Manufacturing – a decade of tough decisions

Ten Years to Transition - 18 October 2010

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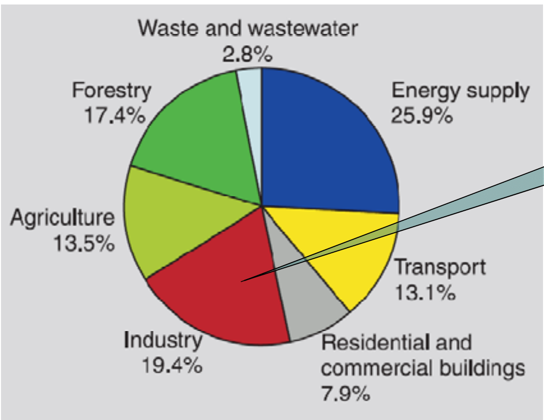
Climate change: a critical issue for cement



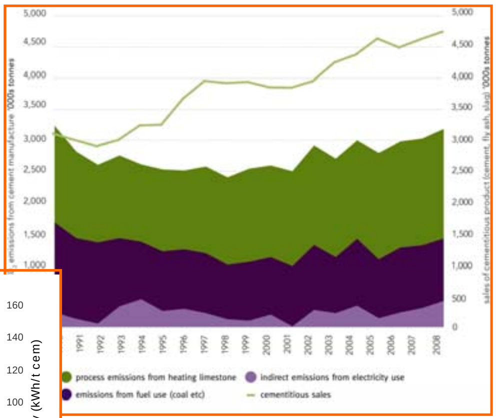
Source: IPCC Fourth Assessment Synthesis Report

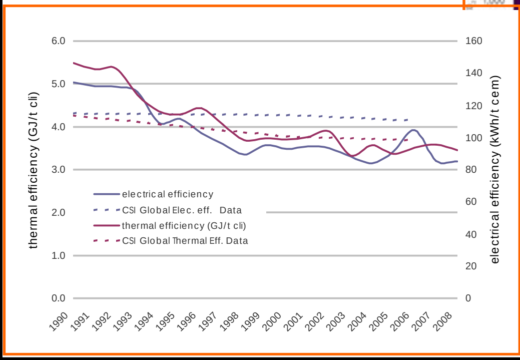
Cement: generally considered to contribute about 5% of global CO2 emissions

… in Australia; cement accounts for 1.5% (and declining) of total emissions through Australia's economy structure, industry efficiency and imports.

Emissions performance: total CO_2 vs. sales

While sales of cementitious products has increased by almost 50%, Our total CO_2 emissions at 2008 are below our emissions at 1990.





The CSI reference lines provide a current global benchmark against over 700 kilns

Effective (and ineffective?) drivers for action

- Abatement performance to date has been cost, and (import) competition driven - in effect energy costs (production and logistics) for EIs already represent a de-facto C-price
- (Slowly) changing market and community expectations are (slowly) driving upstream change – when did you last specify a low carbon cement for your house? When did you last choose a blend cement over OPC? - the universal benefits of cement (ease of use, low value, practicality, flexibility) could be its own worst enemy!
- A more understanding market will more often consider (whole-of) life-cycle assessments for choices relating to the built environment
- For many manufacturing sectors, RD&D and new technology commercialisation may simply be the only viable options
- Oversimplifying the problem does not help – the phrase "big polluters" needs to be redefined to mean the collective "us"

So, what might the future hold?

