National Workshop

Review of Implementation of the Work Programme towards a Comprehensive Climate Change Assessment

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Outline

- Context and Relevance
- Climate Change Assessment in Retrospect
- Element of Current Work programme
- Salient Features and Approaches
- Institutional Arrangements for the Studies
- Programme of the Day
- Outcomes of the Current programme

Context & Relevance

- Climate change – A threat and Challenge
- Origin in human activities
- Climate Change is unequivocal (AR4)
- Wide ranging impacts on physical systems, sectors of the economy and others
- Projected Climate Chang has implications on development, economic growth and food security
- A comprehensive assessment is key towards informed decision making

Climate Change Assessments in Retrospect

Global

- Emergence of climate change as an issue, 1988
- United Nations Framework Convention on Climate Change, 1992
- IPCC Assessments
  - Science
  - Impacts, Vulnerability & Adaptation
  - Mitigation

  (1992, 1997, 2002, 2007)

India

- ADB study, 1994 & 1998

  Focus- Impacts of Climate variability & Observed Climate on agriculture & sea level rise, GHG inventory 1990 & Project based assessments of Mitigation potential
- NATCOM I, 2004

  Focus – Climate change scenarios, CC impacts at sectoral levels, GHG inventory for base year 1994 & development of country specific EFs
- Other isolated studies by researchers

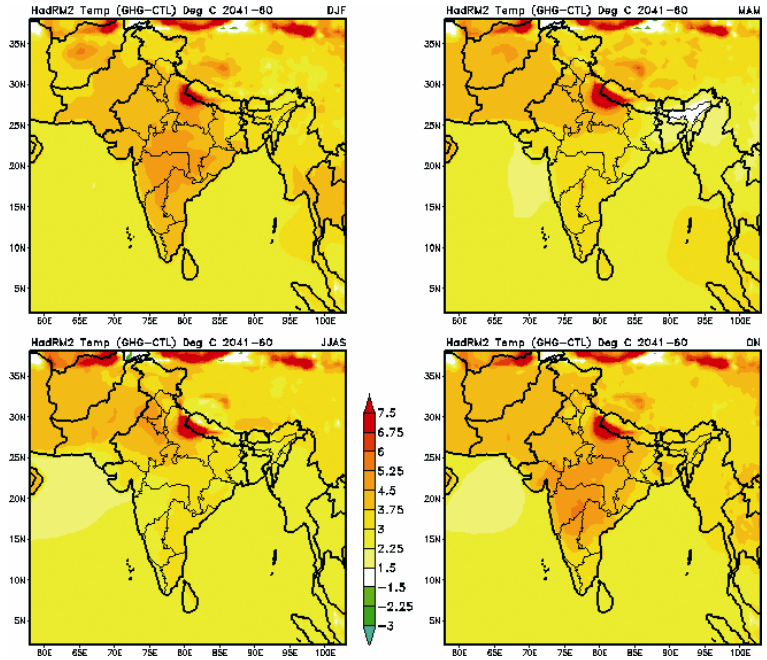
Chronology of GHG Inventory Development in India

Gases	CO_2, CH_4	CO_2, CH_4	CH_4	CO_2. CH_4, N_2O, NOX, CO, NMVOC	CH_4	CO_2, CH_4, N_2O, SO_2, CO	CO_2, CH_4, N_2O
Sectors	Fossil fuel Rice Animals	Transport Coal mines Rice Livestock	All India Campaign Rice - seasonally integrated approach and water regimes defined	Biomass Cement Oil & nat gas, manure Crop residue, soils, MSW	Rice – extended campaign (organic and non organic soils)	All sources (1996 guidelines)	All sources (1996 guidelines)
Emission Factors	Published EFs	Used published EFs	Developed	Default and developed	Developed	Default IPCC	30% Country Specific and 70% Default
Base Year	1990	1990	1992	1990	1998	1990-1995	1994
Reference	Mitra et al., 1991	Mitra et al 1992	Parashar et al, 1997	ALGAS India. 1998	Gupta et al., 1999	Garg & Bhattacharya 2001	NATCOM 2004

