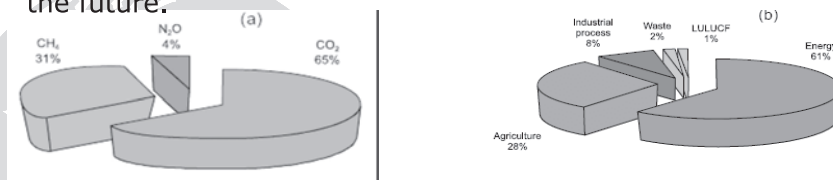


Greenhouse gas emissions

- Contribution of Asian countries on world CO₂ emissions has increased from 9% in 1973 to 27% in 2004. Total CO₂ emissions in 2004:
 - World = 26.6 billion tons; India = 1.1 billions tons (4%)
 - Japan = 1.2 million tons
- Size of India's economy is only 1.7% of the world. But, about 17% of the world's population live in India.
- Since the energy sector in the Asian countries are being developed, the energy related CO₂ emissions are expected to increase rapidly in the future.

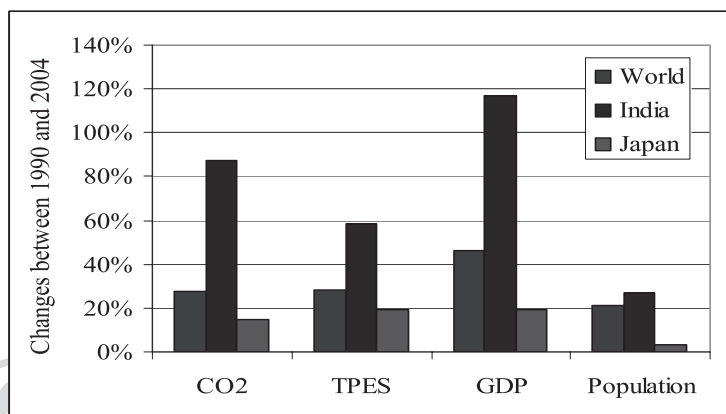


Distribution of GHG emissions from India (1994)

Source: India's National Communication to UNFCCC, 2004; IEA, 2006

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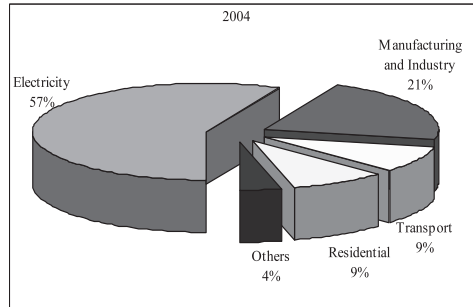
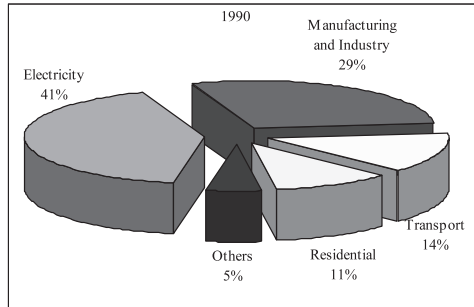
Changes during 2000 - 2004



- ❖ India has relatively high growth rate of CO₂ emission, total primary energy supply (TPES) and GDP as compared of the world average

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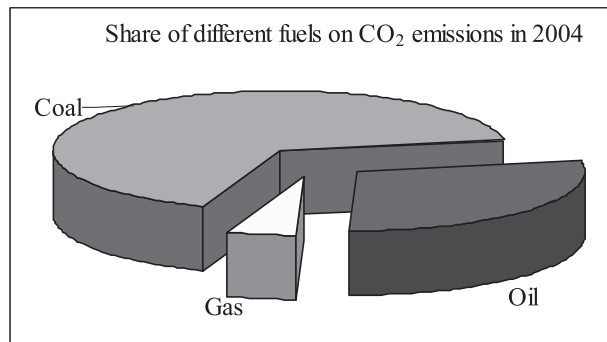
India: Sectoral Contribution to CO₂ emissions



- ❖ Electricity sector is the largest CO₂ emitter in India and its share has increased during 1990-2004
- ❖ Individual share of all other sectors on total CO₂ emissions has decreased during 1990-2004
- ❖ Though the individual share of manufacturing and industry, transport, Residential and others have decreased, CO₂ emission from the respective sectors has increased by 39%, 20%, 53% and 48% between 1990 and 2004