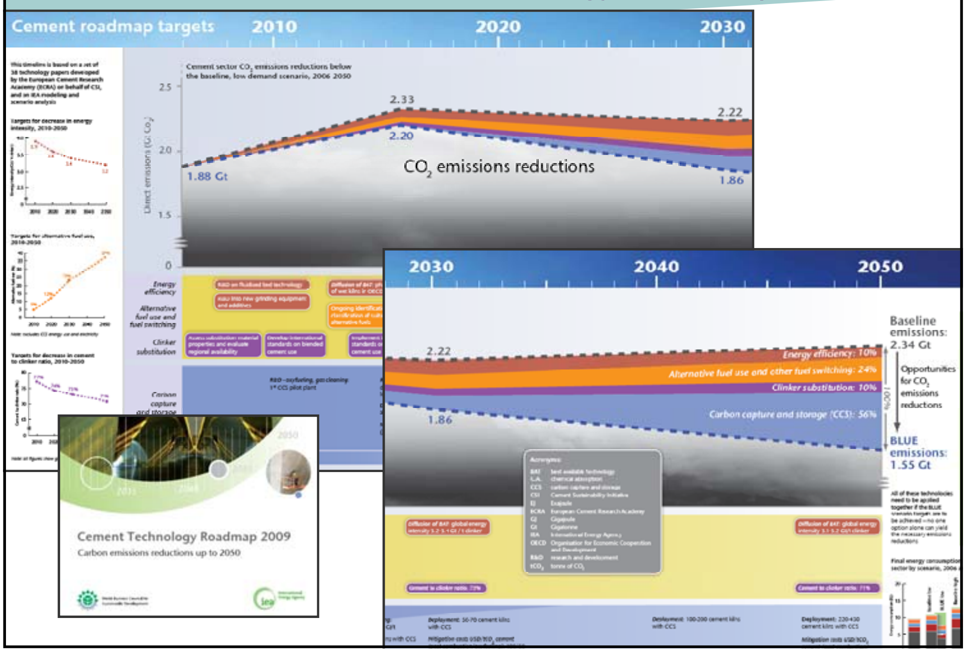
Abatement Strategy?

- ***Driving operational excellence:***
  - Improving plant review processes *(embedding energy efficiency)*
  - Employee-engagement projects *(energy efficiency + extension)*
  - Supply chain optimisation (driver training, customer training(!) *(energy efficiency + extension)*
- ***Implementing best available technologies:***
  - Biodiesel, LNG options for transport; biodiesel for kiln light-up *(alternative fuels/fuel substitution)*
  - maximising resource conservation opportunities *(alternative fuels and raw materials – fuel and raw material substitution)*
  - Developing MIC/SCM opportunities *(product substitution)*
- ***Exploring emerging technologies:***
  - New process technologies – but no more APP *(energy efficiency)*
  - biosequestration via microalgae *(CCS –but requires funding)*
  - international cooperation – but no more APP *(technology transfer)*

Product Strategy?

- ***Sustainable Materials:***
  - RD&D focused on alternative cement-like materials *(product substitution)*
  - maximising resource conservation opportunities *(alternative fuels and raw materials – fuel and raw material substitution)*
- ***Sustainable Construction:***
  - Improving rating tools; improve understanding of materials properties; improve the life-cycle performance of construction elements *(demand/market management)*

WBCSD – IEA Cement Technology Roadmap



WBCSD – IEA Cement Technology Roadmap

- Transition categories:
  - Energy efficiency (10%) – applicable to 50% emissions/developing/laggard economies (US?)
  - Alternative and other fuel substitution (24%) – applicable to 30% emissions/constantly changing market/can be negatively impacted by other industrial ecology developments
  - Clinker substitution (10%) – applicable to 100% emissions
  - Carbon capture and storage (56%) – applicable to 100% emissions

