Achieving emissions reductions in cement industry

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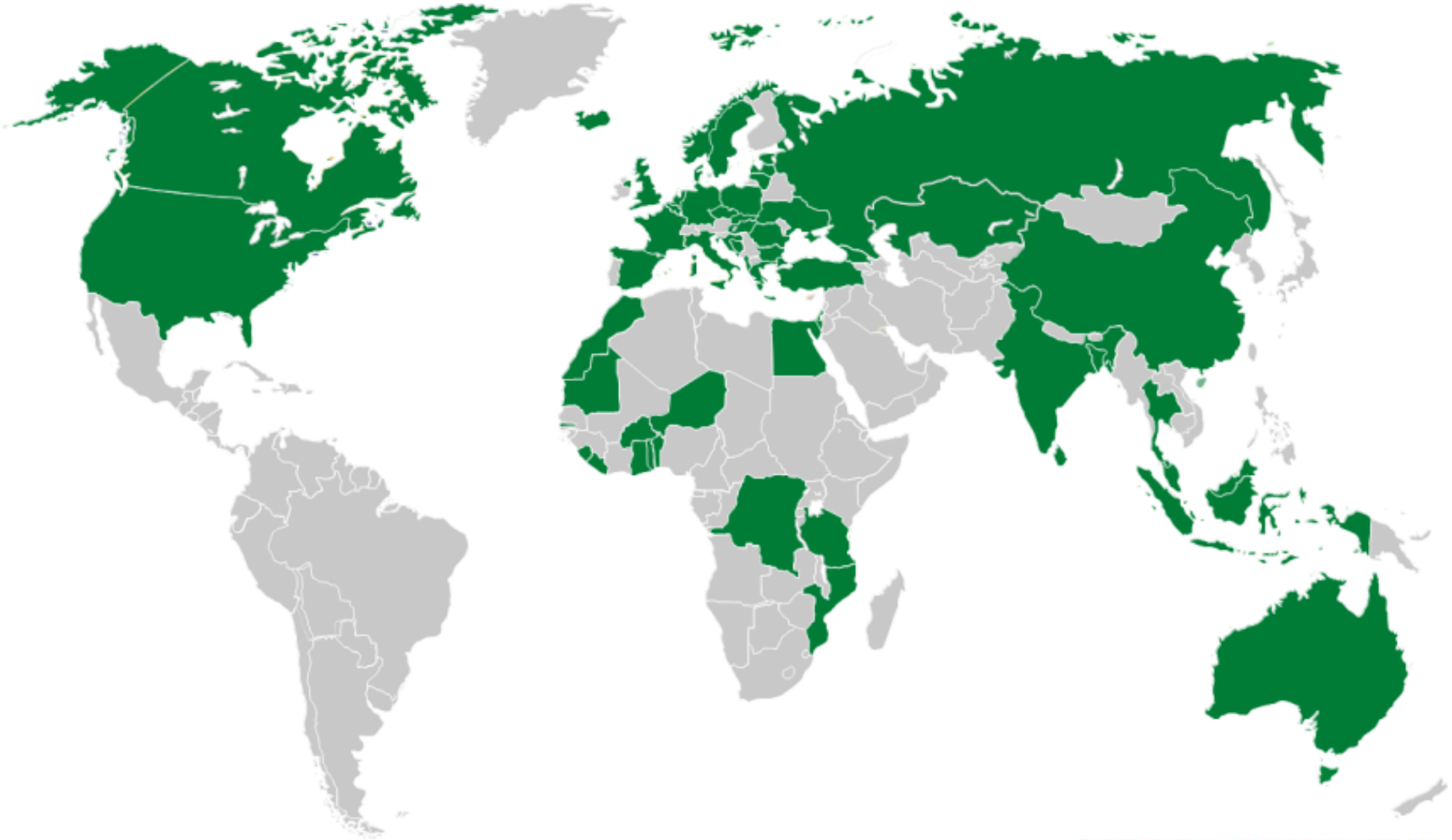
HeidelbergCement is a leader in building materials with operations in over 60 countries



