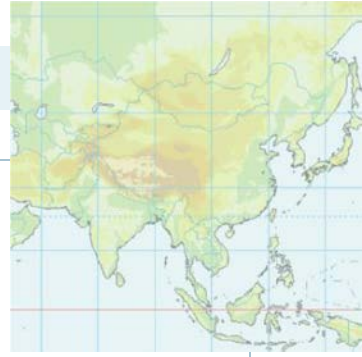


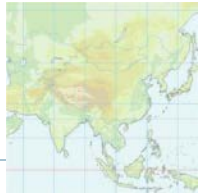
Climate studies in India & expectations from AIM:

Research topics and future collaboration

P.R. Shukla
Indian Institute of Management
Ahmedabad, India

Presented at
15th AIM International Workshop
Tsukuba, February 20-22, 2010

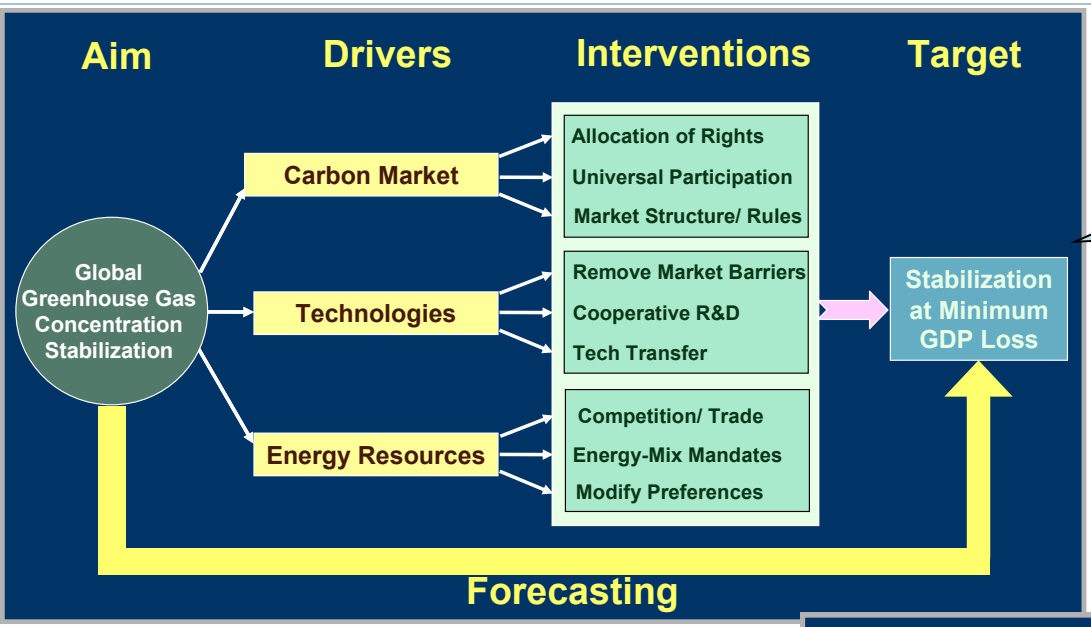
Agenda



1. New Scenarios Development
2. Component Models (& Integration)
3. Model Applications
4. Policy Assessment
5. Research Cooperation
6. Dissemination

