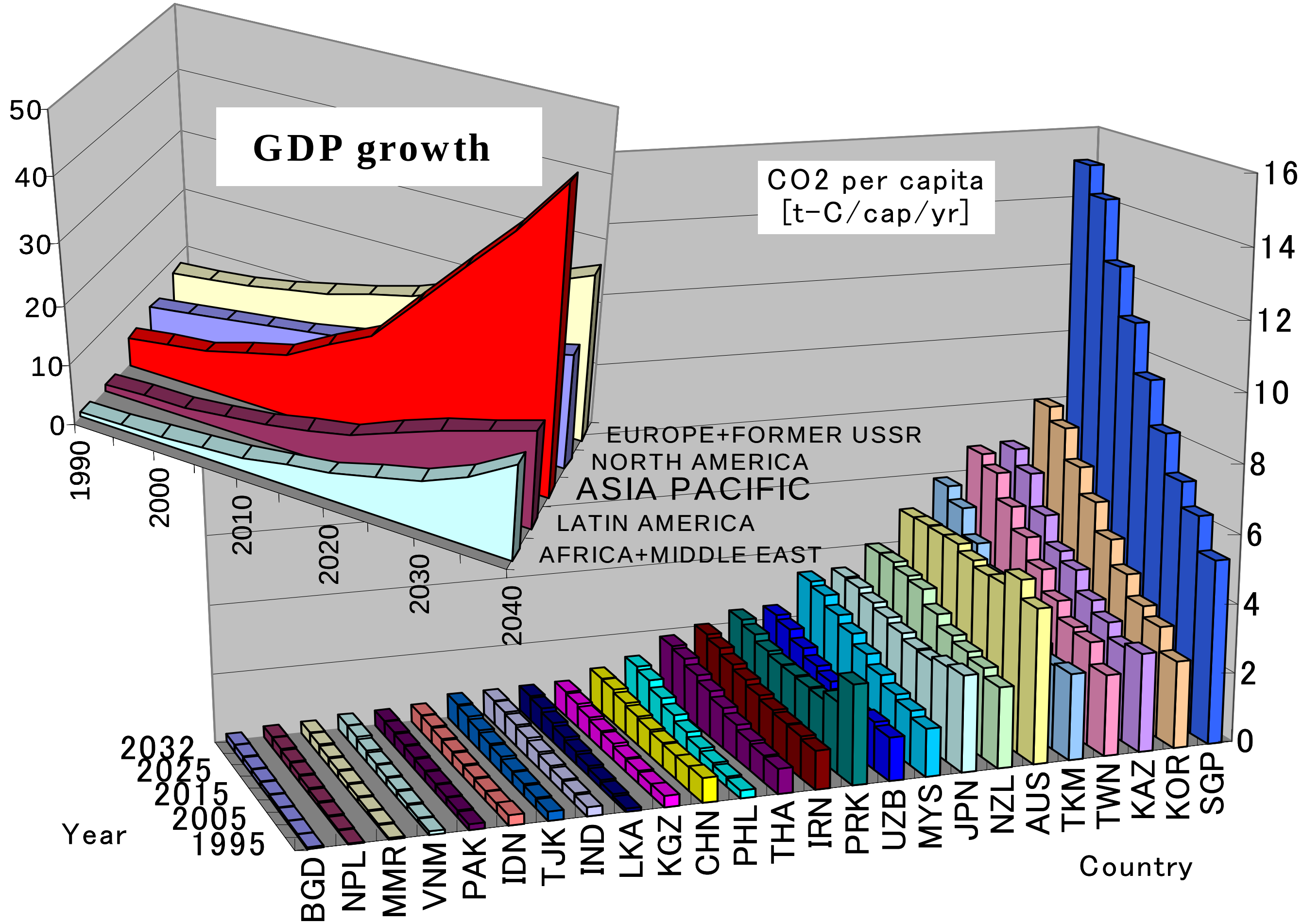
MiniCAM COMPONENTS

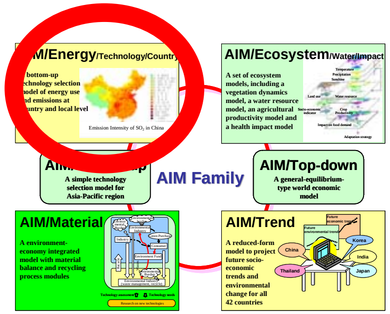


What are Component Models?



