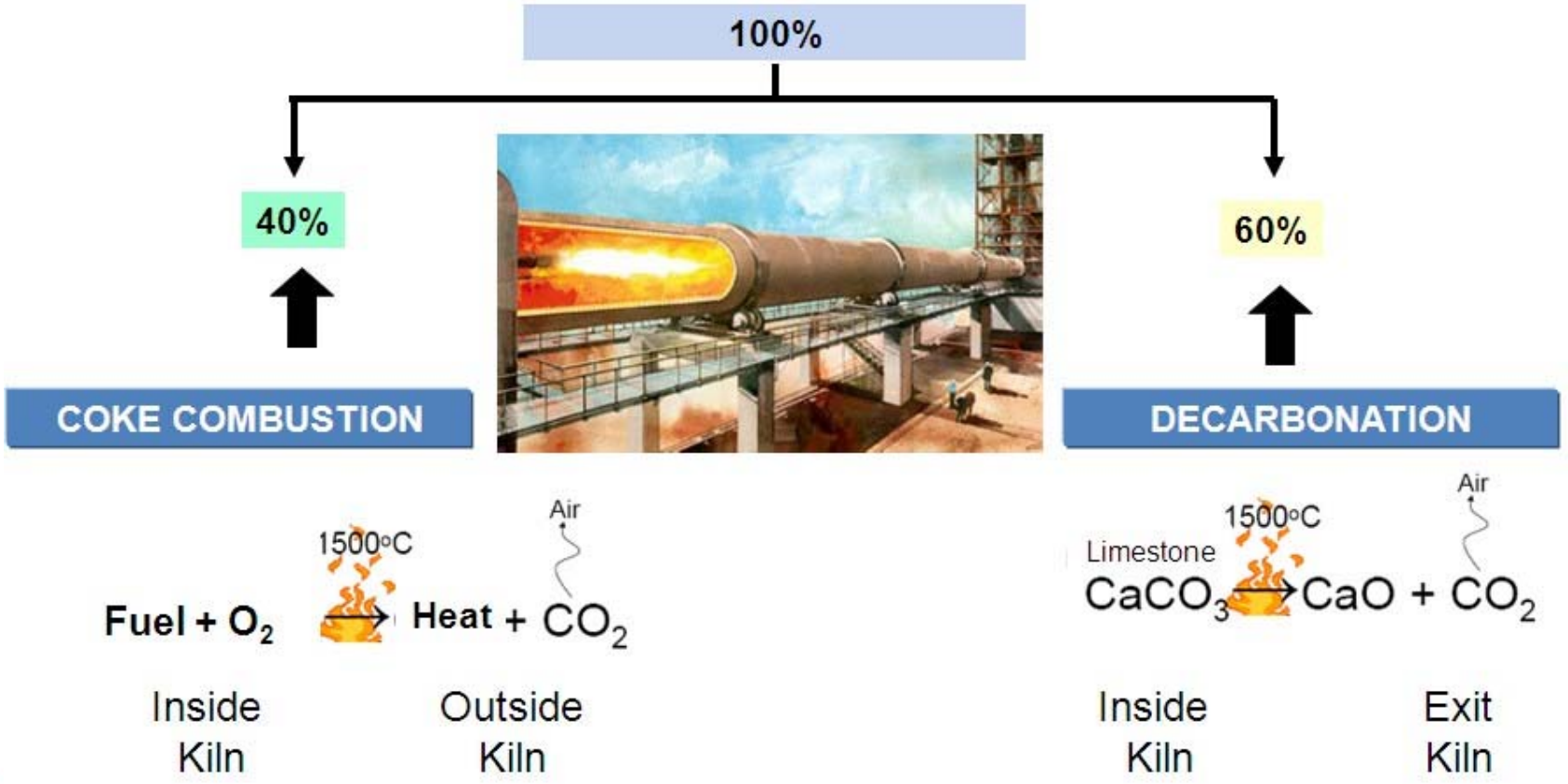
Cement Sector View on Industrial Innovation

Industry Experts Dialogue Workshop – IEA Paris
October 23, 2014

Cement is an energy intensive industry with a high proportion of process emissions

The cement and lime industries are unique due to the fact that most of their greenhouse gas emissions are not caused by energy use from fuel combustion, but come from the raw materials themselves. Also the process involves a high energy consumption (thermal and electricity).