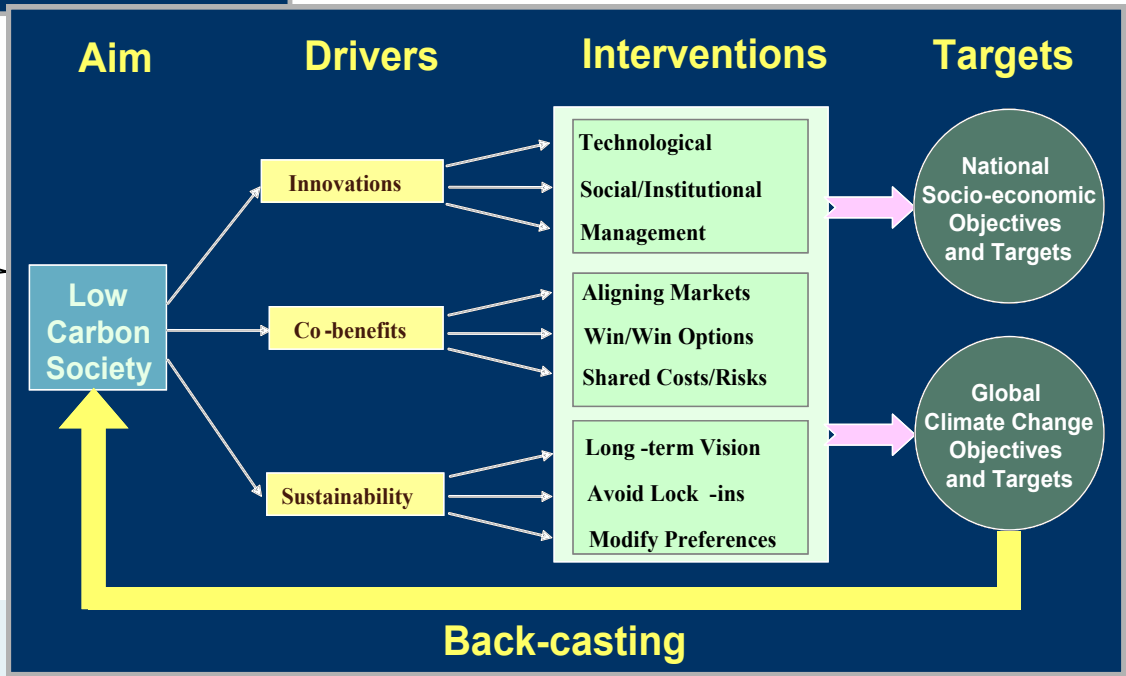
New Scenarios Development

Alternate Development Perspectives



Conventional Climate Centric Paradigm

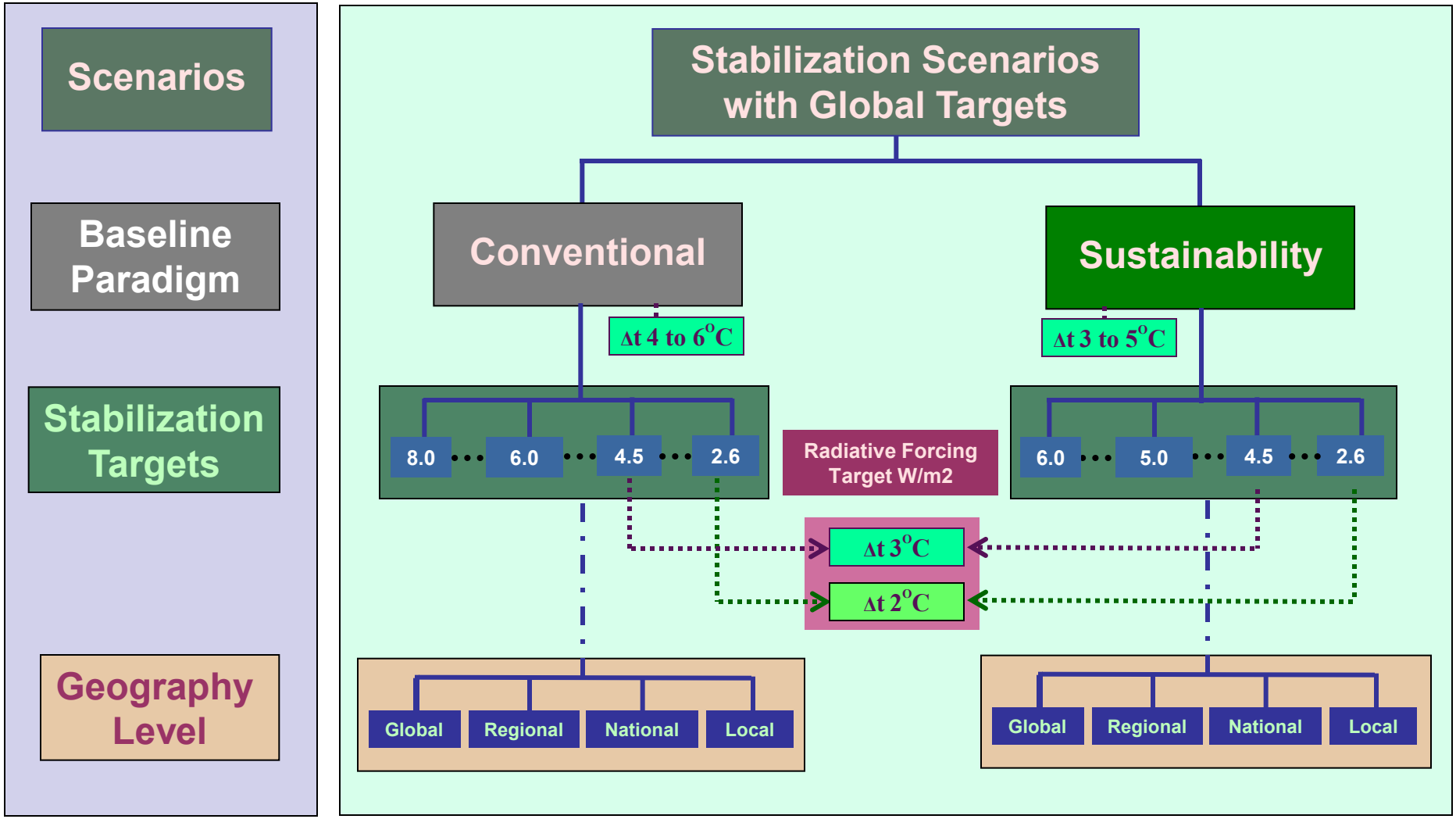
Sustainable Development and Climate Paradigm



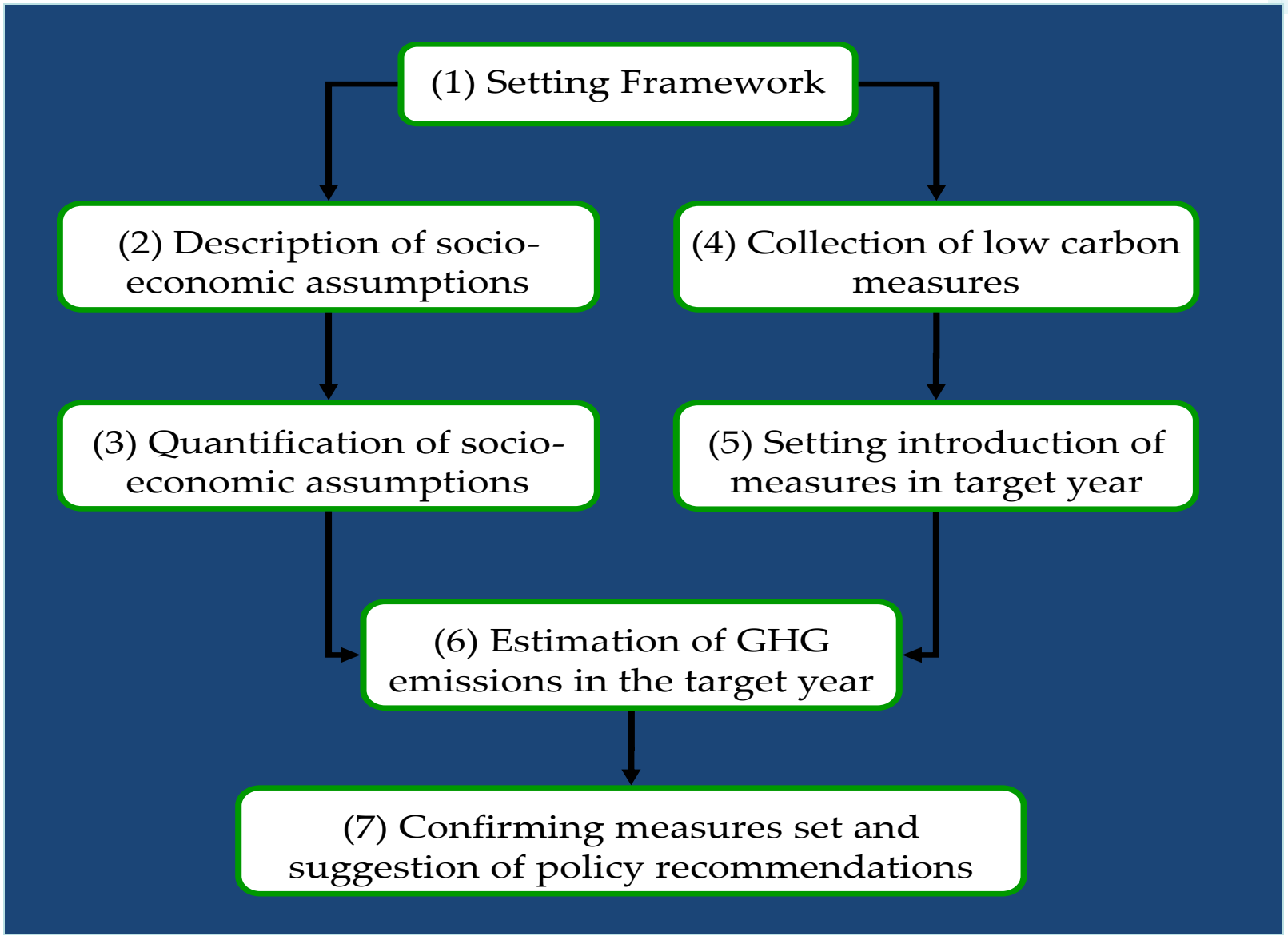
LCS Scenarios with Sustainability

- **Focus on:**
  - Mainstreaming climate actions in development plans/policies/processes
  - Behavioral Changes, Innovations, Co-benefits and Co-operation
  - Up-front decisions to avoid long-term lock-ins
- **Sustaining Capital Stocks**
  - Natural, Man-made, Human & Social
- **Use Systems Approach for Analysis**
  - Integration, Holistic/Long-term Vision, Dynamic Assessment
- **Interventions to influence Drivers of Change**
  - Assess and influence Processes
  - Institutions (to reduce transaction costs/risks and to sustain change)
- **Shaping Stakeholder and Societal Preferences**
  - Information, Awareness, Debates to arrived at informed choices