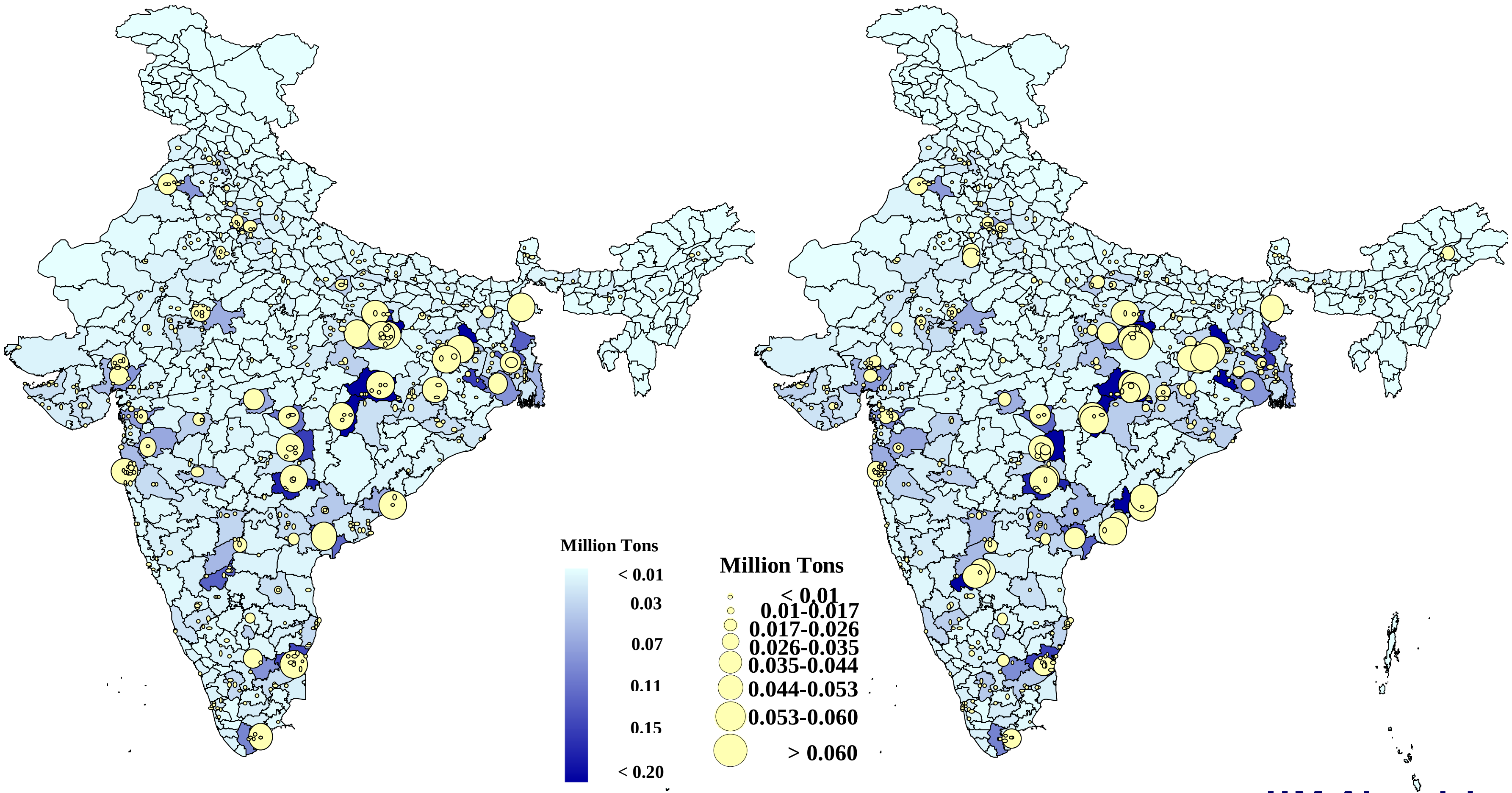
GDP and CO2 Emissions: AIM/Trend Model

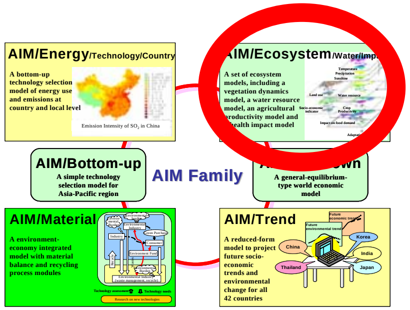




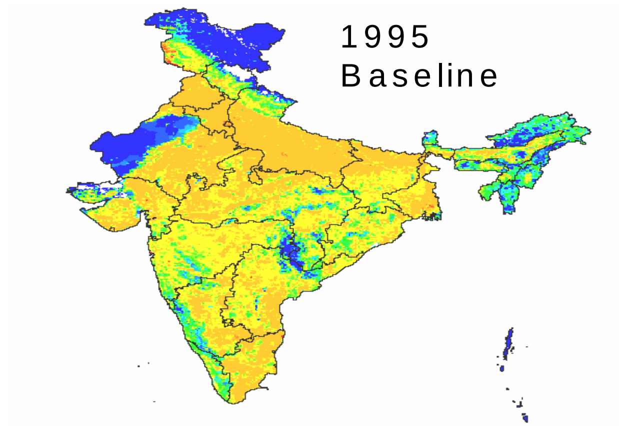
SO_2 Emission AIM/Emission Model

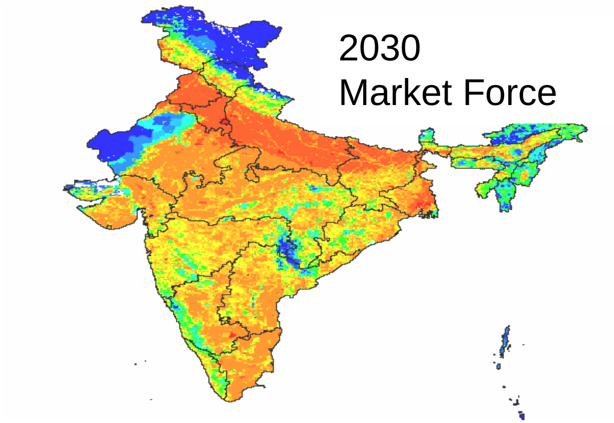
2000 | 2030

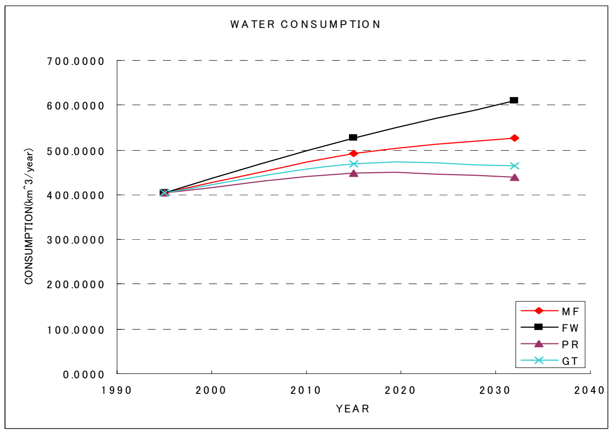


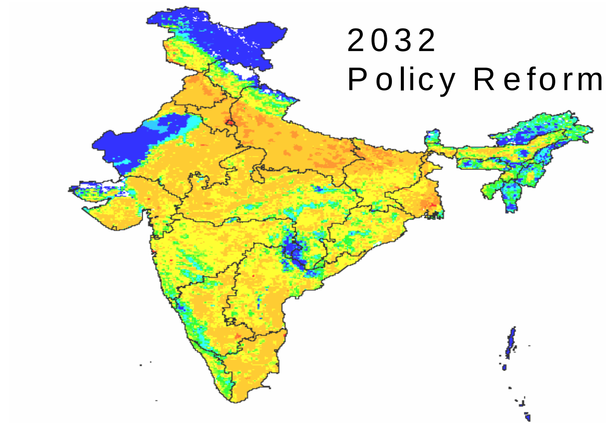


Water Consumption: AIM/Ecosystem Model

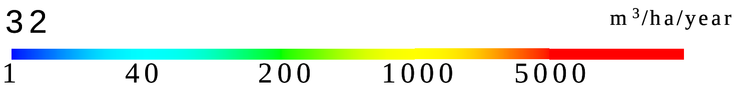




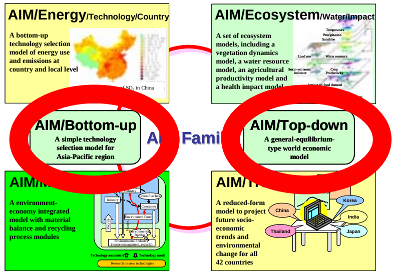




Change of water consumption from 1995 to 2032
(Domestic + Agriculture + Industry)



IIM Ahmedabad



AIM/Top-down & AIM/Bottom-up Model

World level

26 region – 36 sector
Computable General Equilibrium Model
(AIM/Top-down)