Near 60% of CO2 emissions come from inevitable chemical reactions in the process

Carbon emission reduction levers

- **Existing levers for reduction:**
  - **Thermal and electric efficiency** – deployment of existing state of the art technologies in new cement plants, and retrofit of energy efficiency equipment where economically viable.
  - **Alternative fuels** – use of less carbon-intensive fossil fuels and more alternative (fossil) fuels and biomass. Include wastes that may otherwise be burnt in incinerators, landfilled or improperly destroyed.
  - **Clinker substitution** – substituting carbon intensive clinker, an intermediate in cement manufacture, with other, lower carbon, materials with cementitious properties.
- **Technology under development : Carbon capture storage and Re-Use (CCS-U)**
- **Potential low carbon cements** – Still not known their features

CSI-IEA Cement Technology Road Map

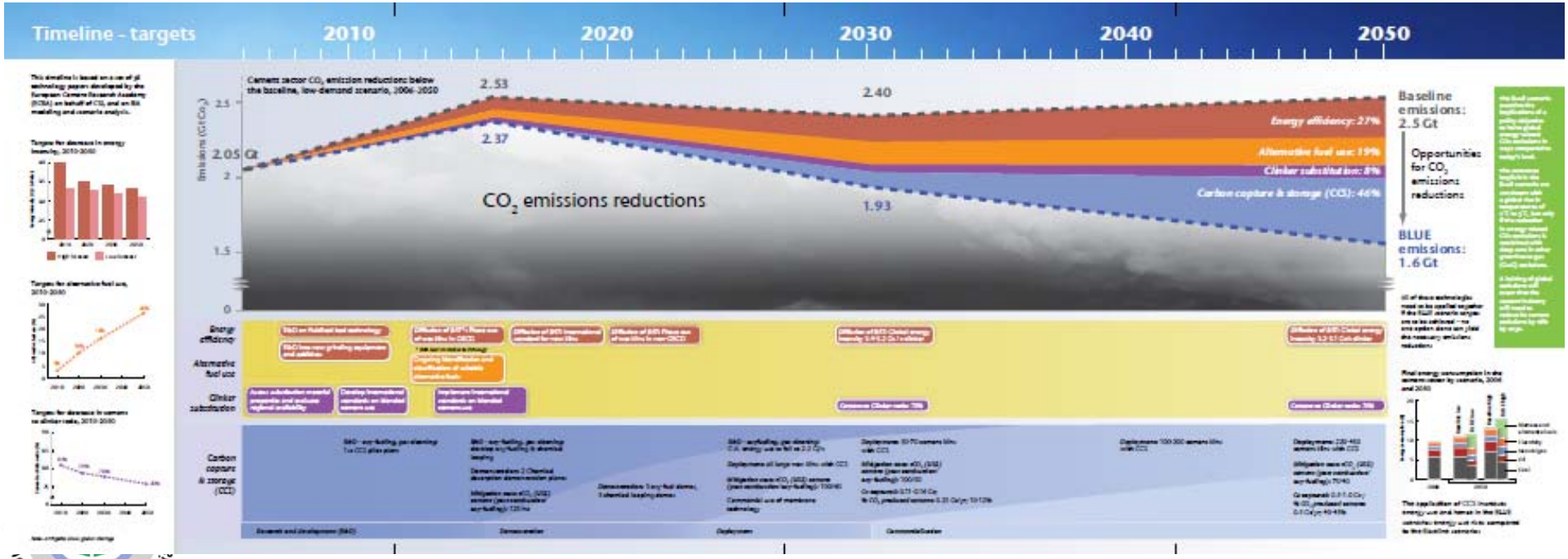
- IEA has worked together with the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI) to develop a technology roadmap for cement.

- The roadmap's technology mitigation options are outlined in a set of 38 technology papers developed by the European Cement Research Academy (ECRA) sponsored by the CSI.

