Sustainability Initiatives of the Cement and Concrete Industries in South Africa

Bryan Perrie

cement & concrete institute

Scope

- Background
- Cement Industry
- Aggregate Industry
- Readymix Industry
- Concrete Industry
- Conclusions

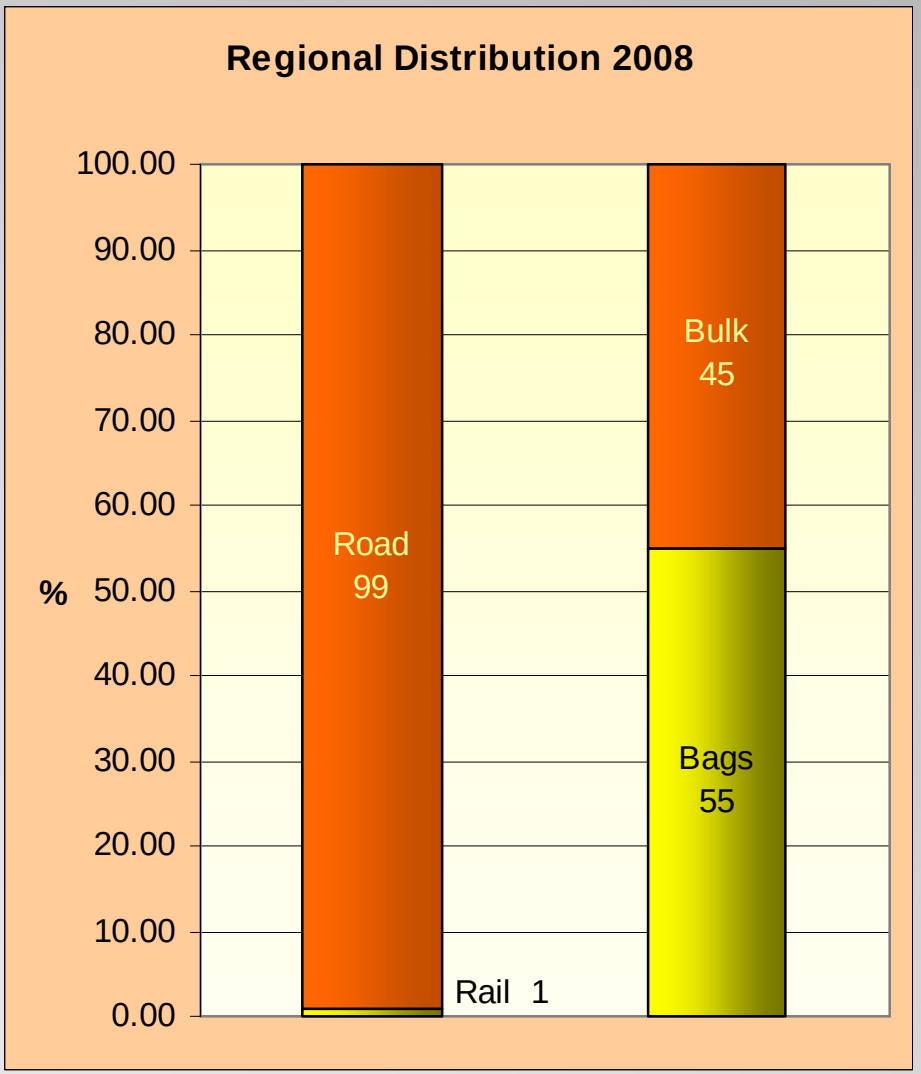
cement & concrete institute

Background

cement & concrete institute

Background

- Population – 49 million
- Cement production – 14.7 mill tons (4 producers)
- Construction industry turnover – 20% of GDP
- Cement consumption
  - Residential 50%
  - Non-residential 30%
  - Infrastructure 20%