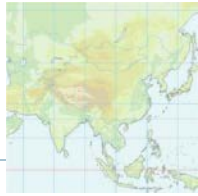
Global Climate Stabilization Scenarios



Local Scenario Development (ExSS)



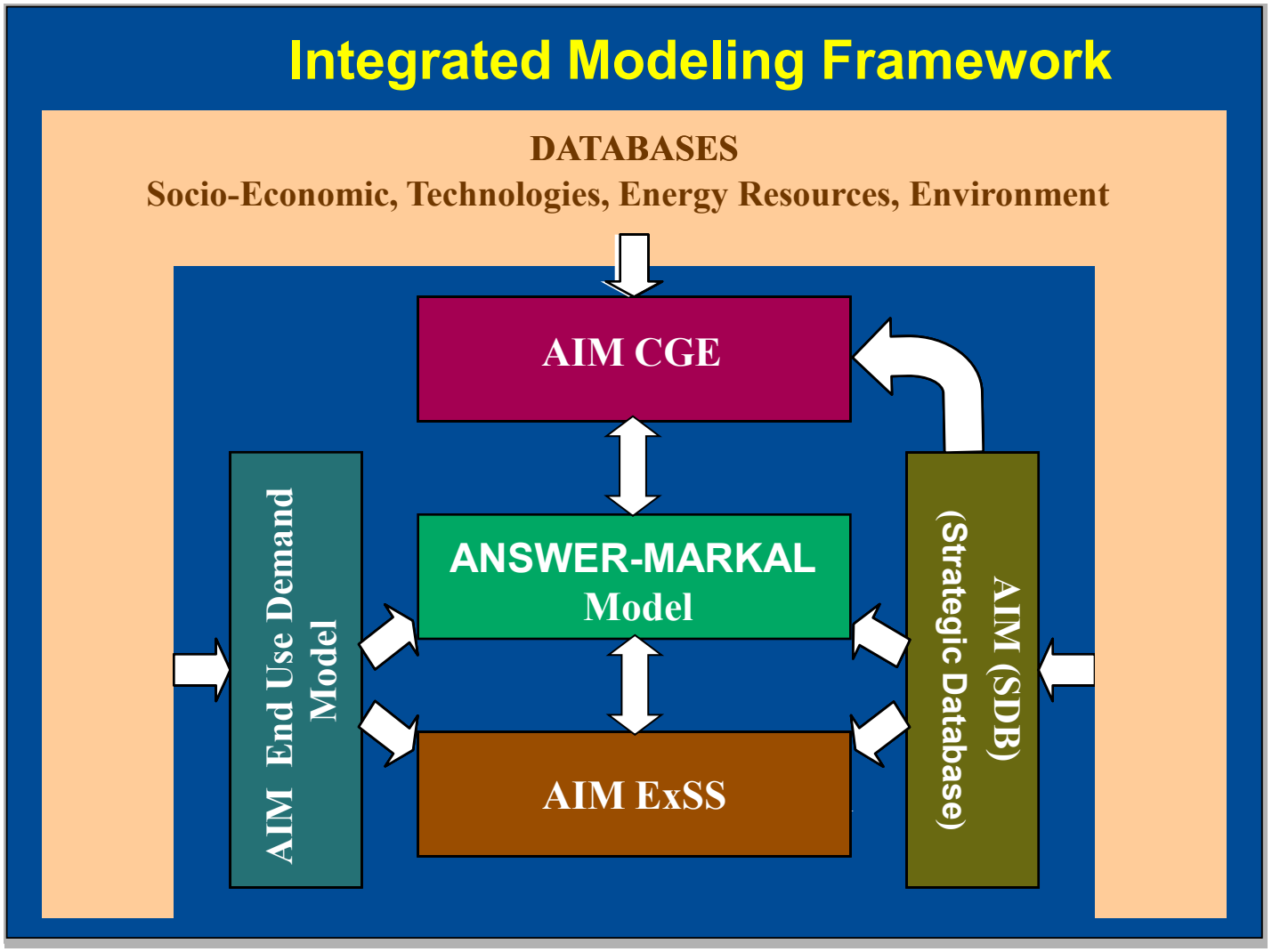
Scenarios: Research Cooperation



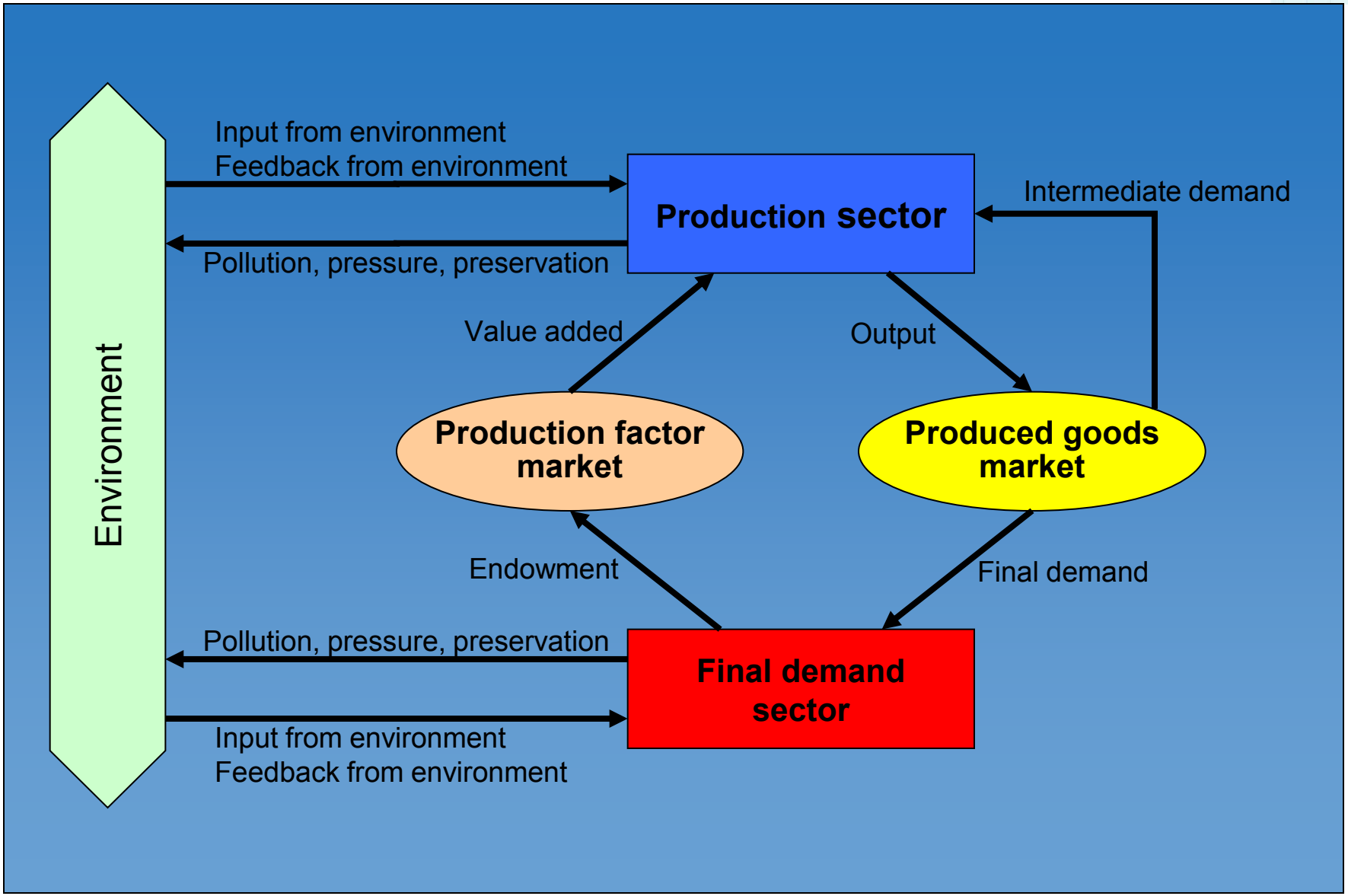
1. IPCC New Scenarios Process
2. Asia Modeling Forum
3. LCS Asia Project
4. Indian National Scenario Exercises
5. City Level Scenarios
6. Sector Scenarios
7. Scenario Database