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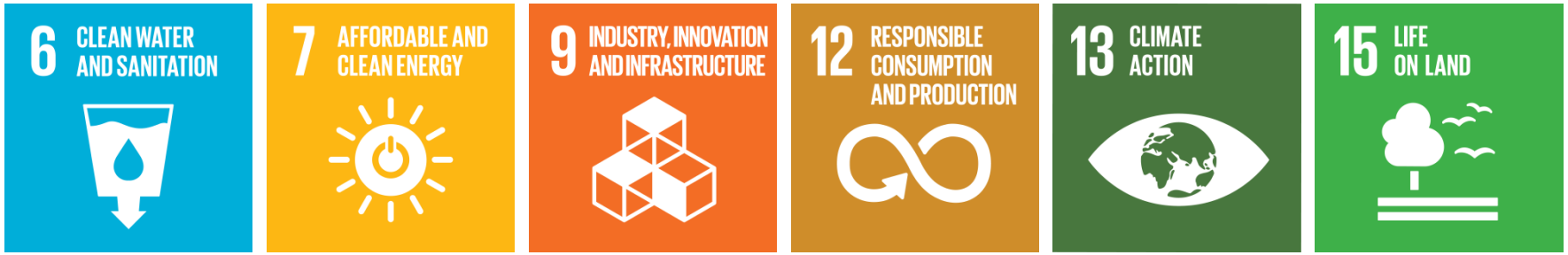
Reducing our **Environmental Footprint**

SUSTAINABILITY COMMITMENTS 2030

"We are committed to fulfilling our share of the global responsibility to keep temperature rise below 2°C, and we will continue to reduce our impacts on air, land and water."

EMISSIONS **WATER** **LAND USE**



Group performance 2016

Parameter	Unit	1990	2000	2005	2010	2015	2016
Clinker production	Mtons/a	55.5	47.1	48.6	45.8	54.4	70.1
Cementious productions	Mtons/a	65.3	58.3	62.5	60.8	74.3	94.7
Absolute Gross CO_2 emissions	Mtons/a	51.0	42.0	42.1	39.7	46.5	59.5
Net CO_2 emissions	Mtons/a	50.4	40.7	40.4	37.7	44.2	56.6
Net CO_2 per ton of cementitous	kg CO2/ton cementitious	781	720	674	653	626	628
Improvement rate	% compared to 1990		**9.5%**	**16.3%**	**19.7%**	**22.9%**	**22.6%**

- **HeidelbergCement voluntary emissions reductions target for 2030**

In 2030 30% reduction of net emissions per ton of cementitious products compared to 1990

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EXECUTIVE SUMMARY

Conclusions

- Your existing 30% scope 1 intensity reduction target from 1990 to 2030 would be acceptable for the Science Based Targets initiative.
- However, to meet the SBT requirements, you need to cover 95% of your scope 1 and 2 emissions in your targets.
- Your combined scope 1 and 2 science-based targets is -15% in 2030 versus 2016.
- You can meet this target by meeting your existing scope 1 intensity target and reducing your scope 2 emission intensity by 18%, for example through purchasing green power.

Additional findings

- Your combined scope 1 and 2 science-based intensity target for 2050 is -50%.
- You can use net emissions for your science-based target setting.
- You don't need to set scope 3 targets, because your scope 3 emissions are not larger than 40% of your total footprint.
- A beyond 2°C scenario would be significantly more ambitious than a 2°C scenario. Your existing target would not be sufficient to reach this.
- For the target setting process, you won't need to submit any other data to the CDP than what you need to fill in in the submission form.

Recommendations

- We recommend you to commit to combined scope 1 and 2 science-based targets of at least -15% in 2030 versus 2016. You can meet these targets by meeting your existing scope 1 intensity target and by reducing your scope 2 emissions by minimum 18%.