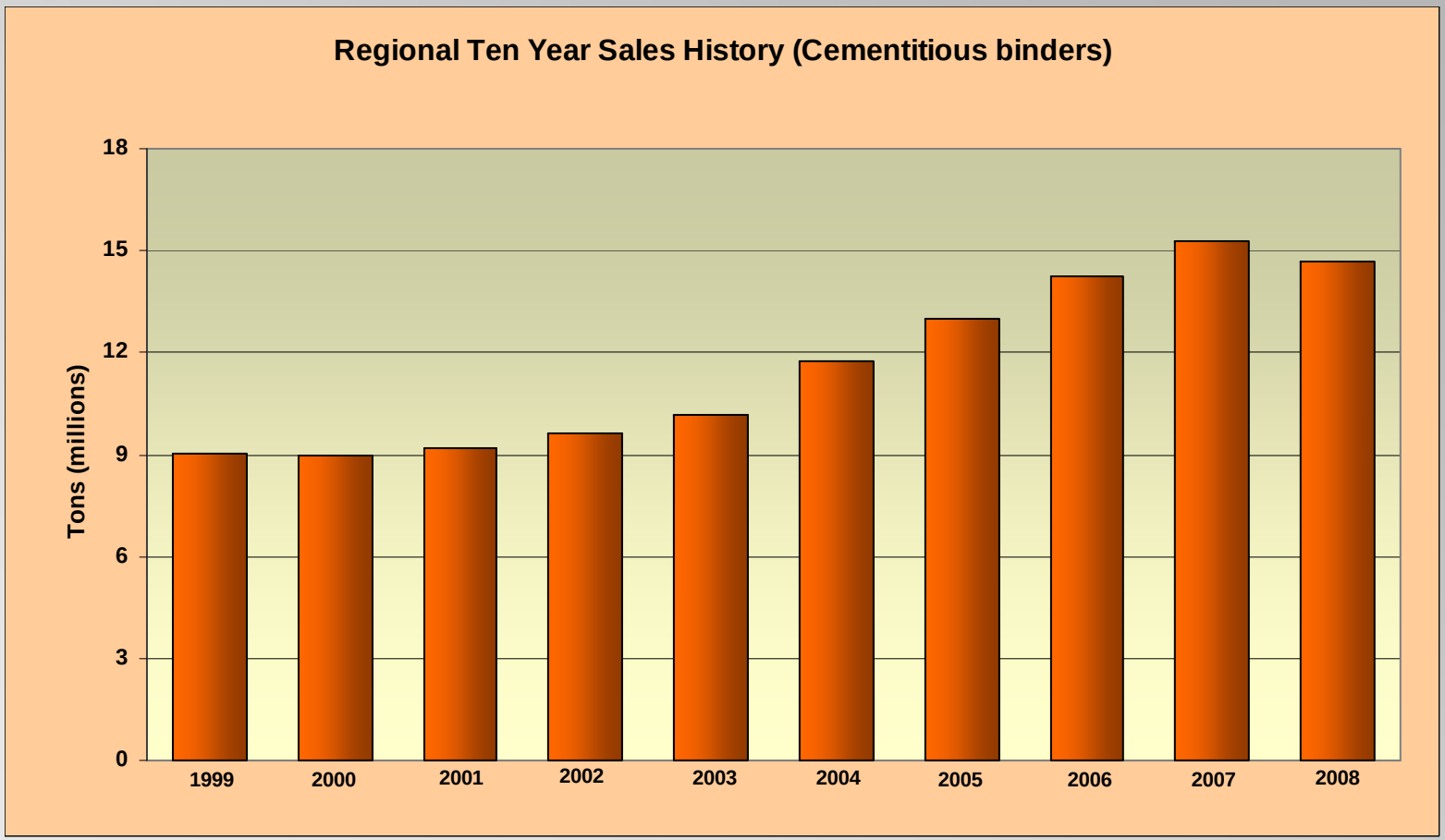


cement & concrete institute

Background cont.

- Cement consumption trends
  - Residential down, infrastructure up
  - Large infrastructure spend
  - World Cup 2010
- Skills scarcity
- Use of extenders:
  - ggbs 1950s
  - Flyash 1980s
  - CSF 1990s

cement & concrete institute



cement & concrete institute

Product Type Sales

Product type	2004	2005	2006	2007	2008
CEM I	2 695 651	3 547 641	3 977 934	3 659 494	3 230 433
CEM II A	4 112 947	3 256 687	3 153 622	3 497 813	3 176 277
CEM II B	2 274 110	3 235 831	3 713 525	3 742 671	3 438 927
CEM III/IV/V	1 214 726	1 423 387	1 811 632	2 750 350	3 477 425
Extenders	1 438 567	1 511 716	1 599 505	1 664 204	1 395 124
Totals	11 736001	12 975 262	14 257 034	15 315 720	14 718 654

Background cont.

- Codes and Standards
  - Traditionally based on BS with modifications
  - Move to European documents
  - Cement since 1996
  - Others in near future, extenders and structural design

Background cont.

