GHG Reduction Potentials In The Indian Cement Industry: A Way Forward

KN Rao

Director, Energy & Environment

***ACC Limited** (LafargeHolcim)*

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World Business Council for Sustainable Development

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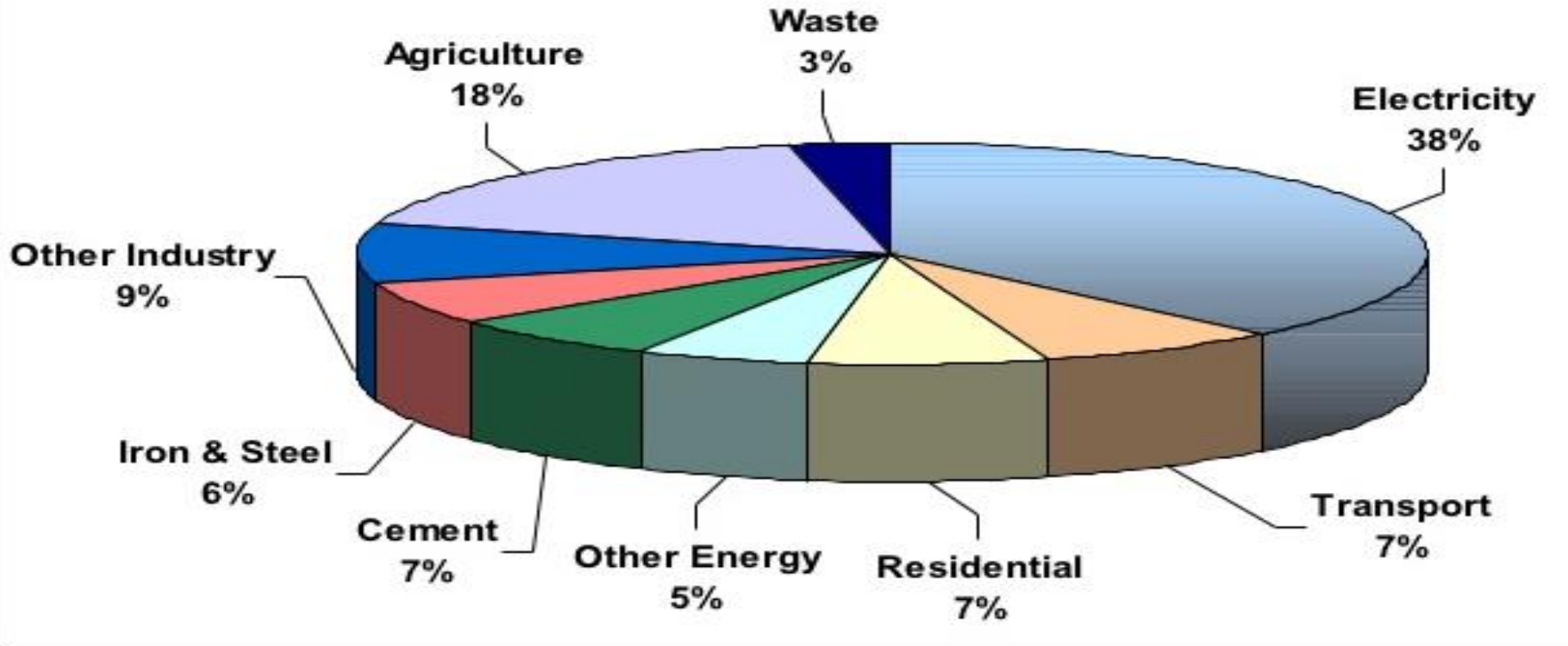
GHG Scenario - India



Total Emission - 2070000 $ktco_2$ Cement Industry (7%)-144900 $ktco_2$

Indian Industry(65%) Cement industry (10.8%)

