IPCC New Scenario from the Viewpoint of Developing Countries

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IPCC NEW SCENARIOS: OVERVIEW

- Context
- The Preparatory Phase and Representative Concentration Pathways (RCPs)
- Phase 1: Prepare climate and socio-economic scenarios in parallel
- Phase 2: "Pair up" climate scenarios with new socio-economic scenarios; and scaling for IAV research
- Phase 3: IAV-IAM "teaming to more fully integrate representation of impacts in IAMs and IAV research.

Scenarios for Whom?

Three major user communities:

1. Climate modeling community—need scenarios to provide a coherent, internally consistent, time-paths for Earth System Models.
2. Impacts modeling community—need scenarios to provide a coherent, internally consistent, time-paths to assess the consequences of potential climate changes and to set the context for adaptive strategies.
3. Emissions mitigation community—to provide a coherent, internally consistent, time-paths to assess the costs of emissions mitigation

REPRESENTATIVE SCENARIOS FORCING AGENTS

GHG Emissions and Concentrations from IAMs

- Greenhouse gases: CO_2, CH_4, N_2O, CFCs, HFC's, PFC's, SF_6
- Emissions of chemically active gases: CO, NO_x, NH_4, VOCs
- Derived GHG's: tropospheric O_3
- Emissions of aerosols: SO_2, BC, OC
- Land use and land cover

Two Important Extensions to Existing Scenarios

- Downscaling of **SHORT LIVED SPECIES** and **LAND USE/LAND COVER** to appropriate geographic resolution, perhaps as fine as ½° x ½° grid scale for the near-term climate scenarios (1° x 1° for the long-term climate scenarios).

- Extension of scenarios to 2300.

Defining Representative Scenarios

Three Initial Stabilization and one Baseline Scenario

- High baseline reference _ 8.5 W/m^2
- High stabilization level _ 6 W/m^2
- Median stabilization level _ 4.5 W/m^2
- Low stabilization level _ 3 W/m^2

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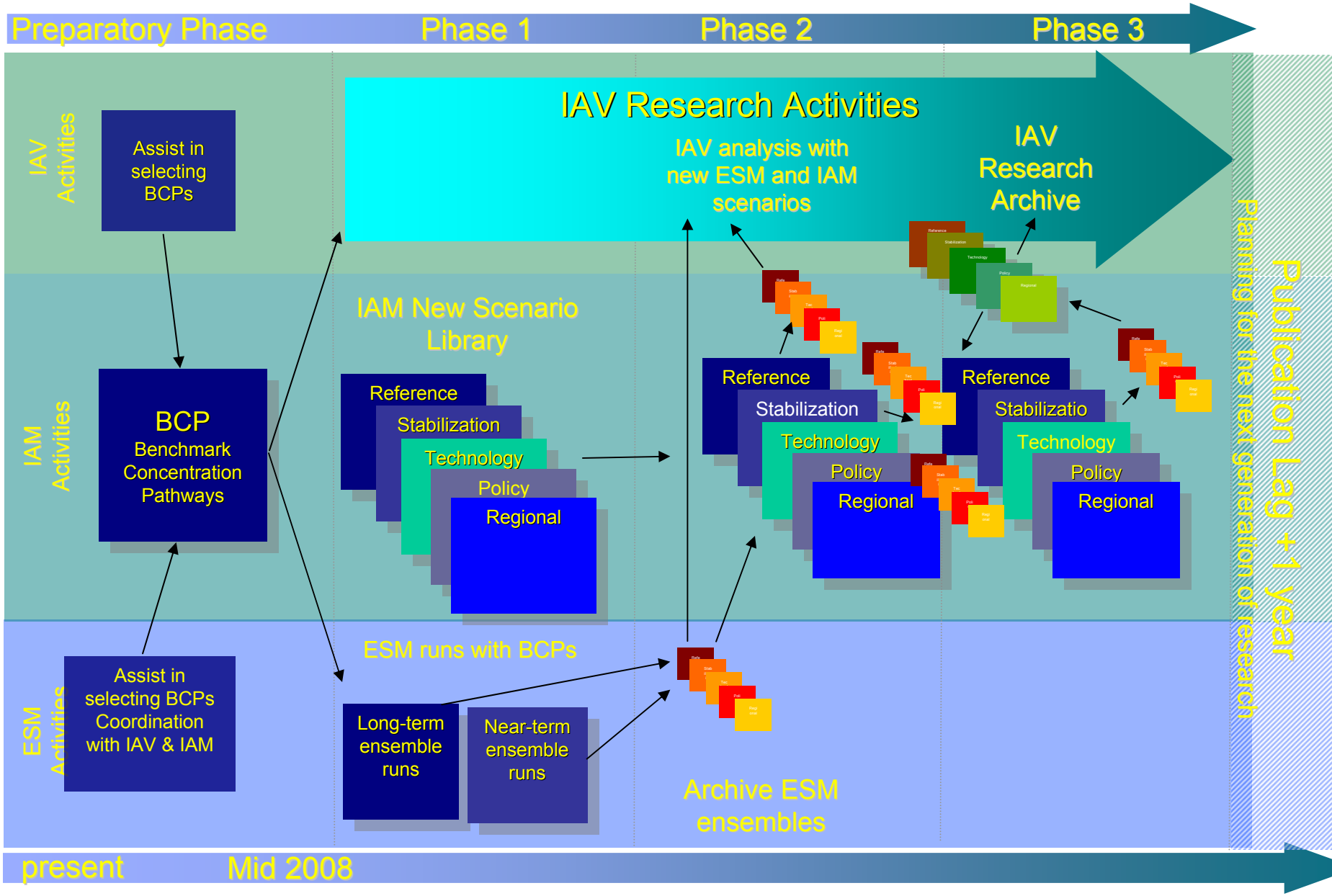

