Climate Change and Sustainable Development

The Case of India

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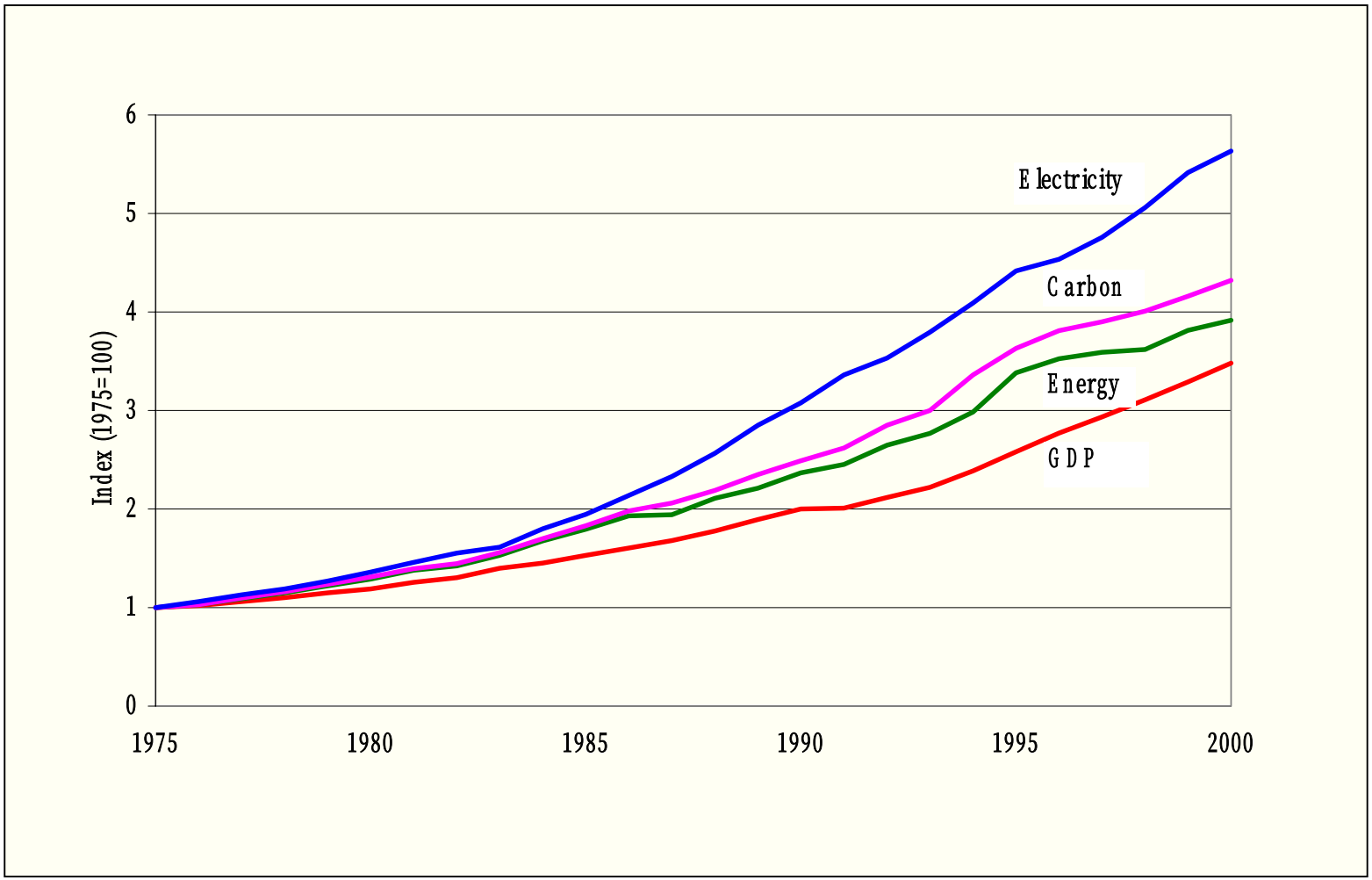
Presentation Agenda

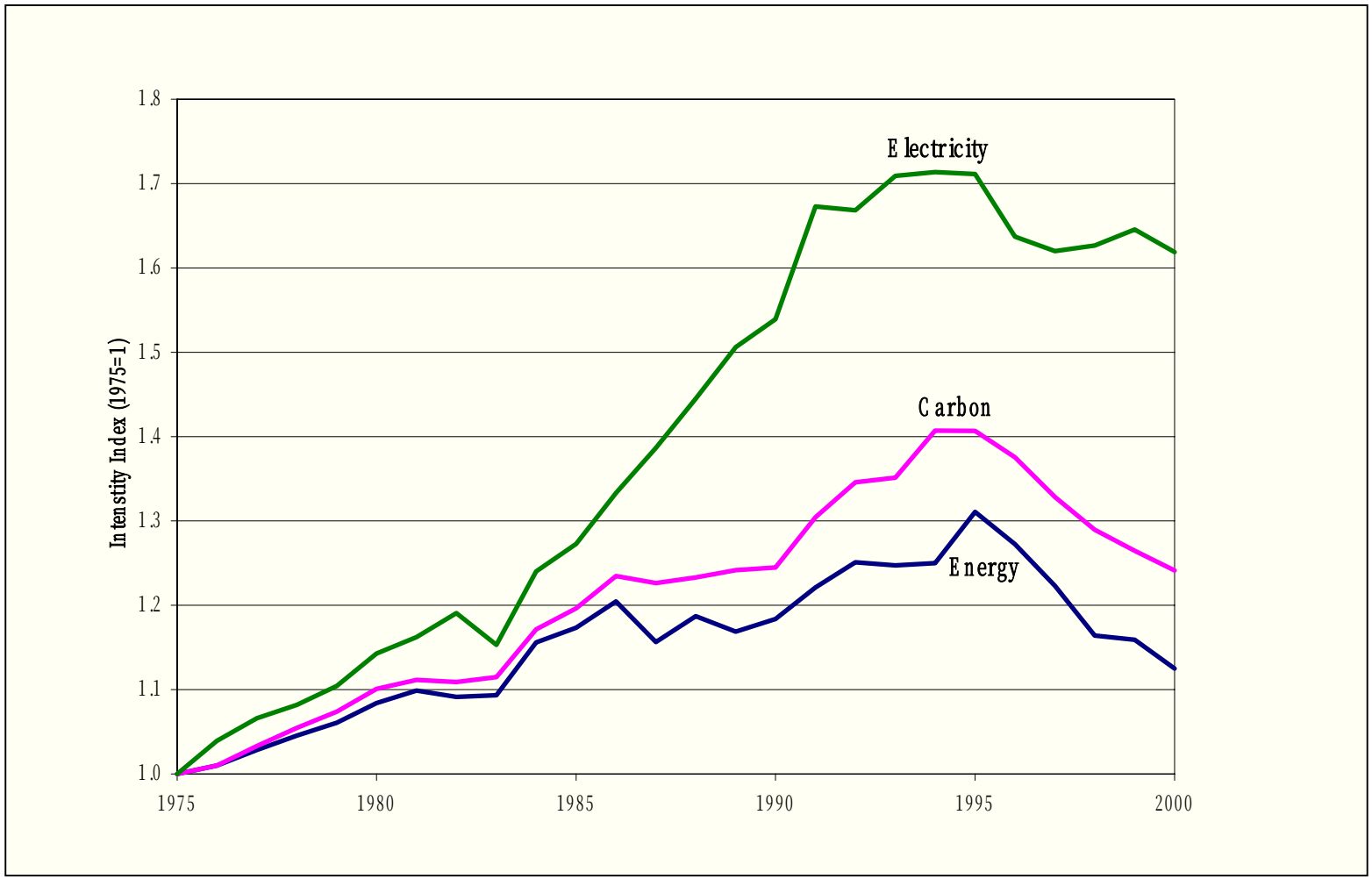
- Climate Change and India: Status
- Future Emissions Trends
- South Asia Regional Cooperation
  - ⇨ Energy and Electricity Markets
  - ⇨ Impacts and Vulnerability
- Linking Climate Policies with Development Goals
- COP 8 - The Delhi Ministerial Declaration
- Kyoto and Beyond

Climate Change and India:
Emissions Status

GDP, Energy, Electricity, Carbon



GDP Intensity of Energy, Electricity and Carbon



GHG Emissions

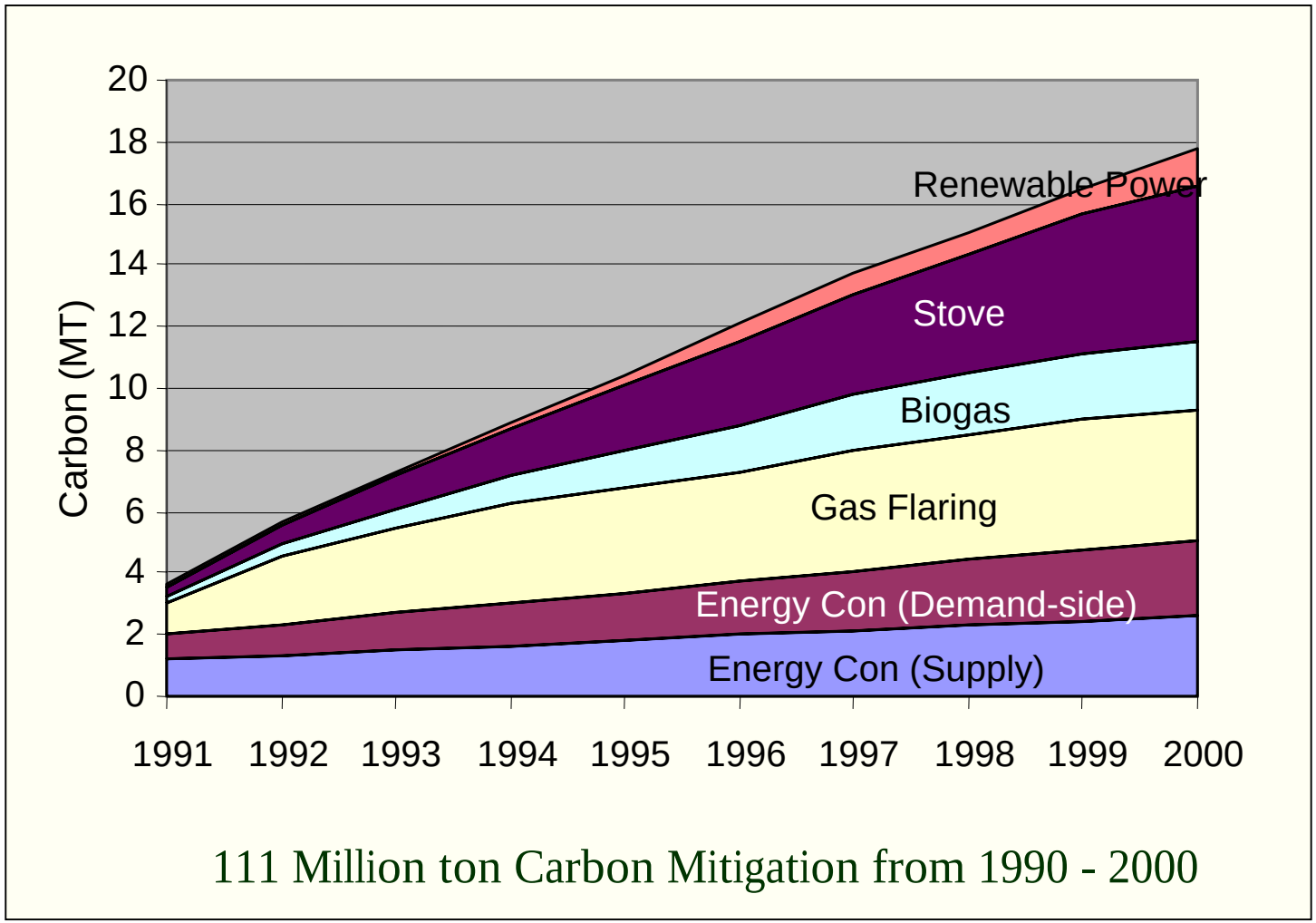
Emissions	1990	2000	CAGR
Carbon	162 (58%)	253 (65%)	4.56
Methane	17.1 (36%)	19.5 (29%)	1.32
N_2O	0.21 (6%)	0.28 (6%)	2.92
CO_2 equivalent	1017	1424	3.42