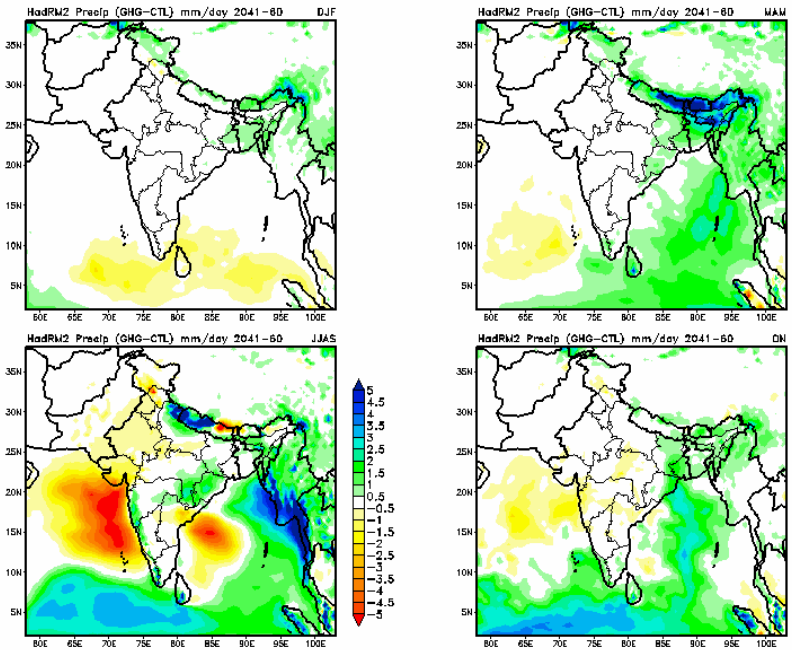
INC- Climate Projection Scenarios (2050s)

- Av. Surface temperature projected to increase by 2 - 4°C
- Marginal changes in rainfall expected in monsoon months (JJAS)
- Large changes during non-monsoon months
- No. of rainy days set to decrease by more than 15 days
- Intensity of rains projected to increase by 1-4 mm/day
- Cyclonic storms likely to increase in frequency and intensity

Temperature

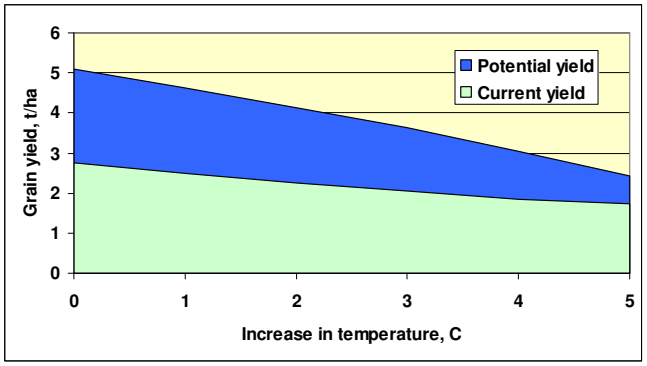


Precipitation



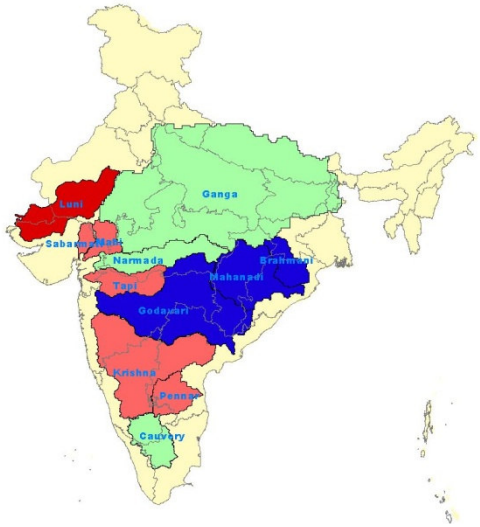
Preliminary Impact Assessments

Agriculture



Decrease in yield with increase in temp.