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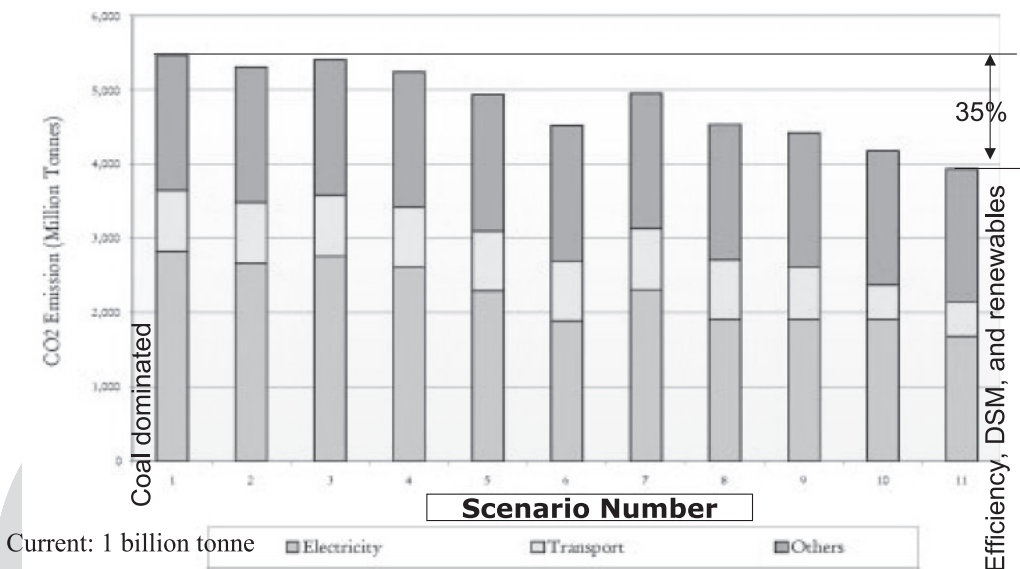
Fuel Mix on CO₂ Emissions



- ❖ Contribution of coal on total CO₂ emissions is 66% of which 78% is due to electricity sector
- ❖ Contribution of oil on total CO₂ emissions is 29% of which 31% and 28% come from transport and Industry sector respectively
- ❖ Contribution of gas on total CO₂ emissions is 5% of which, 55% comes from Electricity Sector

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CO2 emissions in 2031-2032



Integrated Energy Policy, Planning Commission, 2006

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India: Addressing Climate Change

“ ... I made a commitment on behalf of India on carbon emissions. India is prepared to commit that our per capita carbon emissions will never exceed the average per capita emissions of developed industrial countries. Moreover, as developed countries take measures to bring down their per capita carbon emissions, our threshold would come down too. This is our solemn commitment”

Dr Manmohan Singh
Prime Minister of India
7 February 2008

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Measure to Reduce CO₂ Emissions

- ❖ Shift to less carbon intensive fuel especially for power generation
 - Coal to oil to gas
- ❖ Energy efficiency improvement of end use devices
- ❖ Promoting renewable and clean energy
- ❖ Policies that facilitate the above measures to take place
- ❖ Awareness building and capacity development
- ❖ Institutional set ups

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Strategies to Reduce CO₂ Emissions

- ❖ India is a developing country and the economy and its energy infrastructure is being developed.
- ❖ Accessibility for modern and clean energy is very low
- ❖ So, economic development and increasing access to clean energy are urgent issues to be addressed
- ❖ The challenge, therefore,
 - is to promote economic growth in India countries while simultaneously reducing GHG emissions that lead to global climate change
 - can be met through the expanded use of clean, cost-effective technologies and practices that provide essential services and also have a reduced impact on the environment.
- ❖ Sustainable development would also positively contribute to climate change mitigation

