Climate Change and Indian Industry: Impacts and Opportunities

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Industry's Concerns

Why should the Indian industry be bothered about climate change?

- Since it would have to bear impacts due to climate change
- It offers business opportunities like clean technology transfers and energy efficiency improvements
- Funding mechanisms are also available

Climate Change Impacts on Industry

Industries that would be effected due to climate change

1. **Directly sensitive to climate**
2. **Dependent on climate-sensitive resources**
3. **Markets sensitive to climate change**

Directly sensitive to climate

- Coastal industries
  - Hotels
  - Coastal industries (salt manufacturing, fisheries, refineries on coast etc)
- Coastal infrastructure
  - Ports
  - Railway networks (e.g. Konkan Railways)
  - Roads
- Change in energy consumption
  - Increased space cooling requirements in Building and transportation sectors
  - Due to changed irrigation requirements

Dependent on climate-sensitive resources

- Almost all industries, since energy prices would be effected
- Agro-industries
  - Food
  - Beverages
- Industries dependent on forestry
  - Building sector
  - Paper
  - Power generation
- Shipping

Markets sensitive to climate change

- Energy infrastructure
- Change in transport demand due to population migration, changed agro-product movements
- Insurance sector

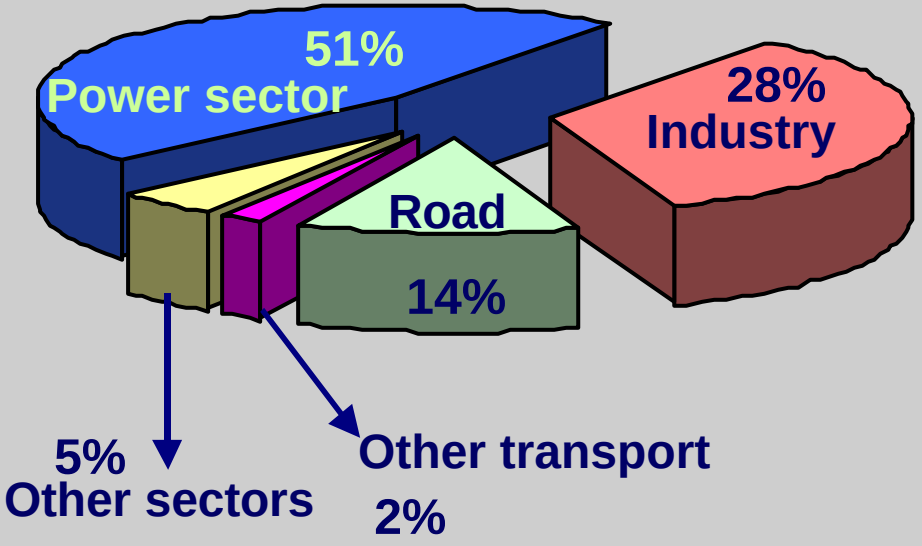
Indian Emissions

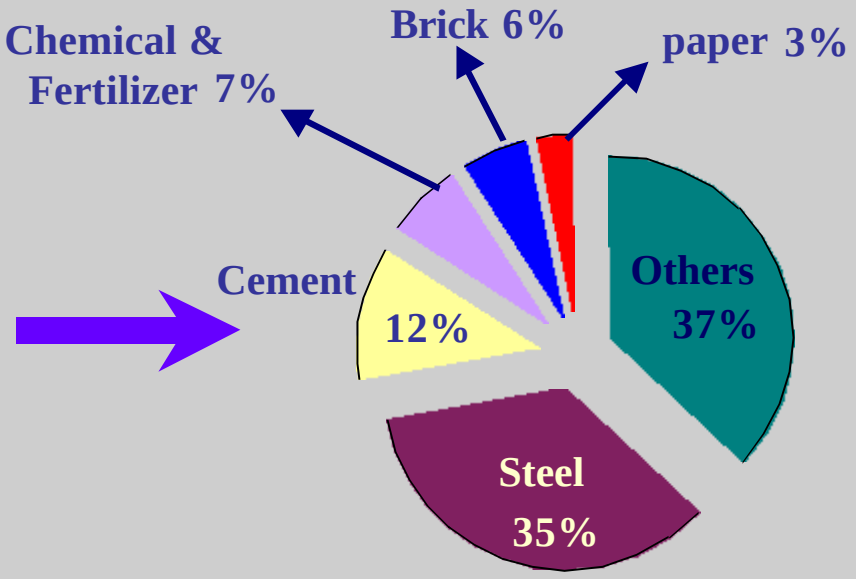
India: CO_2 Emissions (2000)