Decoupling Carbon and Energy:
Policy Measures

- Energy Efficiency and Conservation
- Renewable Energy
- Vehicle Efficiency and Transport Fuel Improvements
- Electricity Reforms
- Forestry and Land Restoration

Carbon Mitigation

(1900-200)



111 Million ton Carbon Mitigation from 1990 - 2000

Carbon Saved in the Year 2000

Technology Initiative		Carbon Saved (Million Ton)
Energy Conservation (Supply-side)		2.60
Energy Conservation (Demand-side)	Steel	0.86
	Cement	0.34
	Other industry	0.78
	Agriculture	0.15
	Transport	0.10
	Residential + Commercial	0.27
Renewable Power	Wind	0.94
	Small Hydro	0.15
	Biomass	0.19
Improved Stove		4.96
Gas Flaring		4.16
Biogas		2.30
	Total	17.80

Cooperative Climate Change Initiatives

- GEF Projects (2.6 Million ton/year potential)
- AIJ and Bilateral Projects
- National Communication
- Accession to Kyoto Protocol
- COP 8

Climate - Development Linkage:

Forestry Initiatives

1) Land Restoration

2) Afforestation

- Joint Forestry Management
- Social Forestry
- Forest Conservation

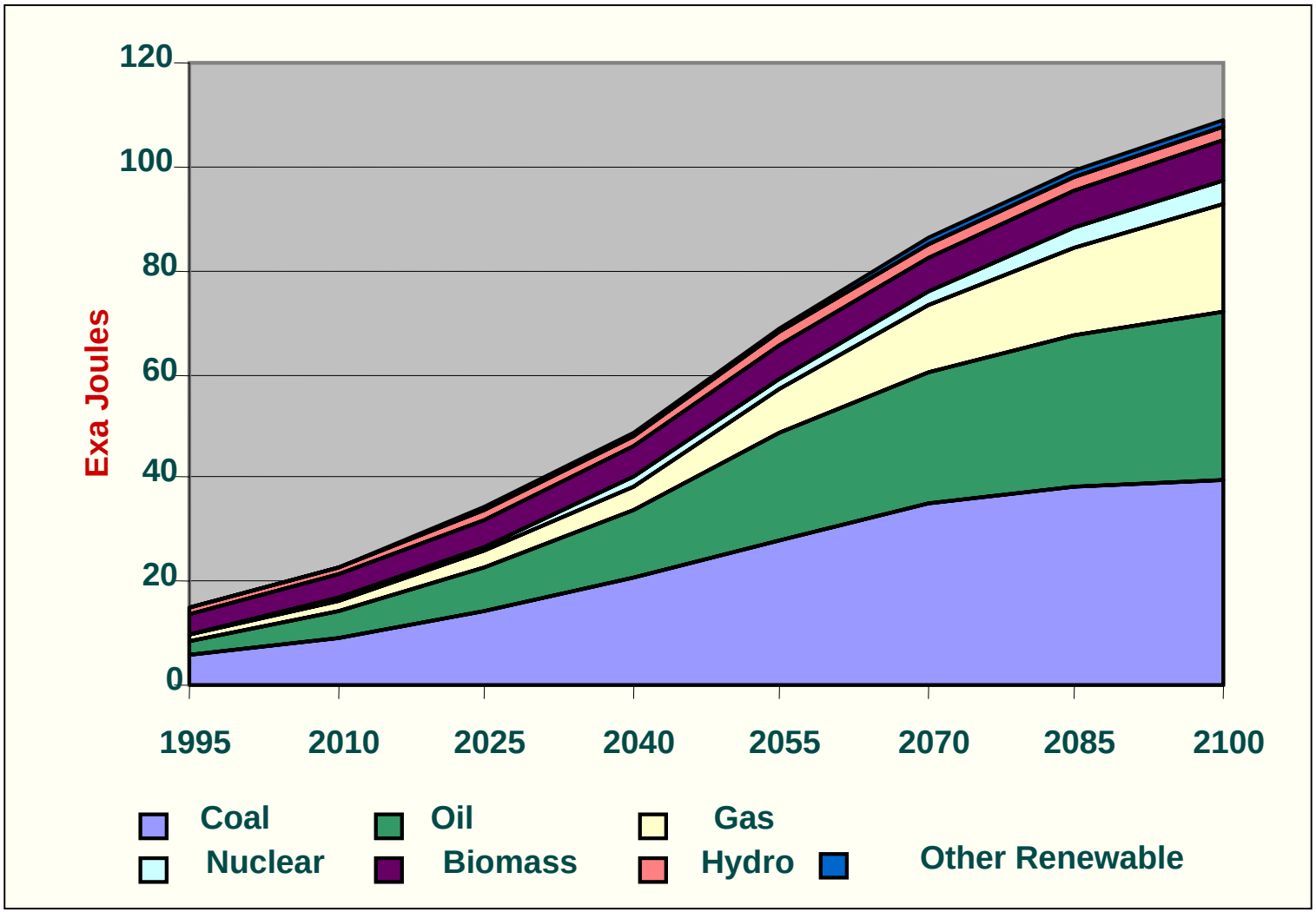
3) Agro Forestry

- Energy Plantation

Future Emissions Trends

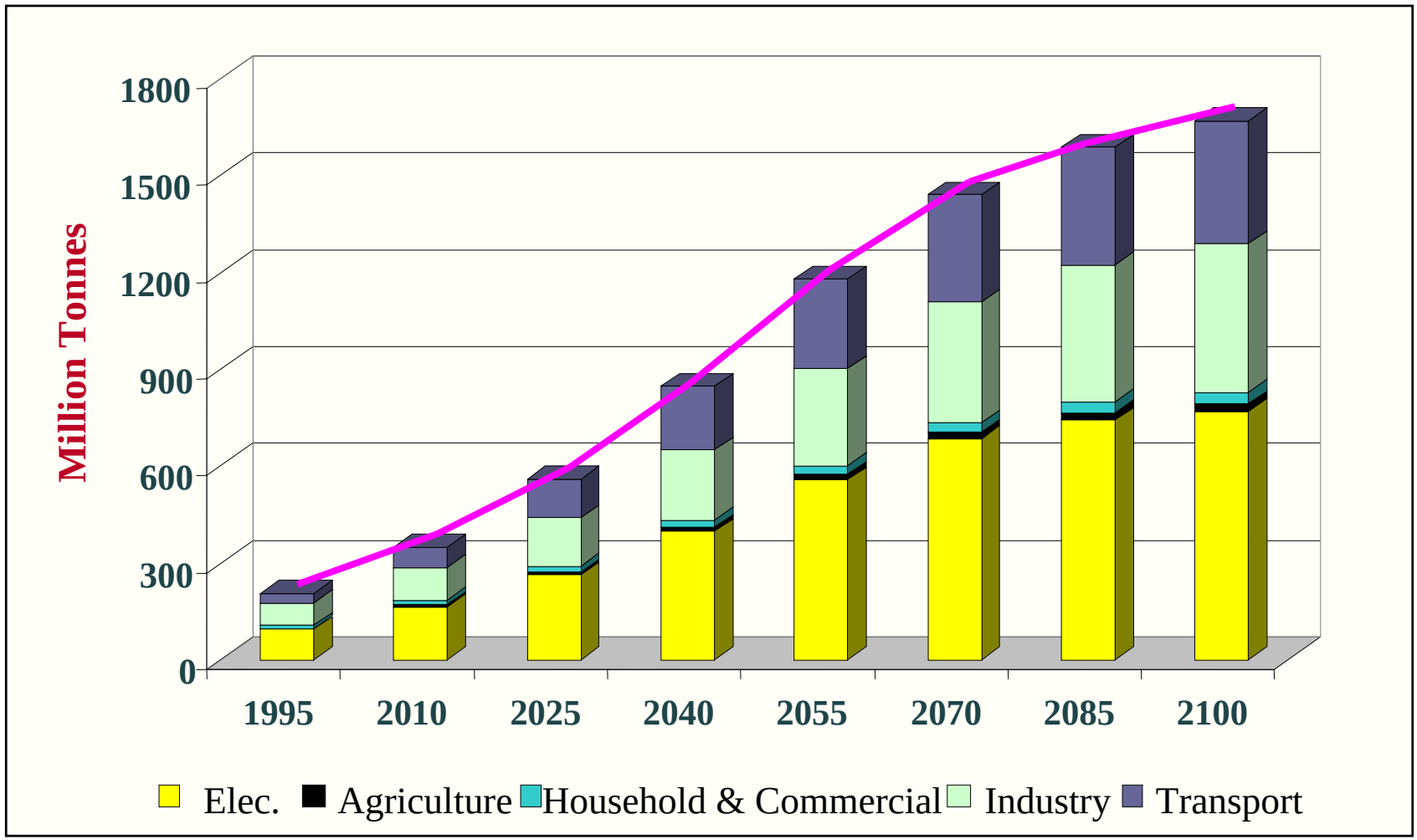
Primary Energy

Reference Scenario



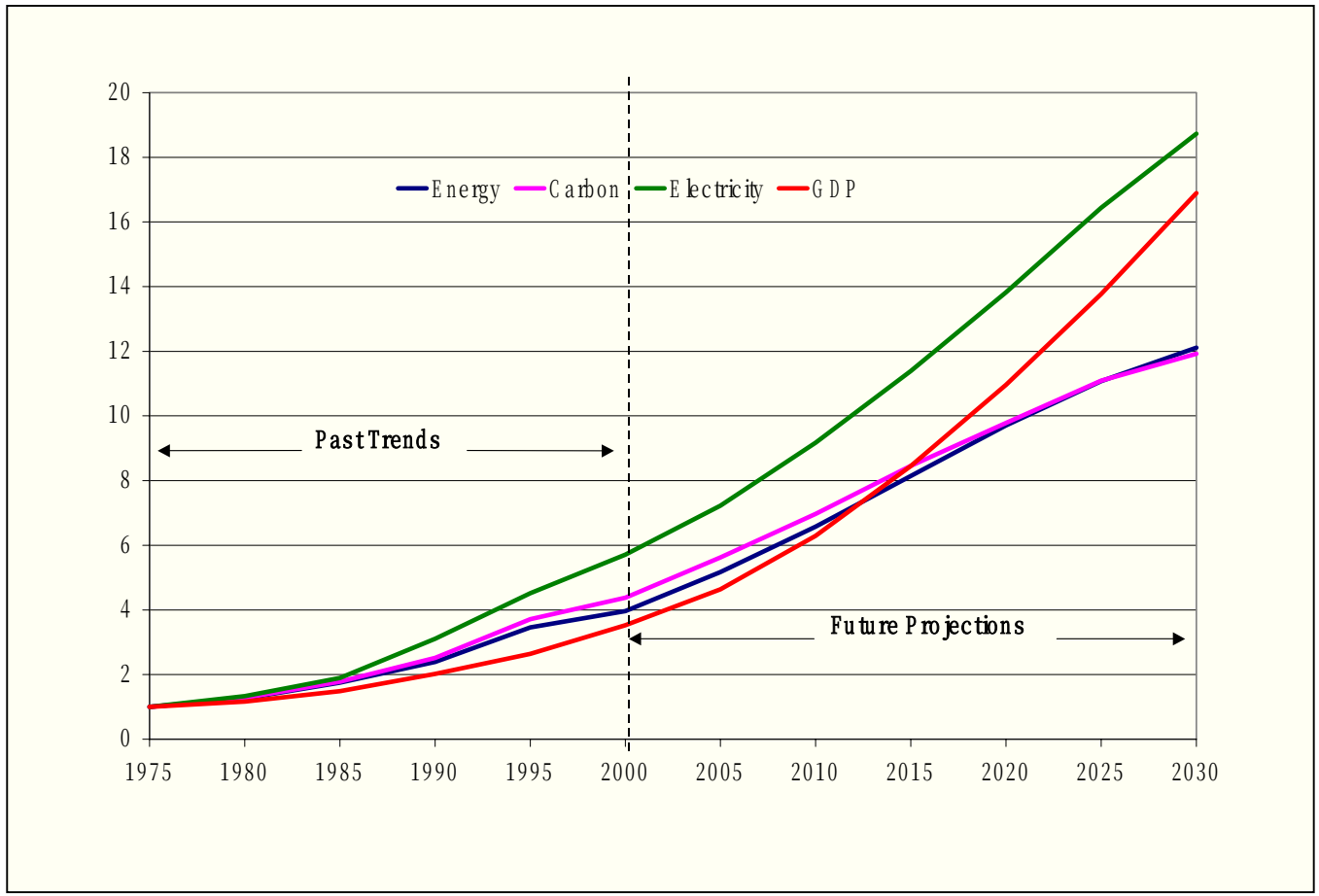
Carbon Emissions

Reference Scenario



Energy, Carbon, Electricity and GDP

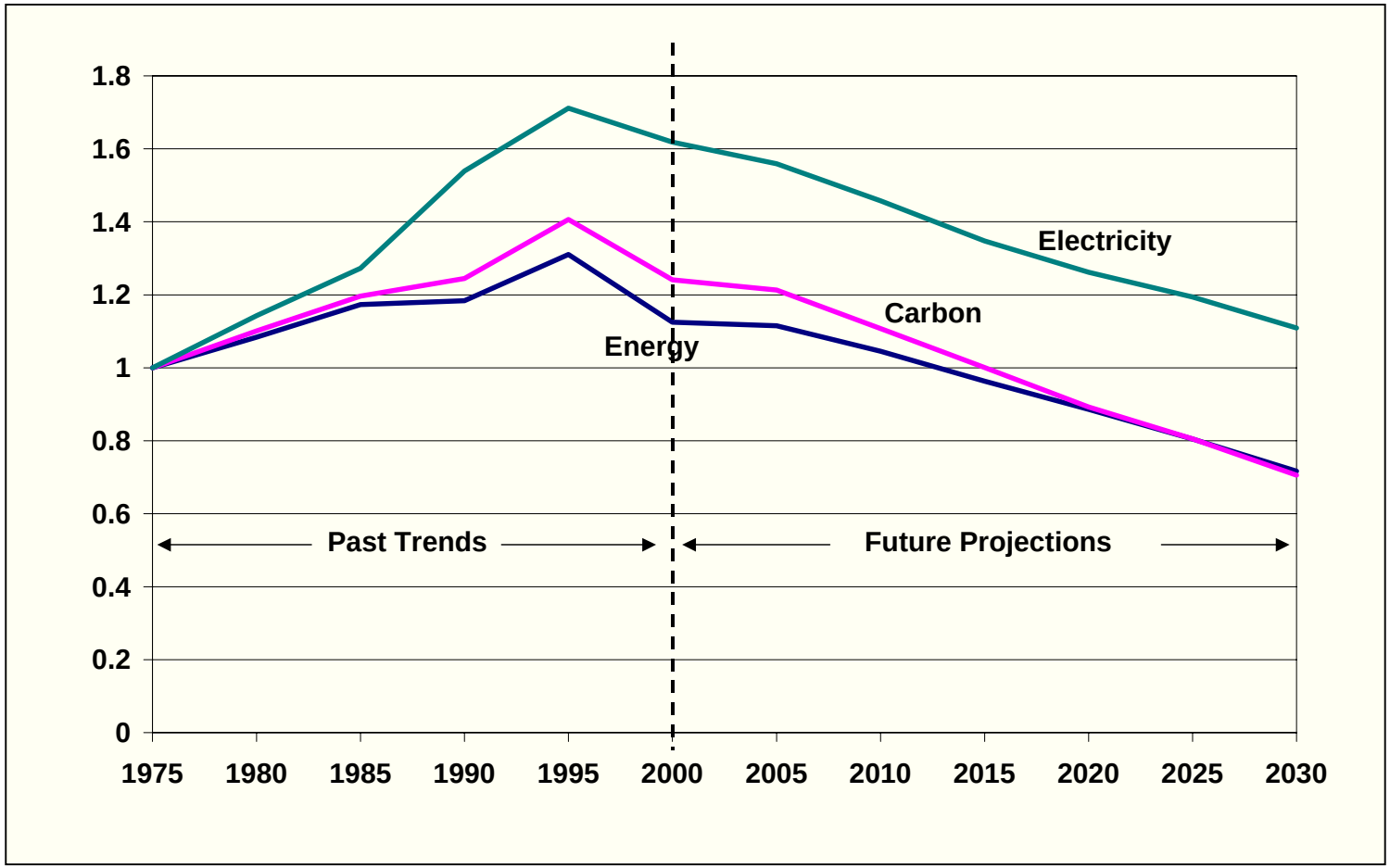
(History and Projections for the Reference Scenario)



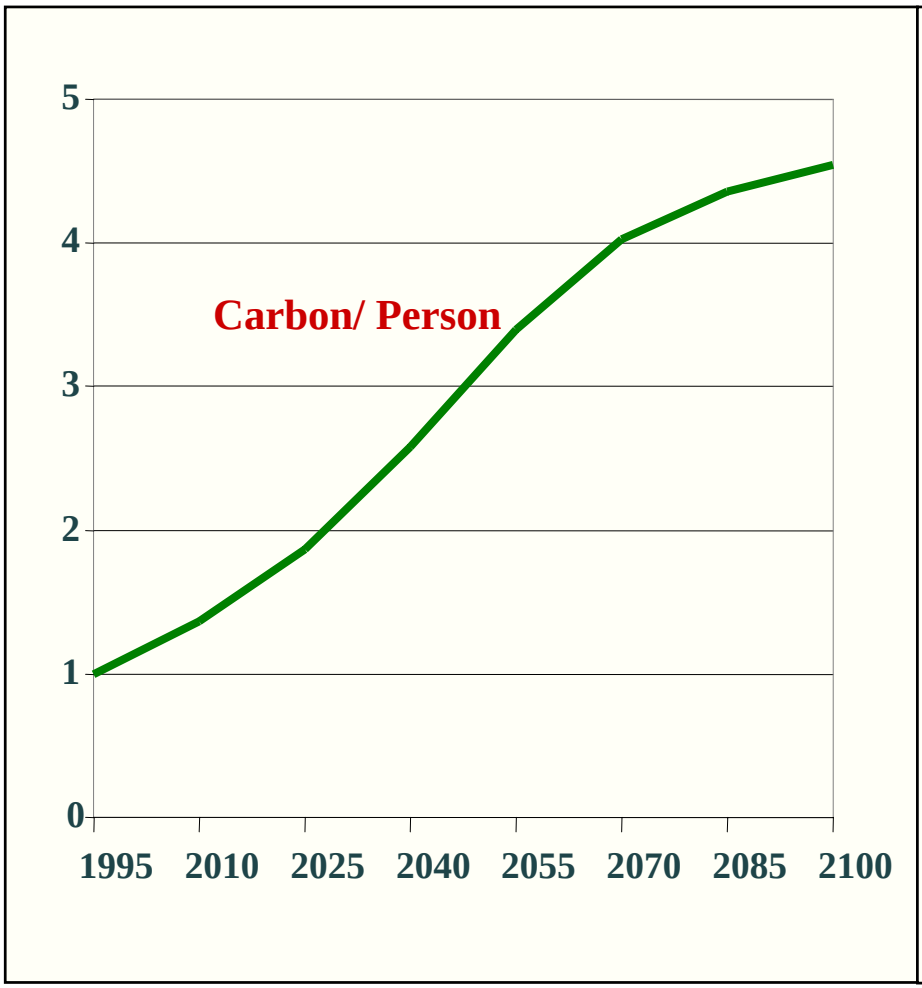
GDP intensities

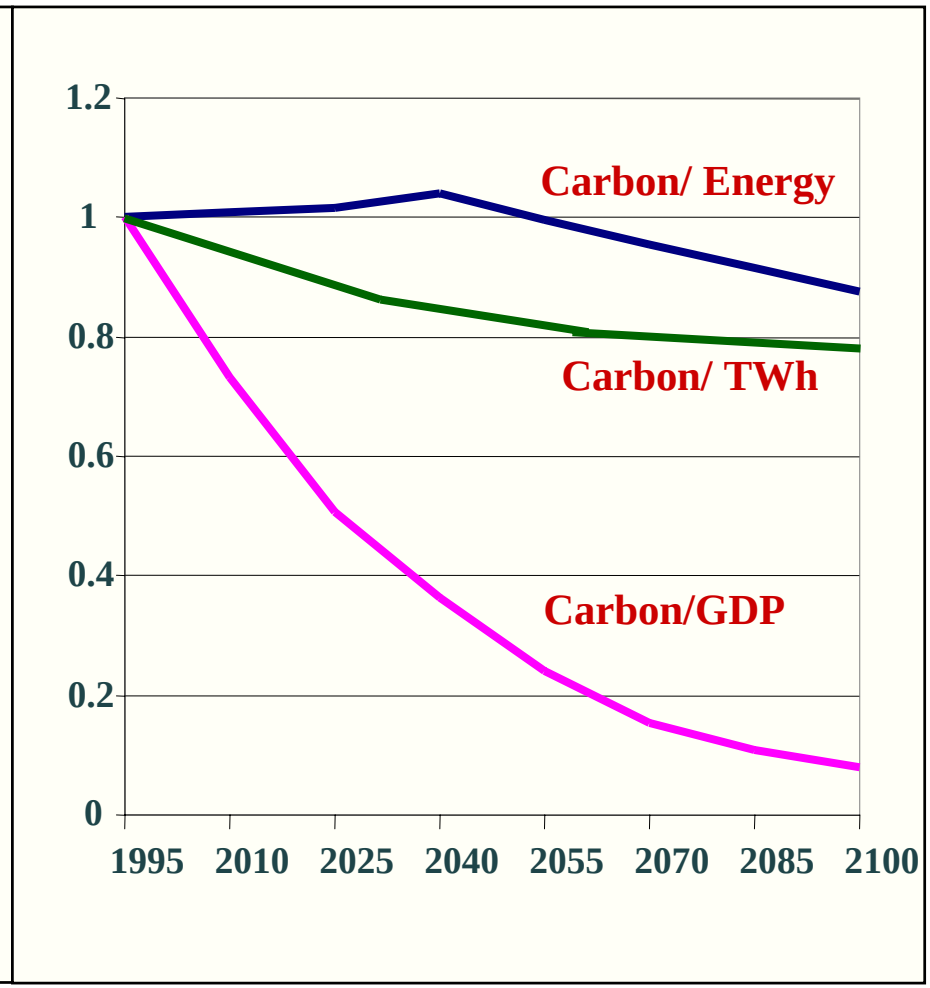
Energy, Electricity and Carbon

(History and Projections for the Reference Scenario)