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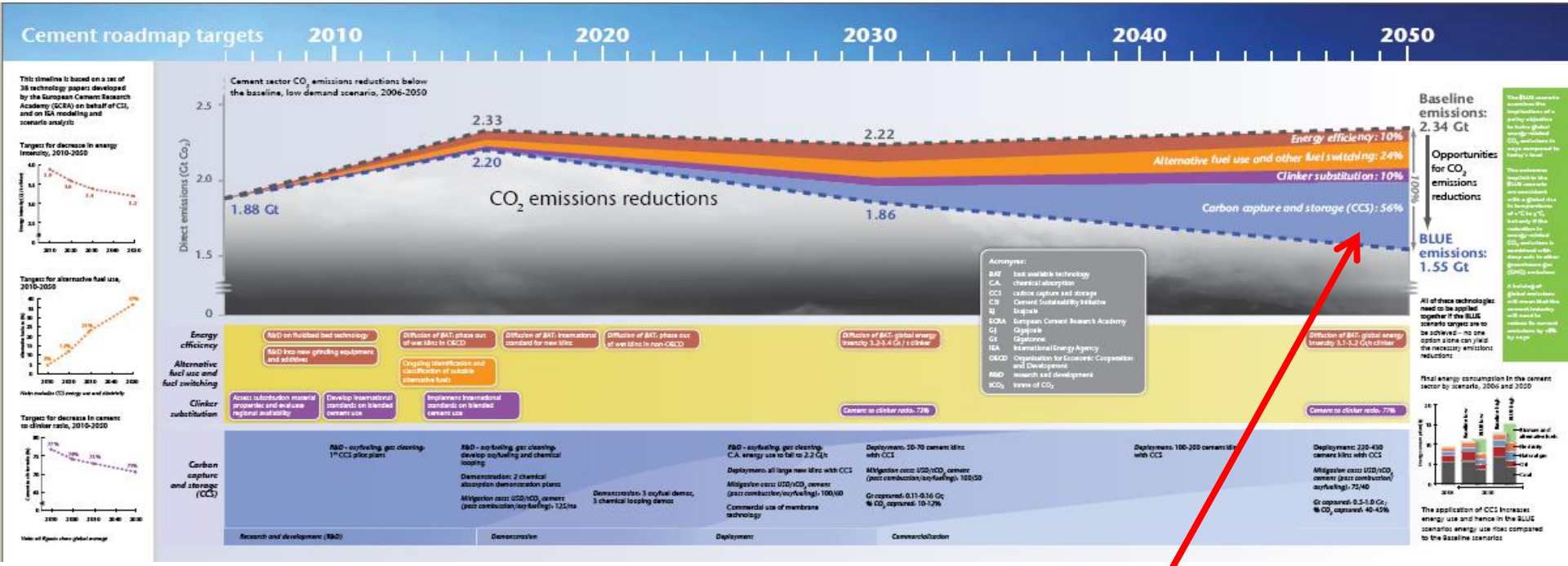
Cement Technology Roadmap – Global (2009)



Published by IEA/WBCSD 2009

Emissions reduction levers:

- **Energy efficiency**
- **Alternative fuels**
- **Clinker substitution**
- **CCS**

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Technology roadmap in India - 2012

Roadmap partners

In consultation with

Principal supporter

Industry supporters

www.wbcsdcement.org/india-tech-roadmap

Cement Technology Roadmap - India

Context :

- ✓ Second largest cement producer after China
- ✓ One of the most efficient in the world

	Range	Avg
Thermal kCal/kg	650-1200	725
Electrical kWh/T cem	65 – 110	80

- ✓ Reduced total direct and indirect CO_2 emissions to an industrial average of 0.719 tonne (t) of CO_2/t cement in 2010 from a substantially higher level of 1.12 tCO_2/t cement in 1996
- ✓ In a BAU, CO_2 emissions projected to reach between 490 - 835 million tonnes (Mt) of CO_2 by 2050; a 255% to 510% increase compared to 2010 levels
- ✓ Extremely low AFR usage
- ✓ High dependency on CPP Power
- ✓ Mostly bagged cement

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‘Low Carbon Technology Roadmap for the Indian Cement Industry’

Phase I

Technology papers

Cement demand data, data modeling, analysis

Data coverage (85%+)

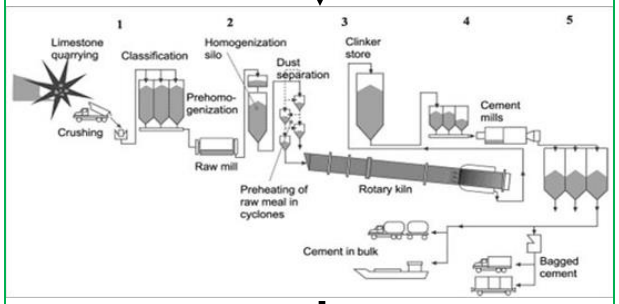
Stakeholder & partner review

Stakeholder outreach

- Technology
- Financing
- Policy

Phase II

Individual plant-level analysis of roadmap



Potential investments identified

Cement Technology Roadmap - India

Roadmap approach:

- ✓ The road map modelling has been developed in response to the IEA 2°C (2DS) and its two variants, based on demand for materials: the Low- and High-Demand Cases

Roadmap Scope and Boundary:

- ✓ Surface mining/quarrying to the sale of cement to consumer,
- ✓ Energy and emission reduction levers specific to the cement manufacturing process
- ✓ CPP is out of scope of Cement manufacturing process and so not included in modeling

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Cement Technology Roadmap - India

- ✓ Key levers to reduce emissions in Indian cement industry viz. increased rates of blending leading to a reduction in clinker factor etc., are identified and discussed in detail
- ✓ By 2050, as much as 150 $MtCO_2$ could be saved through efficiency improvement and use of alternative energy sources in CPPs
- ✓ Additional investment requirements (based on net present value) to achieve the CO_2 emissions reduction set out in this roadmap are between USD 29 billion to USD 47 billion, or 15% to 25% higher than in a BAU scenario

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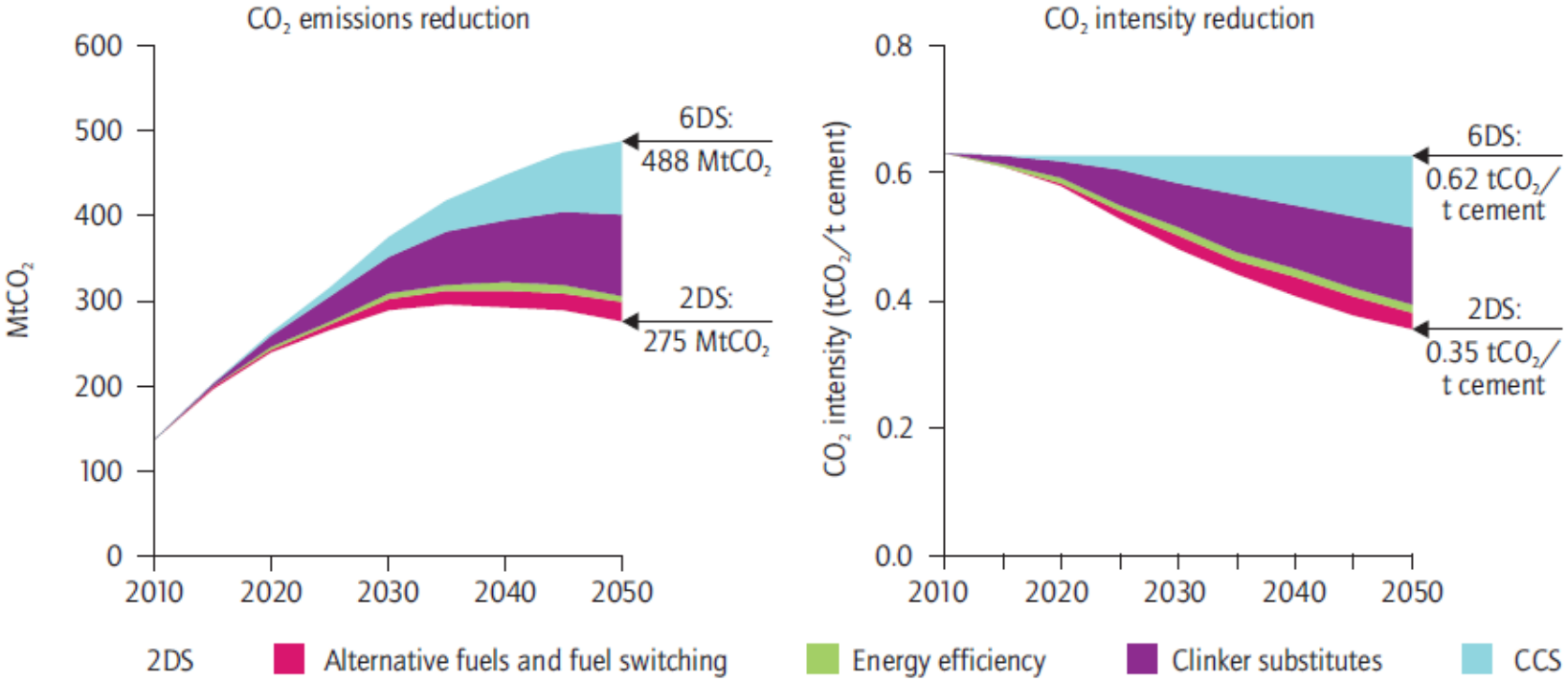
Roadmap findings (low demand scenario)



Notes: Includes only direct CO_2 emissions from cement manufacturing; indirect emissions from the use of electricity are not taken into account.