IPCC new scenario from the viewpoint of developing countries

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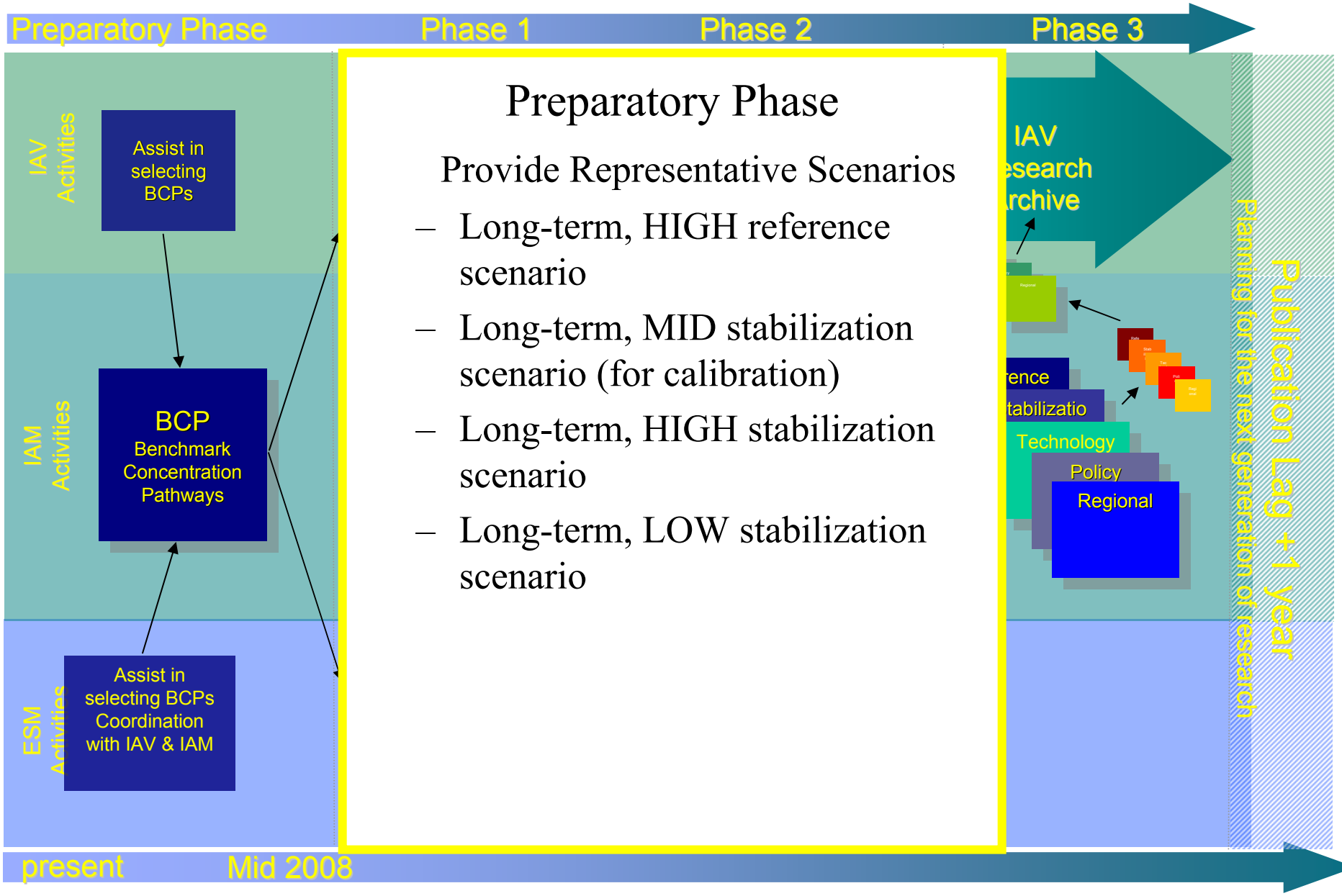