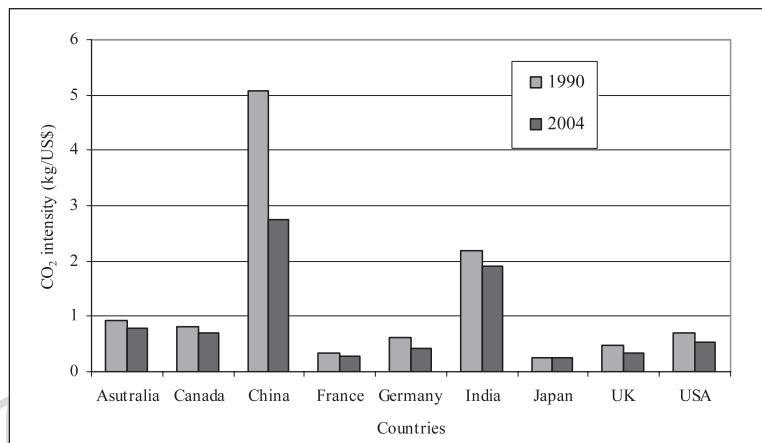
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Strategies to Reduce CO₂ Emissions

- ❖ Energy Conservation Act, 2001
 - To address all issues related to the efficient use of energy
 - Bureau of Energy Efficiency was set up
- ❖ The Electricity Act, 2003
 - To promote competition in the electricity sector
 - The Central Electricity Authority will prepare the National Electricity Plan once every five years
- ❖ Reforms in the Hydrocarbon sector (since the mid 90s)
- ❖ Auto Fuel Policy, 2003
 - To promote efficient combustion in the road transport sector

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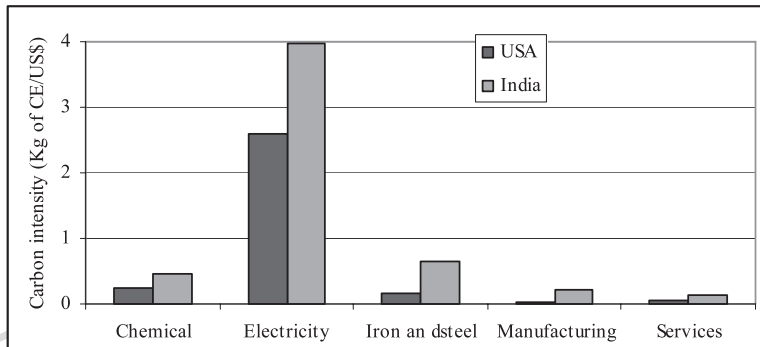
CO₂ Reduction Potential



- ❖ The above figure shows that the Indian economy is energy intensive than most of the developed countries
- ❖ Due to the size of the Indian economy, if the CO₂ intensity can be improved the level of a developed country, large amount of CO₂ emission could be reduced.

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Potential Sectors to Mitigate CO₂ Emissions



- ❖ Figure presents the sectoral CO₂ intensity of India and USA
- ❖ As share of power, industry and Manufacturing sector on CO₂ emission is relative high in India and their CO₂ intensity also higher than that of USA, electricity, iron and steel and manufacturing sectors could be targeted for cutting CO₂ emission in the future.

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Strategies to Reduce CO₂ Emissions

- ❖ Ministry of New and Renewable Sources of Energy
 - Formerly, Ministry of Non conventional Energy Sources
 - Indian Renewable Energy Development Agency (IREDA)
- ❖ Renewable energy use (January 2007)
 - Grid Interactive
 - Agro residues – 510 MW
 - Wind – 6,315 MW
 - Small hydro – 1905 MW
 - Cogeneration and waste to energy – 643 MW
 - Distributed
 - Solar – 2.92 MW
 - Cogeneration and waste to energy – 122 MW
 - Solar thermal collector – 1.66 million sq m
- ❖ The Ministry of New and Renewable Energy is launching a new scheme for installation of Megawatt Capacity Grid Interactive Solar Power Plants (50 MW). The Ministry will provide financial assistance amounting to Rs.12 per KW hour in case of solar photovoltaic and Rs.10/KW hour in case of solar thermal power fed to the electricity grid.
- ❖ A National Plan of Action on Climate Change will be released in June 2008

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India and CDM

- ❖ India has registered the largest number of Clean Development Mechanism (CDM) projects in the world. The country accounted for 283 CDM projects out of the 819 registered by the CDM Executive Board.
- ❖ The Indian National CDM Authority has accorded host country approval to 753 projects, facilitating investment of more than US\$ 16 billion.
- ❖ These projects are in areas of energy efficiency, fuel switching, industrial processes, municipal solid waste and renewable energy and have the potential to generate 421 million CERs by 2012.