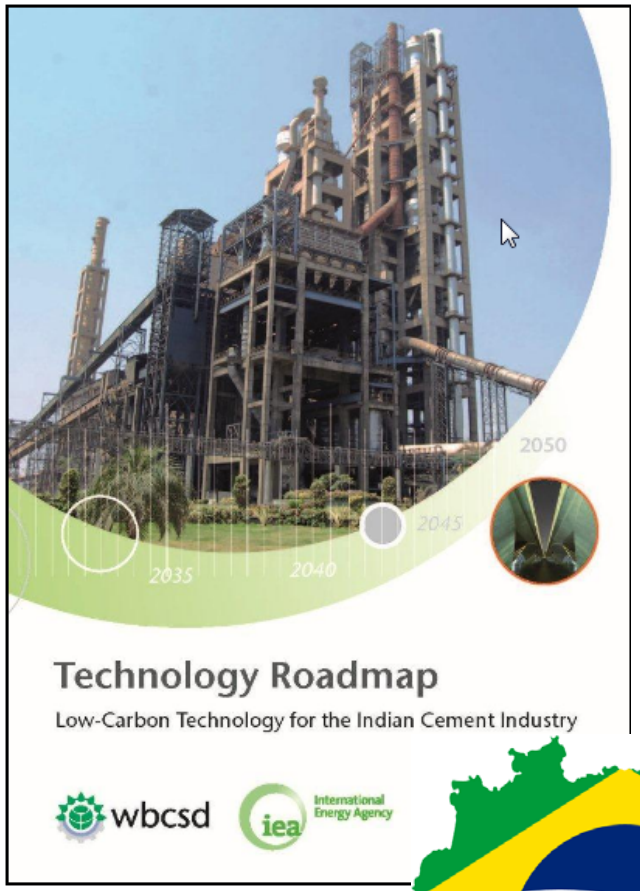
- The roadmap is based on model data from *Energy Technology Transitions for Industry (IEA, 2009).*

Main conclusions from the Roadmap

- The roadmap estimates that the cement industry could reduce its direct emissions18% from current levels by 2050.
- Outlines supportive policies, estimates financial requirements, and describes technical changes, along with recommendations to support research and development (R&D) and future investment decision-making.



Regional Roadmaps India and Brazil



Same process as for the Global Roadmap in 2009

- Partnership with IEA for their scenario and modeling capabilities
- Technical papers developed by regional industry experts
- Set of existing emissions data (GNR)

Financial support by IFC

Two phases

- Development of the roadmap
- Tests on some volunteer plants to implement some of these technologies

Technical and political workshops to widespread knowledge and build capacity in the country

Cement Sustainability Initiative

Low-Carbon Technology Roadmap for the Indian Cement Industry

Roadmap partners

In consultation with

Principal supporter

Industry supporters

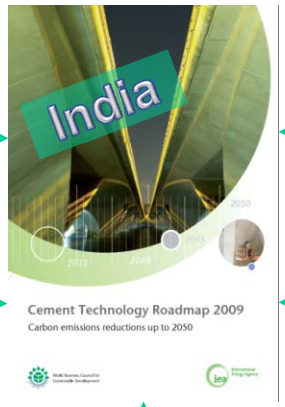
www.wbcsdcement.org/india-tech-roadmap

2-Phase process

Phase I

Technology papers

Cement demand data, data modeling, analysis



Data coverage (85%+)