- Large clients SANRAL, ESKOM moving to durability specifications
- Green building codes and ratings
  - Based on Green Stars (Australia)

Cement Industry

cement & concrete institute

What is the Cement Industry (ACMP) doing…

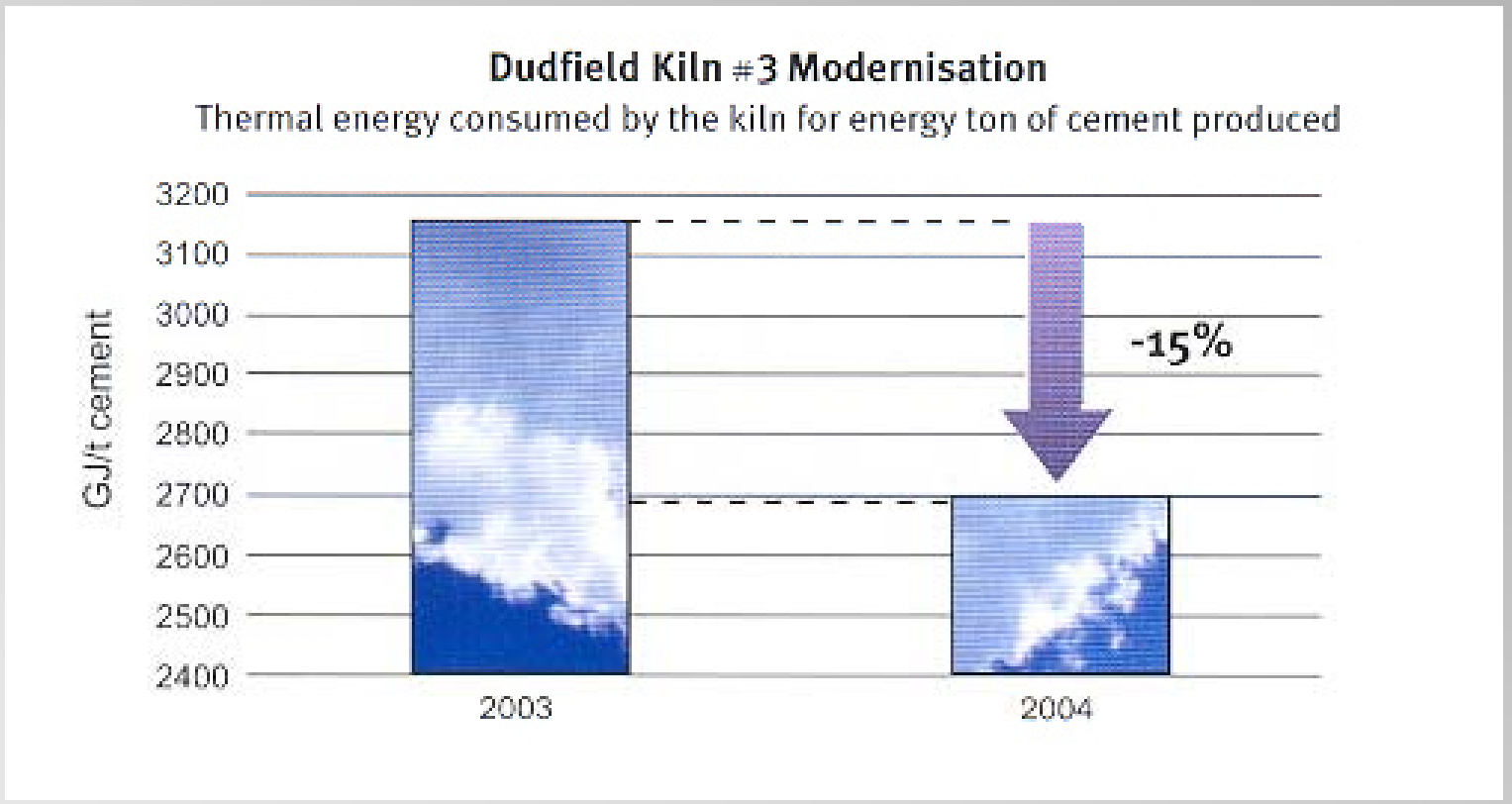
- Reducing usage of raw materials
  - Use of blended cements can reduce clinker factor by 40%
  - Use of extenders such as ggbs, flyash, silica fume, ground limestone
  - Synthetic gypsum from fertilizer and sulphuric acid industries

cement & concrete institute

Cement Industry…

- Reducing energy consumption
  - Reduce use of non-renewable fossil fuels (> 1 million tpa)
  - Introduction of modern technology and equipment

cement & concrete institute



cement & concrete institute

Cement Industry…

- Reducing energy consumption
  - Reduce use of non-renewable fossil fuels (> 1 million tpa)
  - Introduction of modern technology and equipment
  - Target reduction in energy used for mining by 15% by 2015 (>50% by end 2007)
  - Use of alternative fuels including hazardous waste and co-combustion materials

