

The Cement Sustainability Initiative (CSI)

A member-led program of the World Business Council for Sustainable Development (WBCSD)



Green Cementech 2010
Subhasis Chattopadhyay

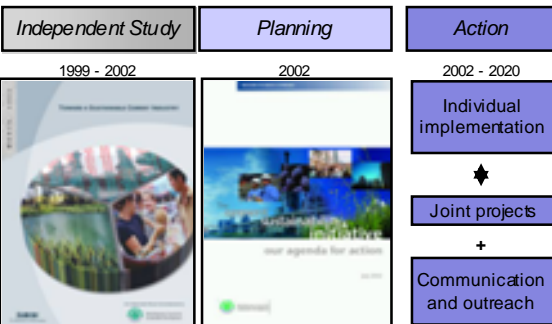


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CSI – 23 member companies, operating in 100 countries



From study to action



All reports available on the CSI website, www.wbcscement.org

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Key issues

CSI Agenda for Action (2002)

- Climate protection
- Responsible use of fuels and raw materials
- Employee health and safety
- Emissions monitoring and reduction
- Local impacts on land and communities
- Communications and progress reporting

Added later

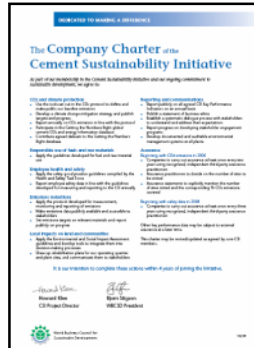
- Concrete recycling (since 2006)
- Concrete sustainability (since 2008)



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CSI Charter

- Summarizes individual member actions of Agenda for Action
- Updated in 2009
- Companies have 4 years to implement commitments and report publicly on progress



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Climate protection

- § Cement production causes approx. 5% of global manmade CO₂ emissions
- § Demand is forecast to increase significantly, particularly in emerging economies
- § Reduction of CO₂ emissions in cement sector urgent
- § 4 recognized levers available:
 - § Energy efficiency
 - § Alternative fuels
 - § Clinker substitution
 - § Carbon capture and storage



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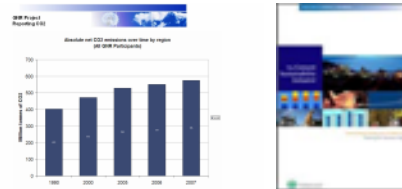
The CSI's response

- § CO₂ protocol used by majority of the world's cement industry
- **Global cement database for energy and CO₂ emissions:** "Getting the Numbers Right (GNR)"
- **Cement Technology Roadmap** to identify technology needs to 2050 (with International Energy Agency)
- § Policy Work – Sectoral approach to reduce CO₂ emissions in the industry
- § New benchmarking Clean Development Mechanism methodology proposed



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"Getting the Numbers Right" Global Energy and CO₂ emissions database



<http://www.wbcsglobalenergy.org/gnr/v2/index.html>



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Global energy and CO₂ emissions database

“Getting the Numbers Right” (GNR)

Representative statistical information on the energy and CO₂ performance of clinker and cement production, worldwide and regionally, to serve the needs of internal and external stakeholders.

Coverage:

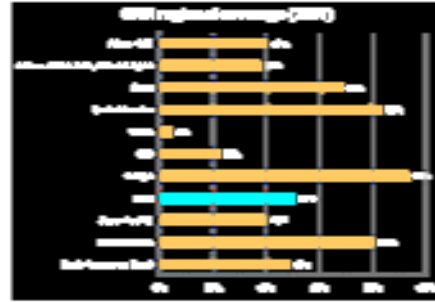
- §891 plants
- §681 million tonnes clinker
- §857 million tonnes cement
- §31% of global cement production



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GNR coverage

31% of global cement production, 51% of Indian cement (2007)