Water



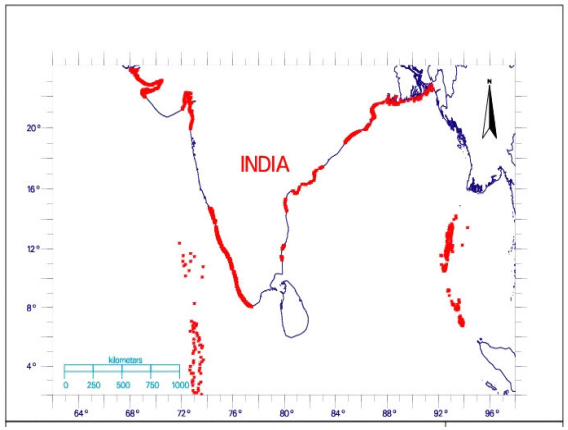
Acute physical water scarce conditions

Constant water scarcities and shortage

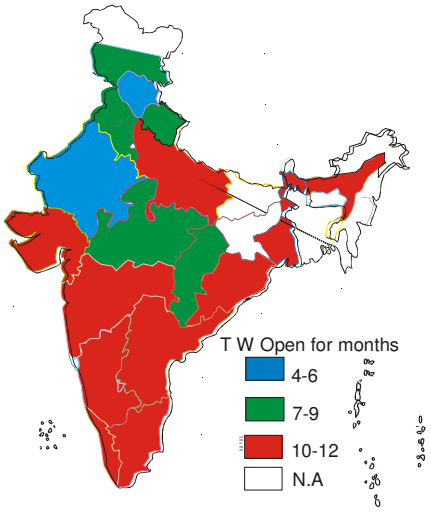
Seasonal / regular stressed conditions

Rare water shortages

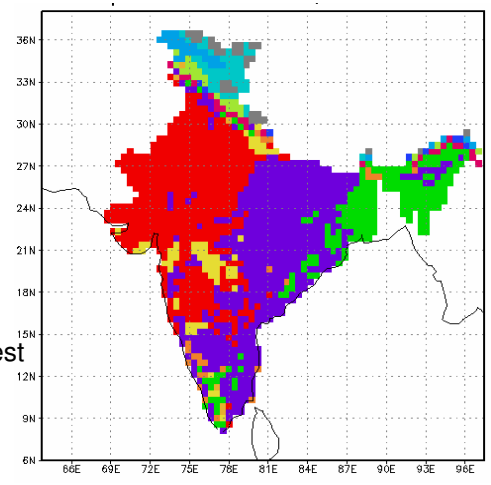
Coastal zones



Health (Malaria)