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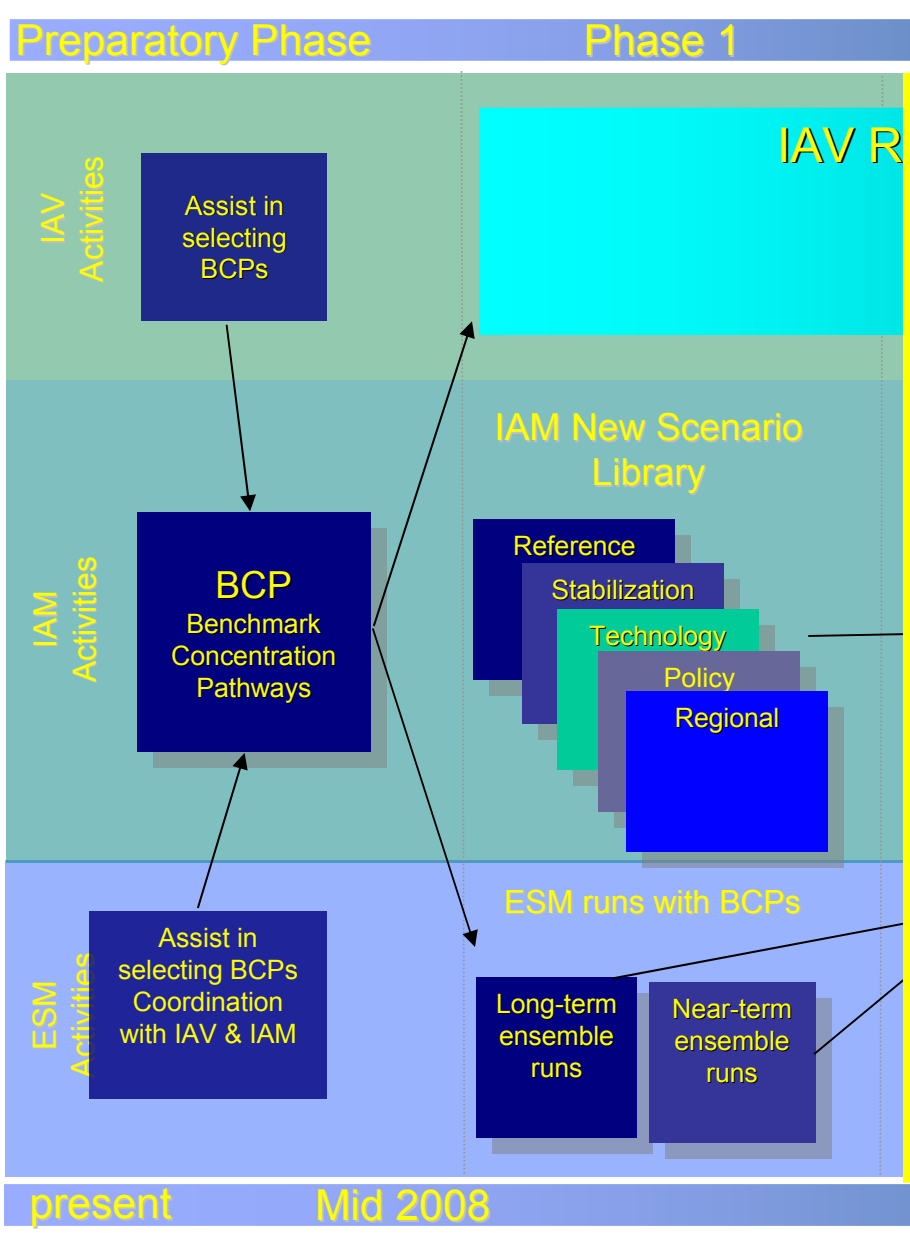