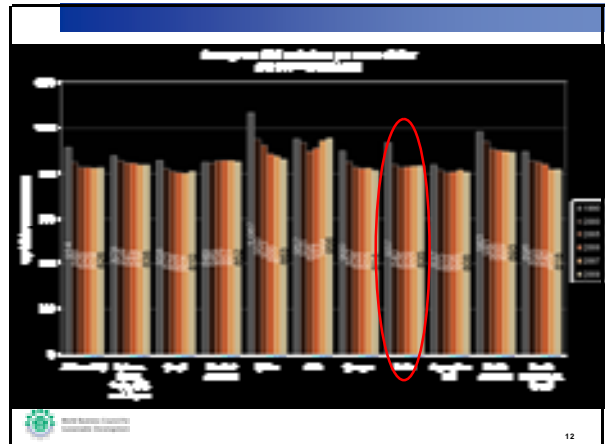


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Some typical GNR outputs 2008

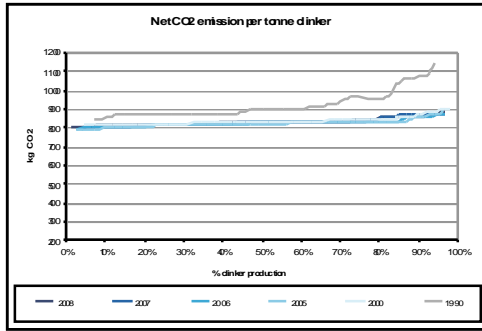


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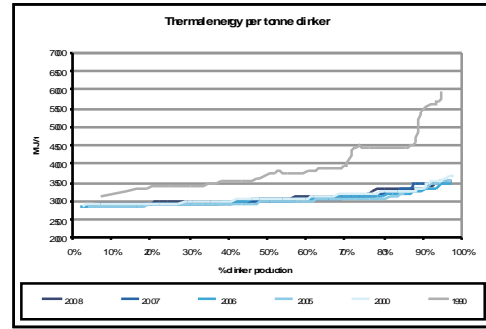
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Net CO₂ emissions per tonne clinker (India)



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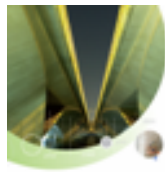
Thermal energy per tonne clinker (India)



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Cement Technology Roadmap

- § Partnership with International Energy Agency (IEA)
- § First industry-specific roadmap
- § Launched in December 2009
- § Roadmap for CO₂ emissions reductions potential up to 2050
- § Based on 38 technology-specific papers by European Cement Research Academy (ECRA)

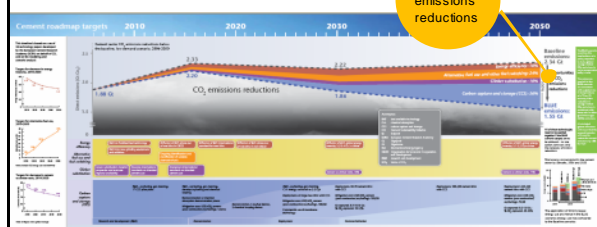


Cement Technology Roadmap 2009
Carbon emissions reductions up to 2050



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Roadmap: key messages



Levers for emissions reductions in the cement industry.

- * Energy efficiency
- * Alternative fuel use
- * Clinker substitution
- * Carbon (capture and storage)



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Roadmap: key messages

- Cement is a key material and no replacement apparent
- Reduction potential: By 2050, 18% reduction compared to 2005, given the right policy frameworks
- Today's options are not sufficient
- New technology is needed – CCS and new cement types
- Step increase in R&D needed
- Deep emission cuts are costly and capital intensive



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Roadmap: recommendations for India

India	BLUE low demand			BLUE high demand		
	2015	2030	2050	2015	2030	2050
Technologies						
Energy use (Mtoe)	19.4	29.9	47.4	19.6	33.6	60.1
Share of alternative fuel use	13%	23%	33%	15%	27%	35%
Clinker to cement ratio	0.77	0.73	0.71	0.77	0.72	0.72
CO ₂ captured (Mt)	0	23.7	99.8	0	28.8	173.1

Note:

- The BLUE scenario examines the implications of a policy objective to halve global energy-related CO₂ emissions in 2050 compared to today's level
- Alternative fuel shares presented exclude the additional energy requirement for CCS.
- The CO₂ storage figures presented here are based on capture potentials. Additional analysis is needed to verify the storage potential in different regions.