Forests



Dry savannah

Xeric Shrub land

Xeric woodland

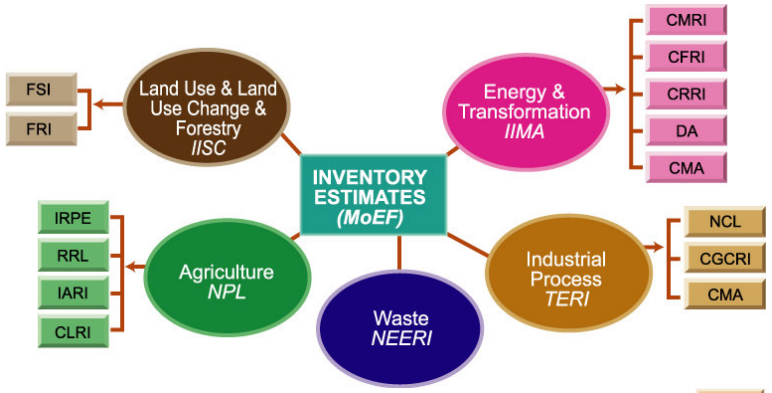
Tropical Seasonal Forest

Boreal Evergreen

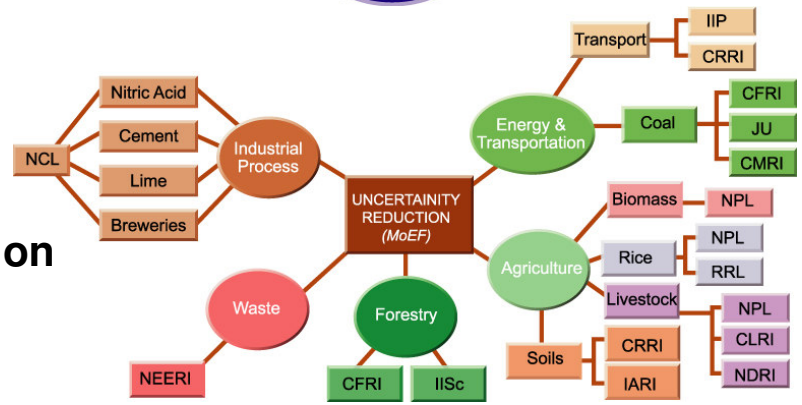
Tundra

Institutional Arrangement in the Previous Assessment

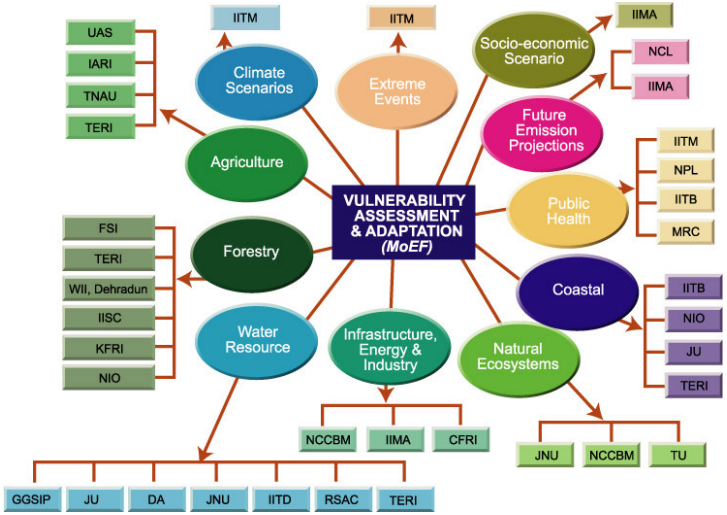
Inventory estimation



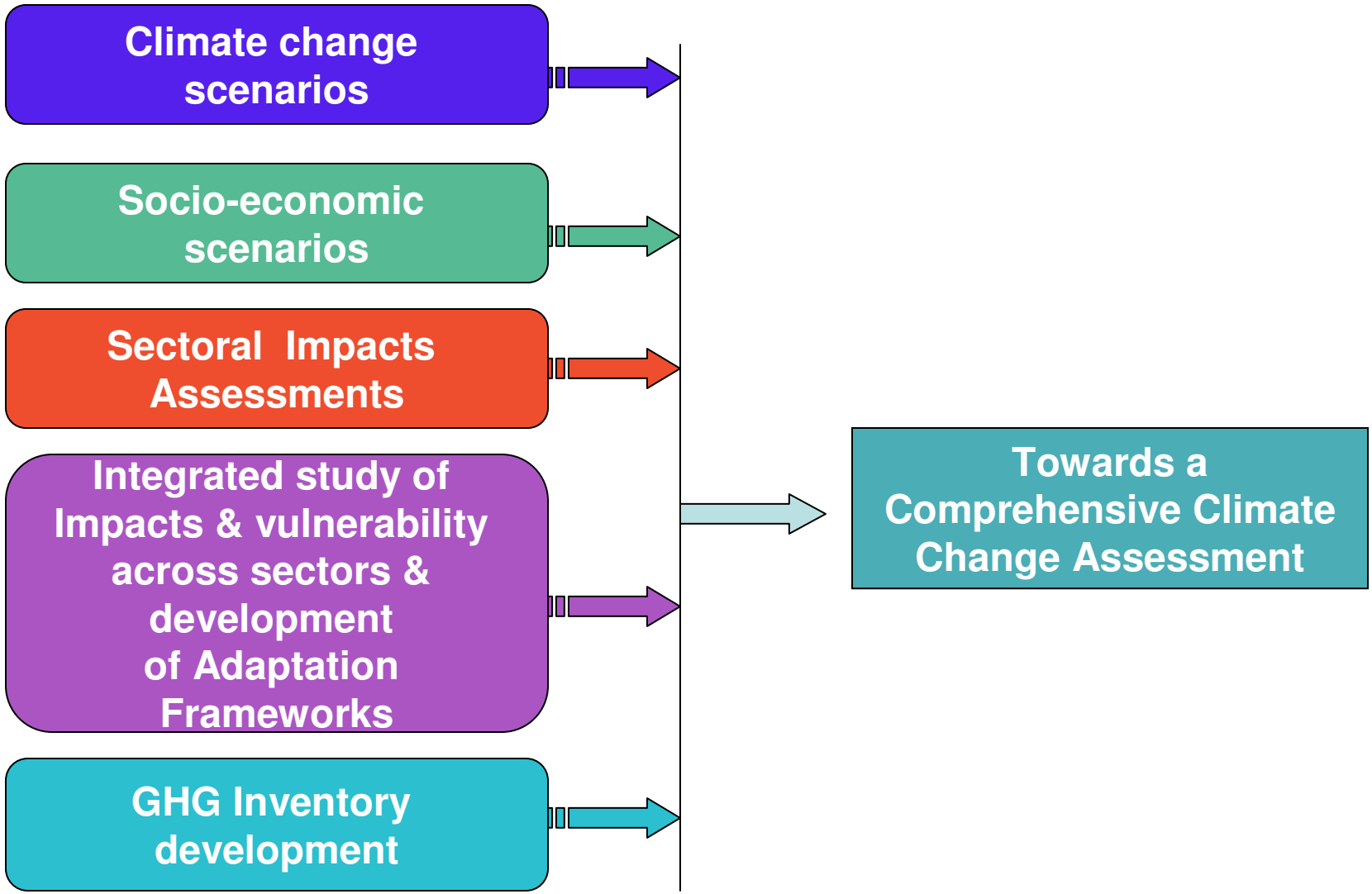
Uncertainty Reduction



Vulnerability Assessment & Adaptation



Elements of Current Work Programme



Salient Features of Approach

V&A

Improvement of the existing Assessments

- Generate ensemble of climate projections
- Develop socio economic scenarios
- Improve the sectoral impact assessments

New Feature- Adaptation to CC

- Target hotspot areas
- Carry out integrated inter-sectoral V&A assessments in the target areas
- Develop Adaptation Frameworks at local level

National Adaptation Framework

Climate Change & Socio-Economic Scenarios

Climate Change scenarios

- Climate change projections using regional climate model PRECIS for IPCC-SRES A2, B2 and A1B scenarios.
- Climate change projections for short/ medium and long term time scales upto 2100
- Frequency and intensity of extreme weather and climate events and onset of monsoon

Socio-economic scenario projections

- Short and medium term timelines
- For various sectors with a focus on agriculture

National Impact Assessments: Water Resources

- Improving river runoff estimates for all the river basins with respect to INC
- Assessing impacts of extreme events on river runoff
- Assessing impacts of climate change on glaciers through literature survey
- Assessing the impacts of climate change on Water demands in the future at the national level

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National Impact Assessments: Agriculture

- Assessment of impacts of climate change on irrigated crops
- Assessment of impacts of climate change on rain-fed crops (like sorghum and groundnut)
- Assessment of Climate change on plantations
- Assessment of impacts of climate change on livestock and fisheries

National Impact Assessments : Forestry and Natural Ecosystems

- Forest boundaries and extent
- Biodiversity and net primary productivity
- Dominant natural forest types
- Economically important species and protected areas
- Mangroves
- Coral reefs

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National Impact Assessments:
Coastal Zones, Human Health, Energy & Infrastructure

Coastal zones

- Sea level rise, inundation of coasts, cyclones, sea surges
- Vulnerability of coastal districts in India threatened vis a vis sea level rise and cyclones