Phase 1

Explore a **broader range** of socio-economic scenarios

- Reference & stabilization levels
- Stabilization accession
- Societal development paths
- Technology dynamics
- Carbon cycle & climate
- "Overshoot" stabilization
- Regional scenarios

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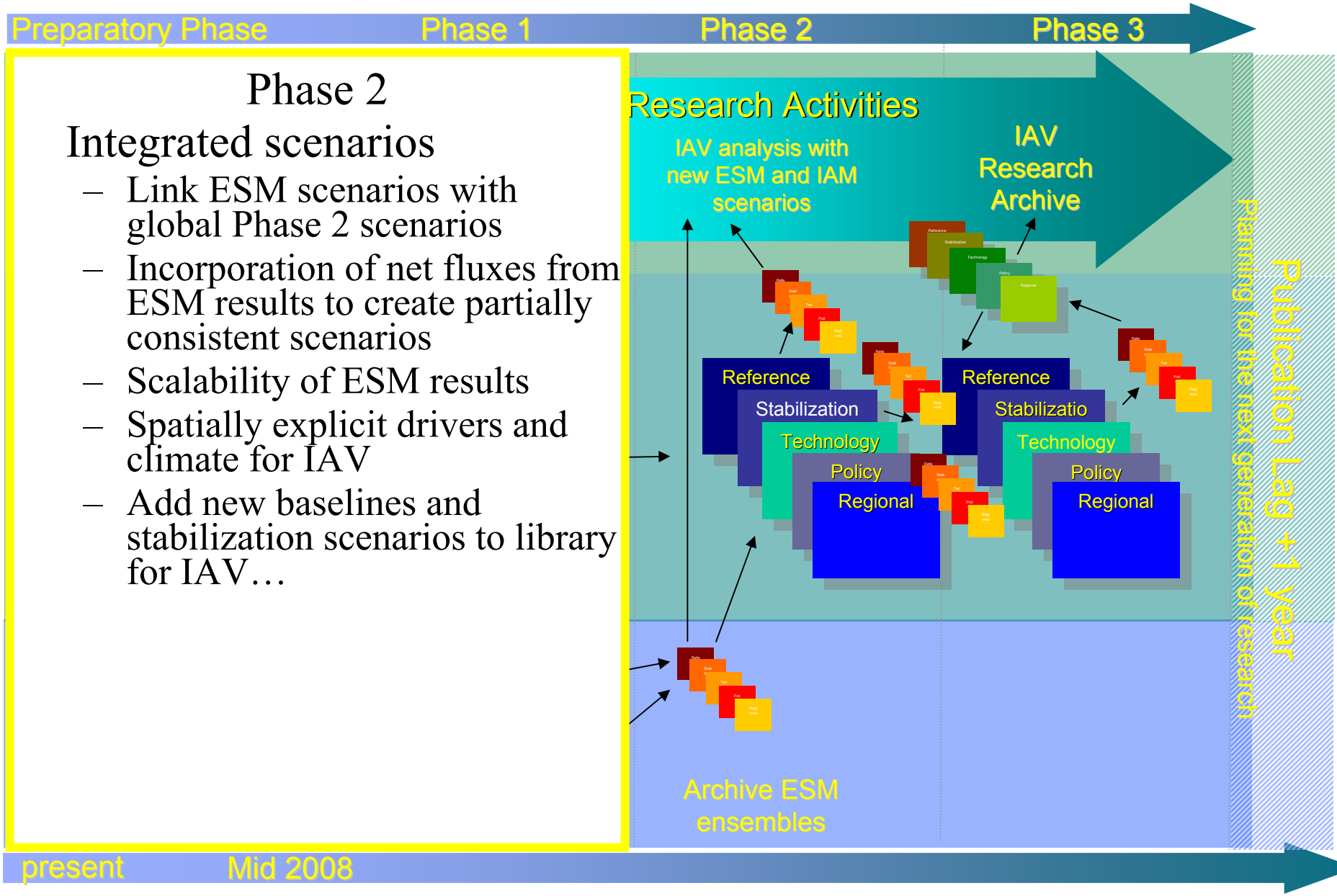