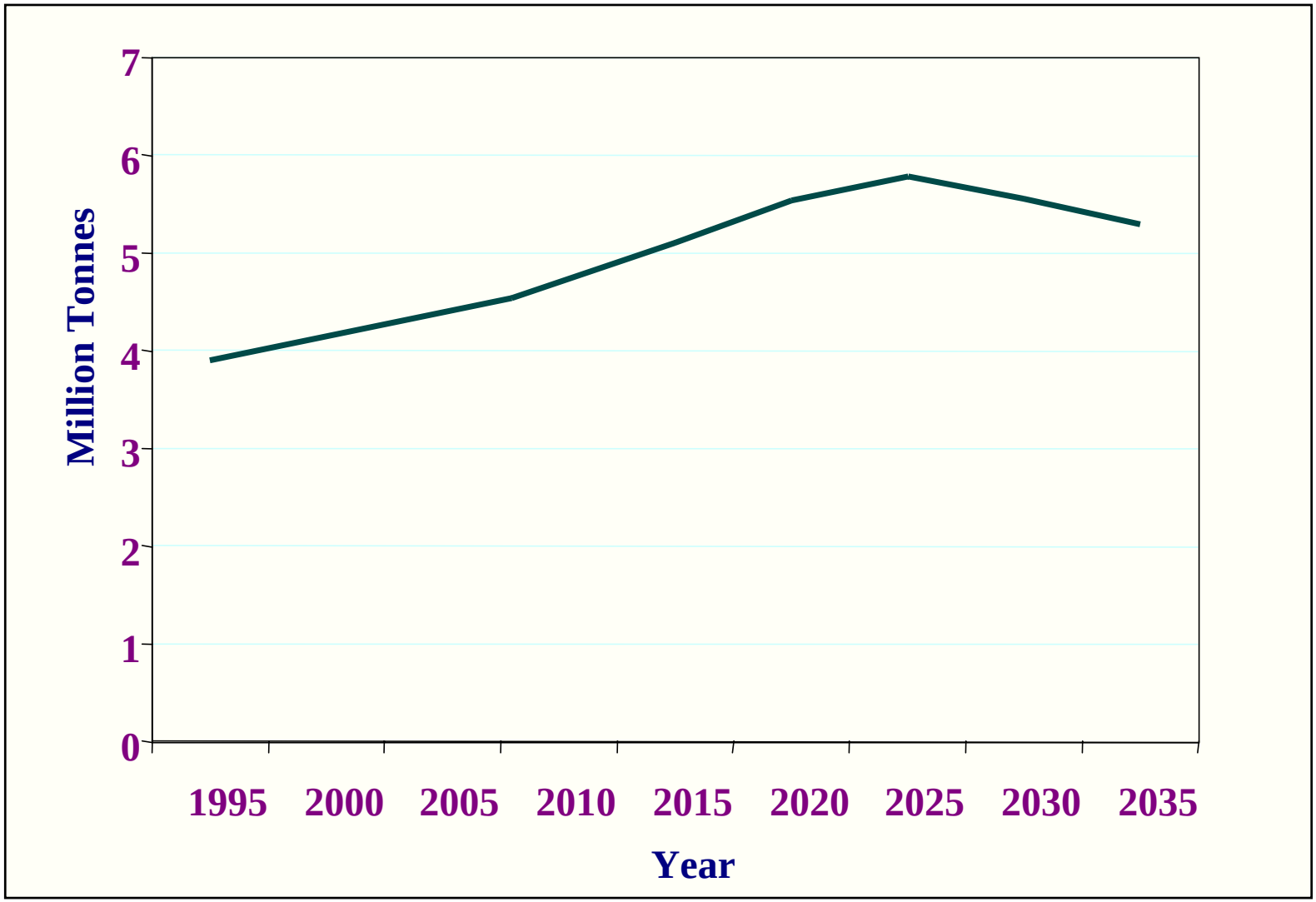


Carbon Intensity: 1995 = 1

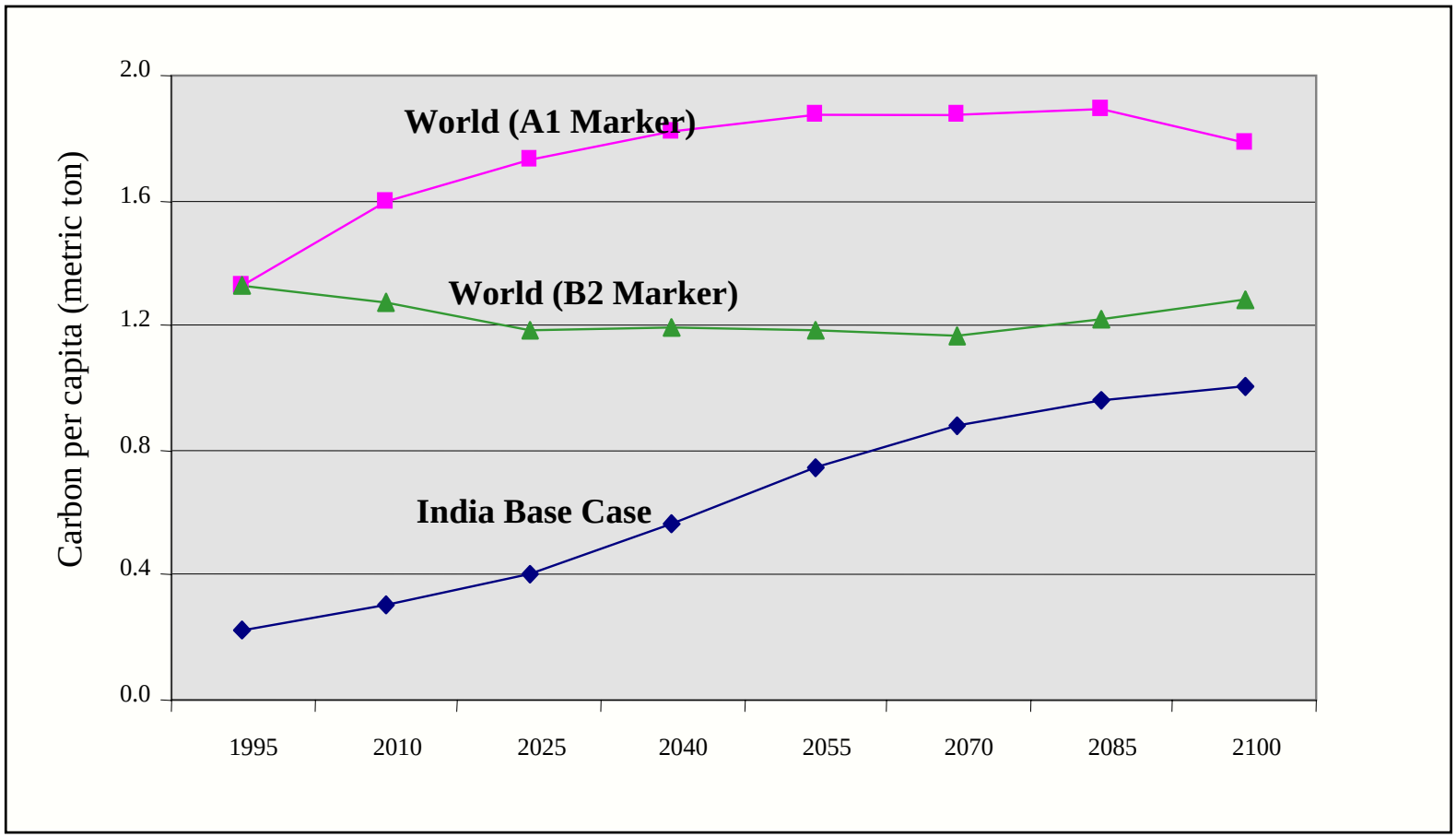




SO2 Emissions

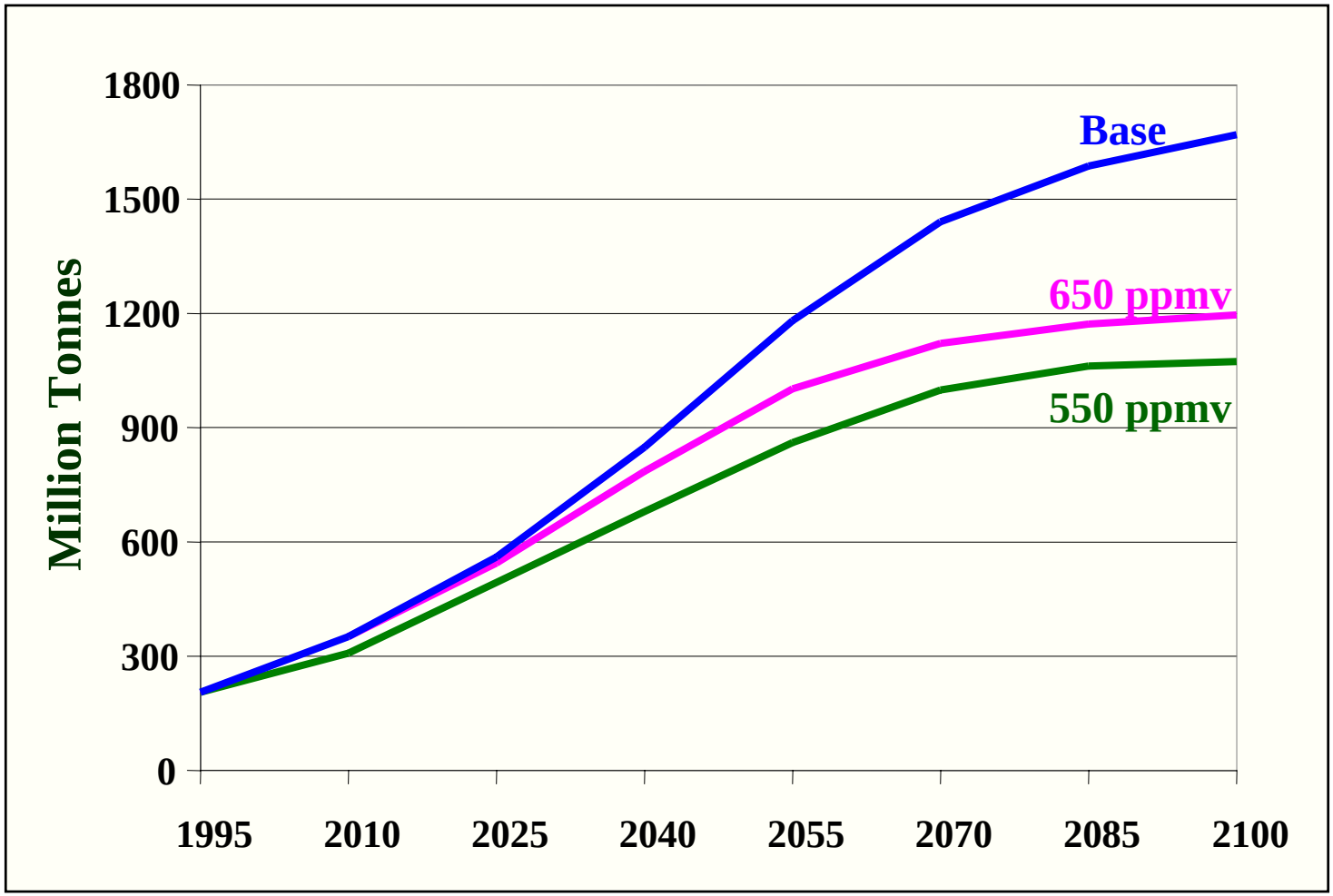


Carbon per Capita in India in the 21st Century under Different Scenarios

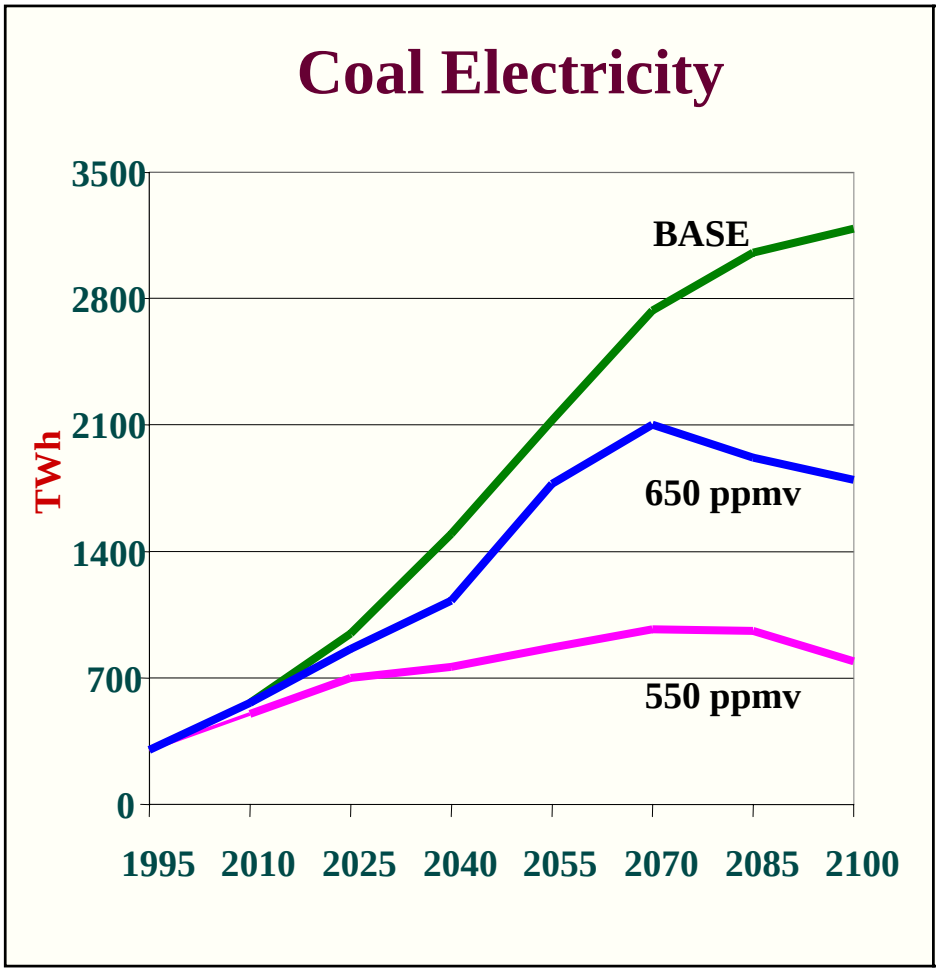


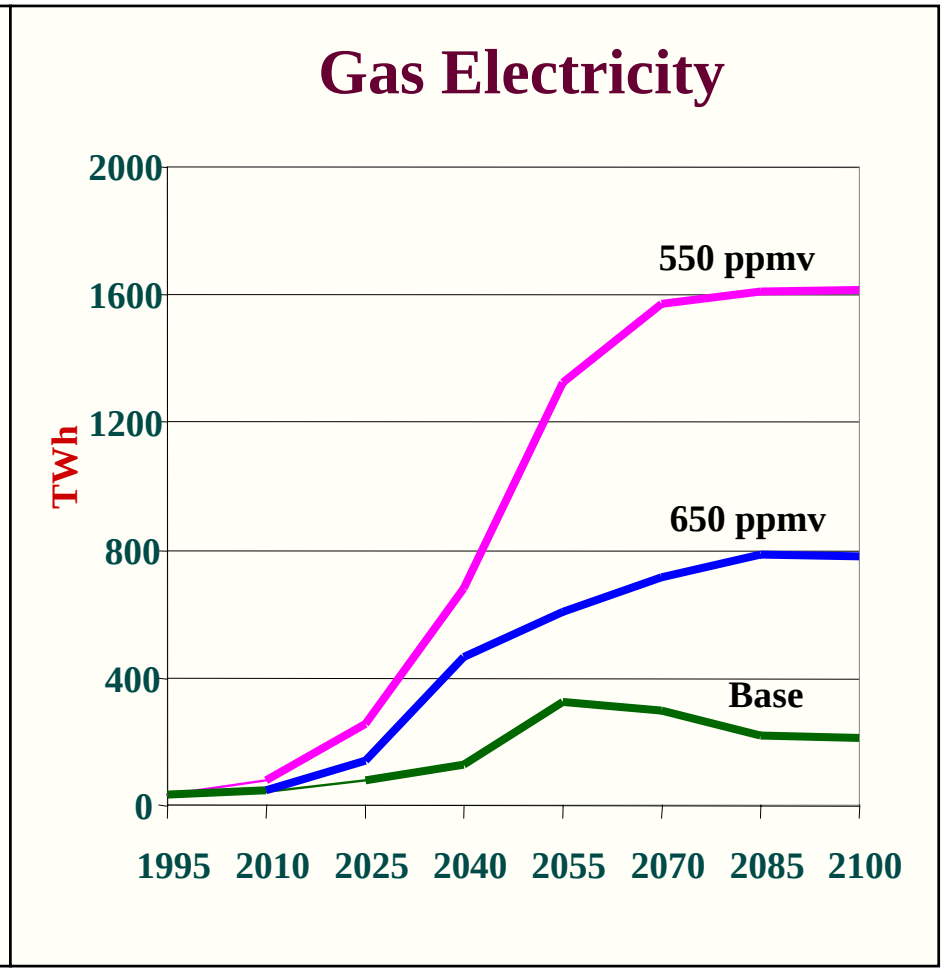
Impact of Stabilization Constraints

Carbon Emission Trajectories



Stabilization: Impact on Electricity Sector





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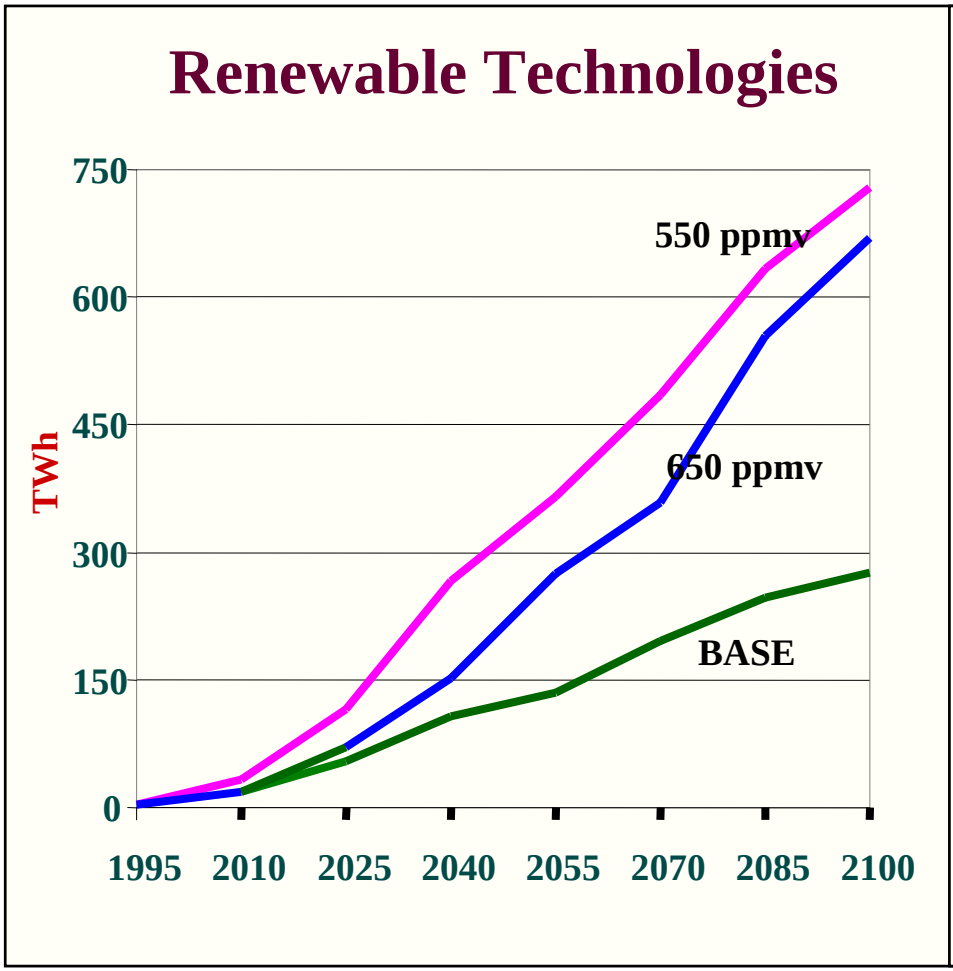
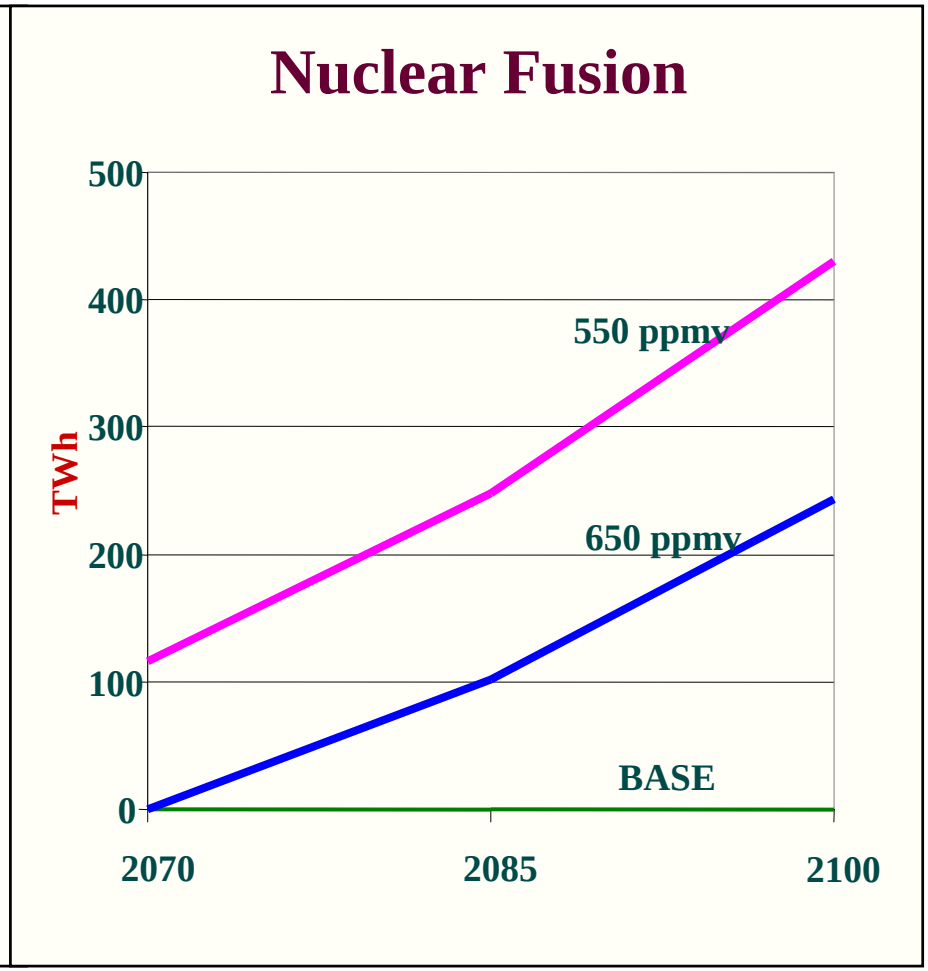
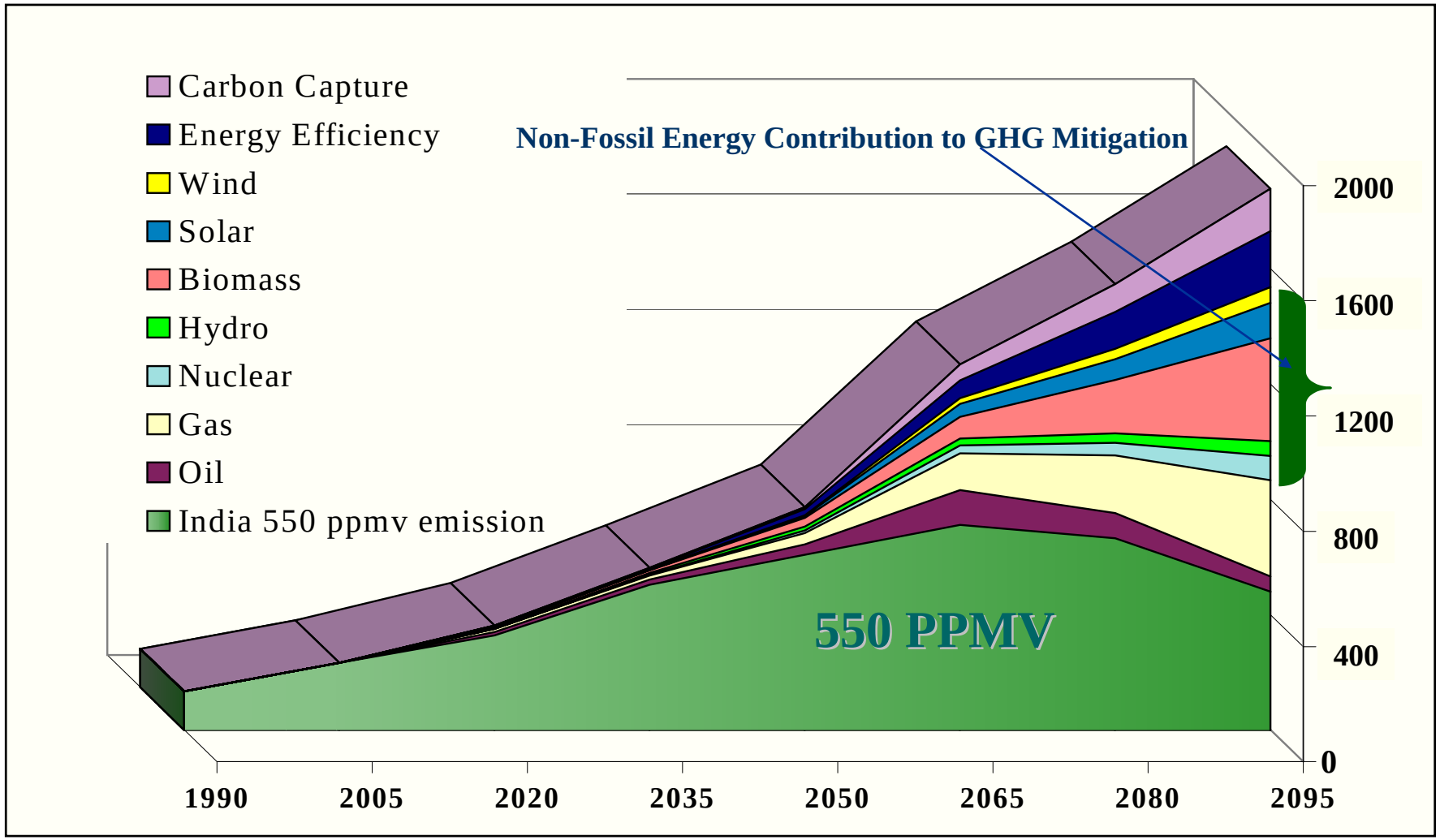




India: Filling the Stabilization Gap



CDM Strategy:
Roadmap to continued meaningful participation

Carbon Mitigation via CDM

(under different Post-Kyoto Scenarios)

Scenarios	Global Carbon Price	Carbon Mitigation (Million Ton)	Cumulative Mitigation %