Innovation in concrete: the construction material needed by society and development

Concrete is needed for development and new cities

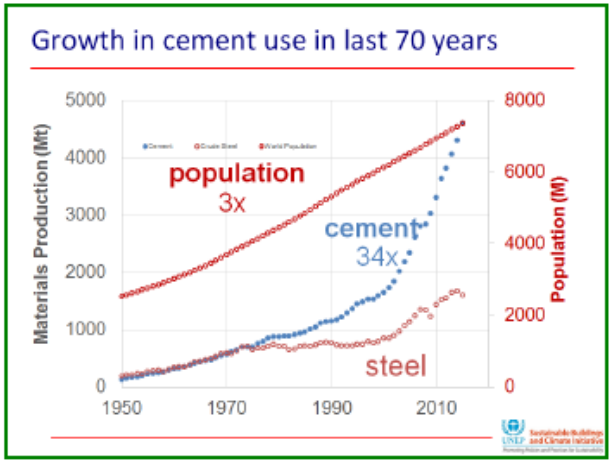
Green Township in Gurgaon

Smart cities & reduced land use

Smart buildings & high performance materials

Infrastructures for mobility

(Grey) building blocks



Source: UNEP Report 2016: „Eco-efficient cements"

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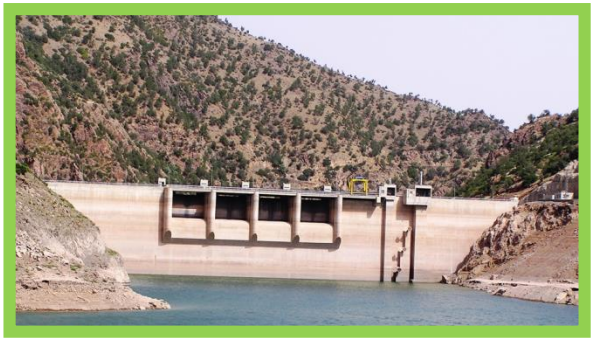
Reduction of the carbon footprint

R&D Focus Areas

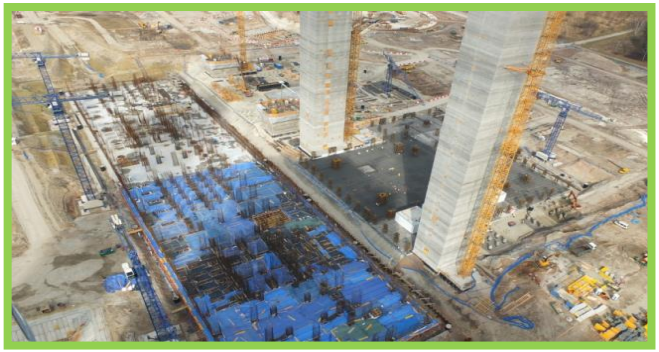
Levers for CO_2 reduction in cement / concrete industry

- **Reduction of clinker content in cement and concrete**
  - Using composite cements resp. byproducts from other industries, in particular slag -REGEN (ggbfs) or fly ash (FA) (state of the art)
  - Alternative cementitious materials increase flexibility
- **Alternative cementitious systems without OPC clinker**
  - Development of OPC-free binders requires time and effort (performance, durability, standardization)
- **Carbon capture and storage / utilization**
  - Pilots on capture technologies in Norway, Belgium, Italy
  - Use of CO_2 to generate Methane, other fuels and bio mass (fish meal)
- **Recarbonation of concrete**

Use of by-products from other industries in composite cements



Fly ashes cement used for a dam in Morocco



Use of slag cement for basements and massive construction parts for a power plant in Poland