260 Million Tons of Carbon

3% of global emissions

5.5% annual growth rate



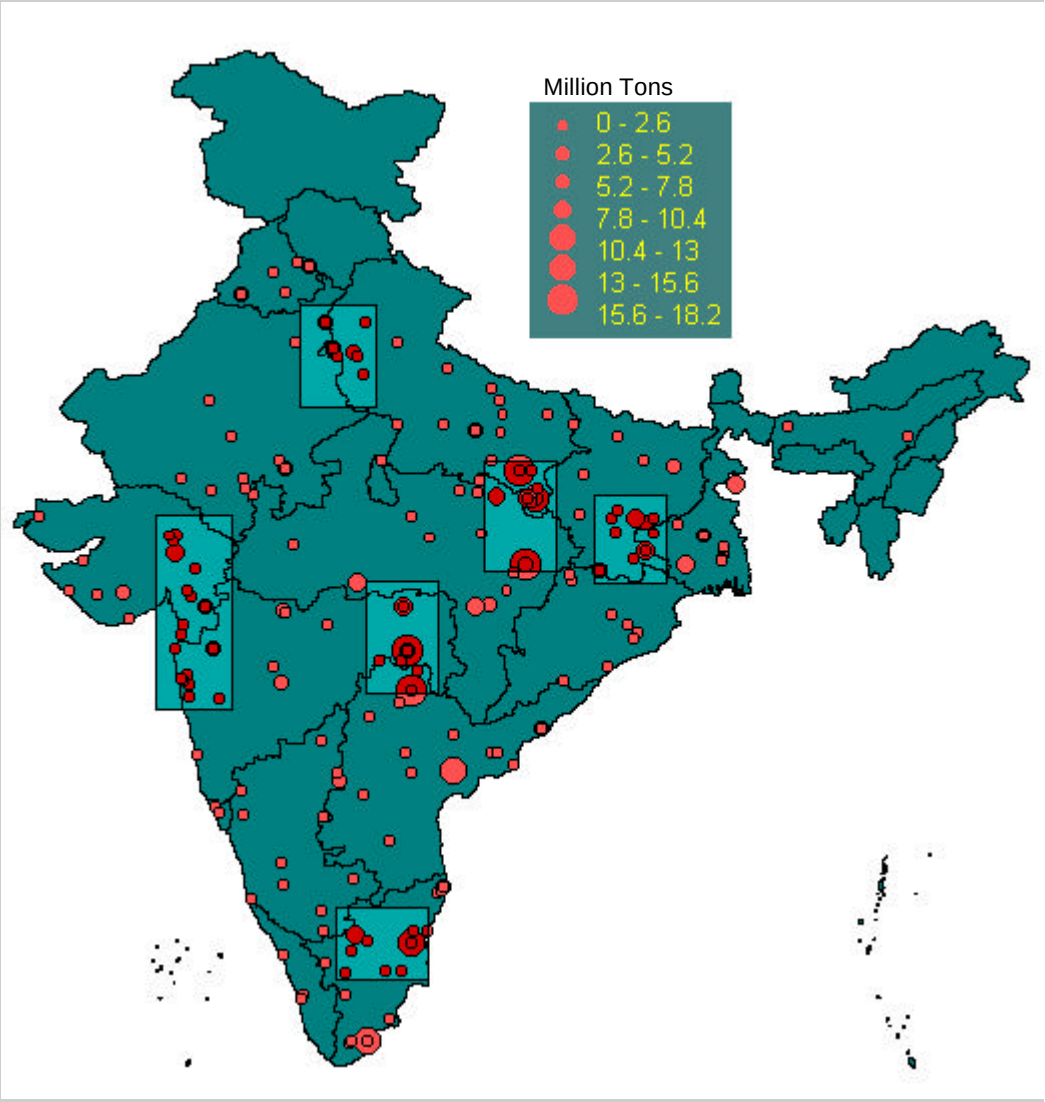


Share of Industry Sectors

Large Point Sources (LPS): CO_2 Emissions

Emission details	No. of LPS	CO_2	
		LPS (Tg)	LPS/Total
Power	94	365	47
Steel	11	48	6
Cement	85	68	9
Fertilizer	31	14	2
Sugar	28	0.7	0.09
Paper	33	2.9	0.37