Country level

Bottom-up technology & land use Model (AIM/Bottom-up)

Bottom-up technology & land use Model (AIM/Bottom-up)

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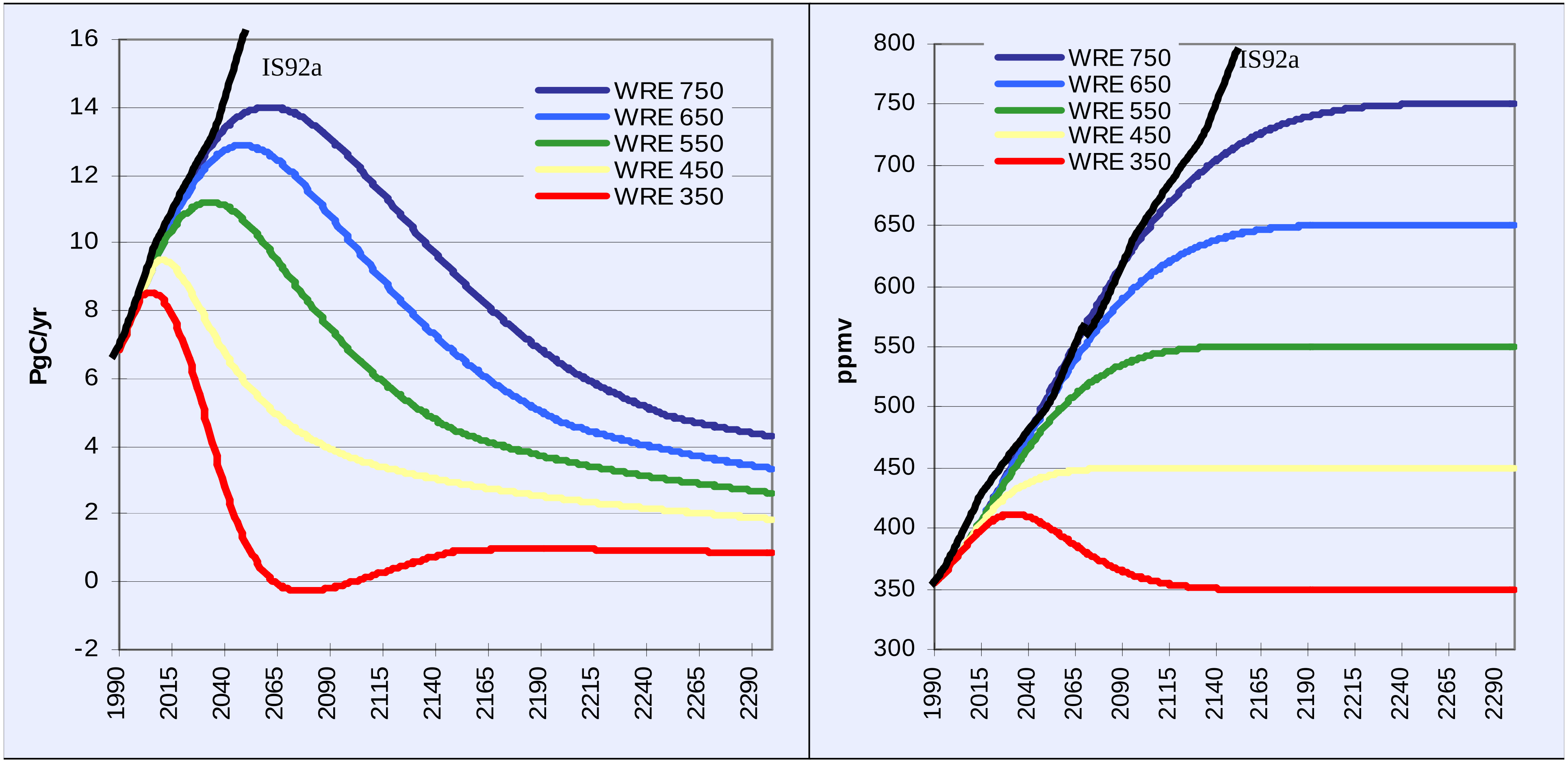
Bottom-up technology & land use Model (AIM/Bottom-up)