750 ppmv	$5-8/ton	138	3%
650 ppmv	$5-10/ton	301	7%
550 ppmv	$5-14/ton	449	10%

Climate Friendly Technology Options

Potential and Costs for Kyoto Period

Greenhouse Gas	Mitigation Options	Mitigation Potential 2002-2012 (Million Ton)	Long-term Marginal Cost ($/ Ton of carbon equivalent)
Carbon	Demand-side Energy Efficiency	45	$0-15
	Supply-side Energy Efficiency	32	$0-12
	Electricity T&D	12	$5-30
	Renewable Electricity Technologies	23	$3-15
	Fuel switching - gas for coal	8	$5-20
	Forestry	18	$5-10
Methane (CH_4)	Enhanced Cattle Feed	0.66	$5-30
	Anaerobic Manure Digesters	0.38	$3-10
	Low Methane Rice Varieties	Marginal	$5-20
	Cultivar practices	Marginal	$0-20
Nitrous Oxide (N_2O)	Improved Fertilizer Application	Marginal	$0-20
	Nitrification Inhibitors	Marginal	$20-40

India's CDM Strategy: Roadmap to continued meaningful participation

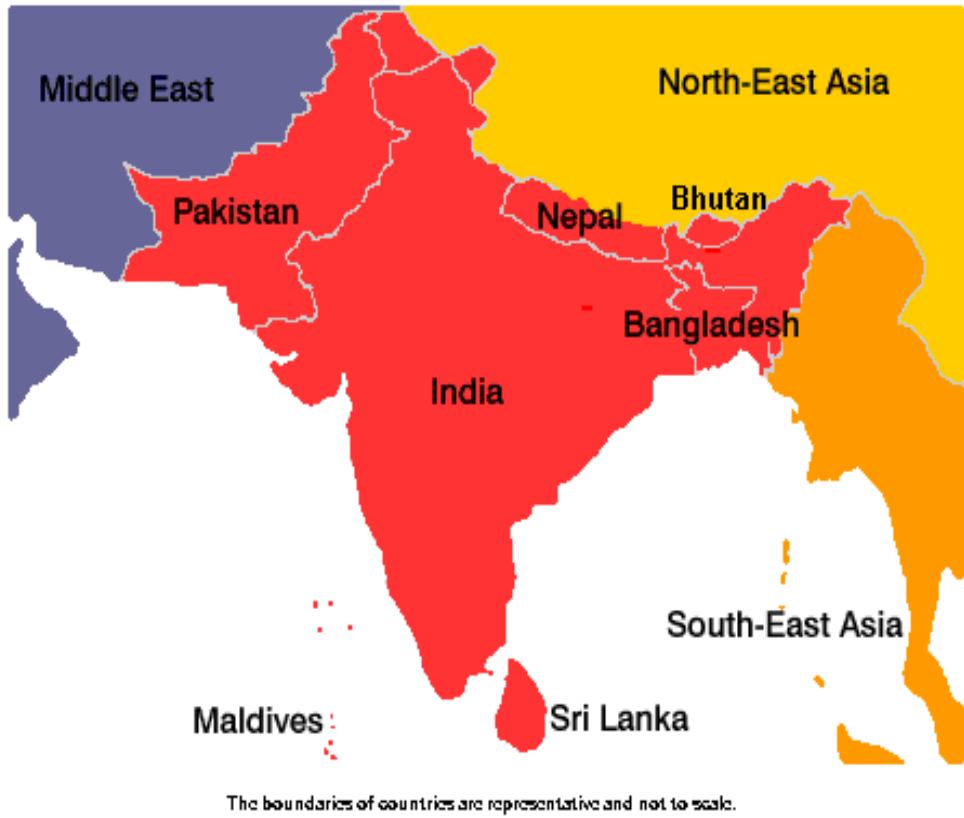
Project / Program	Strategy
Retrofit Projects *(e.g.)* • Boiler retrofit • Process improvements	• Promote technology transition in small / medium industry • Link with resource conservation programs
Green-field Projects *(e.g.)* • New Wind Farm • Gas Power Plant	• Positive list • Promote technical / financial collaborations • Jump start technology transition / hedging
Infrastructure Projects *(e.g.)* • Gas Pipeline • Electricity T&D • Road/Rail infrastructure	• Link with development • Regional energy cooperation • High mitigation potential but difficult to operate under CDM regime
Mitigation Programs *(e.g.)* • Demand-side Efficiency • Electricity Distribution Reforms • Consumer Awareness	• Strong link with economic reforms and sustainable development • High transaction costs but high co-benefits • No way to operate under Kyoto regime