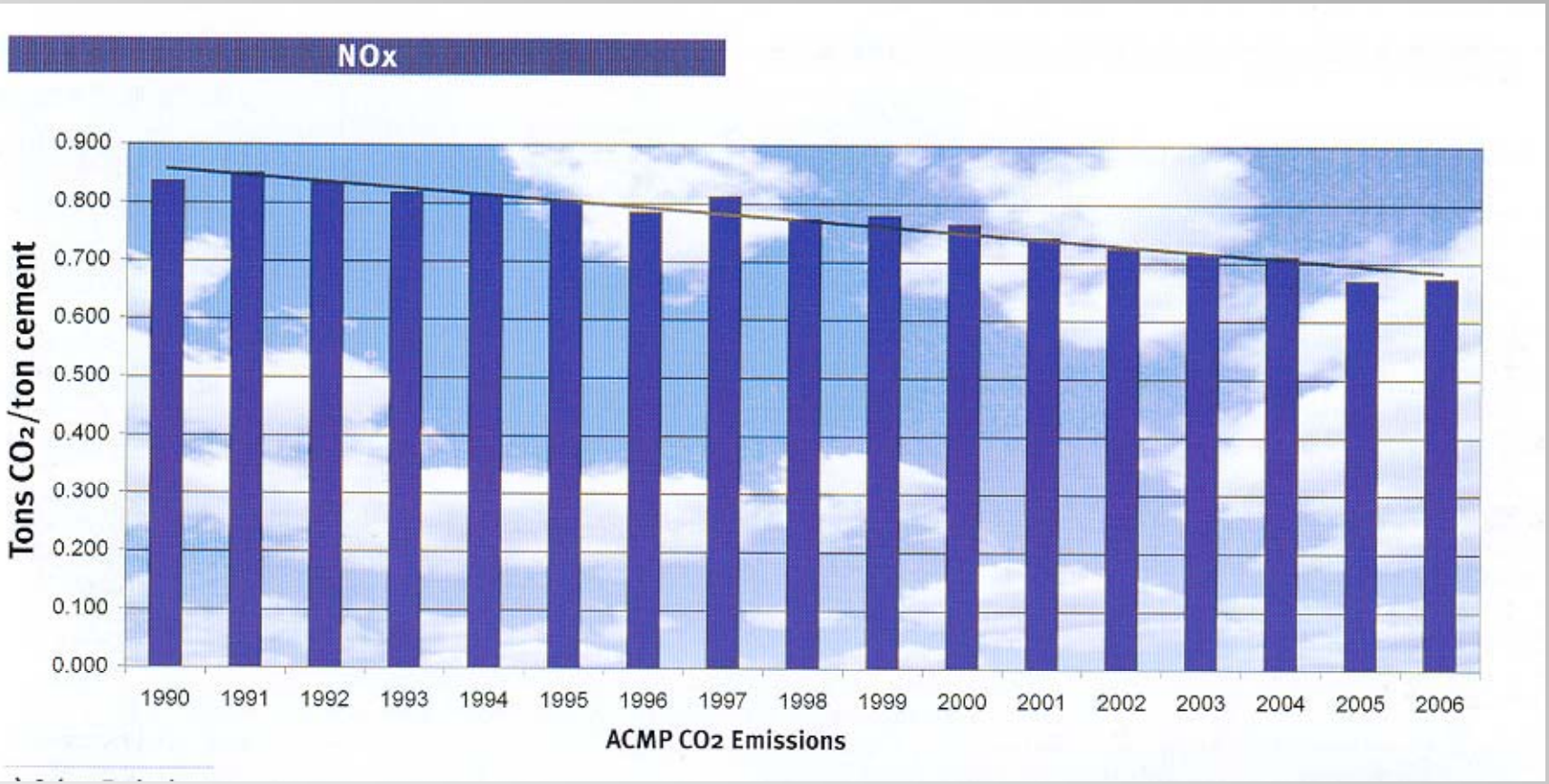
Cement Industry…

- Reducing energy consumption (cont.)
  - Use of waste tyres in kilns
    - Coal – 96 kg CO_2 per GJ energy consumed
    - Tyres - 85 kg CO_2 per GJ energy consumed
    - Steel provides source of iron
    - No ash

Cement Industry…

- Reducing emissions
  - Particulate emissions
    - Use of bag house filters – equivalent to world best practice
  - Greenhouse gas emissions

cement & concrete institute



cement & concrete institute

Cement Industry…

- Reducing emissions
  - Particulate emissions
    - Use of bag house filters – equivalent to world best practice
  - Greenhouse gas emissions
  - Other emissions
    - Reduced by good technology, pre-calciners, pre-heaters, etc.