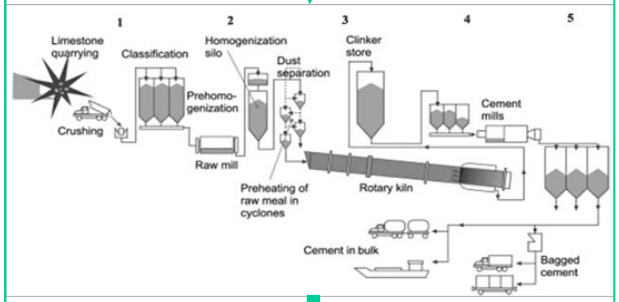
Stakeholder & partner review

Stakeholder outreach

- Technology
- Financing
- Policy

Phase II

Individual plant-level analysis of roadmap



Potential investments identified

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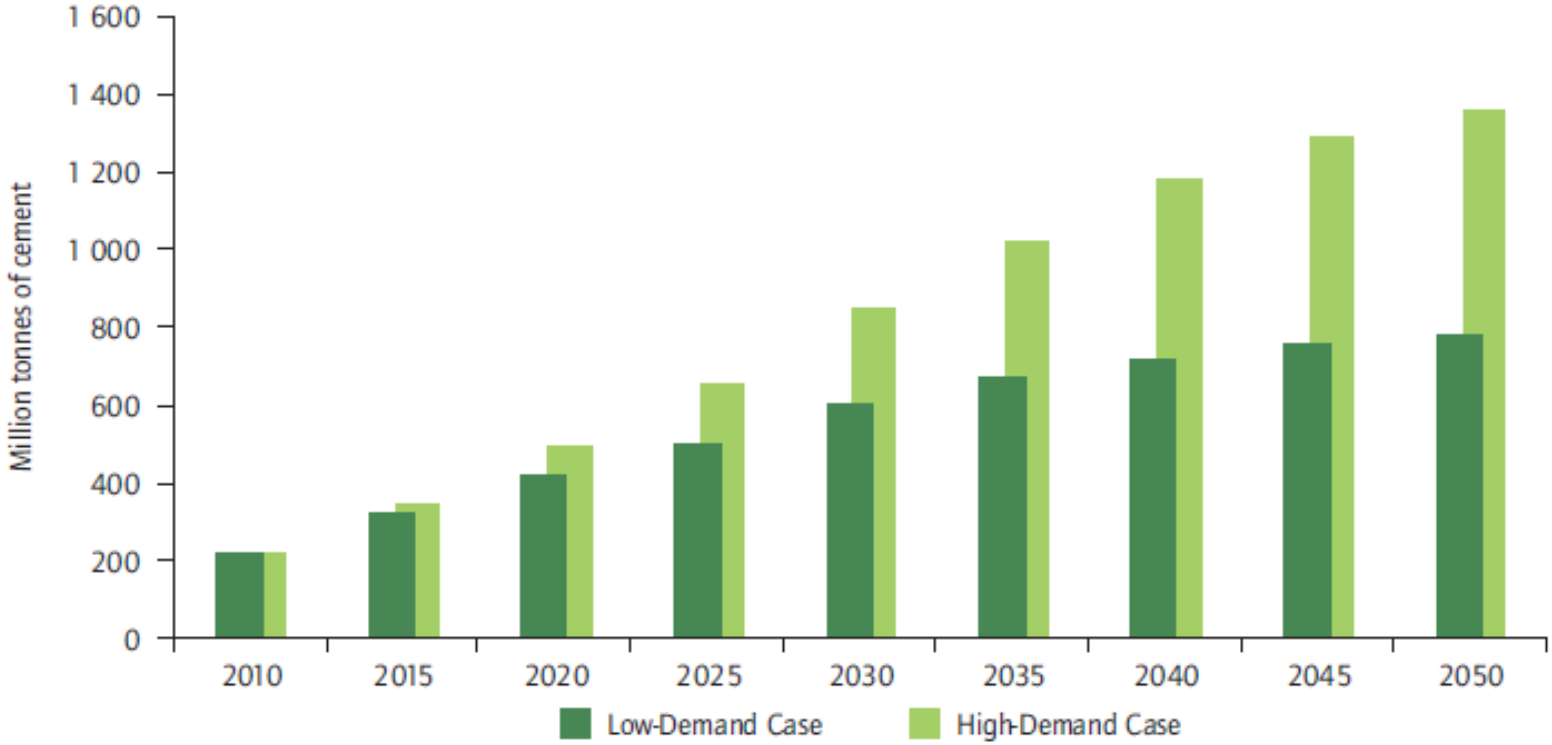
India cement production forecast



KEY POINT: Cement production is projected to increase between 3.6 and 6.3 fold between 2010 and 2050.