South Asia Regional Cooperation

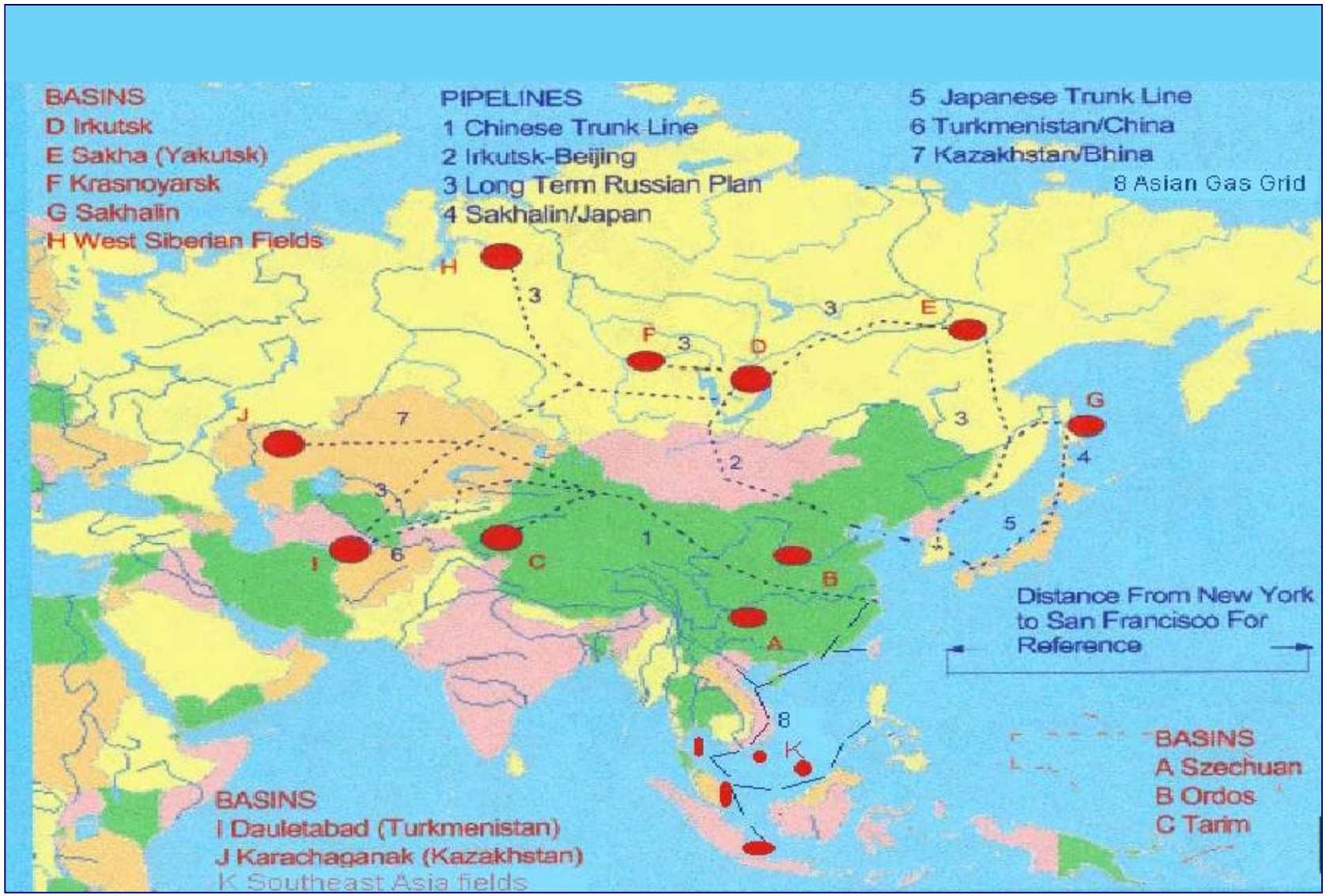
Energy, Electricity and Water Markets

The South Asia Region

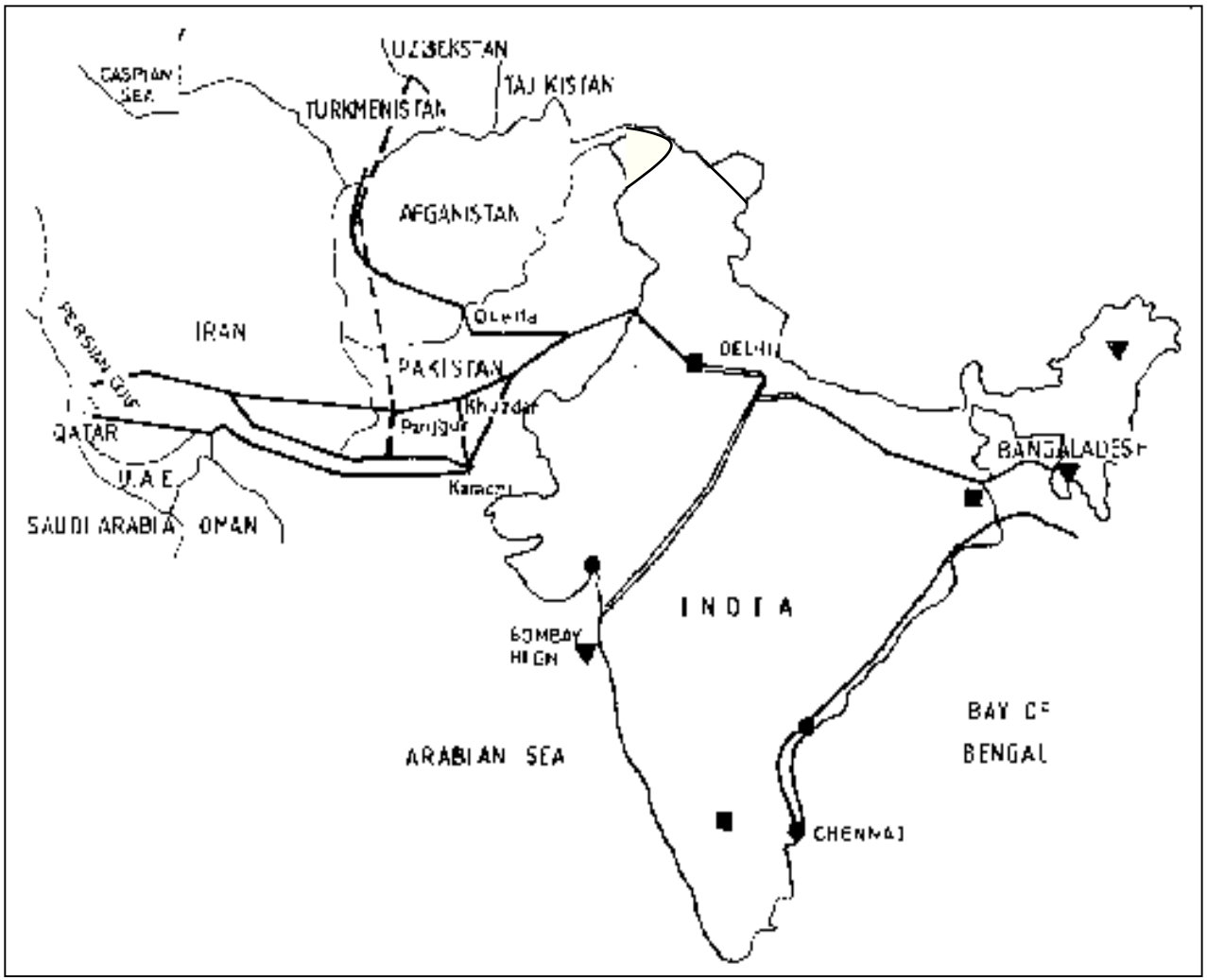
- Consists of Seven Countries
  - ✓ India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan and Maldives.
- 3% of the World Area
- Quarter of World Population
- Among the fastest growing developing country regions



North-East Asia Gas Market Design



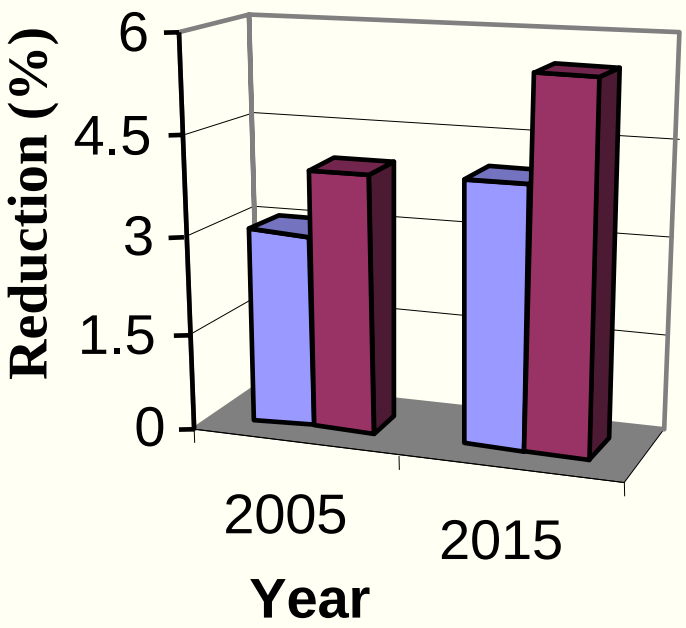
Regional Energy Market Development



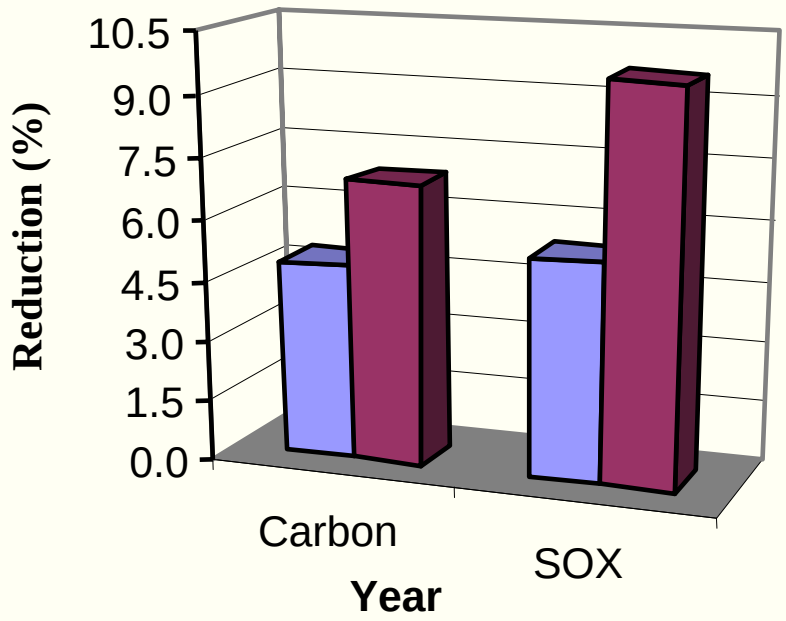
Regional Energy Co-operation:

A Key Link for Development and Climate

Marginal Cost Reduction



Emissions Reduction (2015)



Grid Integration

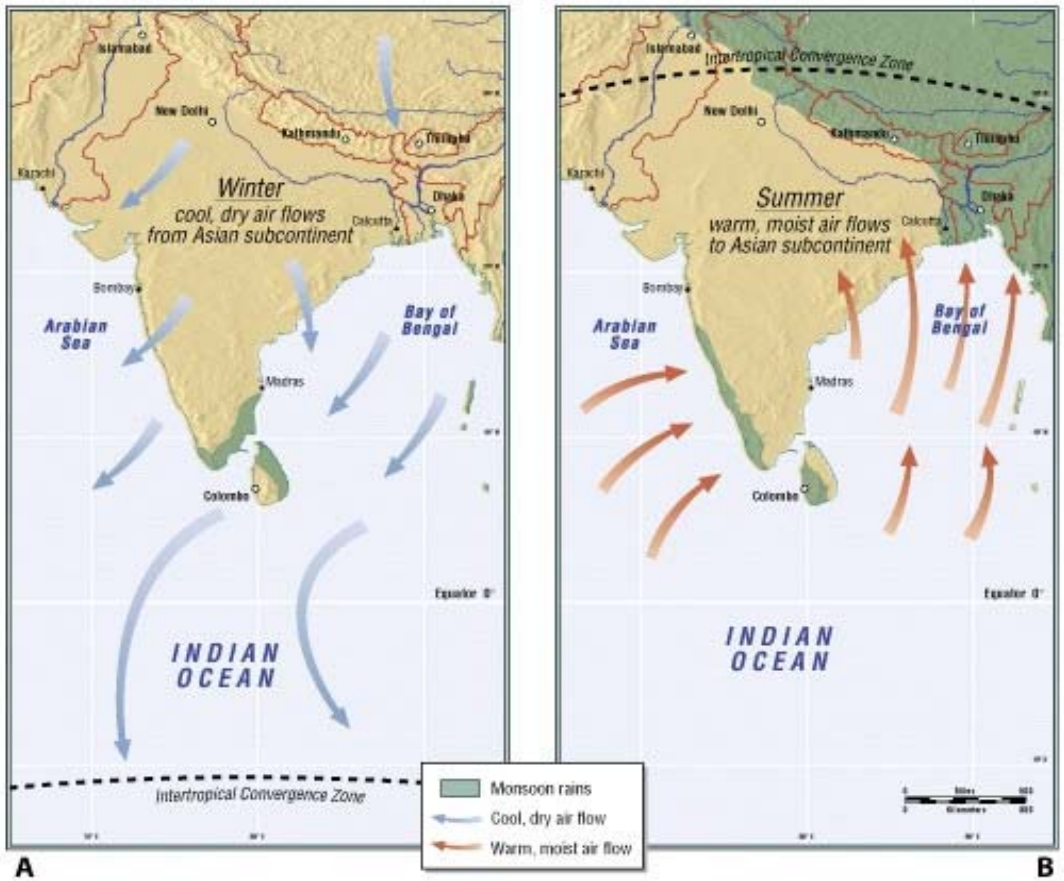
Grid Integration + Regional Energy Co-operation

South Asia Regional Cooperation

Impacts and Vulnerability Issues

Common Regional Climate

- Linked Climate
  - Tropical Monsoon
  - Distribution of Rainfall delineates climate across regions
- Diverse Climatic Regions
  - Long Coast Line
  - Mountains
  - Deserts/ Arid areas
- Resources
  - Diverse Energy Resources
  - Shared Rivers

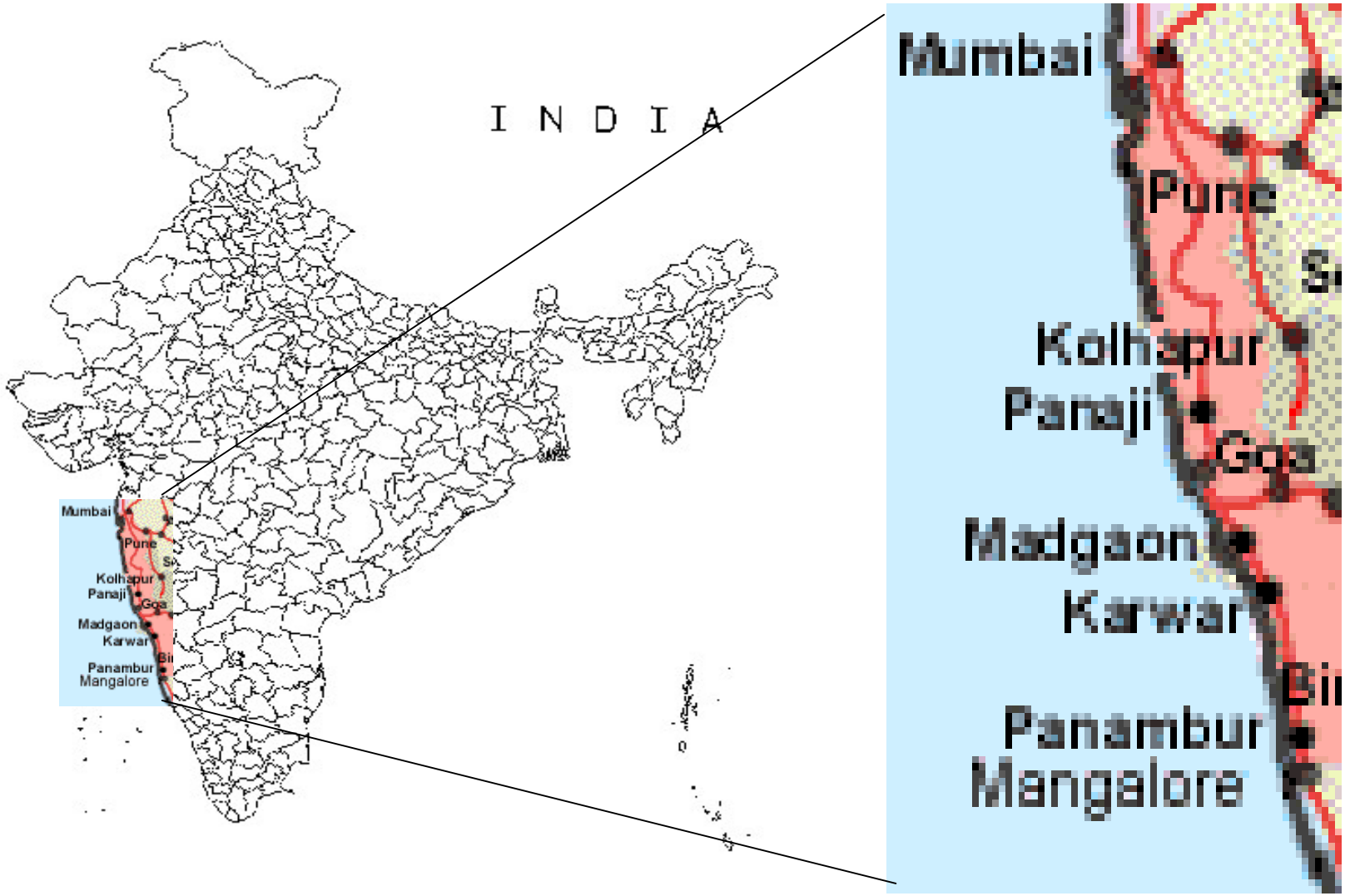


Soft Impacts

- Long Coast-line and Islands
- Enhanced Malaria and Dengue Fever-threat in Tropical Regions of Sri Lanka and spread to mountain regions
- Phytoplankton blooms -South Asian Coastlines
- Melting of Glaciers
- Floods and Droughts?

Hard Impacts

Infrastructure Projects: Konkan Railway



Linking Climate Policies with Development Goals

Development, Local Concerns and Climate:
Policy Linkages and Disjoints

Clean Air Policies and Climate

- Local Air Pollution control leads to Clean Coal (in power) and Ultra-Refined oil products (in transport) and not low carbon technologies

Balanced Regional Development and Climate

- Policies like locating projects in less developed regions lead to clean air, but have little impact on carbon

Regional Energy Market Development

- Strong link with for energy security, clean air and carbon emissions

Regional Water - Energy Linkage

- Strong link with energy security (hydro power), food security (irrigation), health and welfare (flood controls)

Development, Local Concerns and Climate:
Policy Linkages and Disjoints

Infrastructure and Climate

- Coastal infrastructure (Roads, Ports),
- Railway in western mountains (Konkan Railway)

Industry and Climate

- Tourism (sea and Himalayan resorts)
- Refineries on coasts

Implications of Climate Regime for Coal Regions

- Stabilization regime shall affect coal demand and price

Impacts on Islands and their ecosystems

- Lakshdweep, Andamans Islands
- Biodiversity-Climate linkage(Mannar Island)

Impact on Monsoon

Institutional and Capacity Building Measures

1) Public-Private Partnership
2) Stakeholder Consultations
3) Regional/ International Cooperation
4) National Communications
5) Technology Transfer Protocols
6) GEF/ AIJ Projects
7) Bilateral Mitigation Projects
8) Research Projects

Institutional and Capacity Building Issues and Needs

1) Where should the Climate Change focal point be within the Government of India?
2) Capacity to meet Convention Obligations (e.g. National Communicaitons)
3) Regional Integrated Assessment
   - Regional Climate Assessment
   - Vulnerability and Adaptation Assessment (Ecosystems/ Water/ Agriculture/ Coastal development)
   - Mitigation Assessment
3) Regional/ International Cooperation
4) Public-Private Partnership
5) Grassroots Action
6) ……..

COP8 - Delhi Ministerial Declaration

on Climate Change and Sustainable Development

- Parties to Promote Sustainable Development
- Link Climate Change strategies with
  - ⇨ Energy, Water, Health, Food security, Poverty alleviation
- Common but Differentiated Responsibilities
- High Priority to Adaptation
- Technology Transfer
  - ⇨ Energy, Transport, Industry, Health, Agriculture, Biodiversity, Forestry, Water Management
- Access to Clean Energy Services
- Diversified Energy Supply (Clean/ Renewable)

Kyoto and Beyond

Kyoto and Beyond

Mitigation Regime

- Policies and Measures
- Commitment (Targets, Time Tables, Timing, Allocation)
- Extended CDM regime
- Non-Binding Targets
- What is “dangerous anthropogenic interference”?
- Resource Sharing versus Burden Sharing

• Impacts and Adaptation

- Prevention / Insurance
- Future socioeconomic scenarios

• Technology and Financial Transfers

• Institutions

• Capacity building

Conclusions

- Despite no commitments, India mitigated 111 MT carbon in last decade and shifted 2002 baseline by 7%
- Development of regional energy, electricity and water markets would reduce electricity costs, lower emissions and promote sustainable development
- Early signal about post-Kyoto mitigation regime are critical for strategic shift in future emissions baseline
- Concentrations stabilization regime shall significantly impact sub-continent's energy system
- Beyond national sustainable development policies, the emissions mitigation and adaptation policies will have to be crafted for own sake