Component Models (& Integration)

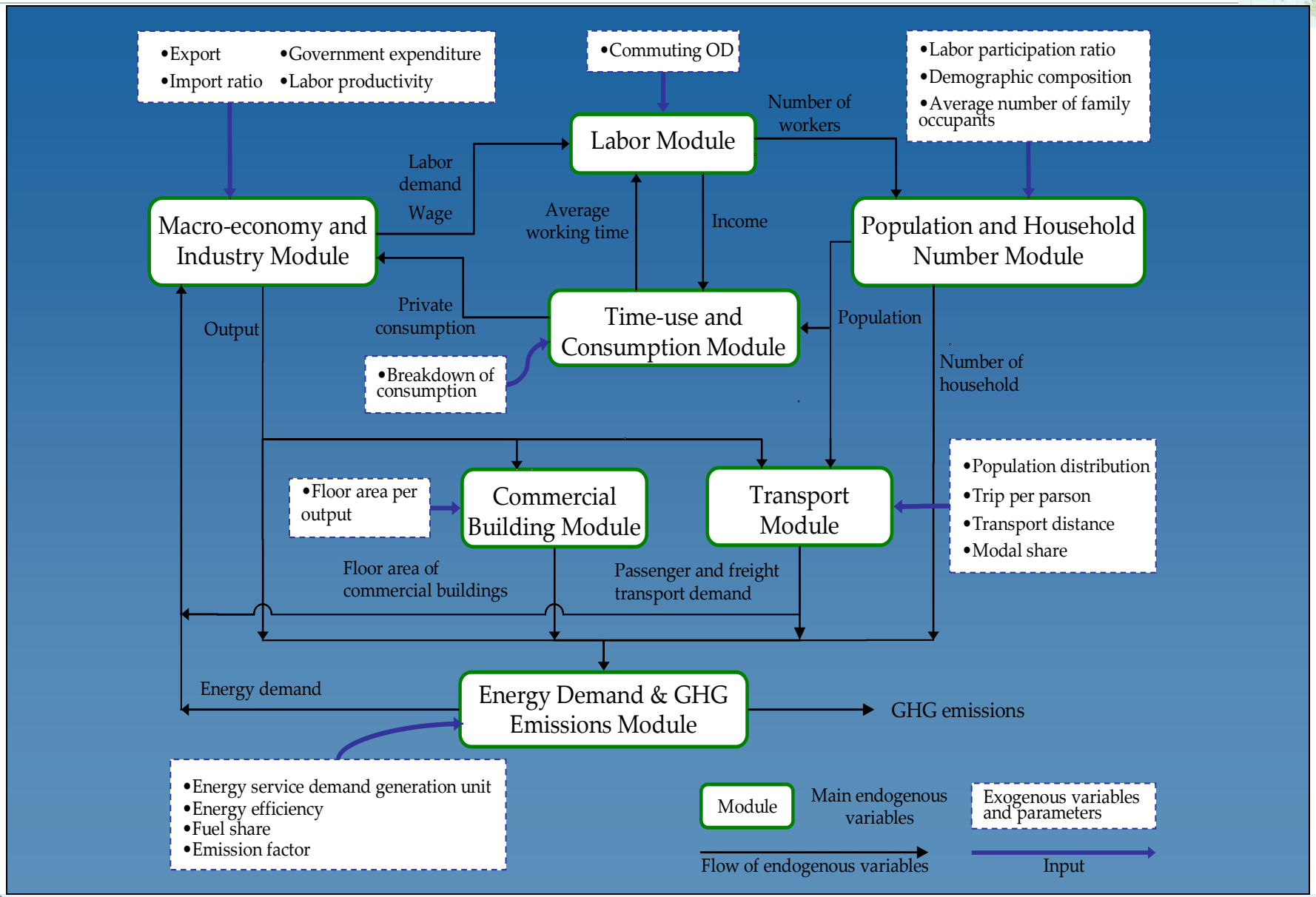
Integrated Modeling Framework



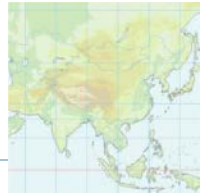
AIM CGE Model



Extended Snapshot Tool



Models Development & Training

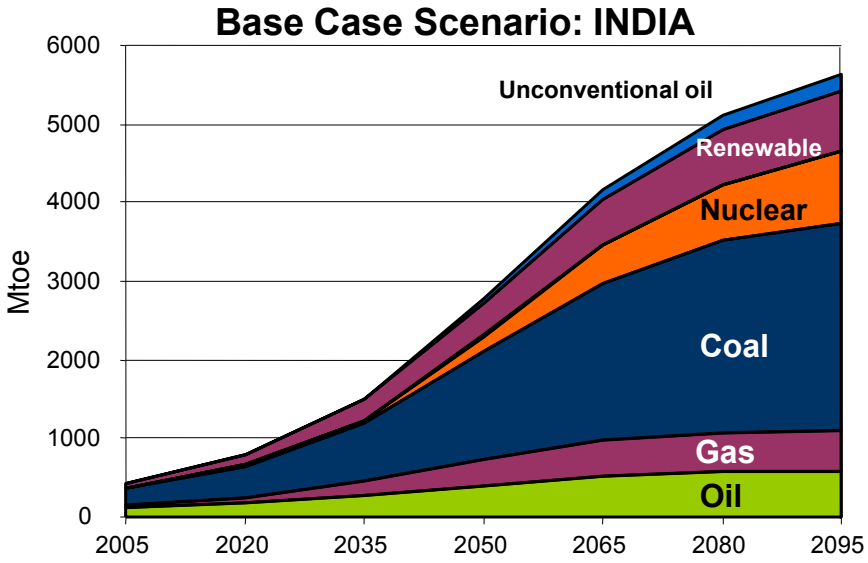


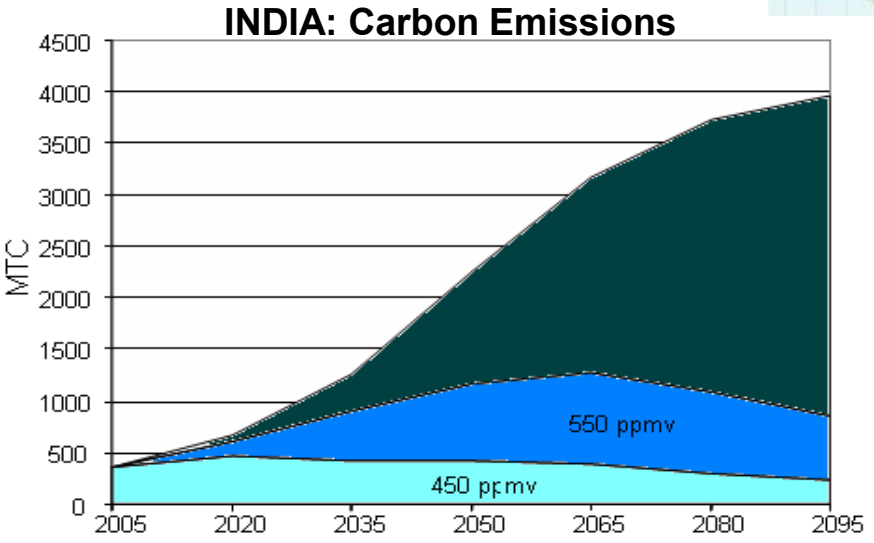
1. Global Integrated Assessment Model
2. Regional Integrated Assessment Model
3. Local Mitigation Models
4. Sector Mitigation Models
5. Impact & Adaptation Data & Models
6. Climate Data Monitoring & Modeling

Model Applications:

- **Geography**
  - **Global, Regional, National, Local (City)**
- **Sector**
  - **Transport, Power, Industries, Residential, Agriculture**

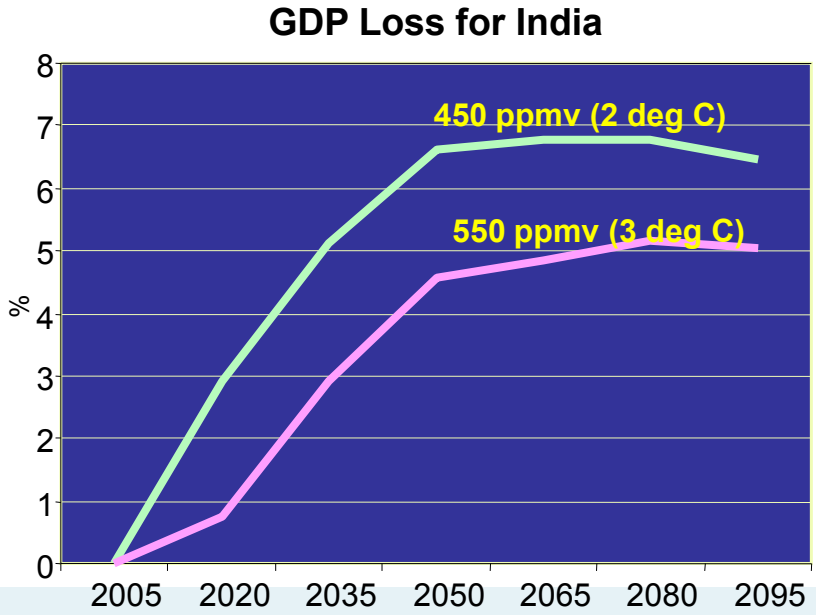
Global & National Analysis: GCAM & AIM/CGE





Electricity Production (in EJ) and CCS Share (in %)

		2005	2035	2065	2095
Total Electricity Production (in EJ)	BAU	2.55	12.43	43.14	65.43
	450 ppmv	2.55	10.78	43.86	67.35
	550 ppmv	2.55	10.51	39.58	61.91
Coal w/CCS (in %)	450 ppmv	0.00	29.71	36.20	33.38
	550 ppmv	0.00	6.20	21.31	29.08
Gas w/CCS (in %)	450 ppmv	0.00	5.38	5.06	4.03
	550 ppmv	0.00	1.63	2.75	2.85
Biomass w/CCS (in %)	450 ppmv	0.00	5.72	10.67	11.83
	550 ppmv	0.00	0.71	3.19	5.54