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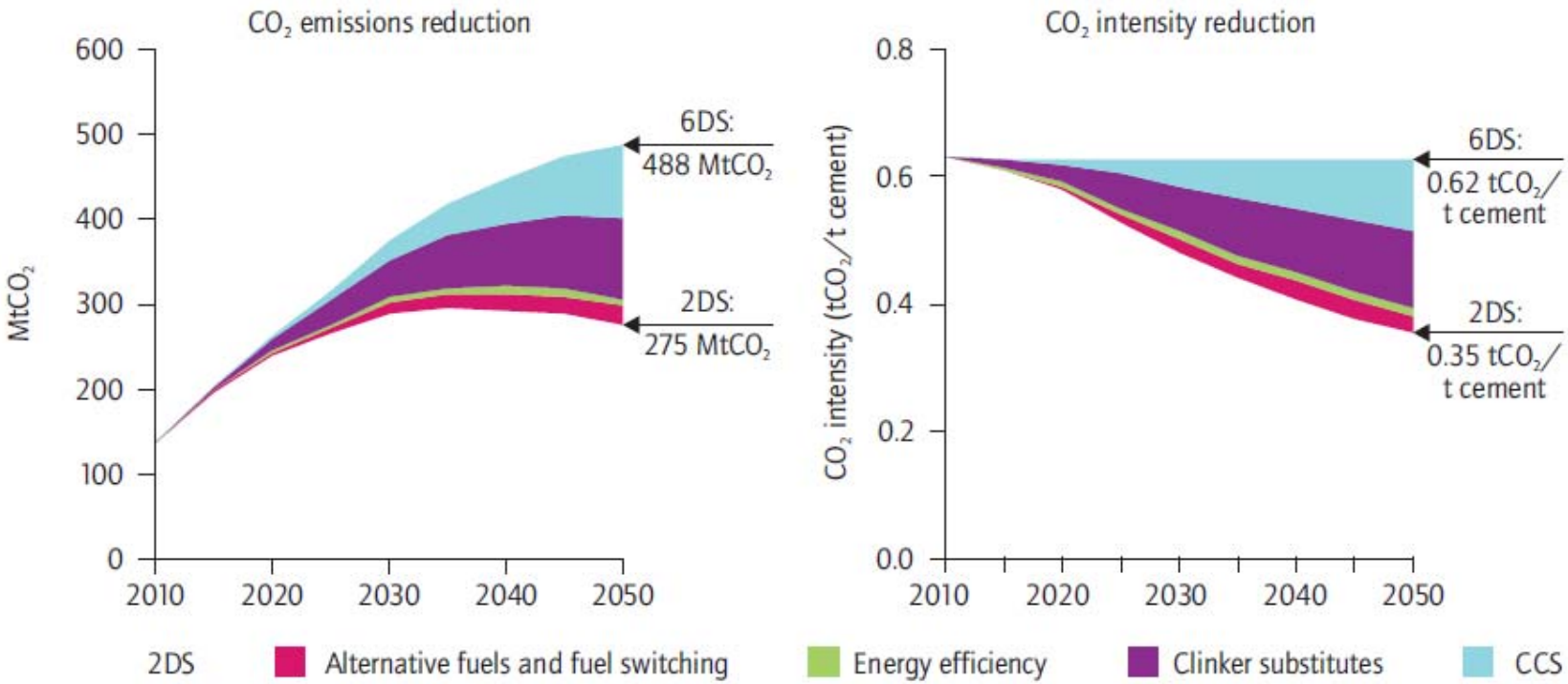
Roadmap findings



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 $MtCO_2$.