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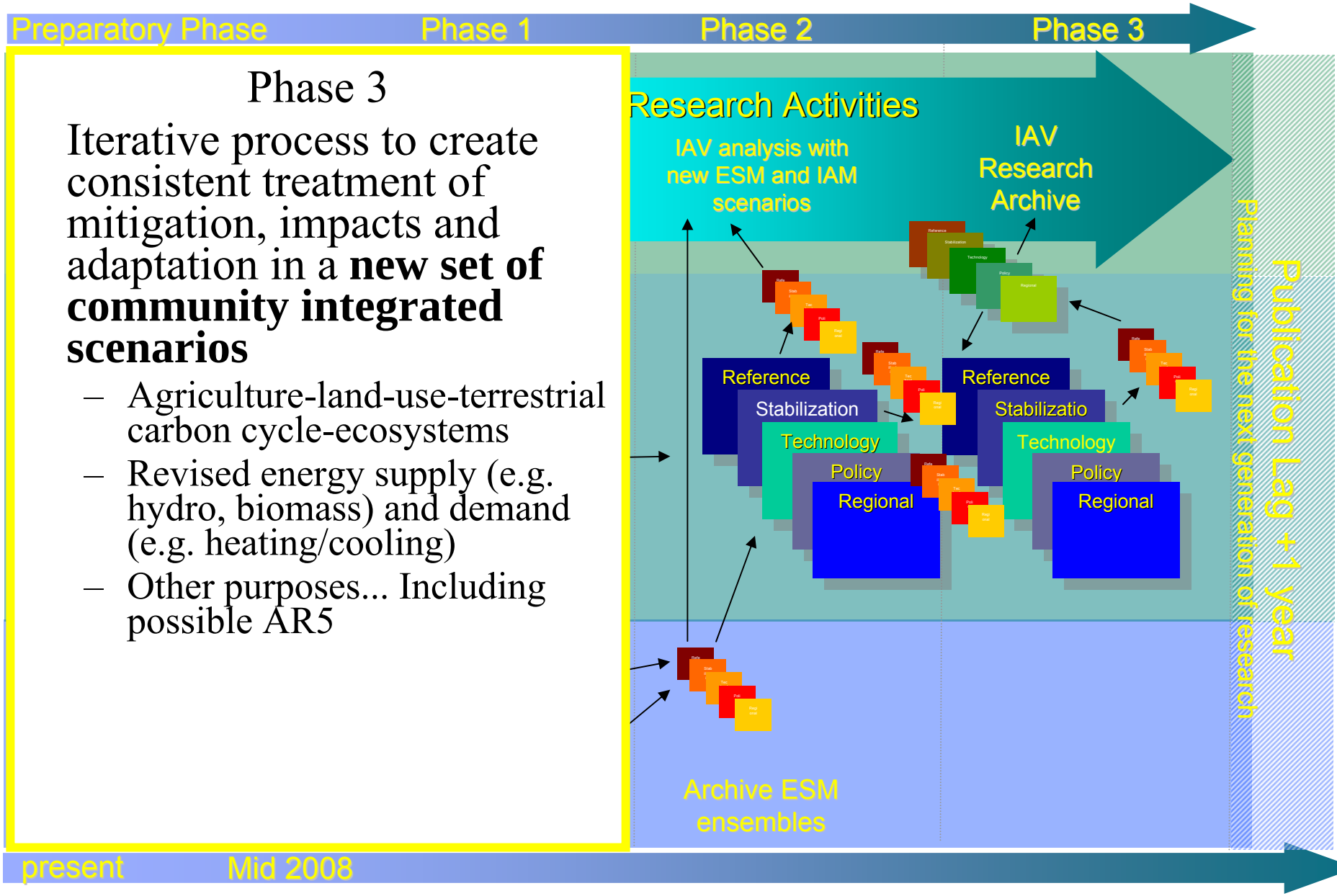
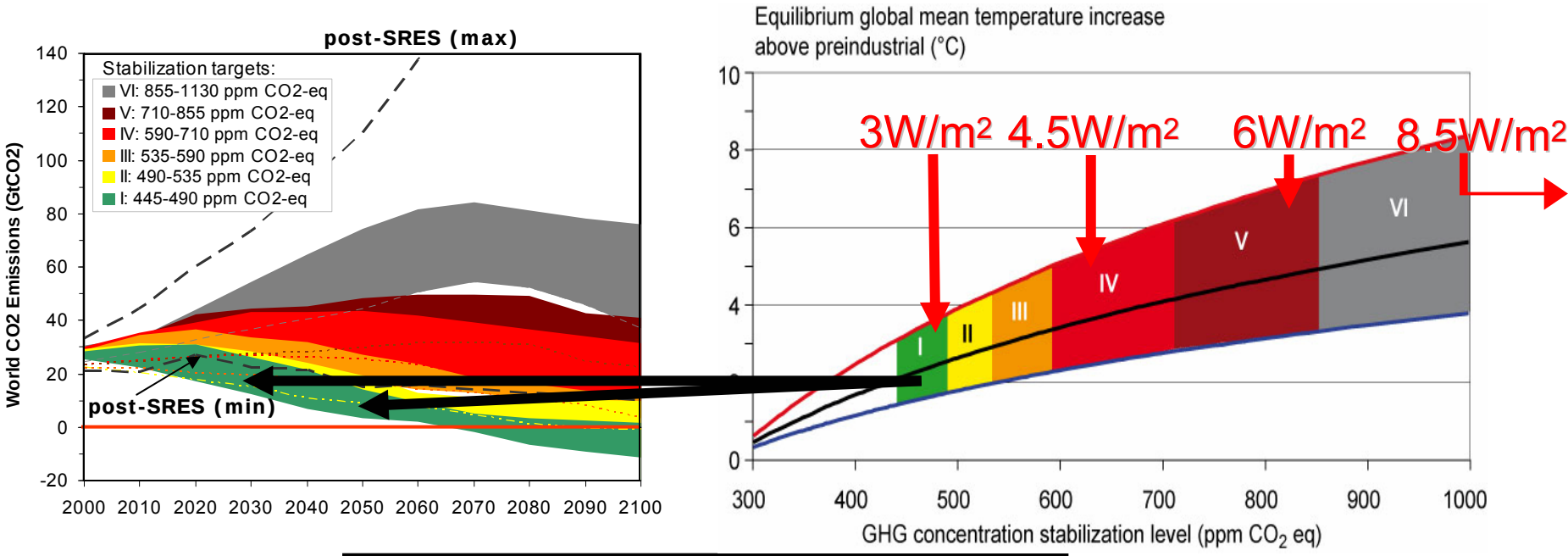