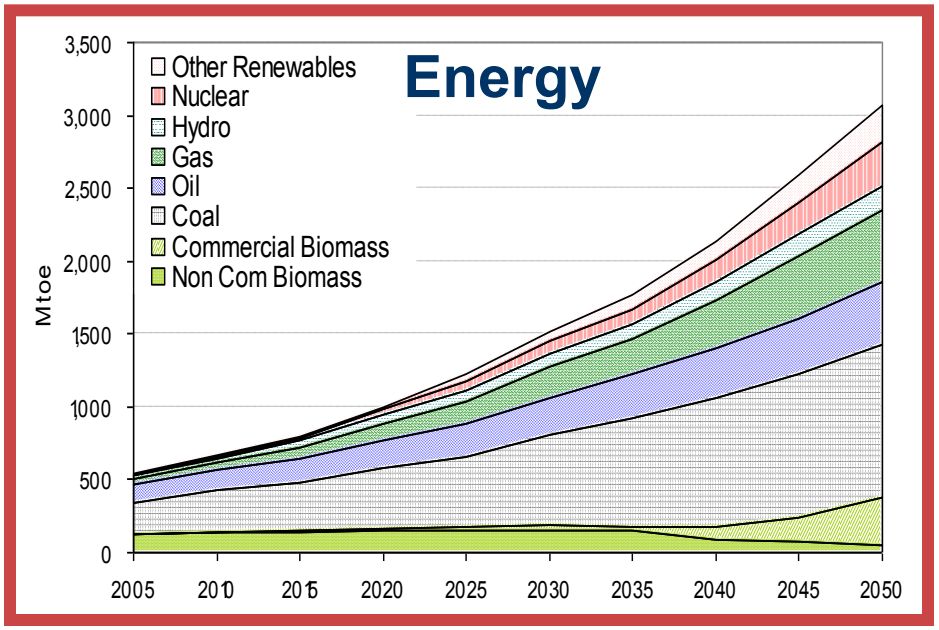


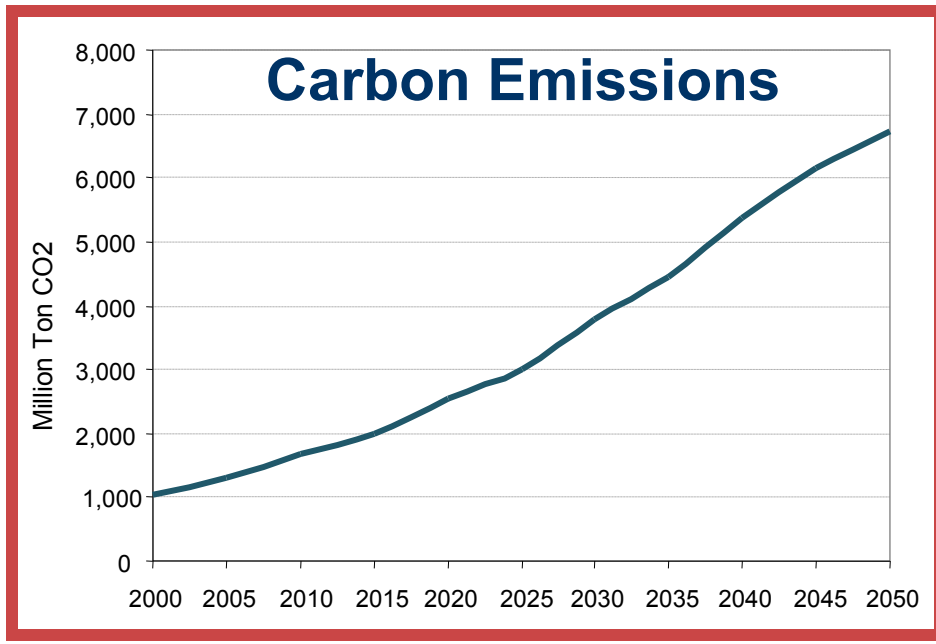
National Analysis: Bottom-up

Base Scenario: Growth of Economy and Population

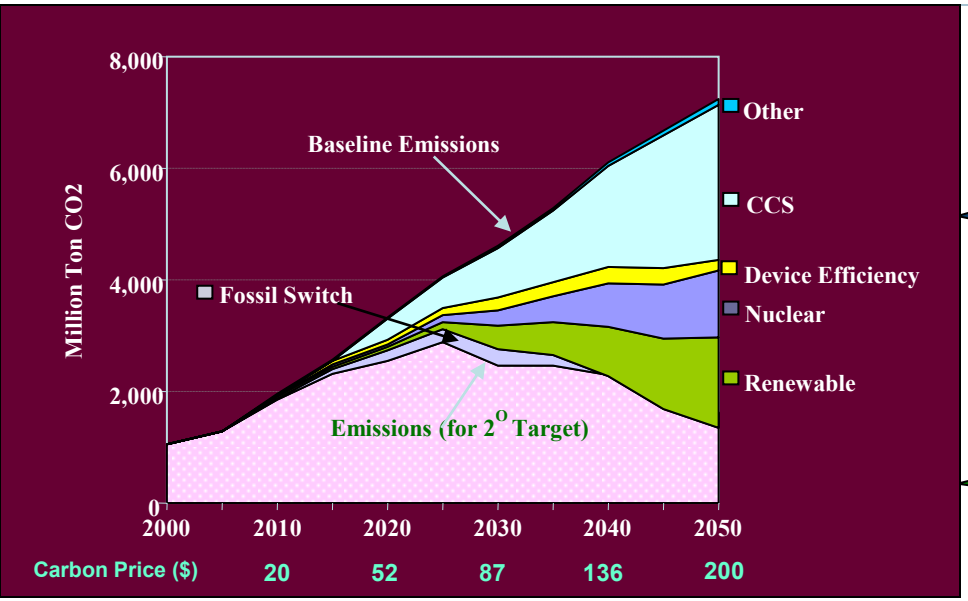
From 2005-2050:
Annual Economic Growth: 7.2%
Annual Population Growth: 0.9%

Absolute Growth in 2050 over 2005
Economy 23 times
Population 1.56 times





Mitigation Options Assessment



Conventional Approach: transition with conventional path and carbon price

- High Carbon Price
- Climate Focused Technology Push
- Top-down/Supply-side actions

Technology Co-operation Areas

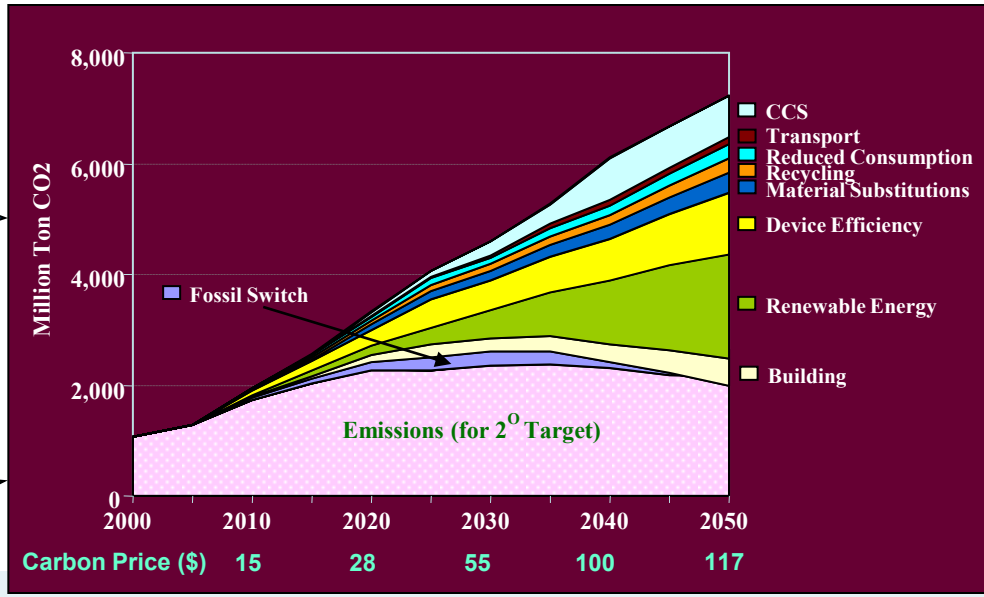
- Energy Efficiency
- Wind/Solar/Biomass/Small Hydro
- Nuclear/CCS

Sustainability Approach: aligning climate and sustainable development actions

- Low Carbon Price
- Bottom-up/Demand-side actions
- Behavioural change
- Diverse Technology portfolio

Technology Co-operation Areas

- Transport Infrastructure Technologies
- 3R, Material Substitutes, Renewable Energy
- Process Technologies
- Urban Planning, Behavioral Changes



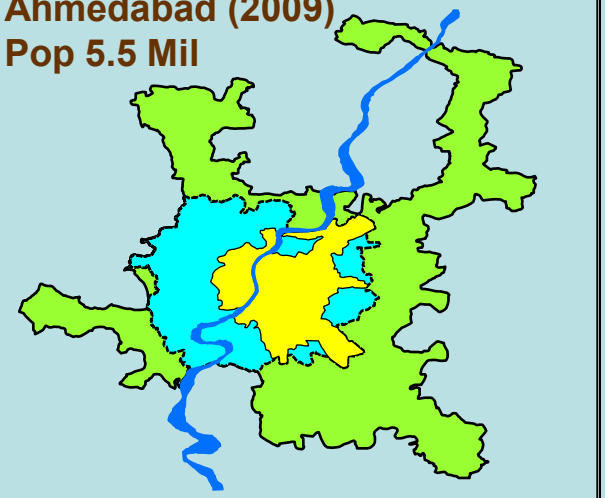
Policy Assessment, Research Cooperation & Dissemination