We follow various approaches to reduce CO_2 in concrete

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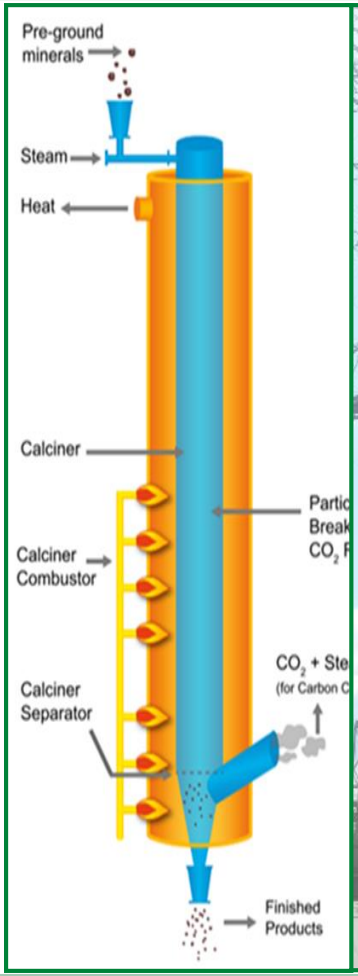
CO_2 separation@calcining at LEILAC

- **LEILAC plant separates CO_2 from calcination from other flue-gas**
- **Rawmeal is indirectly heated to about 900ºC . Proven process for MgO production.**
- **Funding via EU (Horizon 2020) of over €12m, demonstration plant in Lixhe, Belgium with 10 tph capacity.**



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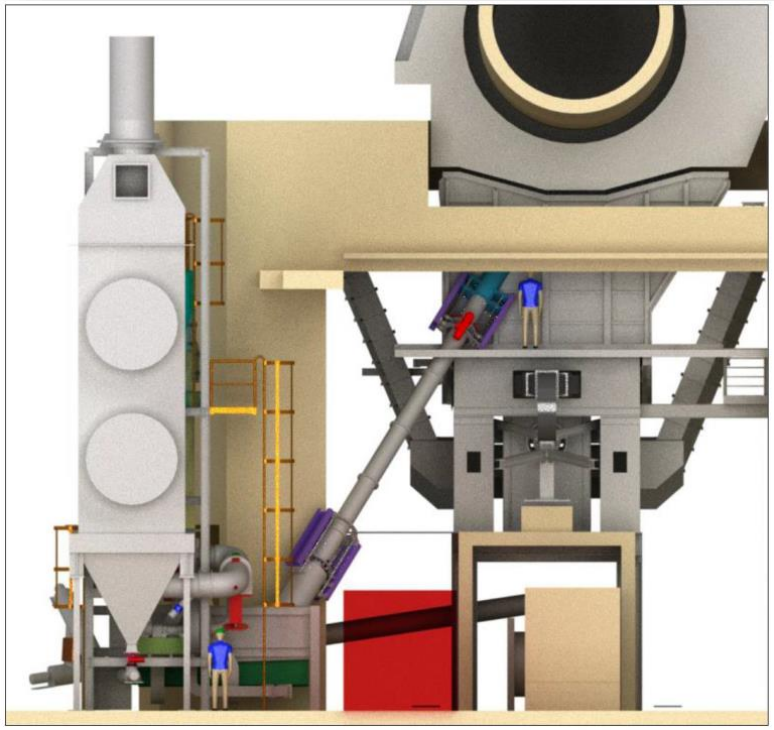
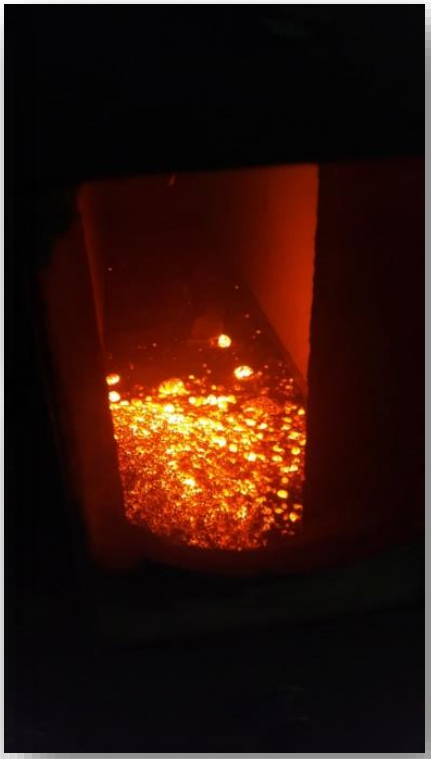
CEMCAP PROJECT: Pilot-scale clinker cooler in CO_2 recirculation

This pilot-scale test has been organized at HeidelbergCement Hannover plant. The project and the installation are supplied by IKN.