Key indicators for Indian cement industry in the 2DS

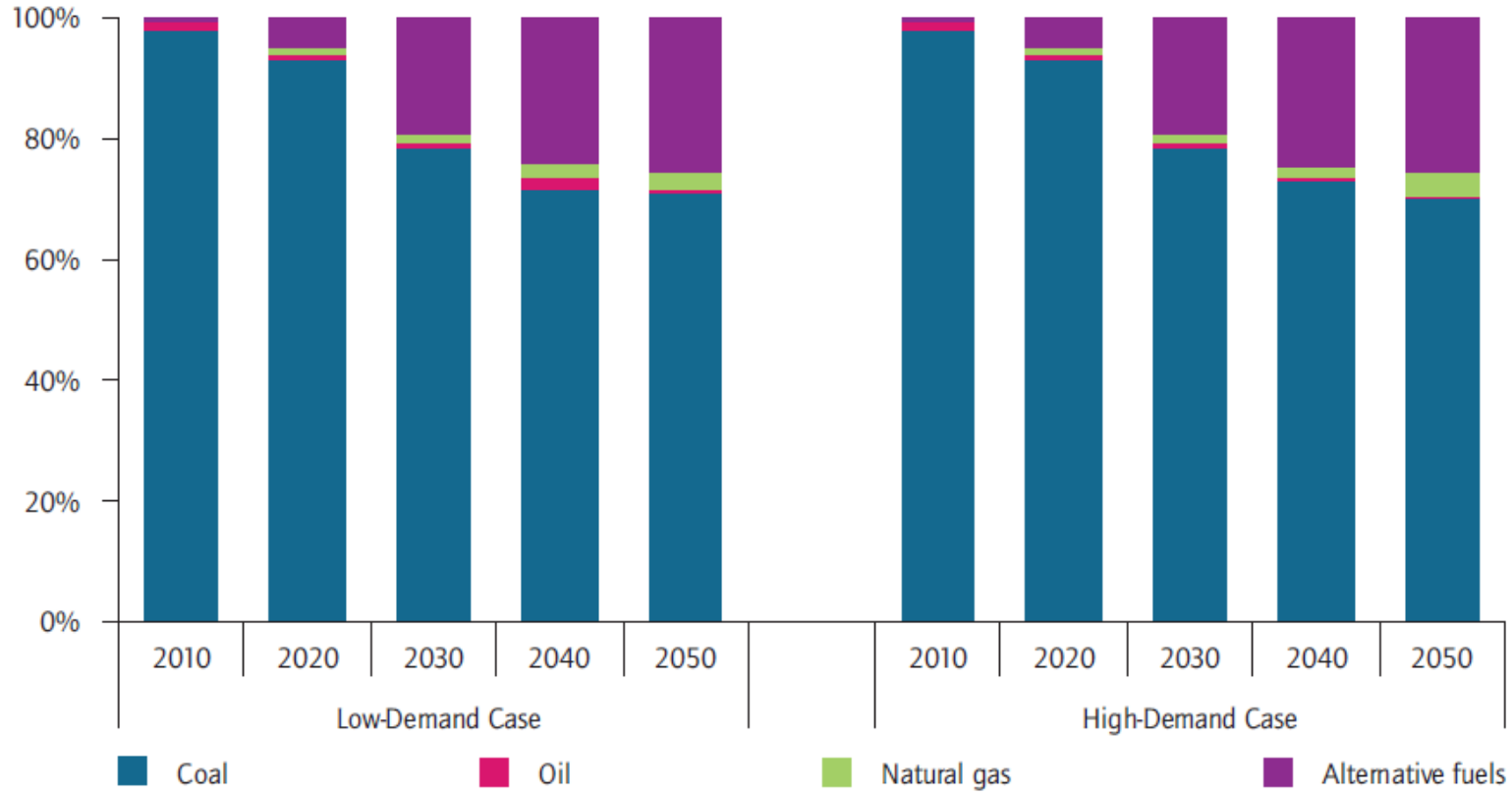
		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Production (Mt)	217	416	598	780	492	848	1 361
Per-capita consumption (kg/capita)	188	309	400	467	364	565	812
Clinker-to-cement ratio	0.74	0.70	0.64	0.58	0.70	0.64	0.58
Electric intensity of cement production (kWh/t cement)	80	76	73	71	75	72	70
Thermal intensity of clinker production (kcal/kg clinker)	725	709	694	680	703	690	678
Alternative fuel use (as a share of thermal energy consumption) (%)	0.6	5	19	25	5	19	25

Notes: Data for 2010 is for financial year 2009/10 ending 31 March 2010. The electric intensity of cement production does not include the reductions that may come from the use of WHR.

Potential energy savings from implementation of the different levers

	Savings from 6DS to 2DS							
	Low-Demand Case				High-Demand Case			
	2020	2030	2040	2050	2020	2030	2040	2050
Total energy reduction (PJ)	65	196	304	377	77	235	395	485
Additional energy required for CCS (PJ)	6	40	80	111	10	64	157	221
Net energy reductions (excluding additional energy required for CCS) (PJ)	71	237	384	488	87	298	553	706
Reductions (PJ) from:								
Thermal energy efficiency	16	48	78	96	18	47	77	97
Electrical energy efficiency	5	12	18	22	3	4	6	8
Waste heat recovery	1	8	15	20	2	15	30	39
Clinker substitution	49	174	288	373	88	250	455	583

Share of thermal energy use in the cement industry by energy source in the 2DS



KEY POINT: By 2050, use of AFR is projected to account for 25% of total thermal energy consumption in the cement sector.

