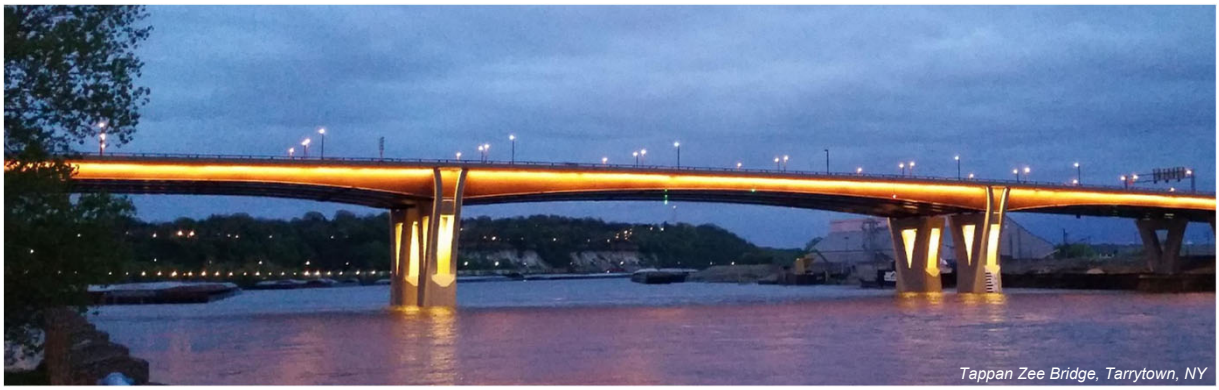

Tappan Zee Bridge, Tarrytown, NY

A Cement Company Perspective on Environmental Sustainability & "Net Zero"

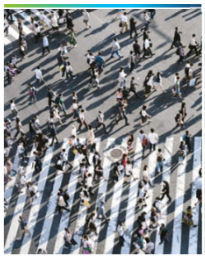
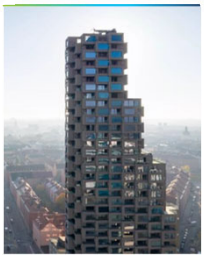
NCC Spring 2022 Meeting – Nashville, TN

Dave Diedrick, Director – Quality & Product Performance US Cement

HOLCIM

SIX MEGATRENDS DRIVING CONSTRUCTION

OUR MARKETS HAVE NEVER BEEN AS ATTRACTIVE

POPULATION GROWTH From ~8 billion today to ~10 billion by 2050	**URBANIZATION AND MEGACITIES** Approximately 2.5 billion more people are expected to live in cities by 2050	Higher demand for **SUSTAINABLE CONSTRUCTION SOLUTIONS** due to resource scarcity & climate change	Increased demand for **BETTER LIVING STANDARDS** and more efficient infrastructure	**INNOVATION DRIVING BUILDING TECHNOLOGIES AND BUILDING EFFICIENCY** accelerated by light and modular construction solutions	More **REPAIR & REFURBISHMENT** driving urban demand
					