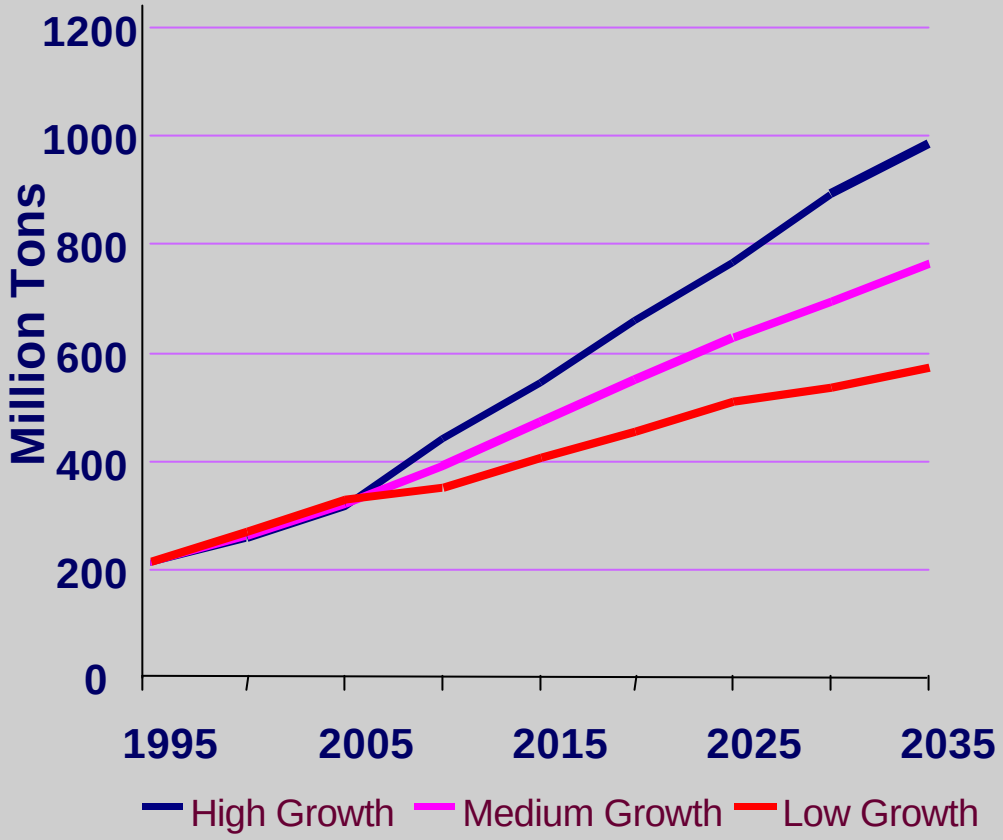
Tg (Teragram) = Million ton



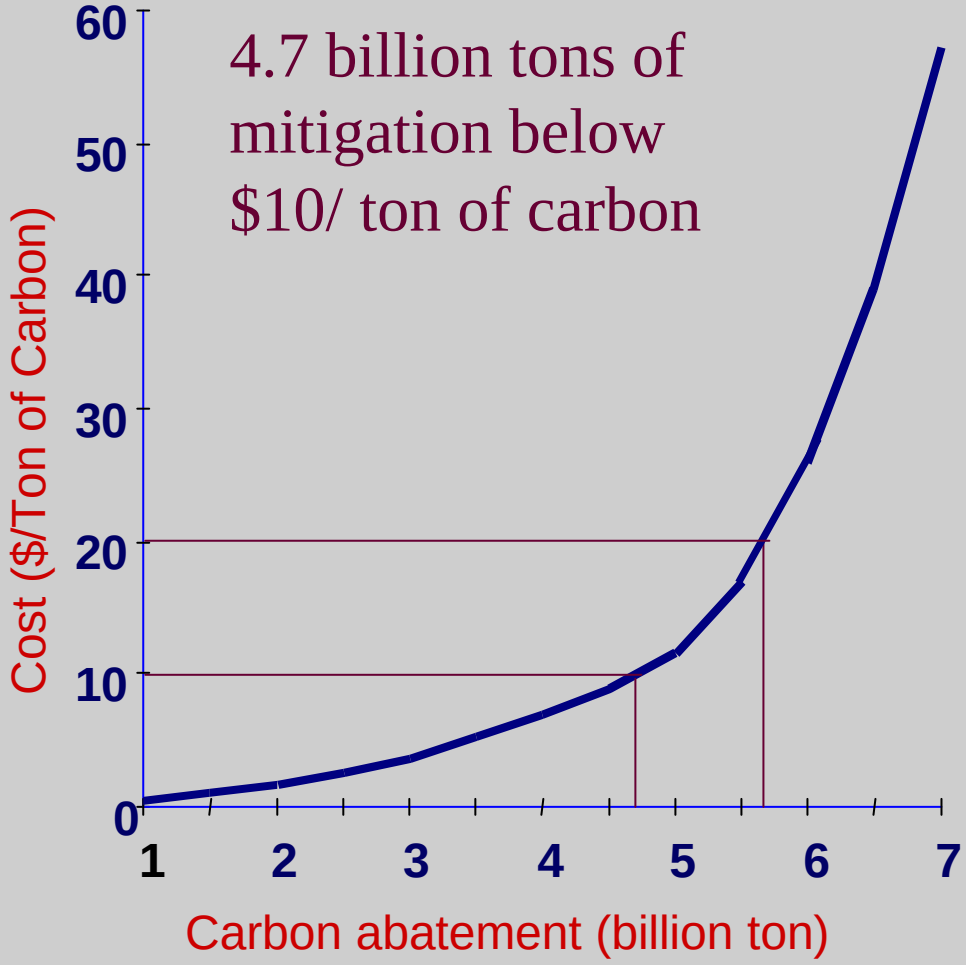
India: Future Carbon

Projected rise in Indian Carbon emissions during 2000-2035

- **BAU: 330% (Compounded annual GDP growth rate 5.2%)**
- **High Growth: 450% (Compounded annual GDP growth rate 6.1%)**