Low-Carbon Technology Roadmap for the Brazilian Cement Industry - Participants

Apoio

wbcsd

International Energy Agency

Coordenação

SNIC
SINDICATO NACIONAL DA INDÚSTRIA DO CIMENTO

Associação Brasileira de Cimento Portland

Colaboradores

InterCement BRASIL

ITAMBÉ

LAFARGE BRASIL

Votorantim Cimentos

NASSAU

CIPLAN

Holcim

CIMENTO TUPI

LIZ CIMENTOS

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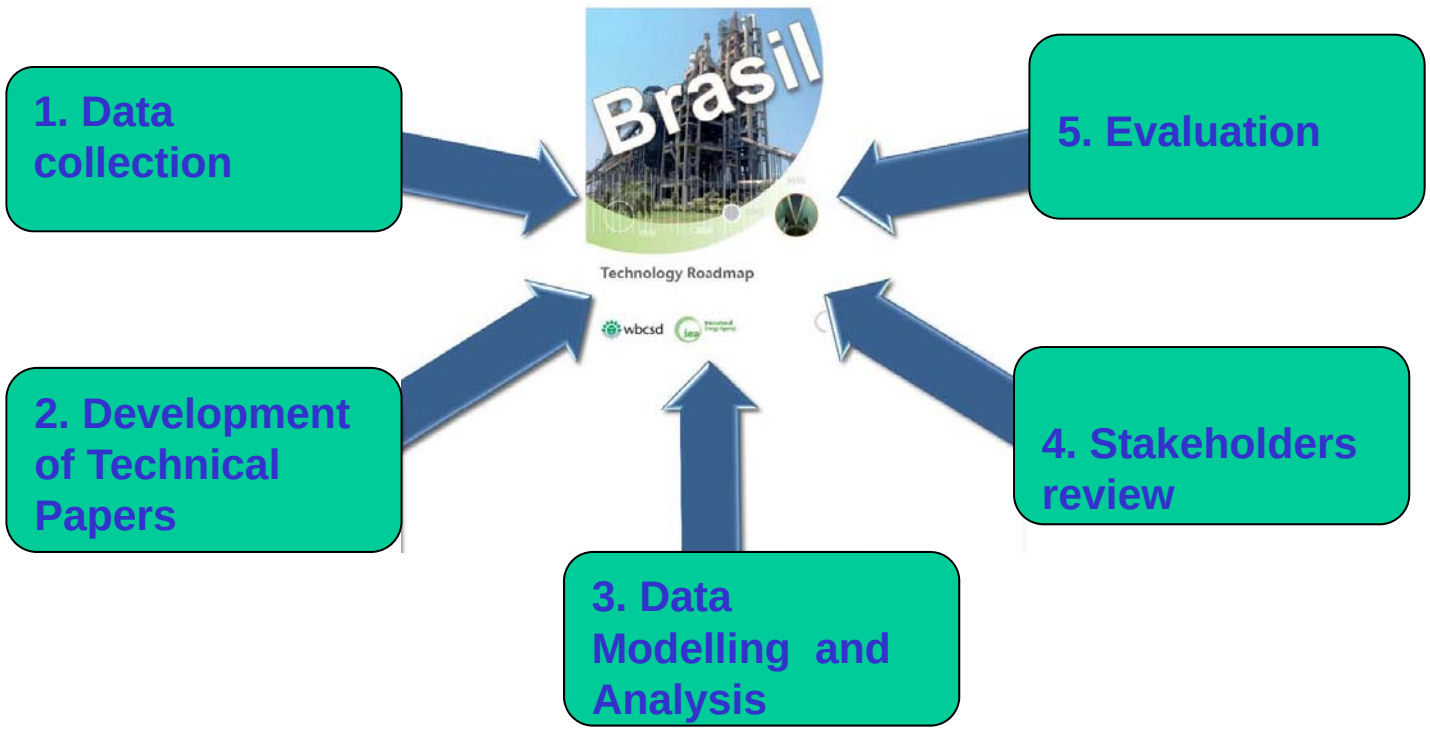
Low-Carbon Technology Roadmap for the Brazilian Cement Industry – Process



Low-Carbon Technology Roadmap for the Brazilian Cement Industry – Update

- Currently choosing **Consultants** (research centres and universities), that will develop the Technical Papers and

- In parallel, together with IEA and a Industry WG **the Data Collection spreadsheet** is being developed.

- These two activities are planned to be concluded by the end of 2014. Beginning of 2015 **some technical workshops on Energy Efficiency and CCS** will be planned, with the participation of Industry Experts, Academics, Equipment suppliers and Research centres.

Thank you

CSI is a member-led program of the

World Business Council for Sustainable Development