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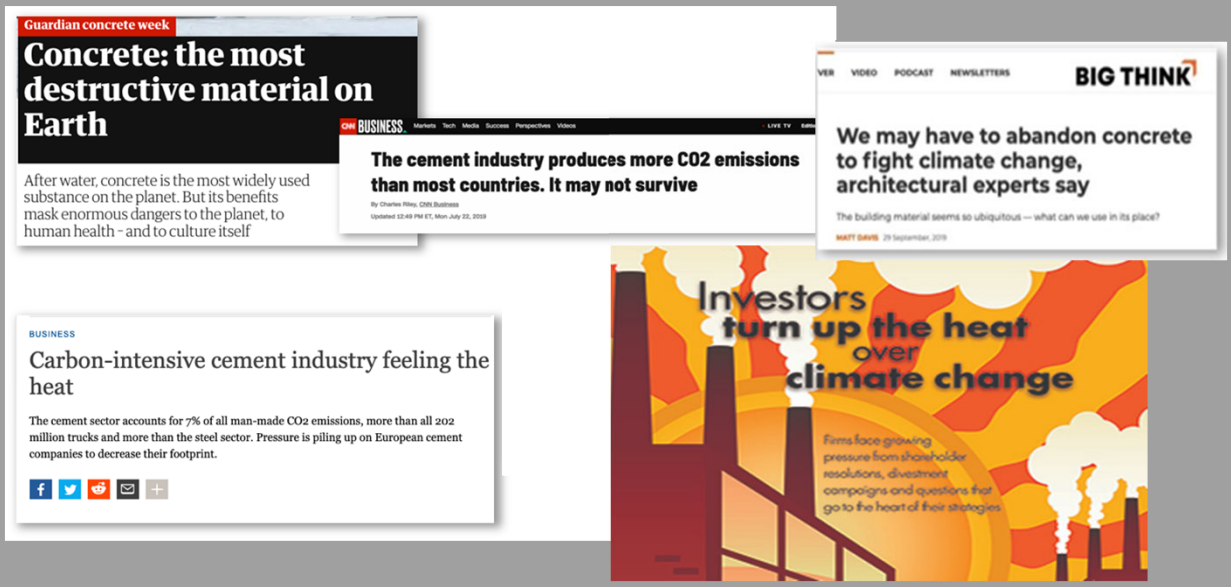
HOW IS THE CEMENT AND CONCRETE INDUSTRY VIEWED?



UNDERSTANDING CARBON

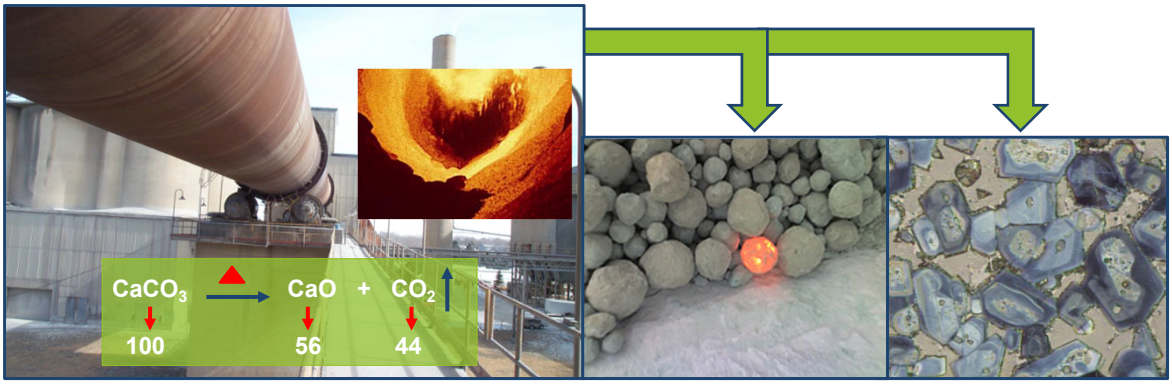
EMBODIED CARBON
Manufacture, transport and installation of construction materials

OPERATIONAL CARBON
Building energy consumption

EMBODIED CARBON: Materials, transportation and construction

OPERATIONAL CARBON: Building energy consumption over time

WHERE DOES CO_2 COME FROM?