cement & concrete institute

Cement Industry…

- Rehabilitation of mines and quarries
- CSI programmes

cement & concrete institute

Aggregates

cement & concrete institute

What is the Aggregate Industry (ASPASA) doing…

In addition to Minerals Act and Health and Safety, committed to

- The National Environmental Management Act (NEMA);
- Environment Conservation Act (ECA);
- National Water Act (NWA)
- Air Quality Management Act (AQMA);
- Atmospheric Pollution Prevention Act (APPA);
- National Veld and Forest Fire Act (NVFFA); and
- The National Forest Act (NFA).

cement & concrete institute

Aggregate Industry…

- Support of the “Triple Bottom Line” management approach
- “About Face” Environmental audits and “Fish Eagle Grading System” based on ISO 14001

cement & concrete institute

Readymix

cement & concrete institute

What is the Readymix Industry (SARMA) doing…

- Support of the “Triple Bottom Line” management approach
- SHREQ Audits
  - Safety
  - Health
  - Road
  - Environment
  - Quality

cement & concrete institute

Concrete

cement & concrete institute

What is the Concrete Industry (C&CI) doing…

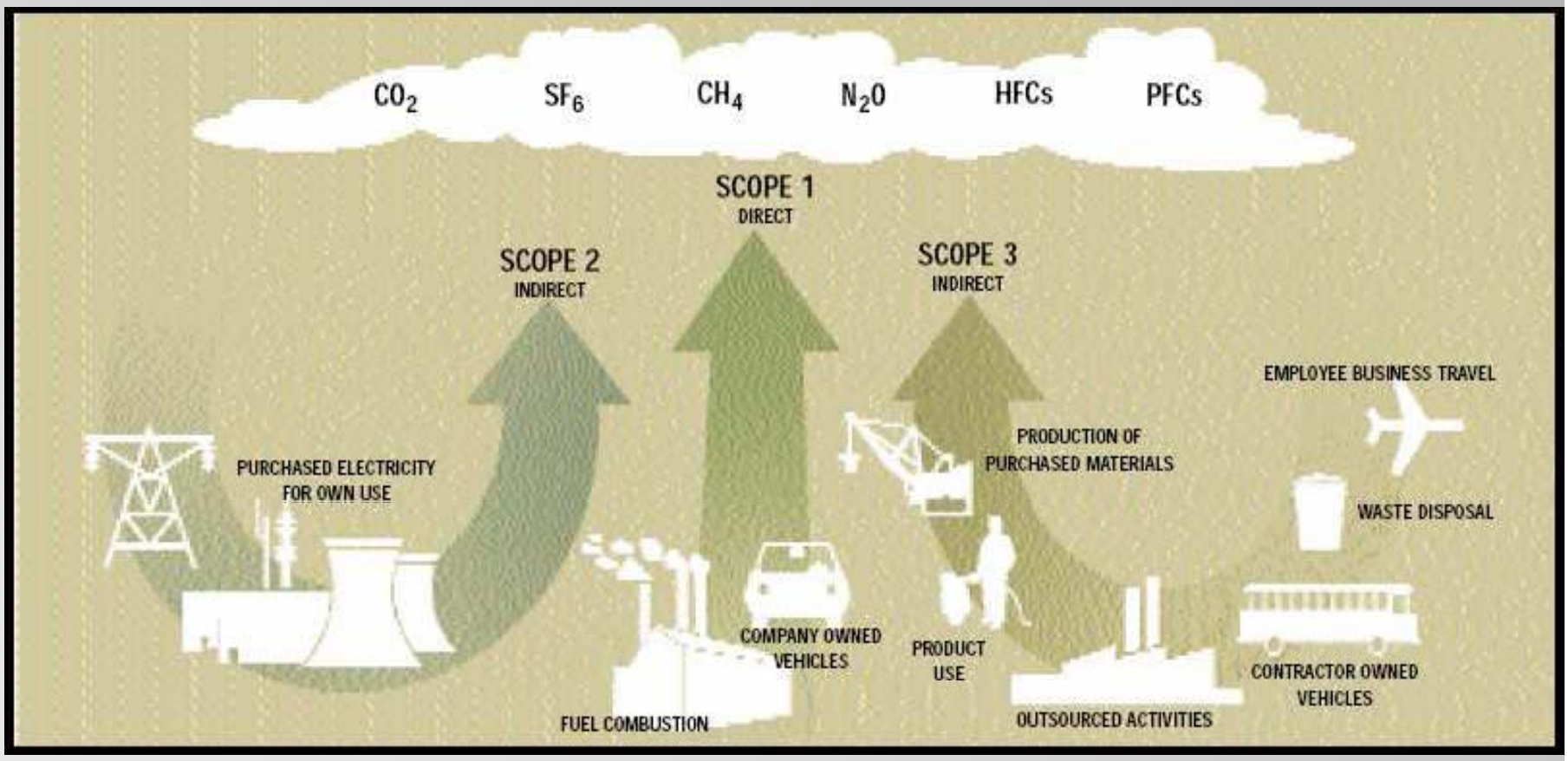
- Quantify embodied energy/CO_2 emissions
- Used Greenhouse Gas Protocol and WBCSD as guideline
- From cradle to gate (future cradle to grave)
- Two goals
  - Manage emissions
  - Quantify emissions