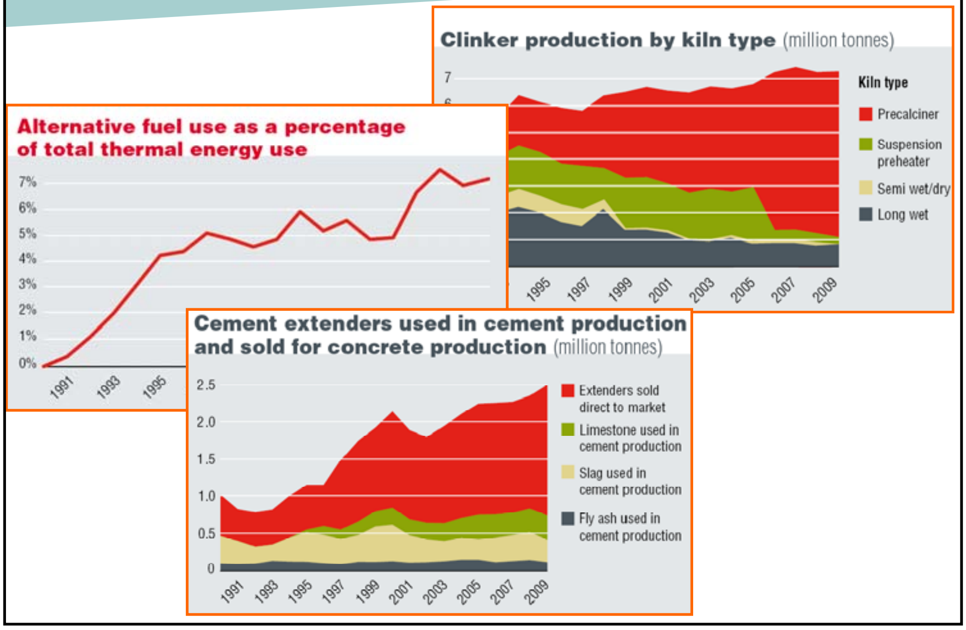
Cement Roadmap Indicators

Cement Roadmap Indicators	2012	2015	2020	2025	2030	2050
Thermal energy consumption per tonne of clinker GJ / tonne	3.9	3.8	3.5-3.7	3.4-3.6	3.3-3.4	3.2
Share of alternative fuel & biomass use (1)	5-10%	10-12%	12-15%	15-20%	23-24%	37%
Clinker to cement ratio	77%	76%	74%	73.5%	73%	71%
CCS						
no. of pilot plants	2	3				
no. of demo plants operating		2	6			
no. of commerical plants operating				10-15	50-70	200-400
Mt stored	0.1	0.4	5-10	20-35	100-160	490-920
Tonne CO_2 emissions per tonne cement (2)	0.75	0.66	0.62	0.59	0.56	0.42

Notes: (1) assumes 25 to 30 Mtoe of alternative fuel use in 2015 and 50 to 60 Mtoe in 2030, and excludes energy from CCS and electricity use, (2) includes reduction from CCS

Source: IEA, 2009

An example of transition - Australian cement



Transition for cement .....

Achievements will be marginalised if we don’t consider the bigger picture relationships i.e.

- Society working towards a sustainable built environment that considers:
  - Sustainable materials - manufacturers doing what they can to produce building materials of varying properties at lowest resource impact; and
  - Sustainable construction - the construction industry as a whole understanding the differing properties of the building materials available and leveraging these properties in such a way that net minimum resource impact is achieved over the life of the application

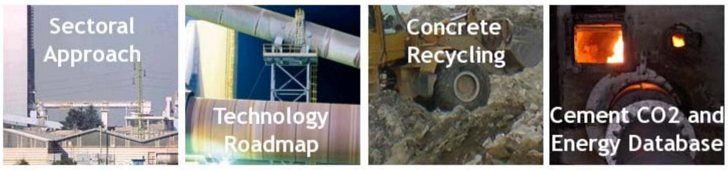
Current directions – WBCSD CSI

Emissions Monitoring and Reduction

Introduction

The Cement Sustainability Initiative (CSI) is a global effort by 23 major cement producers with operations in more than 100 countries who believe there is a case for the pursuit of sustainable development. Collectively these companies account for about one third of the world's cement production and range in siz multinationals to smaller local producers.

Click here to explore the world of cement...



Click here to read about CSI's modeling work... | Click here to learn more about carbon emissions reductions to 2050... | Click here to find out more about recycling practice... | Click here to view global and regional data...