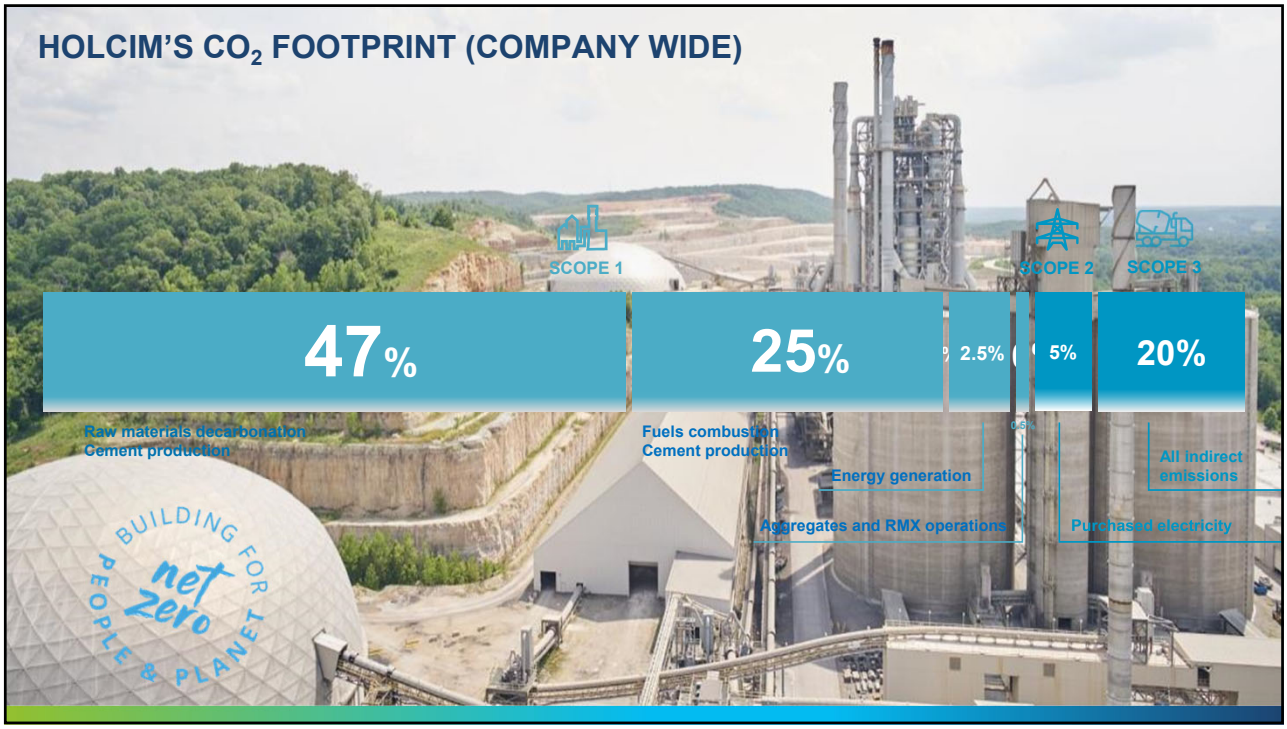


CLINKER PRODUCTION: TWO MAJOR SOURCES

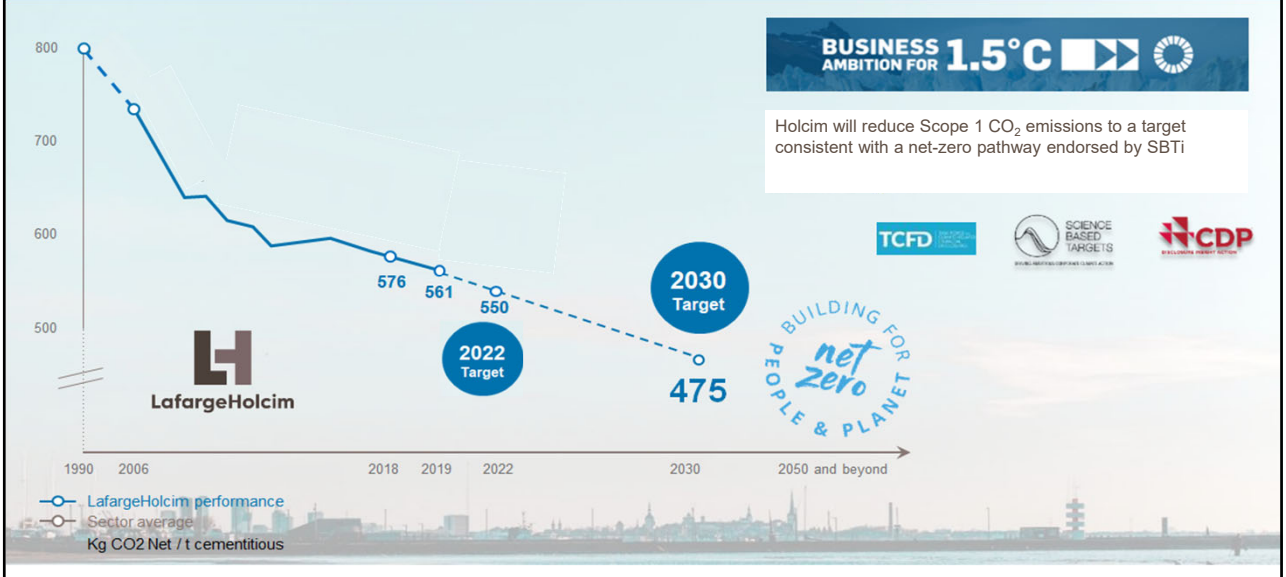
- Pyro Processing – **40-50%**
- Calcination (conversion of $CaCO_3$ to CaO) – **50-60%**