cement & concrete institute

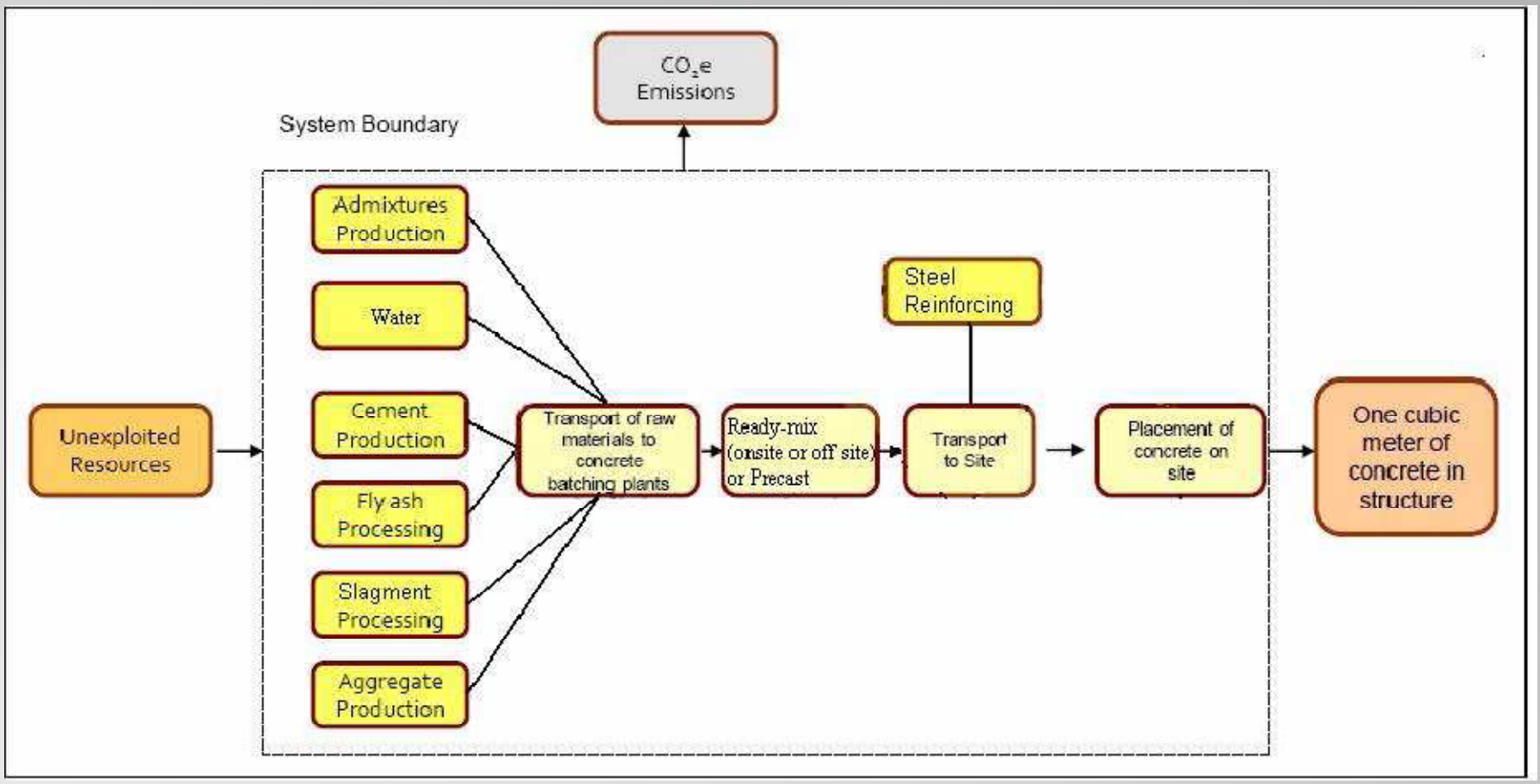
C&CI…

- New models
  - Scope 1,2 and 3 emissions
  - Delivery transport
  - Emissions per ton