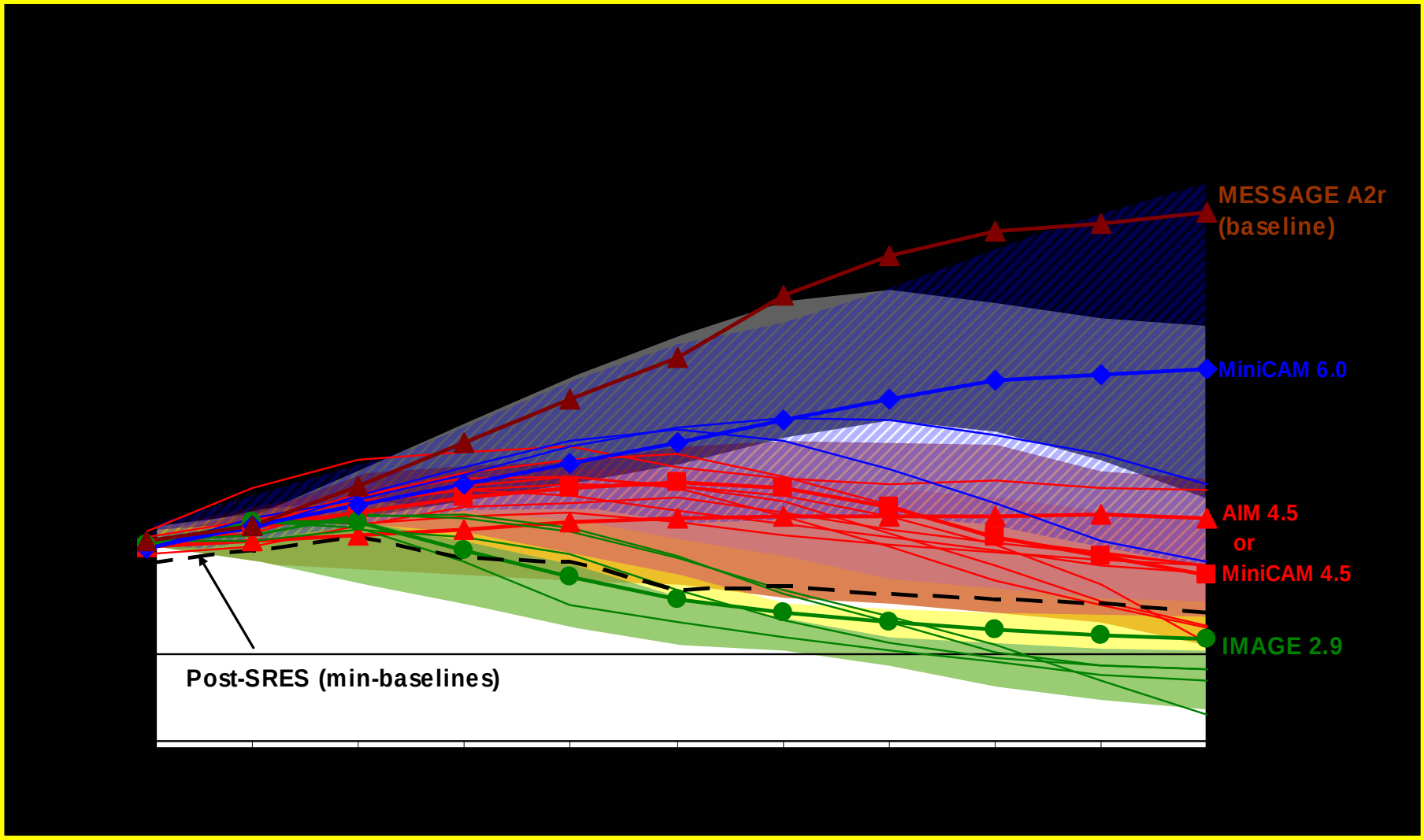
Long-term mitigation: stabilization and equilibrium global mean temperatures

