

GHG Reduction Options - Indian Cement Industry

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IRADe Integrated Research and
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Options to Reduce GHG Emissions through National Appropriate Mitigation
13 May 2009, Beijing



Cement Industry- Status

31st March, 2008

Large Plants

- Cement Plants : 140
- Installed Capacity : 198.30 mn.t
- Cement Production : 168.32 mn.t

Mini & White Cement Plants

- Cement Plants : 365
- Installed Capacity : 11.10 mn.t (5.3%)*
- Cement Production : 6.00 mn.t (3.4%)*

**Percent of total*

Source: CMA

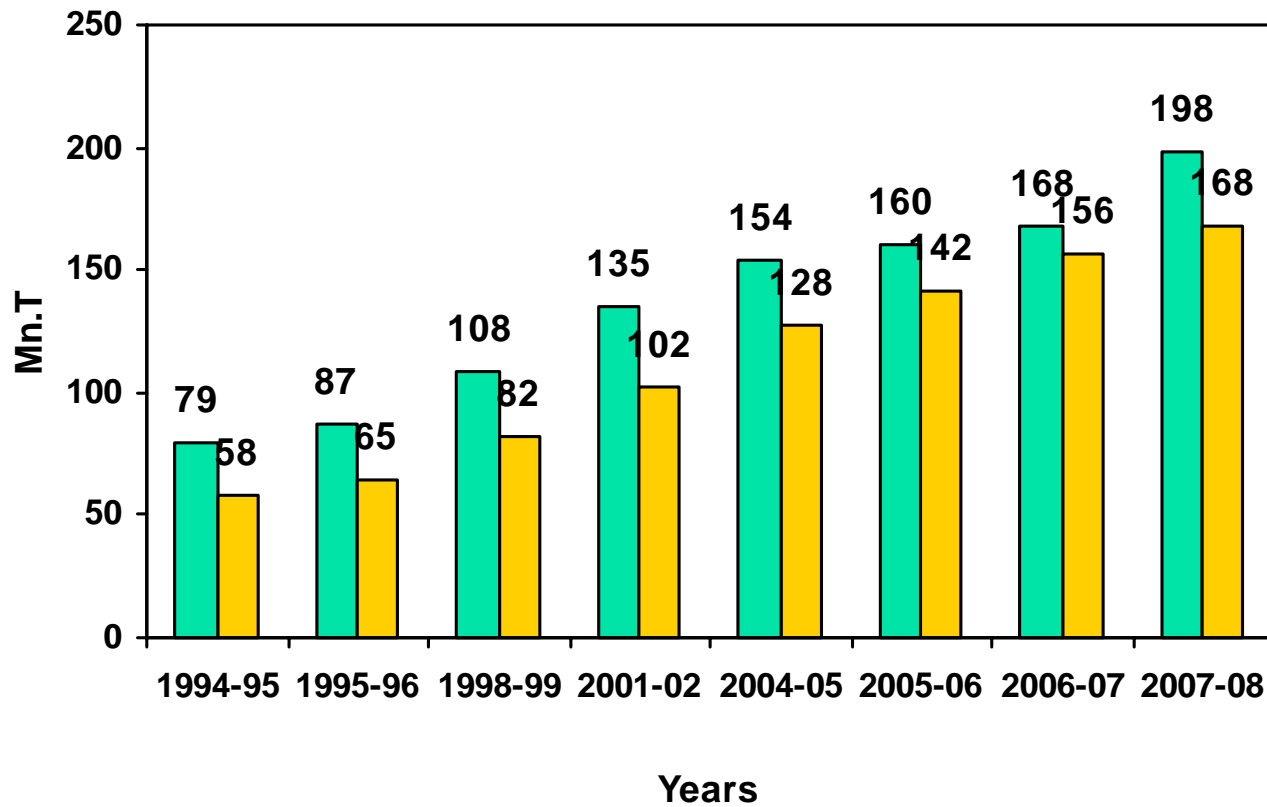
World's second largest producer of cement after China

Per capita consumption:

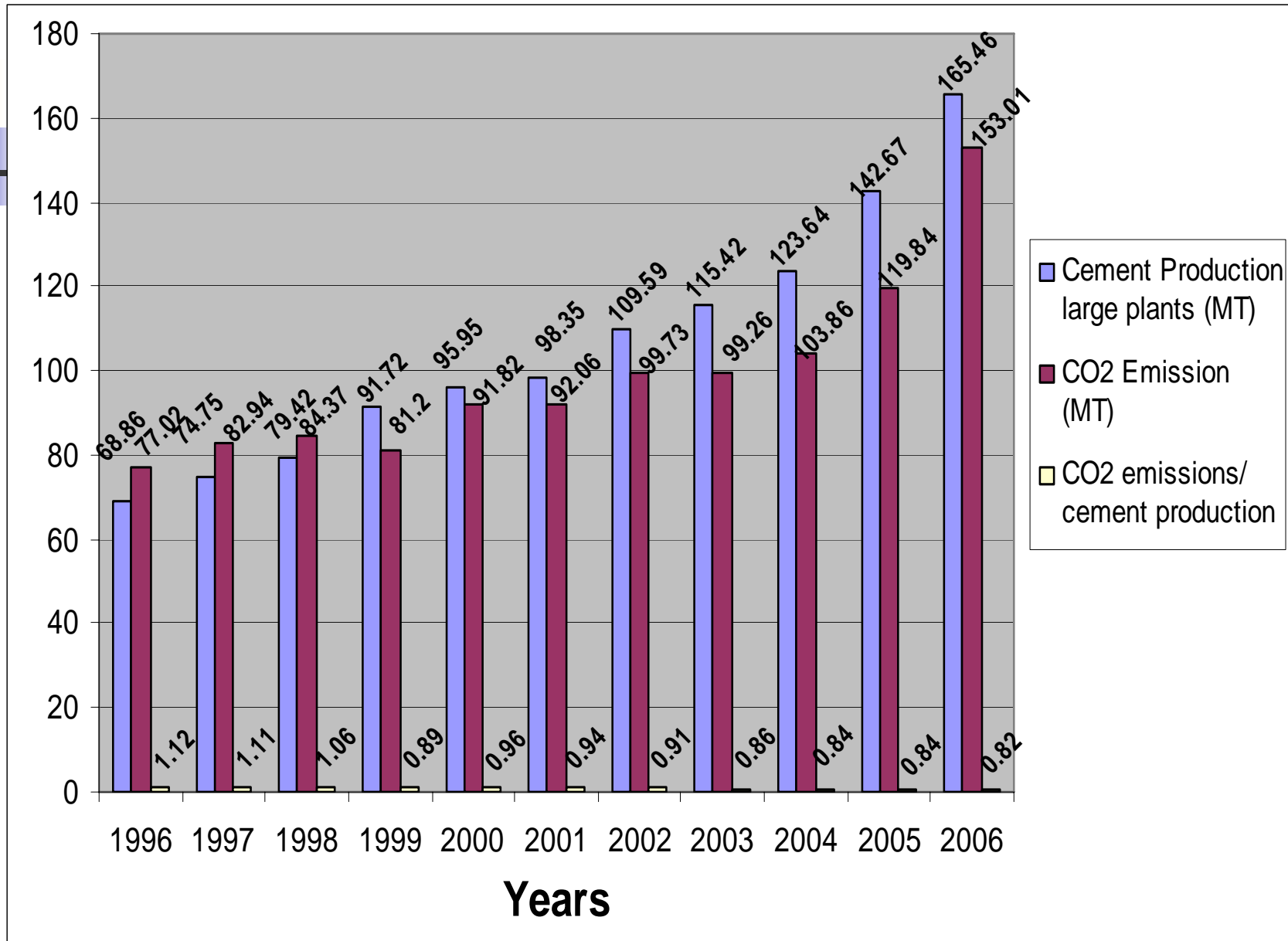
India – 125 kg
China – 800 kg
S Korea – 960 kg
Thailand – 450 kg

Growth of Indian Cement Industry

■ Capacity ■ Production



Emission level v/s Production





Mitigation options

- 1. Production of blended Cement with higher Ratio of Additives/Cement**
- 2. Switch to less Carbon Intensive Fuel in Kiln**
- 3. Waste Heat Utilization for Power Generation/Co-Generation**
- 4. Energy Efficiency Improvements**

1. Production of blended Cement with higher Ratio of Additives/Cement

Replacement of clinker in PPC/PSC by :

- Fly ash obtain from thermal power plant
- Slag obtained from steel plant

	India	Japan
Fly Ash	19 %	100%
Granulated slag	100 %	64%

GHG emission reduction potential

Unit: t-CO₂ equivalent

		Annual blended cement production (kt/yr)		
		1000	2000	3000
Increased share (%)	10	90,000	180,000	270,000
	20	180,000	360,000	540,000
	30	270,000	540,000	810,000