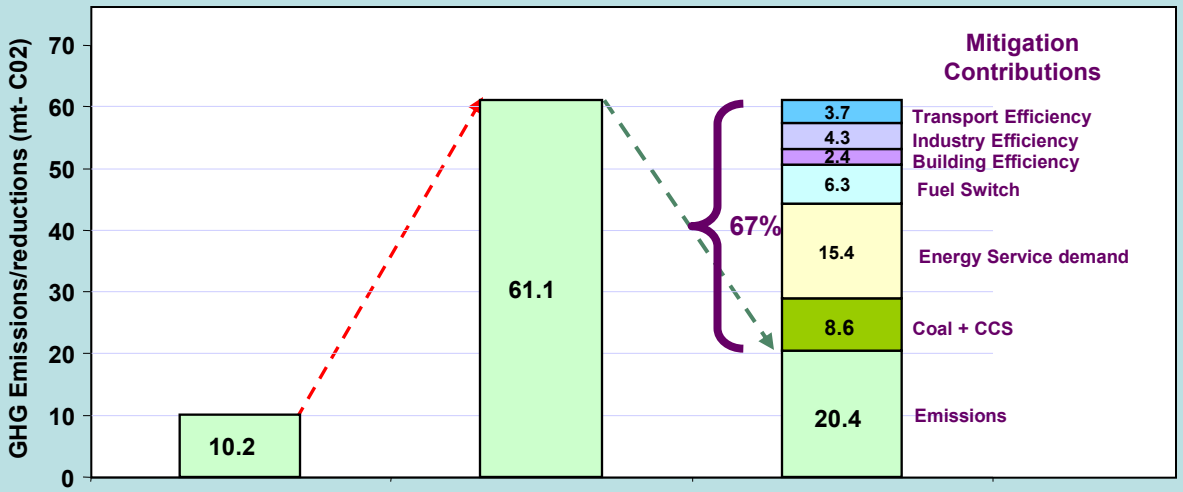
INDIA: National Climate Change Action Plan

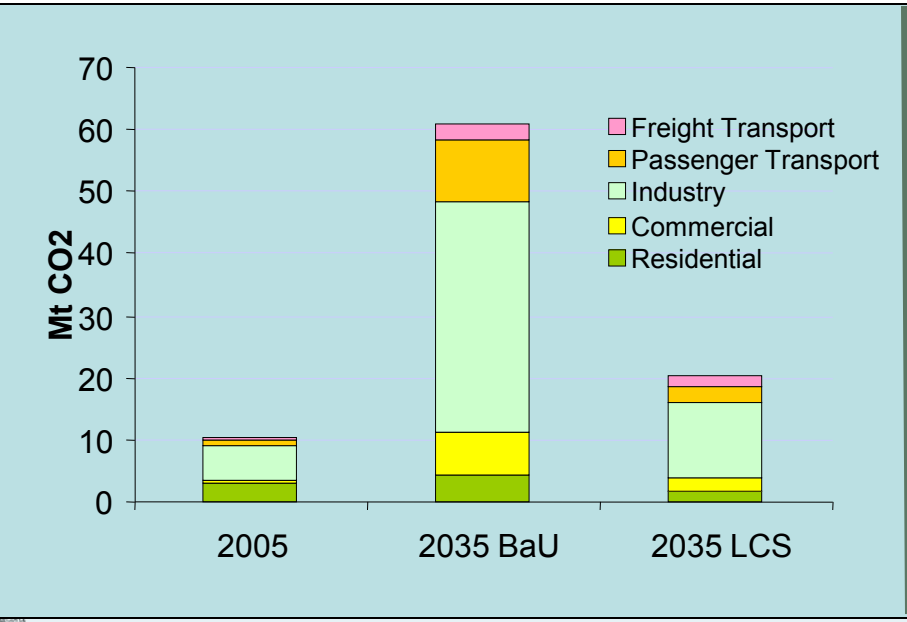
8 National Missions:

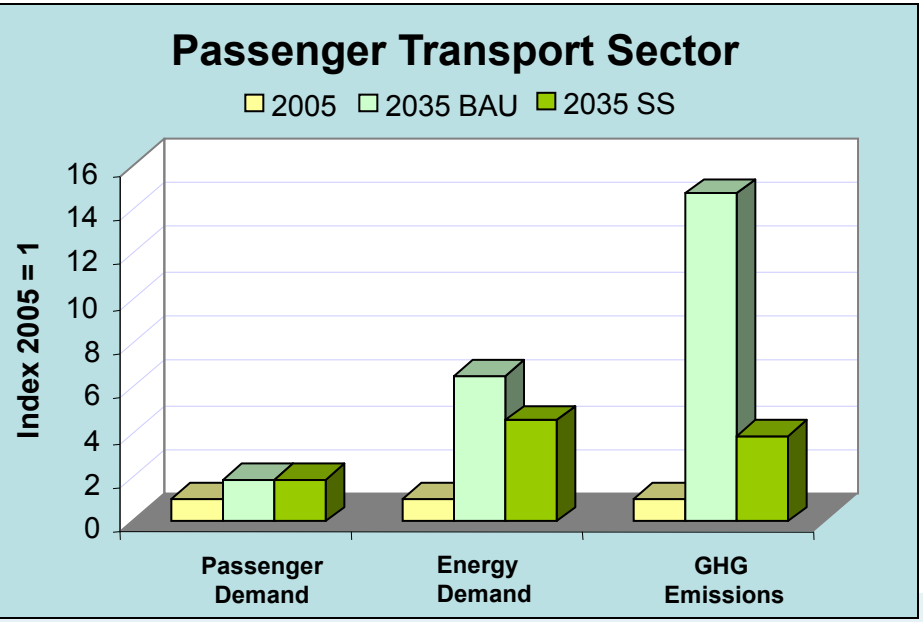
1. **Solar Energy** (100 MW PV/yr; 1000 MW Thermal by 2017)
2. **Enhanced energy efficiency** (10000 MW saving by 2012)
3. **Sustainable habitat**
4. **Water Sector** (20% water use efficiency improvement)
5. **Sustaining the Himalayan eco-system**
6. **A "Green India"** (6 Mil. Hectare afforestation; Forest cover from 23 to 33%)
7. **Sustainable agriculture**
8. **Strategic knowledge for climate change**