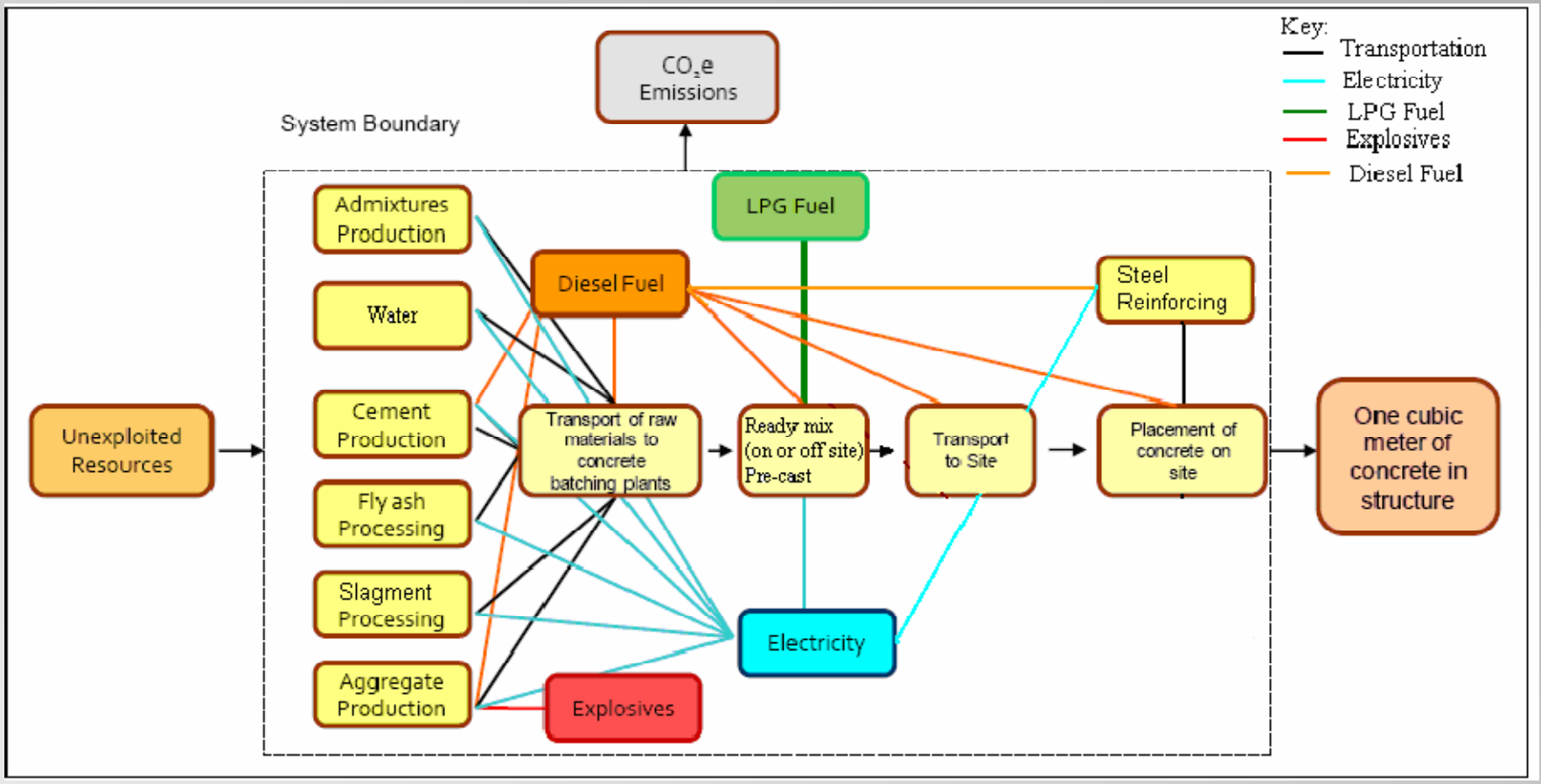
cement & concrete institute



cement & concrete institute



cement & concrete institute



cement & concrete institute

C&CI…

Sector	Respondents
Admixtures	1*
Aggregates	27
Cement	13
Flyash	3
Slagment	3
Water	1*
Reinforcement	1
Precast concrete	13
Insitu concrete/readymix	68

cement & concrete institute

C&CI…

Sector	Emission Factor
CEM I	100
CEM II A	89
CEM II B	79
CEM III A	59
CEM IV	63
CEM V	58

cement & concrete institute

C&CI…

Sector	Emission Factor
Admixtures	23
Aggregates	0.55
Flyash	0.17
Slagment	14
Water	0.1
Reinforcement	287
Precast concrete	2.0
Insitu concrete	1.2