Insights from

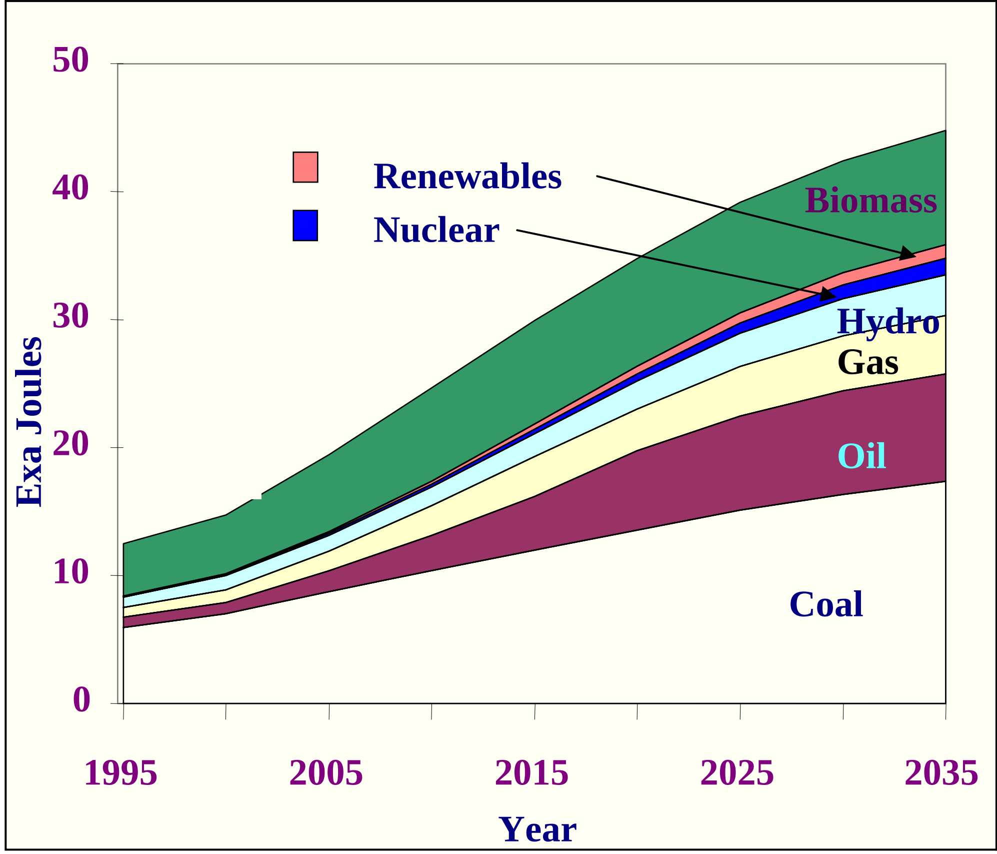
Integrated Climate Change Assessment

Emissions and Concentrations

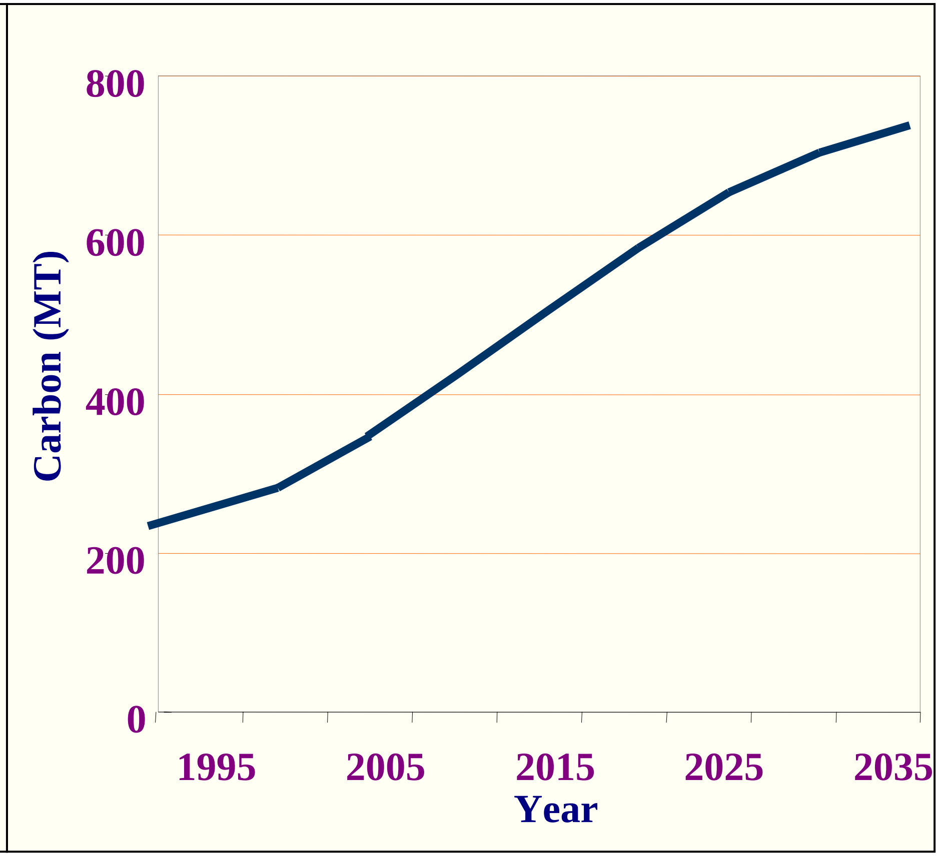