Sustainable Low Carbon Cities: Ahmedabad









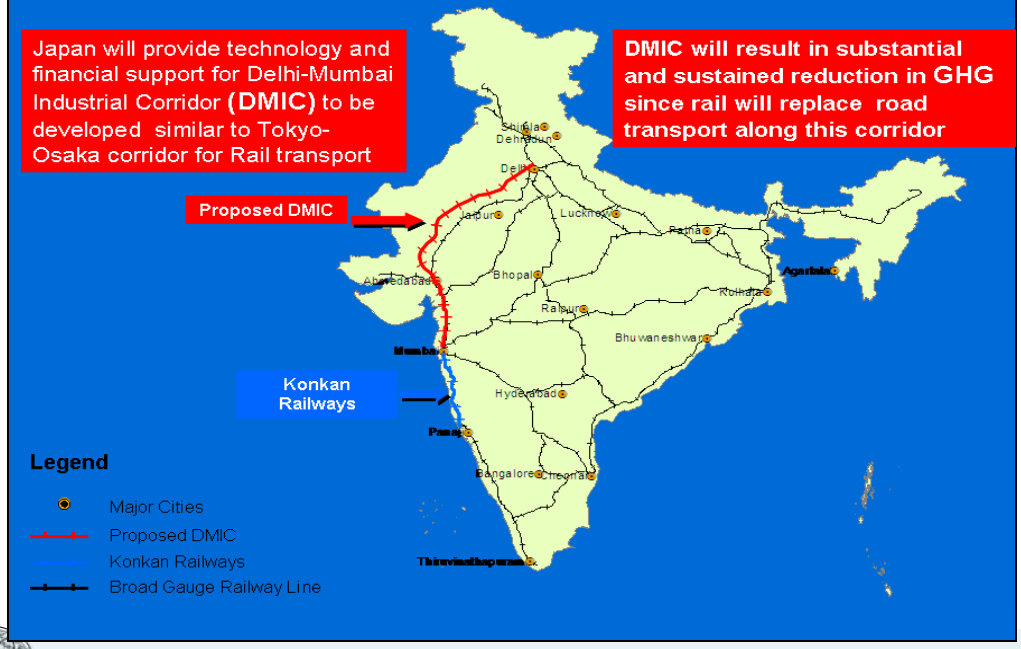
Sustainable Low Carbon Transport

- Sustainable modal shift
- Efficient logistics
- Infrastructures investments
- Associated development

Technologies for Train Corridors

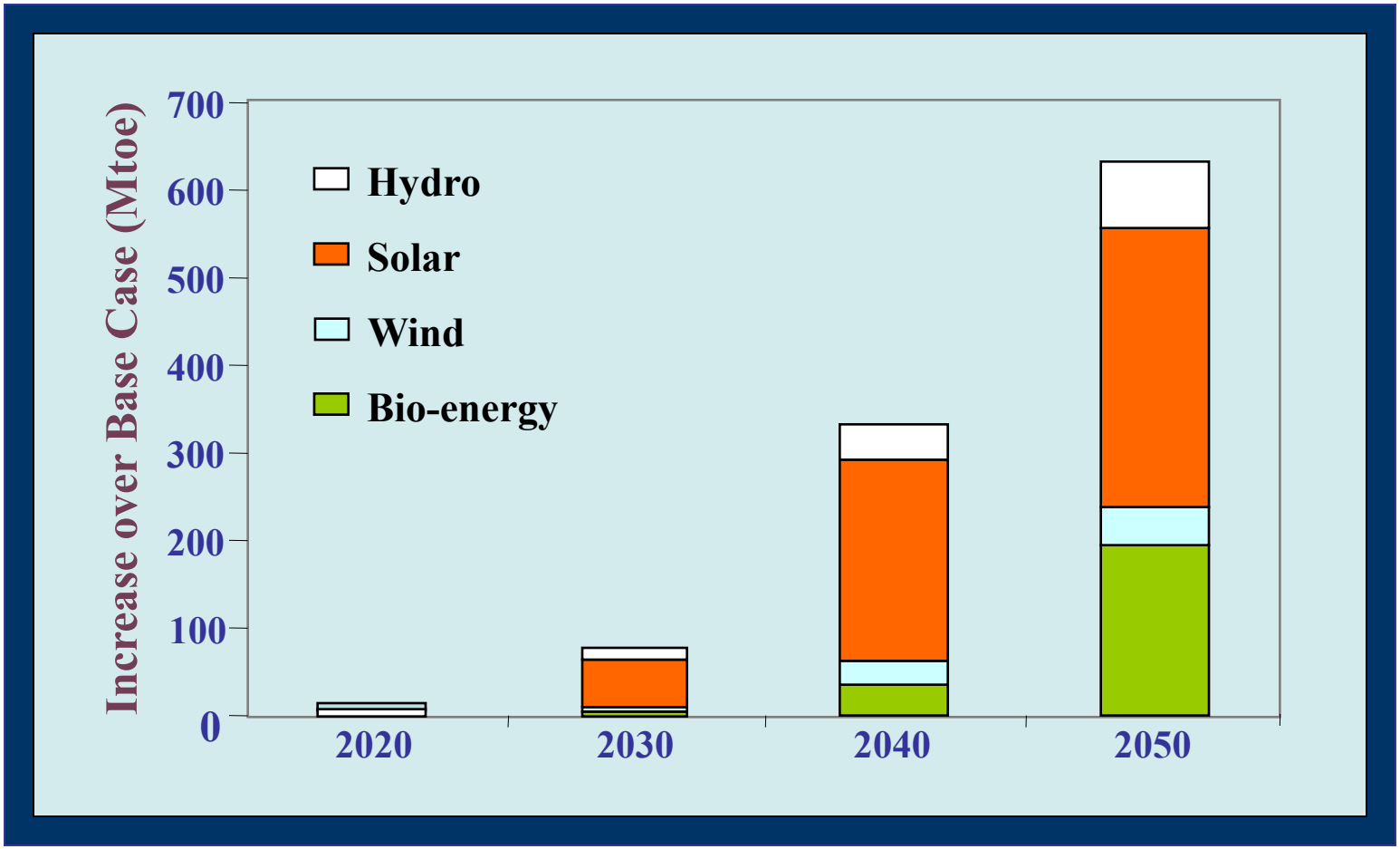
Japan will provide technology and financial support for Delhi-Mumbai Industrial Corridor **(DMIC)** to be developed similar to Tokyo-Osaka corridor for Rail transport

DMIC will result in substantial and sustained reduction in GHG since rail will replace road transport along this corridor



Renewable Energy Scenarios

Additional Renewable Capacity in Low Carbon Scenario over the Base Case



Key Policy Assessment Areas

- Low carbon Infrastructure Development & Investments
  - Freight Corridors (Delhi Mumbai – JBIC)
  - Inter City Movements (Delhi Metro – JBIC)
  - Eco Towns (Dahej - JICA)
- Water Energy Climate Change Nexus
- Scenario development at local level
  - Extension of Ahmedabad LCS Analysis to other cities in India
- Sectoral Focus
  - Energy (Renewable, Clean Power, Nuclear)
  - Intra City Transport (Metro, BRTS)
  - Intra City Transport (Freight Corridors, Bullet Trains)
  - Urban architecture (City planning, use of Information Technology)

Research Cooperation & Dissemination

1. IPCC New Scenario & AR5
2. Low Carbon Asia Project
3. LCS-RNet
4. Asia Modeling Forum Exercises
5. Coordinated Publications
6. Dissemination Strategy **(Web, Print, Events)**

Thank you