Human health

- Vector borne diseases
- Heat stress

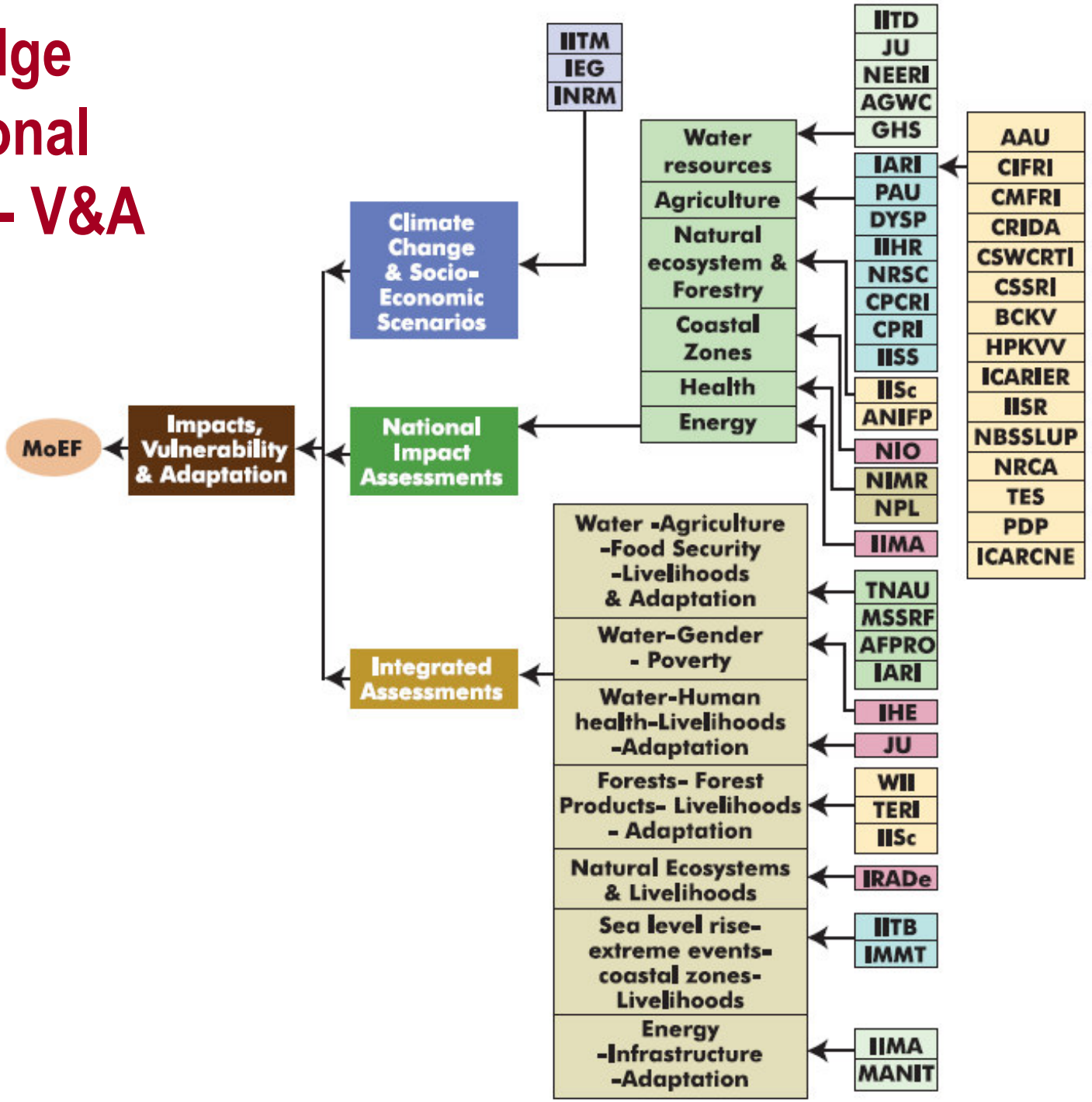
Energy and infrastructure

- Impacts on demand and supply side of Energy Systems

Integrated Impacts, Vulnerability Assessment and Adaptation

- The nexus of water-agriculture-food security and livelihoods
- Forests, forest products and livelihoods
- Natural ecosystems and Livelihoods
- Water resources, human health, livelihoods
- Extreme events -Energy and infrastructure
- Water-gender-Poverty
- Coastal Zones & Livelihoods