Energy and Carbon Emissions for India: AIMENDUSE Model

Energy Consumption

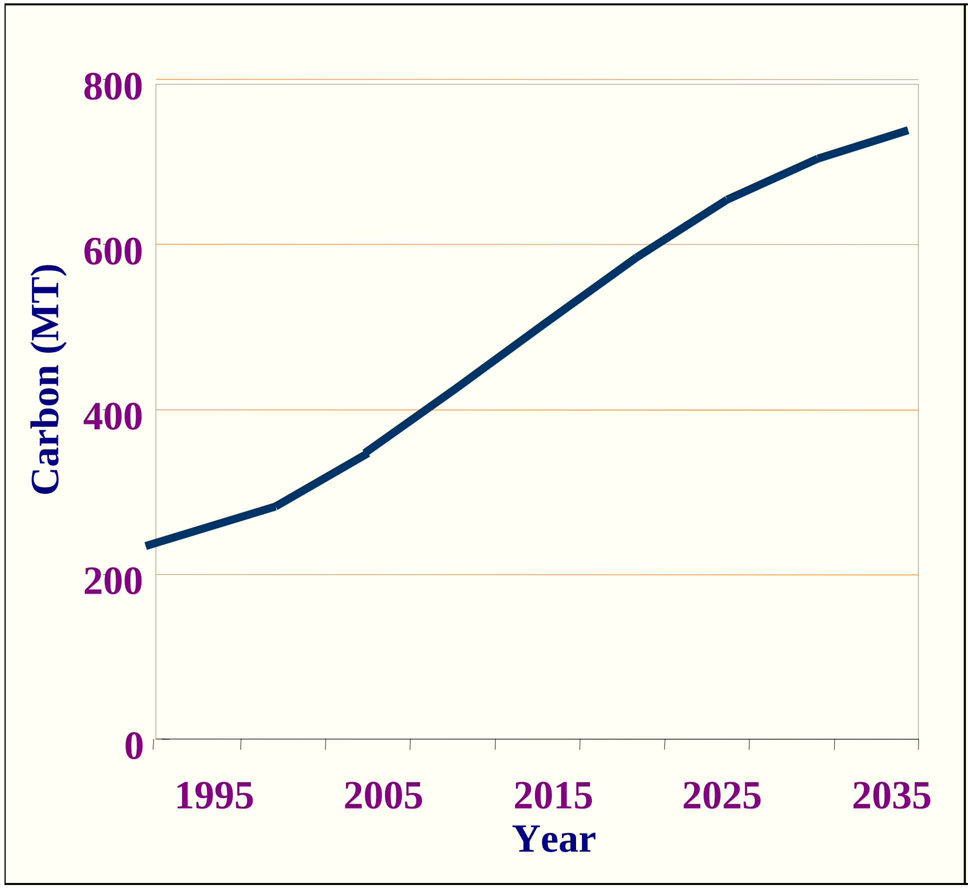


Carbon Emissions

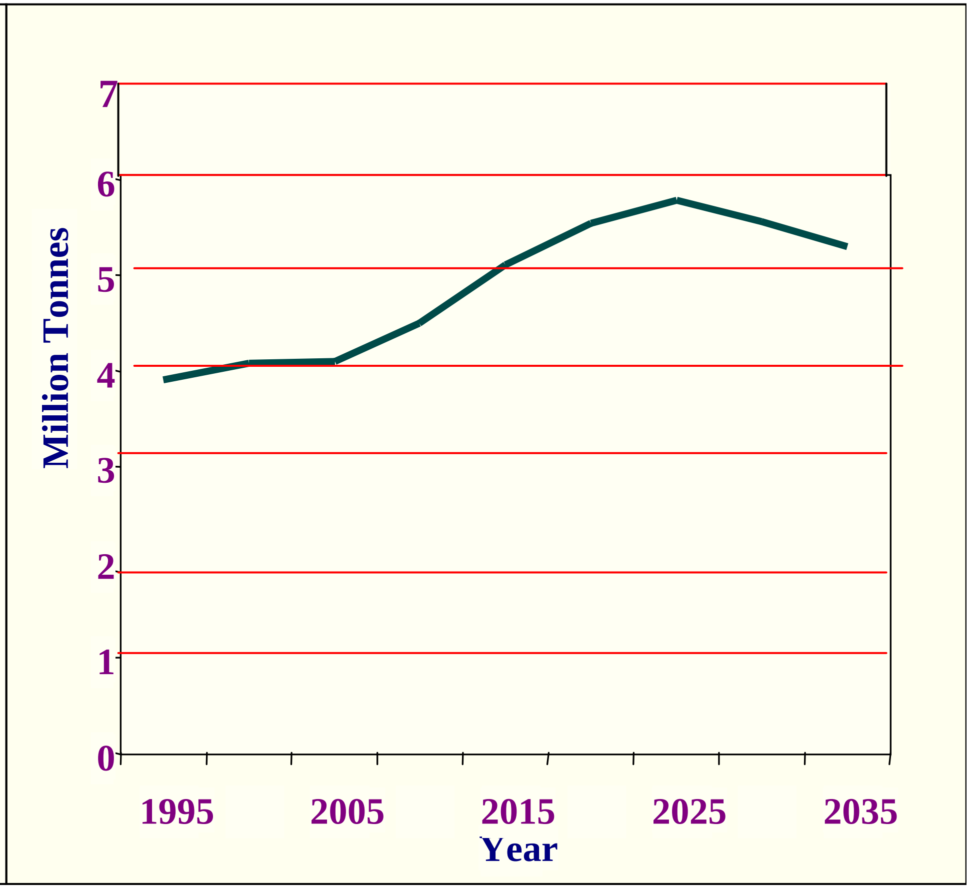


GHG versus Local Emissions in India