Source: India Business Equity Foundation, 2008

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Transport Sector

- ❖ India will replace 10 per cent of its transport fuels with environment friendly biofuels in the next 10 years to cut carbon emissions. Currently, mixing ethanol extracted from sugarcane in petrol and experimenting with doping diesel with non-edible oils like ones extracted from Jathropha.
- ❖ India's largest automobile maker Tata Motors and space agency ISRO are likely to launch next year, the prototype of the world's cleanest vehicle that will run on hydrogen. It would be completely electric-driven.
- ❖ Public sector transport will be considered in the National Plan of Action on Climate Change

Source: India Business Equity Foundation, 2008; DSDS, 2008

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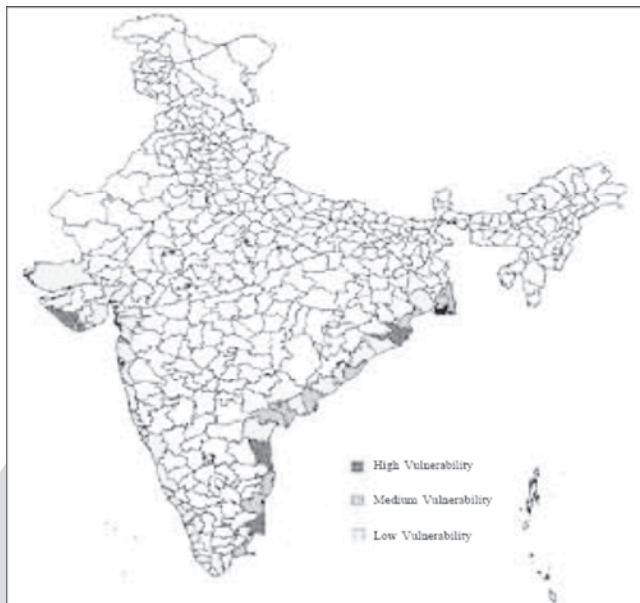
Building sector

- ❖ Green buildings are becoming a popular alternative in the country. Today, the country has over 25 million square feet of registered green building expanse, which is all set to touch a 100 million square feet by 2010-12.
- ❖ ITC Green Centre in Gurgaon when inaugurated in May 2007, became the world's largest green building with space of 170,000 square feet. It was awarded the United States Green Building Council-Leadership in Energy and Environmental Design's (USGBC-LEED) platinum rating - the highest in the order.

Source: India Business Equity Foundation, 2008

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Coasts vulnerable to Climate Change



Station	Sea level rise (mm/year)
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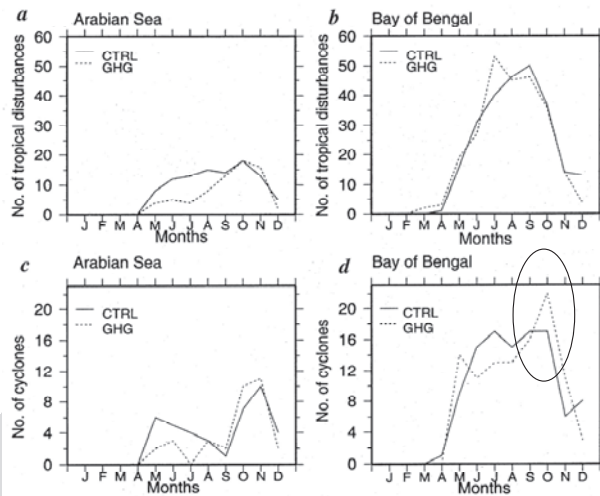
Mumbai	0.78
Kochi	1.14
Vishakhapatnam	0.75

Source: Unnikrishnan et al, 2006

Source: India's National Communication to UNFCCC, 2004

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Climate Change Impact: Tropical Disturbances and Cyclones



Even though there is no significant change in the number of total tropical disturbances in the increased GHG simulation from that in the control run, there is an increase in the number of intense events (cyclones) in the Bay of Bengal, particularly during the post-monsoon period (Figure d).

Source: Unnikrishnan et al, 2006 [Current Science, Vol 90, No 3, pages 362-368, 10 February 2006]

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Summary

- ❖ World, Asian and Indian primary energy consumption trends
- ❖ CO₂ emissions: India's emissions are much lower as compared to developed nations.
- ❖ Specific issues related to developing countries – economic development and climate change concerns
- ❖ There is a high potential for CO₂ reduction in various sectors
- ❖ Many measures have been introduced to improve energy efficiency and promote renewable energy

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Thank you for your attention
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