2 m^2 aerated area



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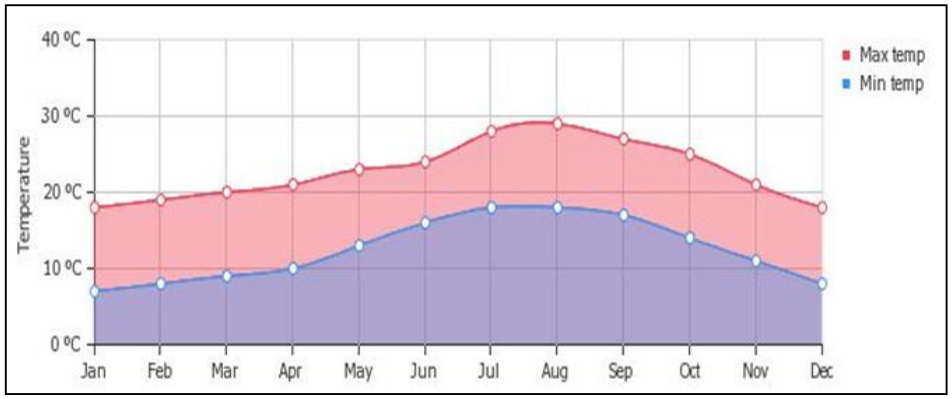
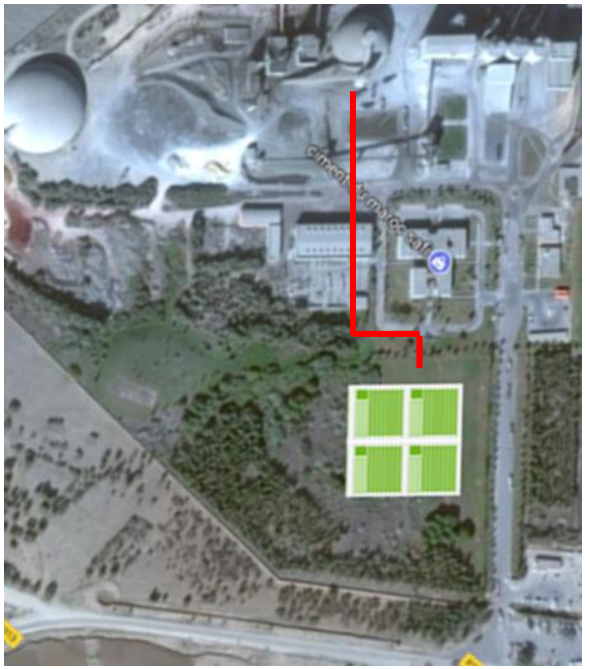
Micro-algae project to use CO_2

- Climate Safi (close to sea) ideal





- Large plot of non-arable land
- Access to PV-electricity improves LCA
- Low costs per kg (low wages + high output)

CO_2 sequestering in minerals; 3 year R&D for 3 m€

- 90% funded BMBF program with next project partners
  - HeidelbergCement (HTC Global R&D)
  - RWTH Aachen present with 4 institutes
  - IASS Potsdam (Stakeholders + LCA)

- Minerals to be investigated:
  - Natural: basalt, olivine
  - By-products: steel-slag, concrete fines

- Focus points:
  - How much and how fast can CO2 be sequestered
  - Value of generated products (chemical and physical properties)
  - Energy-balance, LCA and economic aspects

Conclusions

1. **Global emissions of cement and concrete industry have to be reduced significantly to achieve the 2 degrees scenario from Paris.**

2. **Several options exist**
    1. Process improvements: energy efficiency, alternative fuels, etc.
    2. Low carbon cements, clinker substitution, alternatives to clinker and cement
    3. CCS and CCU

    All options have to be explored !

3. **HeidelbergCement committed to fulfil its share.**