Carbon Emissions

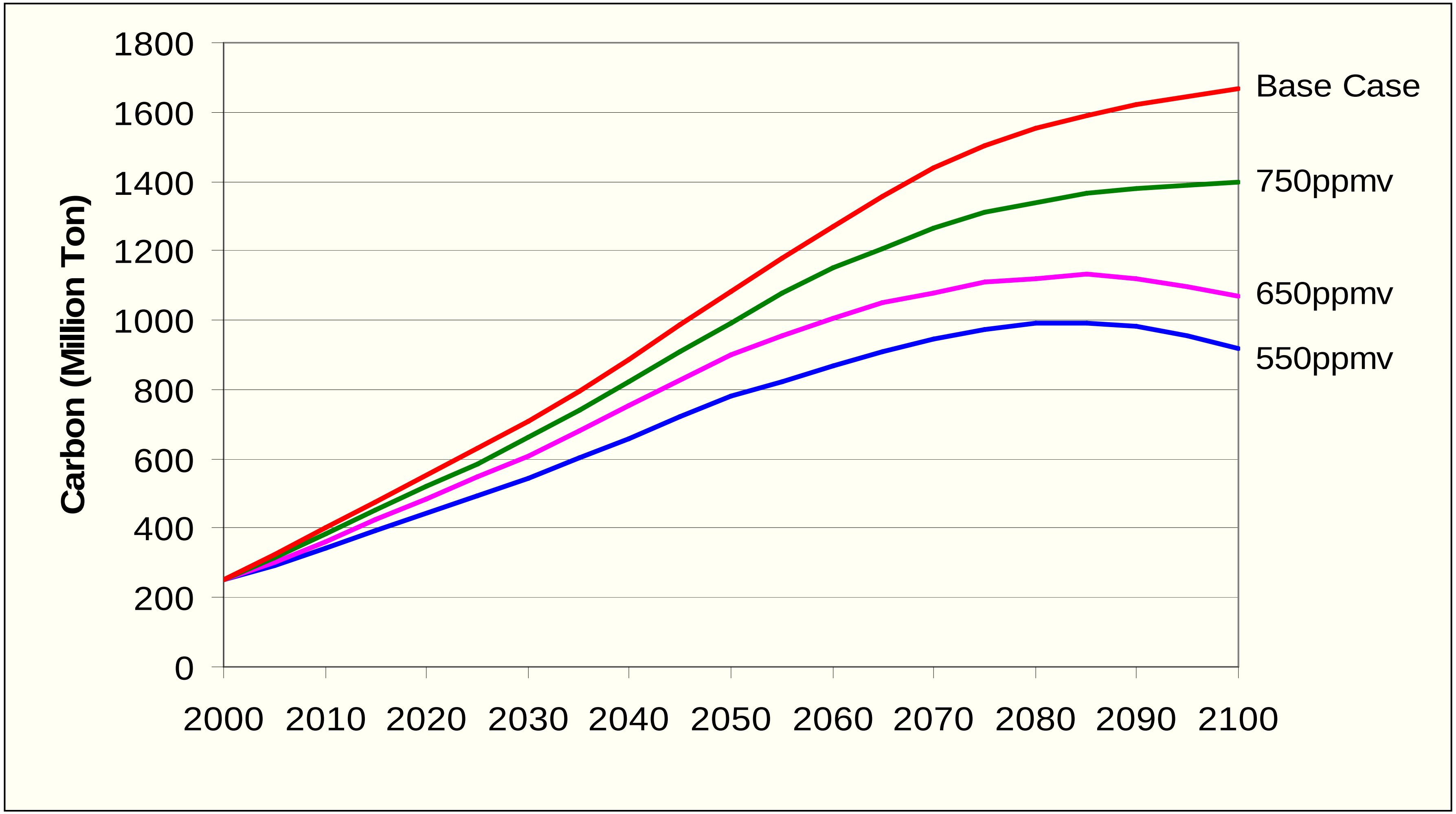


SO_2 Emissions

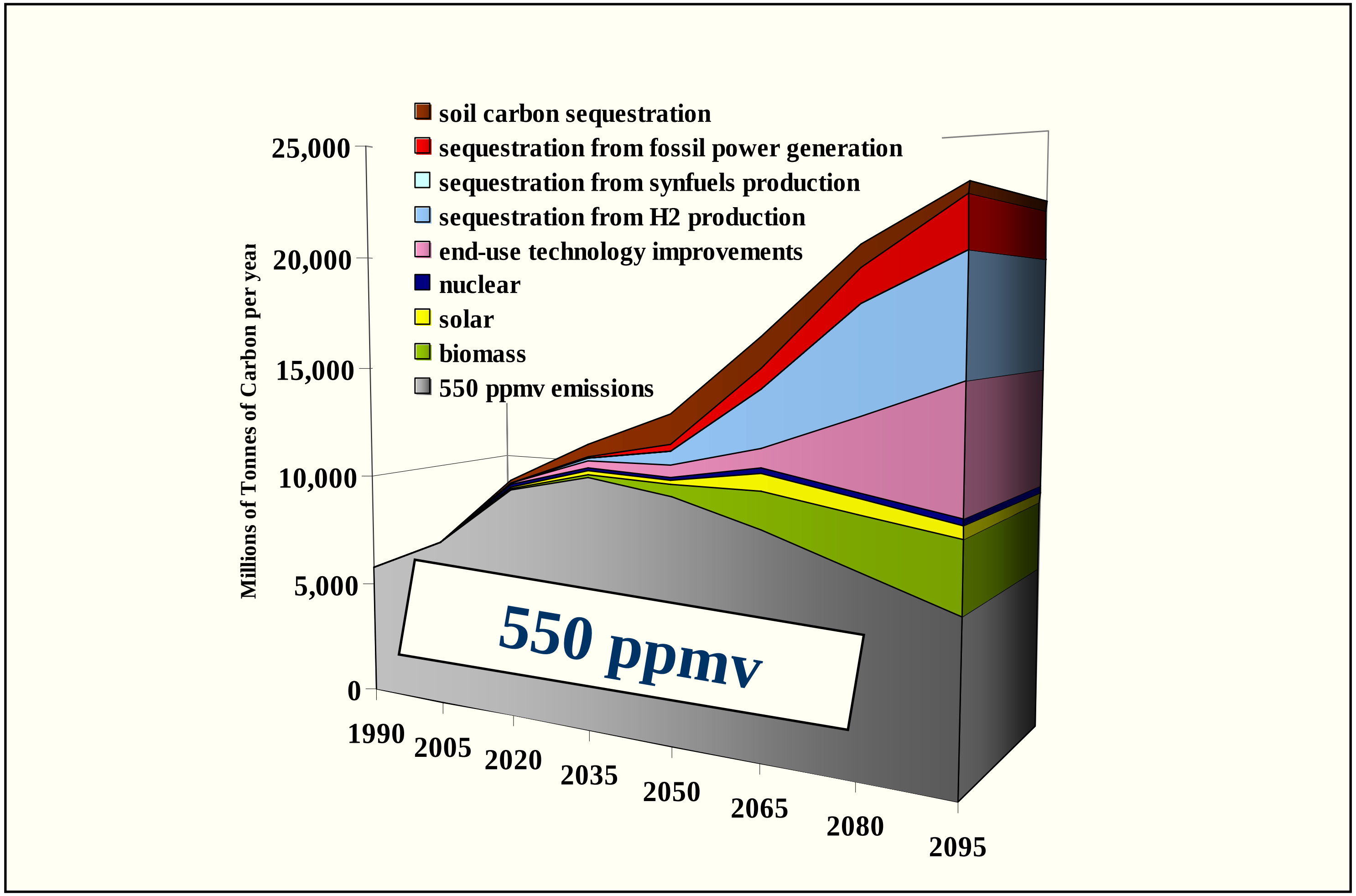


Global Carbon Mitigation Scenarios

(2000 - 2100)