Source: CER estimation toolkit, ver. 02, March 2007



Barriers

- Cement Strength is reduced with increasing blend of fly ash so it is difficult to increase the percentage of fly ash in PPC to the expected levels whilst maintaining the quality of the cement.
- BIS issued guidelines to use designated quality of fly ash, also the quantity of fly ash has been modified to a use of a minimum of 15% and a maximum 35%.
- At initial stage a huge amount of money is needed to invest into transportation, storage and handling of fly ash.
- Market Acceptability

Domestic Policy options

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- **Financial Incentives**
 - **Research & Development**
 - **Awareness Programme**
 - **Categorization of Blended Cements:** Categorization of blended cements like 30, 40, 50 and 60 Mpa grade so that customers can choose as per their needs.
 - The **BIS should develop quality standards** so as to allow manufacture of composite cement using various sorts of waste products, in line **with the international practices.**



2. Switch to less Carbon Intensive Fuel in Kiln

- Coal continues to be the main fuel for the Indian cement industry.
- Shifting from Coal to Natural Gas or application of waste derived alternative fuels like:
 - Gaseous alternative fuels (like coke oven gas, refinery gas, pyrolysis gas, landfill gas)
 - Liquid alternative fuels (mineral oils, hydraulic oils, insulating oils)
 - Solid alternative fuels (waste wood, plastic, tyres, petroleum coke)
 - Waste derived fuels (including used rubber tyres)
 - Bio-mass wastes

GHG Emission Reduction Potential

Unit: t-CO2 equivalent

			Quantity of alternative fuel (ton/yr)			
			5000	10000	15000	20000
Alternative fuel	Wastes Originating from fossil sources	Tire	6,759	13,518	20,277	27,036
		Plastic	6,416	12,832	19,248	25,664
	Biomass residues		9,224	18,447	27,671	36,894

Source: CER estimation toolkit, ver. 02, March 2007

Barriers



- **Huge capital investment** (fuel cost, transportation cost, loading unloading and storage of fuel etc).
- **Biomass use** in kilns requires extensive modification in the plant facility because of high volatile contents of biomass.
- **Proper feeding of fuel**
- **Process disturbance.**
- **Non-uniformity of Alternate Fuel**
- **A number of trials** are required for the project activity.



Domestic Policy Options

- Extension programs to facilitate the general use of new (Biomass/less carbon intensive) energy technologies
- R&D in new energy (less carbon intensive) technologies
- To develop skilled manpower and providing basic engineering infrastructure for the local production of components and spare parts for biomass and other less carbon intensive fuels.



3. Waste Heat Utilization for Power Generation/Co-Generation

- **Use of hot Gases in existing System :**

Waste gases at the Preheater, Kiln and Calciner have a temperature around 300-350°C. These gases can be utilized for Power Generation.

GHG Emission Reduction Potential

Unit: t-CO₂ equivalent

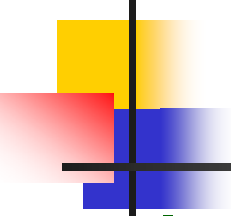
		Gross Electric Power Output (MW)		
		10	30	50
Increased share (%)	0.400	23,652	70,956	118,260
	0.600	35,478	106,434	177,390
	0.800	47,304	141,912	236,520
	0.100	59,130	177,390	295,650

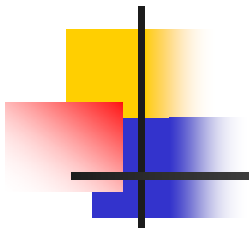


Barriers

- Non availability of proven technology indigenously.
- Non availability of installation or operating experience in India resulting in lack of confidence.
- Special design requirements of waste heat recovery boiler suiting to high dust load.
- Large capital requirement and financial constraints owing to depressed cement marketing scenario.
- A number of trials are required for the project activity.
- To meet the demands of the skilled staffs, the project entity has made a great deal of efforts both in employing and training.

Domestic Policy Options

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- **Incentive** setting up of plants for cogeneration of power using waste heat recovery in production process. The incentive could include capital subsidy and tax exemption.
 - The Ministry of Environment & Forests (MoEF) should formulate guidelines for implementing the principle of '**Polluter to Pay**' for disposal of wastes.
 - Treatment, storage & disposal facilities for cost effective co processing of combustible industrial wastes in cement kilns as an alternative to incineration.
 - Restricting land filling of hazardous and toxic combustible wastes having potential for co-processing in cement kilns.



Thank You