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ECRA technology papers

§ 5 overview papers on State-of-the-Art technologies for cement:

- § Thermal efficiency
- § Electric efficiency
- § Alternative fuels and biomass
- § Reduction of clinker content
- § Carbon Capture and Storage

Technology papers	Current tech's	Future tech's
I Thermal energy efficiency	13	1
II Electrical energy efficiency	5	1
III Product quality	6	2
IV Carbon Capture and Storage	-	5



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Roadmap: Energy efficiency messages

“Promote the adoption of best available efficiency technologies for new and retrofit kilns.”

- § Phase out inefficient long-dry kilns and wet production processes
- § Strengthen international cooperation:
 - § to gather reliable, industry-level energy and emissions data
 - § to identify regional and national performance gaps and best practice
 - § to support effective policy development
- § Develop and implement international standards for energy efficiency and CO₂ emissions
- § Share best practice policies for the promotion of energy efficiency



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Roadmap: Alternative fuel use

“Encourage and facilitate increased alternative fuel use.”

Current contribution: 20% in Europe, 10% in South America, 4% in Asia (India: 0.3%)

Key barriers:

- § Waste management legislation
- § Waste collection networks
- § Level of social acceptance



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Thermal energy efficiency

Current technologies:

1. Improve rawmix burnability;
2. Change from long/wet/shaft kilns to preheater/precalciner kilns;
3. Preheater/calcliner modification (eg low pressure drop cyclones);
4. Efficient cooler technology;
5. Waste heat recovery systems;
6. Additional preheater cyclone stage(s);
7. Oxygen enrichment technology;
8. Upgrade plant automation/control package;
9. Alternative decarbonated raw materials for clinker production;
10. Alternative fuels, including biomass, replacing conventional fossil fuels;
25. Fuel switch (coal/petcoke > oil/gas/pure biomass);
26. Increase kiln capacity;
27. Retrofit mono-channel burner to modern multi-channel burner;

Future technologies:

19. Stationary fluidized bed cement kiln ;



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Electrical energy efficiency

Current technologies:

11. Cement grinding with vertical roller mills and (bigger) roller presses instead of or in addition to ball mills ;
13. High efficiency separators for ball mills ;
14. Optimization of ball mill load/filling, optimization ;
15. Variable speed drives ;
29. Separate grinding of raw material components;

Future technologies:

33. Advanced grinding technology ;



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Technology papers: Product quality

Current technologies:

12. Further reduction of clinker content in cement by use of blast furnace slag;
16. High performance cements resulting in reduction of the cement content in concrete;
28. Impact on very high/very low lime standard ;
30. Further reduction of clinker content in cement by use of fly ash;
31. Further reduction of clinker content in cement by use of Pozzolaneas;
32. Further reduction of clinker content in cement by use of other materials ;

Future technologies:

23. Geopolymer cement;
24. Other lower carbonate clinkers (belite clinker, CSA clinker , etc)



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Technology Papers: Carbon Capture and Storage

Future technologies:

17. Hydrogen from syngas in gasification processes used as fuel for cement kiln burners (precombustion);
18. Oxyfuel technology, to be combined with carbon storage;
20. Absorption technologies (chemical absorption, physical absorption);
21. Membrane processes (gas separation membranes, gas absorption membranes);
22. Solid sorbent processes (physical absorption processes, mineral carbonation, carbonate looping)

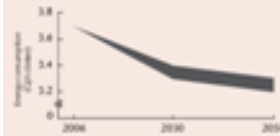


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Roadmap: Projected energy consumption

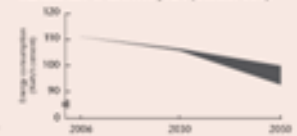
Thermal efficiency

Thermal energy consumption for clinker manufacture in different years:



Electric efficiency (approximately 10% of energy consumed)

Electric energy consumption for cement manufacture in different years (without CCI):



Source: ECEA Technology Papers (2009)



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Conclusion

- “Getting the Numbers Right” (GNR)
 - Ø Increase coverage
 - Ø Improve data quality and validation
- Cement Technology Roadmap
 - Ø Relevance for India
 - Ø Alignment with national reduction targets
- For further information: www.wbcdcement.org



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Thank you



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