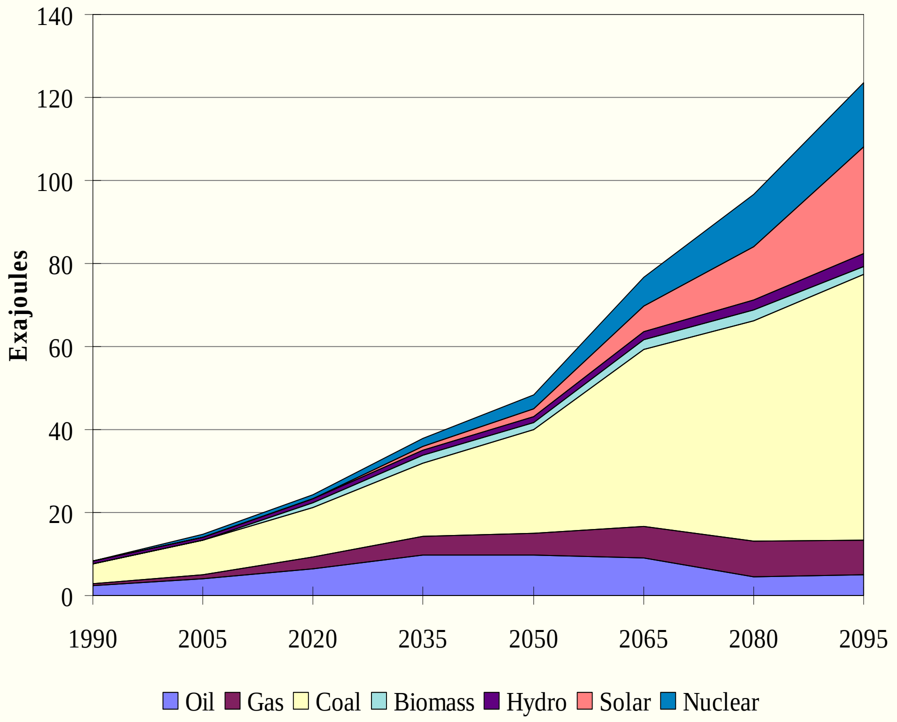


Technology, Energy & Climate: MINICAM

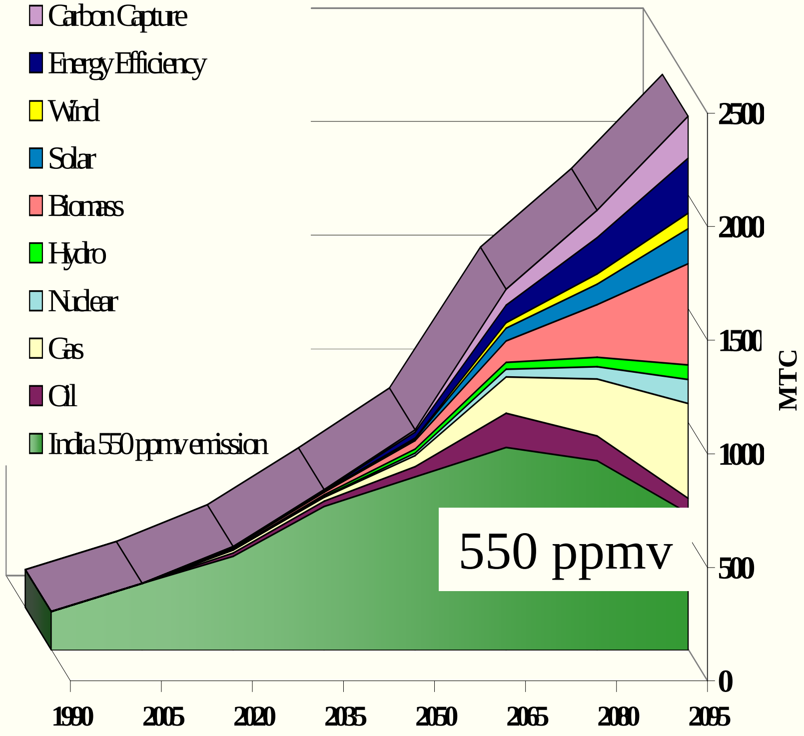


Indian Energy System Transformation Under 550 ppmv Stabilization

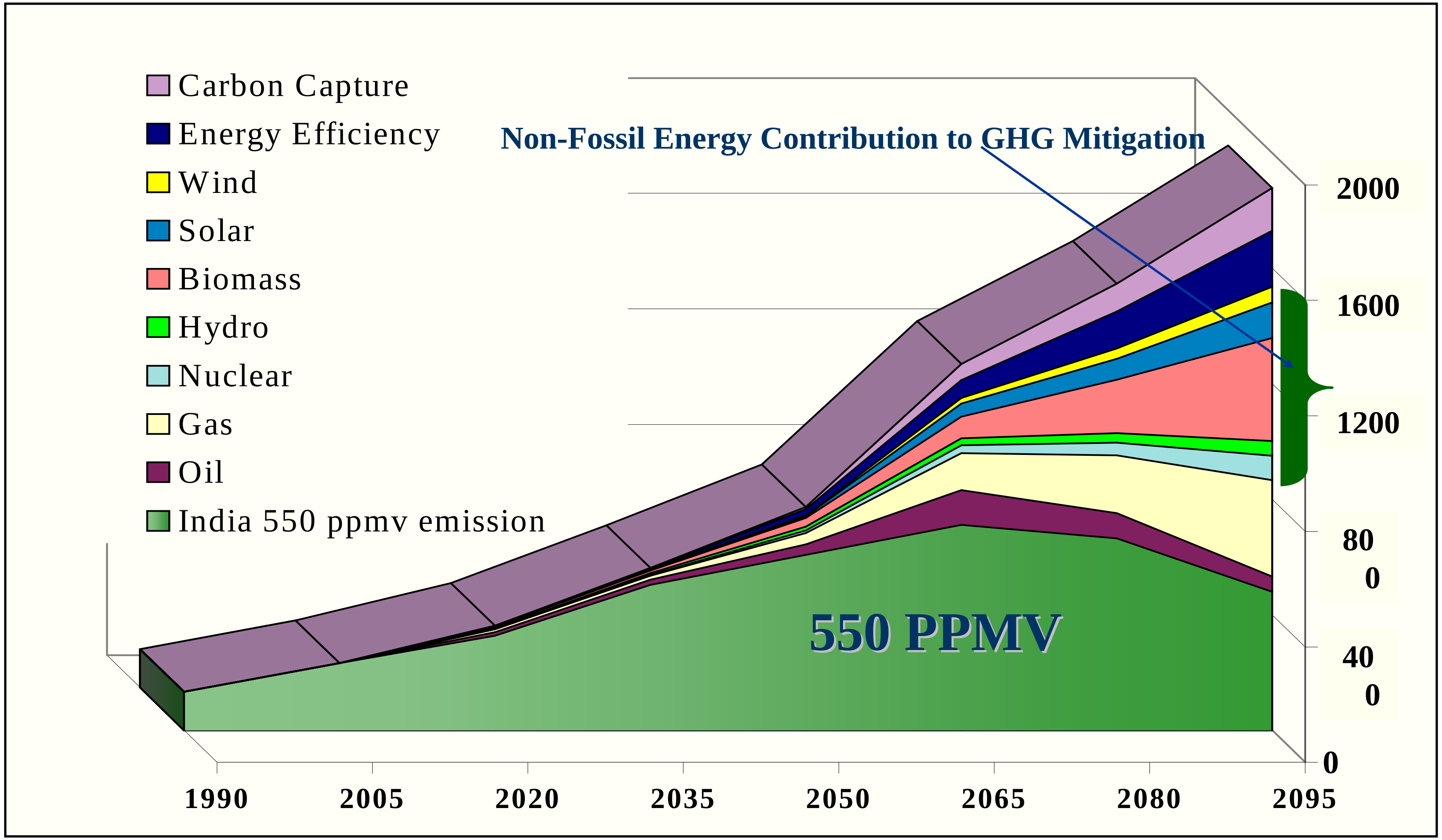
Base Case Energy System



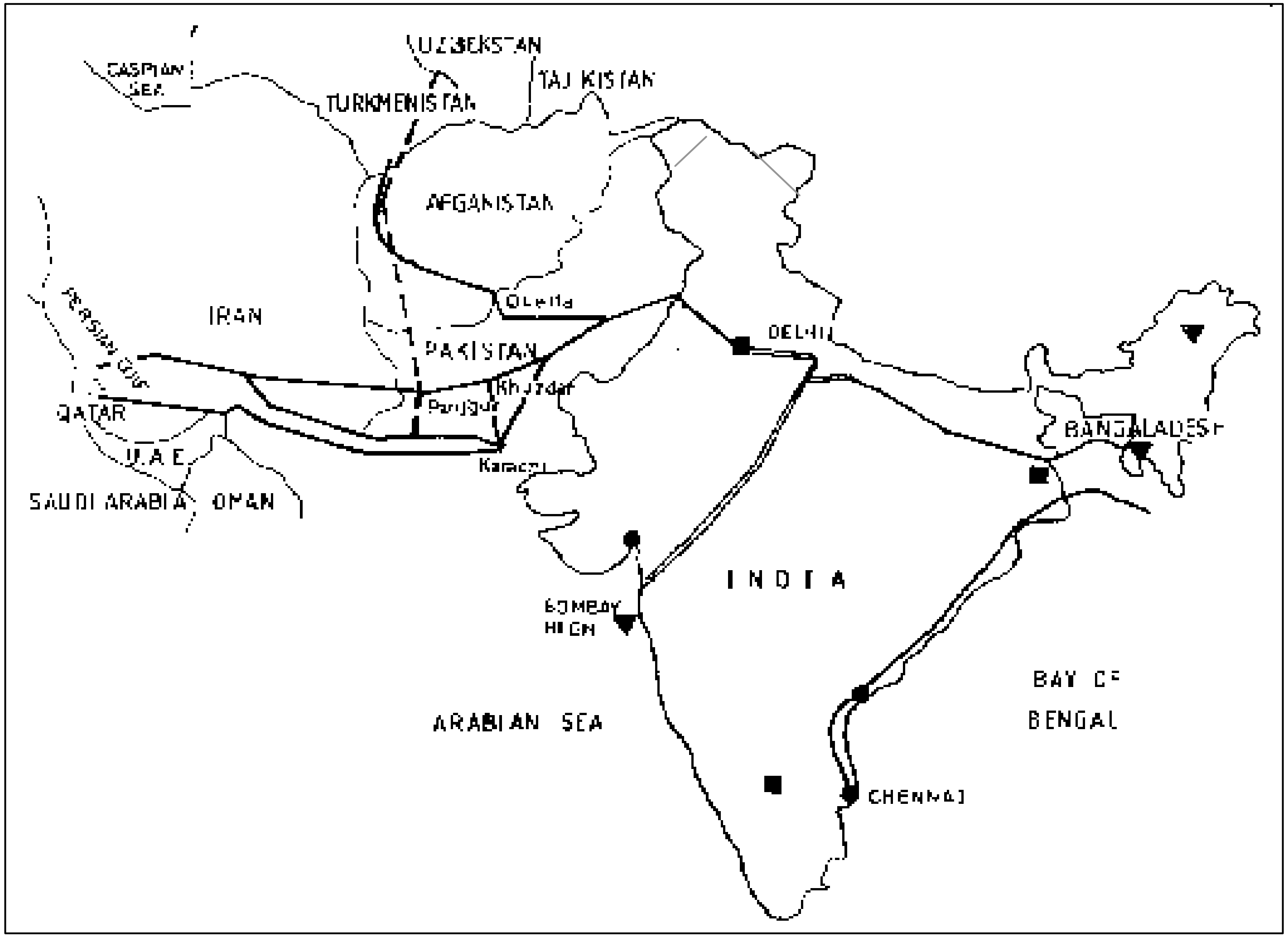
Energy Changes: 550 ppmv Case



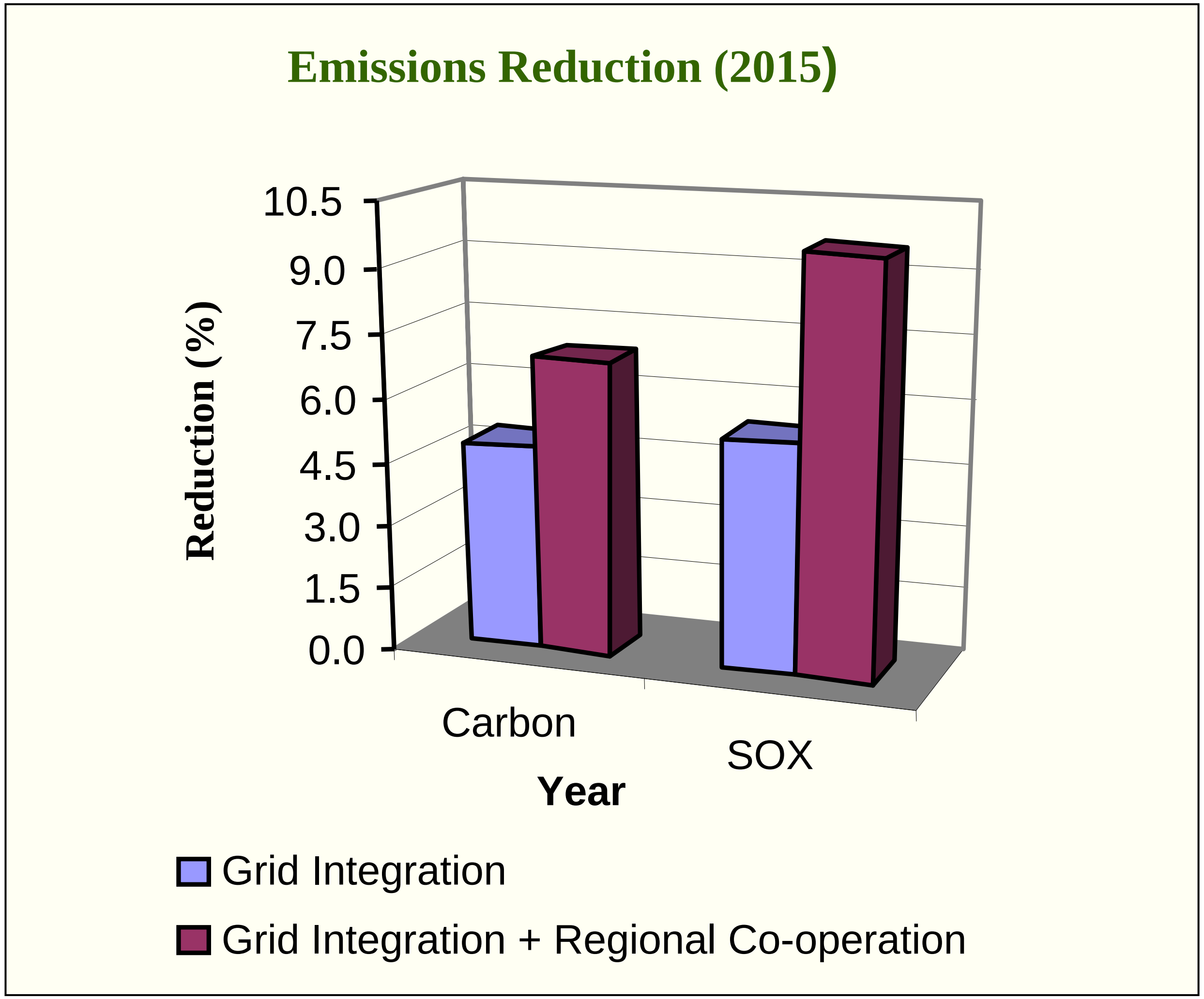
Technological Change in India to Stabilize CO_2 at 550 ppmv



Regional Energy Market Development



Impact of Regional Energy Market Developments in South-Asia



Why and What kind of Capacity Building for Integrated Environment Assessment in Developing Countries?

Integrated Environment Assessment: Developing Country Problems

- Assessment and modeling capabilities
- Inadequate database
- Structural changes in the economy
- Myriad and conflicting developmental concerns
- Weak regional and international linkages
- Lack of sustained funding

Limitations of Present Approaches

- Limited capability to characterize and parameterize long term interactions between the economy, society, and environment
- Assumptions derived from developed world perspective
- Inability to characterize discontinuities and extreme events
- Weak behavioral interfaces
- Distance between analysts and policy makers

Capacity Building Needs for Developing Countries

- Inventorize existing best competence, data and experiences
- Networking and cooperation with regional and global teams
- Promote integrated assessment modeling under developing country expert leadership in cooperation with global experts
- Sustained funding
- Institutionalize integrated assessment activities