C&CI…

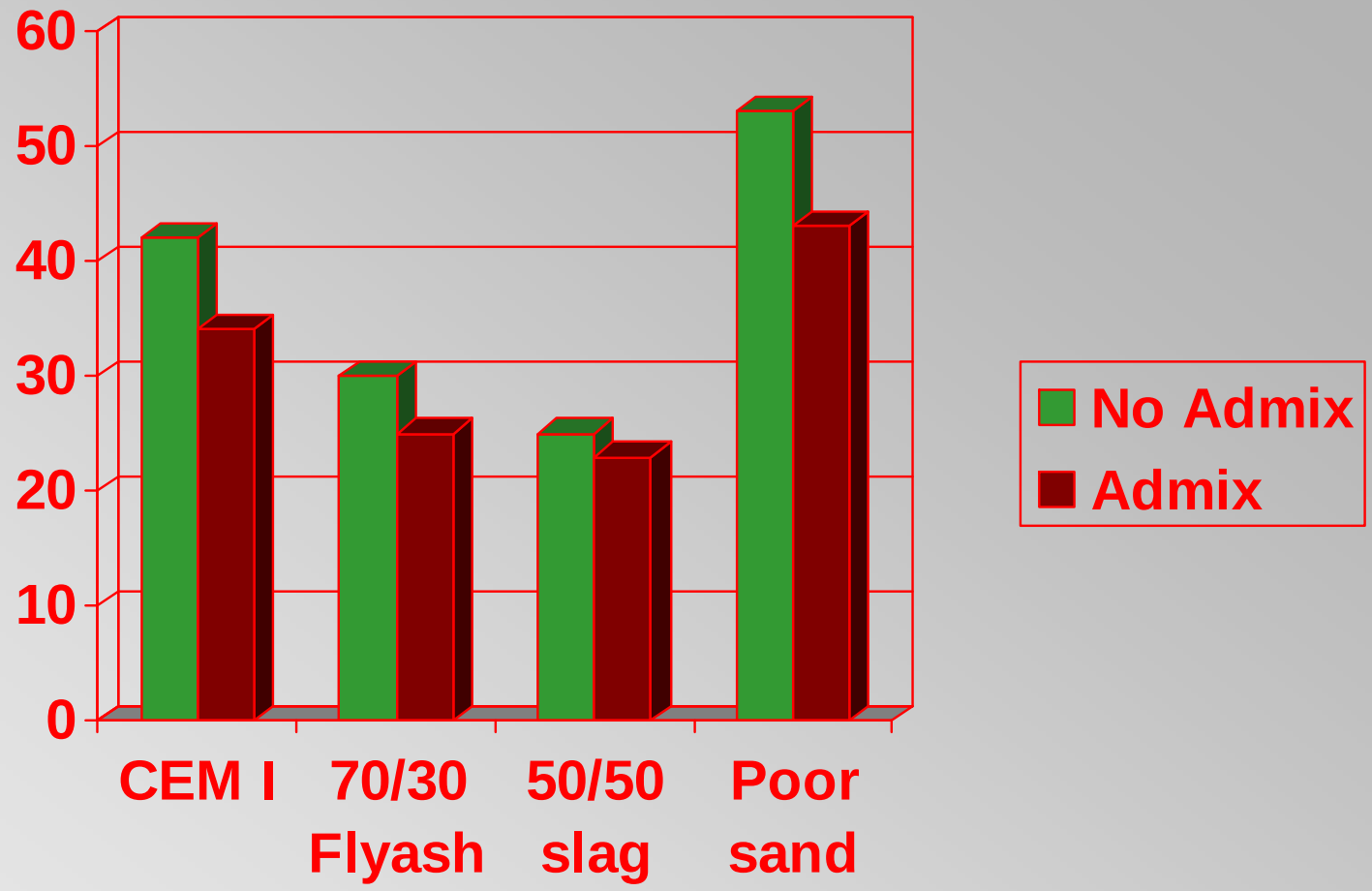
- Developed concrete mixes
  - CEM I
  - 70/30 flyash
  - 50/50 slag
  - Poor sand
- All with and without admixtures

cement & concrete institute

C&CI…

Models

cement & concrete institute



cement & concrete institute

Conclusions

cement & concrete institute

Conclusions

- All parts of the industry are working towards a sustainable future
- Increased use of extenders has a very positive benefit
- Now we can quantify accurately CO_2e for 1 m^3 of concrete cast insitu or precast
- Precast includes:
  - Masonry
  - Hollow core flooring
  - Roof tiles
  - etc
- Conduct research to fill the gaps in knowledge (Fellowship for PhD at UCT)

cement &
concrete
institute