Knowledge Institutional Network- V&A



Developing GHG Emission Profile

- Energy
- Industrial Process and Product Use
- Agriculture
- Land Use Land Use Change and Forests
- Waste

Limitations in Inventory Estimation in Earlier Programmes

- **Non-availability of required data**
  - Non-availability of time series data for some categories
- **Non-accessibility of data**
  - Proprietary data
  - Institutional arrangement for data sharing
- **Other Data Issues**
  - Data formats
  - Inconsistency in top-down and bottom-up data sets
  - Mismatch in reported datasets across different published documents
- **Use of non-representative Emission Factors in majority of source categories**

Unique Features in the Present Programme

- Developing emission time series
- Enhanced Coverage
  - Mandatory (CO2, CH4, N2O)
  - Additional gases (CO, NO_X, NMVOC, HFC, PFC & SF_6)
  - New Carbon pools
- A mix of IPCC 1996 and IPCC 2006 methodology being followed
- Focus on key sectors
  - Emission of categories falling within 95% of the cumulative emissions & those increasing rapidly over a period of time
  - Updating old emission factors – NCV coal, CO2 from Cement, CH4 from rice, CH4 from enteric fermentation
  - Development of new emission factors- CH4 from solid and liquid waste, N2O from soils, CO2 from power and steel units
- A strong emphasis on QA/QC procedures
- Quantitative determination of uncertainties

Elements of GHG inventory preparation– Energy

- Refinement of NCVs of coking, non coking and lignite consumed in thermal power plants
- Refinement of GHG emission estimates from the road transport sector by proper apportionment of the fossil fuel used in various types of road transport vehicles
- Refinement of emission factors for different types of gasoline and diesel driven vehicles incorporating driving cycles
- Measurement of plant level –technology specific GHG emission factors for thermal power plants
- Development of methodology and generate data related to oil and natural gas venting, flaring, transmission and distribution sector
- Estimation and compile emission inventory from all categories of the energy sector

Elements of GHG inventory preparation– Industrial & Product Use (IPPU) Activities

- Refine GHG emissions estimates from iron and steel manufacturing
- Determine technology specific (dry, wet and semi dry) GHG emission factors through measurements for cement production
- Determine country specific emission factors for ammonia production process
- Estimate and compile emission inventory from all categories of the IPPU sector