On average in the US, 922 KG of CO_2 equivalent is produced for every 1000 KG of portland cement.
Source: 2021 PCA Industry Average

HOLCIM'S CO_2 FOOTPRINT (COMPANY WIDE)

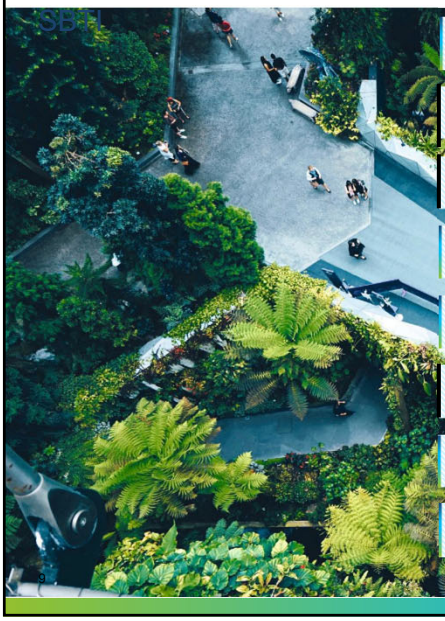


WHAT IS HOLCIM'S NET ZERO PLEDGE?



OUR JOURNEY TO NET ZERO

FIRST COMPANY WITH 2050 TARGETS APPROVED BY SBTi



CLINKER FACTOR AND ALTERNATIVE FUELS	Maximize usage of alternative fuels and mineral components in cement
RENEWABLE ENERGY	Expanding wind turbines, solar panel farms, waste heat recovery systems
GREEN PRODUCTS	Accelerating Green Solutions
PLANTS OF TOMORROW	Driving efficiency from automation to artificial intelligence
CIRCULAR ECONOMY	Including use of Construction Demolition Waste in Cement & Concrete
CARBON CAPTURE	Getting ready to scale up CCUS technologies
NEXT GENERATION TECHNOLOGIES INCL. SOLUTIONS & PRODUCTS	New technologies that offer solutions to sustainability and reduction in carbon footprint
ACTING ACROSS THE VALUE CHAIN	First Movers Coalition focusing on green procurement and supply chain

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REDUCING CO_2

FIVE MAIN STRATEGIES

1. More efficient cement plants
2. Reduction of purchased electricity
3. Lower CO_2 fuels (including waste derived fuels) and raw materials
4. Less clinker in cements
5. Carbon capture utilization & storage (CCUS)

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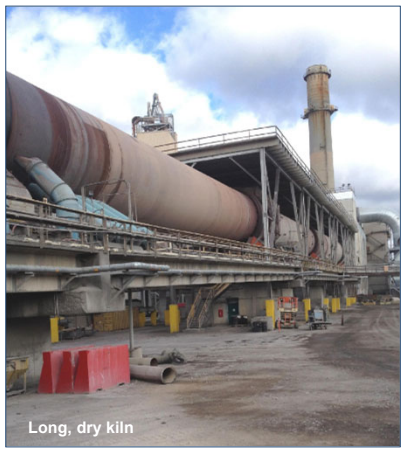
REDUCING CO_2
STRATEGY #1 – MORE EFFICIENT PLANTS

Preheaters / Precalciners vs long, dry or wet kilns

- GWP of long, dry kiln (no preheater/precalciner) **~ 1000 kg CO_2 / mt**
- GWP of new, preheater/precalciner kiln ~ **750 kg CO_2 / mt**