- The lower the stabilisation level the earlier global CO_2 emissions have to peak



Multigas and CO2 only studies combined

Global CO_2 Emissions



Time Scales

- The proposed approach focuses on
  - Near-term (~2030)
  - Long-term (2100, with extension to 2300)

Near-term (~2030)

- Primary aims:
  - Increase focus on adaptation (help "mainstreaming")
  - Explore near-term opportunities/constraints on mitigation (given technological and institutional inertia), transitions
- Key dimensions:
  - A single central GHG concentration pathway
  - AOGCMs (no interactive carbon cycle) at higher resolution, multi-member ensembles, to provide improved representation of regional changes, extremes, and air quality (important research issues, e.g., initialization)

Long-term (2100, extended to 2300)

- Primary aims:
  - Explore implications of different stabilization (forging) levels (climate, impacts, and socio-economic/energy) -- "thresholds," and discontinuities
  - Analysis of "overshoots" for low stabilization levels
  - Assess feedbacks (carbon cycle)
- Key dimensions:
  - Lower resolution ESMs (but with interactive c-cycle) or AOGCMs, multi-member ensembles
  - IAMs will need to extend socio-economic forcing scenarios from 2100 to 2300

Developing Country Perspective on IPCC New Scenarios

Regional Modeling and Applications: Relationship to Global Scenarios

Emilio L. La Rovere, P. R. Shukla, Paul Runci

Presentation at "*IPCC New Scenarios Expert Meeting*"
Noordwijkerhout, September 19-21, 2007

Research Issues

- DC regional models and scenarios : shorter time horizons than in global climate change scenarios
- DC representation in global Integrated Assessment models may be underspecified
- Disaggregation of DC in global models is insufficient for regional IAV and mitigation studies

