THE CEMENT & CONCRETE INDUSTRY: READY FOR FUTURE CHALLENGES !!!

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Finnish Concrete Industry Association

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WHAT WILL THE FUTURE LOOK LIKE?
World Population
Projected world population until 2100

1990: 5.3 billion
2015: 7.3 billion
2030: 8.5 billion
2050: 9.7 billion
2100: 11.2 billion

Source: United Nations Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2015 Revision
Produced by: United Nations Department of Public Information

- 2 out of 3 people will live in cities
- Growth will concentrate in Africa & Asia / decrease in Russia, Japan, Europe
- Need for housing and infrastructure
WHAT PEOPLE WANT

SMART CITIES

ENERGY EFFICIENT BUILDINGS

ELECTRICAL CARS

DIGITAL HIGHWAYS …

DURABILITY

RESILIENCE

AFFORDABILITY

LESS CO₂
ARE CEMENT & CONCRETE PART OF IT?
WE CAN OFFER SOLUTIONS

- SUSTAINABLE CITIES
- INFRASTRUCTURE
- ENERGY
- SAFE DRINKING WATER

WITH RESPECT FOR THE ENVIRONMENT
CONCRETE AS ENABLER FOR THE LOW CARBON ECONOMY

SUSTAINABLE TRANSPORT  RENEWABLE ENERGY  THERMAL MASS
HOW WILL WE TACKLE IT?
Some Background: Cement Production 2016

Evolution Since 2001

- EU: 169 million tonnes, 225 million tonnes
- Global: 4.1 bn tonnes
- China: 2.4 bn tonnes, 661 million tonnes
- Turkey: 75.4 million tonnes, 30 million tonnes
- US: 85.9 million tonnes, 88 million tonnes
- India: 290 million tonnes, 102 million tonnes
CEMENT CONSUMPTION PER CAPITA: WORLD OVERVIEW

- **World** (cement consumption kg/inhab.)

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</thead>
<tbody>
<tr>
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<td>68</td>
<td>232</td>
<td>557</td>
<td>553</td>
<td>574</td>
<td>565</td>
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- **Some consumers categorized by size** (cement consumption kg/inhab.)

<table>
<thead>
<tr>
<th>Region</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
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<tbody>
<tr>
<td>Qatar</td>
<td>2950</td>
<td>Russia</td>
<td>Burundi</td>
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<tr>
<td>Saudi Arabia</td>
<td>1922</td>
<td>EU28</td>
<td>Rwanda</td>
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<tr>
<td>China</td>
<td>1705 (300 in 1993, 6 in 1953)</td>
<td>USA</td>
<td>Chad</td>
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<td>India</td>
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Concrete =

- Cement (10%-15%)
- Water (15%-20%)
- Aggregates (65%-75%)
TAKING RESPONSIBILITY ALONG THE SUPPLY CHAIN

quarries → raw materials → fuels → clinker & cement production

CO₂ and ENERGY INTENSIVE

concrete in the built environment → recycling end-of-life

LOW CARBON PRODUCT THAT CONTRIBUTES TO CARBON NEUTRALITY ALONG THE VALUE CHAIN
CO₂ REDUCTION MEASURES: 2050 PERSPECTIVE

-14% reduction to date

-32% reduction using conventional technologies

-80% reduction using breakthrough technologies

Source: ECRA and CEMBUREAU own calculations

Note: Other technologies (e.g. electrical efficiency, alternative raw materials) not displayed as long term reduction potentials are severely limited.
% of Thermal energy from Alternative Fuels in the Cement sector in the EU-28

- 1990: 2%
- 2000: 9%
- 2005: 15%
- 2006: 18%
- 2007: 19%
- 2008: 22%
- 2009: 28%
- 2010: 30%
- 2011: 34%
- 2012: 37%
- 2013: 39%
- 2014: 41%
- 2015: 43%
- 2016: 44%
THERMAL ENERGY CONSUMPTION BY FUEL TYPE for the year 2016

- Alternative Fossil Fuels: 29%
- Biomass: 15%
- Conventional Fossil Fuels: 56%
BREAKDOWN OF ALTERNATIVE FUELS 2016

- RDF including Plastics, 40%
- Tyres, 11%
- Other biomass, 4%
- Animal meal, bone meal and fat, 7%
- Other fossil based wastes, 9%
- Mixed industrial waste, 17%
- Impregnated saw dust, 2%
- Solvents, 7%
- Dried sewage sludge, 3%
- Other fossil based wastes, 9%
Carbon capture

Post-combustion: Norcem Brevik project (pilot testing); CEMCAP prototype
Oxyfuel: ECRA, LafargeHolcim / Air Liquide / FLSmidth, CEMCAP
Move to industrial scale oxyfuel / EUR 90 MM funding required

Carbon re-use

algae cultivation; methane, CO₂ carbonation

• develop non-hydraulic binder to produce cement (less limestone / lower kiln temperatures) / 30% less CO₂

• concrete production through mineral carbonation of non-hydraulic binder, capturing 300 kg CO₂/t cement
Clinker substitution / Lower Carbon Cements
- Continued reduction efforts but constraints (availability of raw materials; product quality,…)

New binders / Novel cements
- Low energy demand / CO₂ reduction (around 50%)
- Niche applications / early development
  - CSA cements, Celitement, Carbonation
    - hardening cement, Magnesium based cements,…

Product durability remains key (www.nanocem.org)
- Research on impact of different cement types or materials in concrete mix on product quality
GOING DOWN THE VALUE CHAIN

- **Thermal mass** of concrete
- **Energy storage** capacity of concrete
- **25% CO₂ reduction** per dwelling / 50% reduction in the need for peak electricity supply capacity / savings up to EUR 300 per household per year

- **Durable**: life cycle between 50-100 years
- **Resilient**: fire-safe; withstands extreme weather conditions
Thermal storage of peak loads within the building structure by

- activation of massive building parts in
- nearly zero energy buildings with energy supply
- via heat pump linked to the grid
• **Concrete recycling**: crushed concrete can be used as an aggregate in concrete or as a foundation or backfilling for many applications.

• **Recarbonation**: exposure of crushed concrete at end of life increases CO₂ uptake through contact of concrete with air / proper recycling allows 25% of originally emitted CO₂ to be recycled / further research ongoing.
CONCRETE RECYCLING: NATIONAL ACTION REQUIRED

- C&DW = 25%-30% of all waste generated in the EU
- In a lifetime, an average EU citizen generates 160 tons of C&DW
- WFD sets a 70% C&DW recycling target by 2020
- Protocol focuses on
  - improved waste identification, source separation and collection
  - improved waste logistics
  - improved waste processing
For recovery of energy and recycling of materials from waste, we need:
- Landfill ban
- National barriers to be addressed
- Material recycling counting towards national recycling targets

For breakthrough technologies:
- Consistent and accessible public financing / risk financing

For cement and concrete in the built environment:
- Standards and building codes that combine environmental, reliability and durability criteria
- A building life cycle approach
- Recognition of thermal mass and thermal energy storage in energy efficiency and grid discussions

OVERALL NEED FOR
- Level playing field
- Material neutrality

At the demolition phase
- Join up with the building sector to increase recyclability of concrete at the end of life

A FACILITATING REGULATORY FRAMEWORK
WE NEED THE FULL VALUE CHAIN TO ENGAGE

That is why we developed the 5C approach …

https://lowcarboneconomy.cembureau.eu/
THANK YOU FOR YOUR ATTENTION