India: Marginal Cost of Carbon Mitigation (1995-2035)



Carbon Market Opportunities

Carbon Market Mechanisms: The Kyoto Protocol

Buy and sell Carbon emissions through;

- **Article 6: Joint Implementation**
  - **Annex I parties (mostly developed countries)**
- **Article 12: Clean Development Mechanisms**
  - **Non-Annex (India is here) and Annex I parties**
- **Article 17: Emissions Trading**
  - **Global**

New Kyoto Protocol and Carbon Market Size and Price

OECD: Annual Mitigation Target (2008-2012)

0.5 Billion Tons

Hot Air

300 Million Tons

Marginal Mitigation Cost

(in Year 2010)

Domestic Action	US $/tC
➢ Japan Alone	458
➢ W. Europe Alone	130

Annex I Trading	20
Annex I Trade +CDM	10

Global Carbon Market: Summary

- Size: 0.5 Billion ton / year (in 2010)
- Enlarging demand
- Global supply (no transport cost)
- Market price (Minus US in Kyoto Regime)
  - $10/ tC (with global flexibility in C mitigation)
  - Up to $ 450 / tC (only domestic mitigation by developed countries)

CDM: Criteria

- **Sustainability**
- **Climate Change Effectiveness**
  - **Additionality**
- **Cost Effectiveness**
  - **Partnership between developed and developing countries**

Typical CDM Projects

Generic Project Areas
Carbon Mitigation

1. Energy System
2. Production Technologies
3. Recycling/ Substitution
4. Recovery (Capture) of Gases
5. Sequestration (Sink development)

Energy Projects for Carbon Mitigation

1. Energy Efficiency Improvements

2. Fuel Switching
   - No-Carbon Energy (Renewable, Nuclear)
   - Low Carbon Energy (Gas for Coal)

3. Reduce Fuel Leakage/ Waste

4. Low Carbon Waste Fuels
   - Methane from Landfill and Waste Water
   - Biomass Waste in Agro-process Industry

Coal to Gas Switch for Power Plant

	Units	Coal Power	Gas Power
Fuel Price	Rs./ GJ	80	150
Generation Cost	Rs./ Kwh	2.2	2.5
Carbon Emission	kg/ Mwh	290	160
Sulfur Emission	kg/ Mwh	6	0
Ash	kg/ Mwh	240	0

Mitigation

	kg/Mwh
Carbon	130
Sulfur	6
Ash	240

@ 6000 Hrs per year Operation

☛ 780 Tons of Carbon saved/ MW

@ Rs 480/ tC

☛ Rs. 0.06/ Kwh

CDM Project:
Renovation of Coal Power Plant

	Units	Old Plant	New Plant
Efficiency	%	35	38
Renovation Cost	Mill. Rs./ MW	-	2
Carbon Emission	kg/ MWh	290	267
Sulfur Emission	kg/ MWh	6	5.5
Ash	kg/ MWh	240	220

	kg/MWh
Carbon	23
Sulfur	0.5
Ash	20

@ 6000 Hrs per year Operation
- ☛ 138 Tons of Carbon CERUs/ MW

@ Rs 480/ tC
- ☛ Rs. 65,000 per Year/ MW

@ Rs. 80/GJ Coal Price
- ☛ Fuel Saving of Rs. 420,000/ MW

Mitigation Projects in Sinks, Capture and Recovery of GHGs

CO_2 Sink Projects

- Energy Plantations
- Biomass Power

Methane (Recover and Burn)

- Coal Bed
- Sewage Water
- Landfills

CO_2 (Capture and Storage)

Prospects in Mitigation of Other than Carbon GHGs

Other than Carbon Gases in Kyoto Protocol

1. Methane (CH_4)
2. Nitrous Oxide (N_2O)
3. Hydrofluorocarbons (HFCs)
4. Perfluorocarbons (PFCs)
5. Sulfur hexafluoride (SF_6)

Conclusions

1. Indian industries would be effected in varying degrees due to climate change
2. It makes business sense to be climate friendly
3. Opportunity to expedite energy efficiency initiatives
4. Funding mechanisms exist
5. Industrial federations may help in reducing transaction costs

Thank you