Understanding Development

- Dual Economy
- Multiple Transitions
- Informal Activities
- Subsistence Production
- Market Performance and Disequilibria
- Non-commercial Fuels
- Non-economic Concerns
- Policy Distortions

Transitions

Socio-Economic

- Demographic
  - Population
  - Urban / Rural
  - Gender ratio
  - Migration
- Development
  - Soft indicators: Income, Equity, Literacy, Health
  - Hard indicators: Infrastructure, Housing, Vehicles, Appliances
- Political
  - Institutions
  - Laws
  - Policies

Consumption/Life-style Transitions

- Conservation
  - Substitutions
  - Recycling
- City Planning
- Architecture/ Building Codes
- Changing Preferences
- Income Effects

Backbone Technology Transitions

- Logistics
  - Pipelines
- Electricity T&D
  - Decentralized utilities
- Information
  - Wireless
- Nanotechnology
- New and Renewable Energy
  - Hydrogen

Main Modeling Difficulties in DC Context

Reliability of Economic Data

- high inflation rates
- uncertainties on input/output coefficients, price elasticities, interest rates

Specificities of National Circumstances

- skewed income distribution
- dual economy (size of informal economy)
- Disequilibria, non-optimal baselines
- energy resources endowment: e.g. biomass
- relevance of emissions from land-use change

Research Issues: Mitigation Studies

1) Technical Change in Energy and Non-Energy sectors

- New Infrastructure, structural changes, localization
- Autonomous x induced energy efficiency improvements
- Energy systems: fuel mix consumption patterns from different income distributions

2) General Economic Theoretical Background

- Labour productivity growth, catch-up assumptions
- Types of production functions

Methodological Difficulties: Treatment of Market Imperfections

- Incomplete and fragmented markets, unequal marginal costs and multiple discount rates across sectors and regions
- Strong influence of governmental policies and agents in energy systems and land use changes
- Financial constraints: upfront costs x financial market imperfections and insufficient saving rates; external debts and international capital flows

Emerging drivers of Technological change

International Labor market

- Wage differential
- Income gaps
- Migration

Human Capital

Knowledge flows

- Diasporas and social networks
- Shifting comparative advantage in knowledge services
- Role of local and contextual knowledge

- Governance, risks and investment flows

Relevance of Biomass in DCs

- High Share in total energy supply
- Main biomass energy resources: wood, charcoal, sugarcane bagasse, rice husks, ethanol from sugarcane, vegetal oils, bio-diesel;
- Agricultural land availability:
  - Land used by agriculture sector
  - Land used by energy crops
  - Estimated land for energy production
  - Total agricultural land (exclusive of land suitable for forest plantations and energy crops)
  - Land still available for agriculture in open agricultural frontiers

Challenges for addressing Bio-energy

- Disaggregation of biomass primary resources and secondary fuels;
- Links between bio-fuels and international trade: commodities markets (e.g. ethanol x sugar, corn, bio-diesel x castor oil, palm oil, soybeans); effects of price subsidies, WTO rounds, large scale bio-energy programs on international prices of feed-stocks and final products, and on income of small farmers.

Challenges in Land-use Change Emissions

- Deforestation drivers go far beyond economic factors
- Key drivers from social policies
  - Lack of access to land x agrarian reform
  - Governance: land-use planning x enforcement of laws & regulations;
- How far will deforestation go?
- Huge potential for reforestation of degraded land

Impact, Adaptation and Vulnerability – IAV Studies

- Downscaling and up-scaling issues in both climate and socio-economic scenarios and storylines
- Need for enhanced focus on regional storyline and scenario development to ensure consistency with global scenarios
- Local credibility (buy-in from regional stakeholders) is key

Developing Country Participation

1. DC Scenario Development in Global Models

- Inventory and assess current intra-regional modeling in DC and identify needs for coordination and linkage with global models
- Inventory and assess current DC representation in global IAMs
- Identify capacity building needs by geographic areas
- Foster collaborative efforts among DC modelers and with global modelers for development of new regional storylines and scenarios

Developing Country Participation

2. Increasing Modeling Capacity in DC

- Establish DC scientific peer groups to identify key areas for capacity development
- Promote intra- and trans-regional DC modeling and scenario development initiatives
- Promote collaborative efforts between modeling groups in DC and IC
- Establish an online network/clearinghouse of DC experts and institutions
- Establish funding mechanisms to support these capacity building initiatives