KEY POINT: Total savings between the 6DS and 2DS amount to 212 $MtCO_2$.

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Socio-economic benefits derived from Roadmap levers

- **Clinker substitution & Increased AFR usage**
  - Decreases loads on landfills & incinerators & their environmental impacts, including: potential groundwater pollution, methane generation and hazardous ash residues
  - Properly designed and operated cement kilns can provide a practical, cost-effective and environmentally effective alternative to landfill and incineration
  - Energy and materials recovery, offering safe disposal options for many different types of waste
  - Creating safer livelihoods by bringing waste scavengers into the organized sector
  - Energy plantations create sustainable livelihoods in rural areas
  - Conservation of limestone & fossil fuel

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Socio-economic benefits derived from Roadmap levers

- **Energy efficiency**
  - Reduction in consumption of coal and other fossil fuels has a direct bearing on contributing to the energy security of the country
  - Electricity access for all due to reduction in demand
  - Conservation of fossil fuels
  - Opportunity for job creation and GDP growth
- **Carbon capture & utilisation**
  - Conversion of CO_2 to chemicals or fuel
    - Reduces dependence on natural raw materials and fuels
    - Minimizing CO_2 mitigation costs

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Additional investments required to reach the CO_2 emissions in the 2DS from the 6DS (business-as-usual scenario) in India

Low-Demand Case					
USD billion	2010-20	2020-30	2030-40	2040-50	2010-50
New kilns and refurbishments	3 to 4	1	1	1	6 to 7
Clinker substitution	0.1	0.2	0.1	0.1	0.5 to 0.6
Alternative fuels	3	2	1	0	6 to 6
Carbon capture	0	3	6	8 to 9	17 to 19
Total	**6 to 7**	**5**	**8**	**10**	**29 to 32**
High-Demand Case					
USD billion	2010-20	2020-30	2030-40	2040-50	2010-50
New kilns and refurbishments	4 to 5	0	-2 to -3	-1	1 to 0
Clinker substitution	0.1	0.2	0.1 to 0.2	0	0.4 to 0.6
Alternative fuels	3 to 4	4	3	2	12 to 13
Carbon capture	1	5	11 to 13	16 to 17	33 to 36
Total	**8 to 9**	**9 to 10**	**13 to 13**	**17 to 18**	**46 to 50**

Notes: In a High-Demand Case, the savings from increased used of clinker substitutes will offset the additional investments required for new plants.

Additional investments are analysed for options that could lead to a reduction in direct CO_2 emissions in the cement production process. As such, this excludes waste heat recovery (WHR). Investments for WHR are estimated at approximately INR 80 to INR 100 million per megawatt hour (USD 1.6 to USD 2 million).

Reductions from captive power plants (CPP) are not included in the modelling of potential emissions reduction in this roadmap, but it should be noted that current investment requirements are approximately INR 5 crore (USD 1 million) per megawatt.

Phase 2 outcomes (Summary of findings from 5 plants with 15.3 MTPA share)

Parameter	No. of Projects	Mio (USD)
Total Annual Saving	259	20.24
Annual saving without investment	47	1.23
Annual saving with investment	212	19.01
Investment required	212	68.31
Simple payback period	**Months**	**43**
GHG Reduction Potential	**MTPA**	**375631**

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Phase 2 outcomes (Status of implementation in 3 plants)

Summary of Achievements	Unit	Identified	Implemented	%
Name of the facility		TOTAL FOR 3 FACILITIES		
No of Energy saving projects (ESP) Implemented	Nos.	168	67	39.9
Investment	Mio USD	46.49	0.40	0.01
Energy Cost Savings	Mio USD/Yr	12.09	1.57	0.02
Total CO_2 Emission Reduction from ESPs	tCO_2	245463	33748	13.7

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25 CSI member companies around the world

Operate in more than 100 countries

One third global cement production
Two thirds outside of China

www.wbcsdcement.org

or email us at cement@wbcsd.org

CSI is a member-led program of the World Business Council for Sustainable Development

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