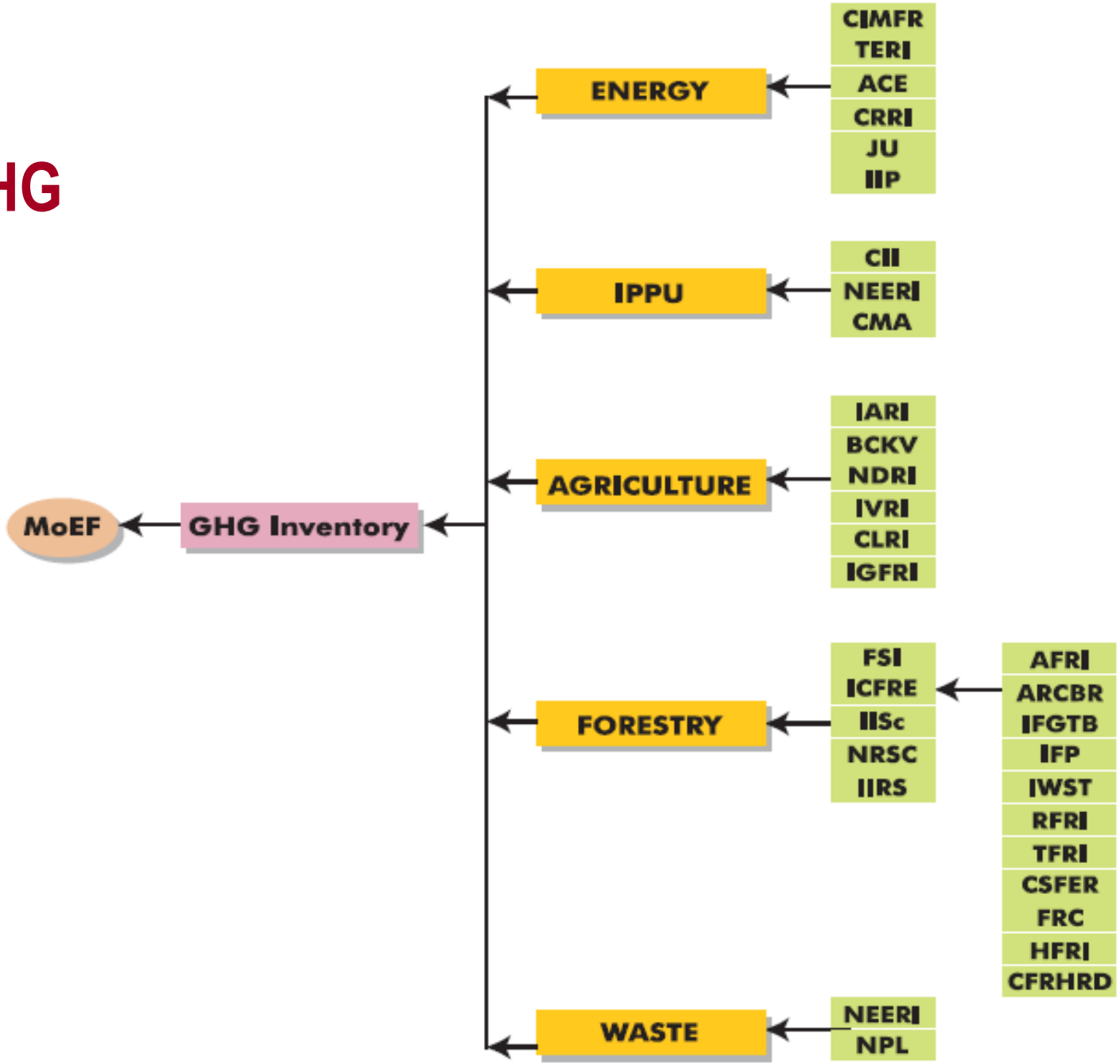
Elements of GHG inventory preparation– Agriculture, Forests and Other Land Use

- Improve N_2 O emission inventory from croplands
- Improve GHG emission estimates from rice cultivation in the emission hotspots identified in INC
- Undertake region wise surveys of livestock feed intake, milk production etc. and estimate EF of CH_4 from this source
- Undertake region specific measurements of CH_4 emission due to enteric fermentation in dairy cattle
- Develop a matrix on land use and land use change of area under crops, forests, waste land, settlements and others through literature survey, remote sensing and onsite assessments
- Assess biomass stocks, carbon fraction of biomass, biomass growth rate of various types of species (crops/forests)
- Estimate and compile emission inventory from all categories of the AFOLU

Elements of GHG inventory preparation– Waste

- Generate data on MSW handling practices for urban areas
- Determine CS-EF of CH4 from landfills
- Undertake detailed chemical analysis of wastewater in key industries
- Estimate and compile emission inventory

Knowledge Institutional Network- GHG Inventory



Outcomes

- Provide inputs to the National Communication to United Nations Framework Convention on Climate Change
- Towards development of National Inventory Management System
- Assessment of Climate change, its Impacts and Associated Vulnerabilities at state level, Agro-ecological and agro climatic zones
- Adaptation Frameworks

Outcomes….contd.

- Help to develop emission inventory and climate change impact assessments at national level
- Serve as authentic source of information
- Help create a network of climate change knowledge institutions
- Develop scientific capacity for undertaking research in the area of climate change
- Can provide a good basis of devising comprehensive national programmes in priority areas

Thus a good base and basis for taking up national level comprehensive climate change assessments exists

Programme of the day

Presentations on

- Climate scenarios
- Socio-economic scenarios
- CC impacts on key sectors
- GHG inventory estimation
- Integrated impact & vulnerability Assessments

Based on

- 57 studies
- 127 institutions with direct & indirect involvement
- About 225 scientists and researchers

Total number of presentations

- 19 presentations
- special address by Dr. V Ramanathan on black Carbon


Thank you