Long, dry kiln

Preheater/precalciner kiln

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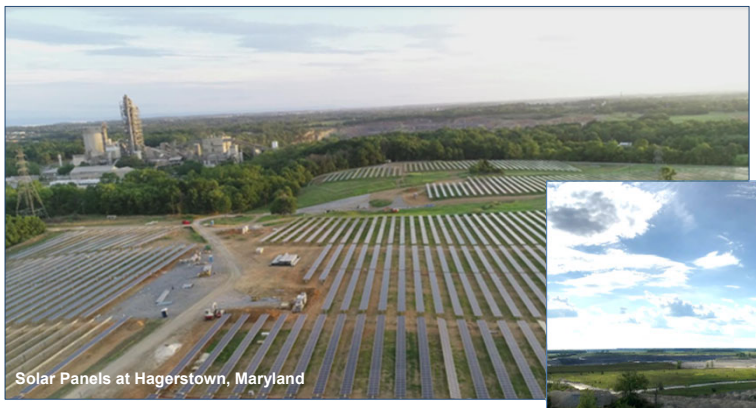
REDUCING CO_2
STRATEGY #2 – REDUCTION OF PURCHASED ELECTRICITY


Solar Panels at Hagerstown, Maryland

Windmills at Paulding, Ohio

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REDUCING CO_2
STRATEGY #3 – LOWER CO_2 FUELS AND WASTE-DERIVED FUELS

Use of natural gas vs coal and petcoke in the kilns

- Natural gas reduces CO_2 by **~40% compared to coal**

Ravena Plant in New York uses natural gas as a fuel (summer months only)

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REDUCING CO_2
STRATEGY #3 – LOWER CO_2 FUELS AND WASTE-DERIVED FUELS

Waste Derived Fuels – use of liquids, plastics, tires, construction waste, etc.

- **Saves CO_2** if material is normally disposed by incineration
- **LEED** does not give credit for waste-derived fuels
- **Paulding, Ohio** burns 80% - 90% liquid waste-derived fuels
- **Whitehall, Pennsylvania** burns tires and plastics
- **Holly Hill, South Carolina** burns liquid waste-derived fuels

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WHAT IS THE FINISHED CEMENT PRODUCTION PROCESS?

ASTM C150 portland cement

ASTM C595 Blended Cement and
ASTM C1157 Performance Cements

- Reduction in clinker factor and GWP
- Current US average clinker factor ~0.90

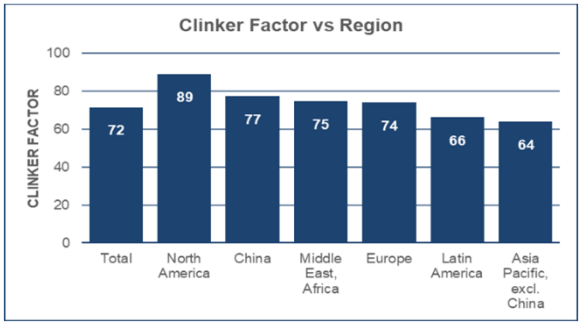
REDUCING CO_2

STRATEGY #4 – LESS CLINKER IN THE CEMENT

Supplementary Cementitious Materials (SCMs) and ground limestone can be used to replace the clinker portion of a cement

ASTM C595 Blended Cements

- **Type IS** using slag cement (up to 70%)
- **Type IP** using fly ash, silica fume or natural pozzolans (up to 40%)
- **Type IL** using ground limestone (up to 15%)
- **Type IT** using any two of the above



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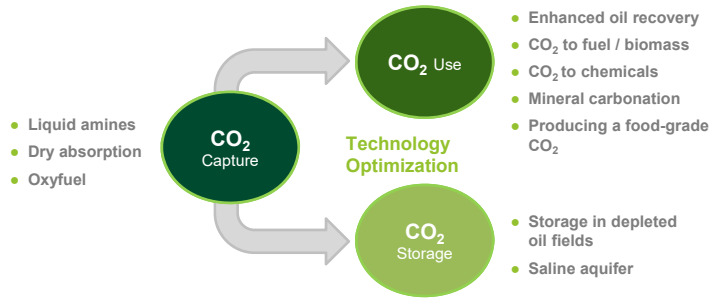
WHAT IS CARBON CAPTURE?

WILL THIS SOLVE CARBON ISSUES?

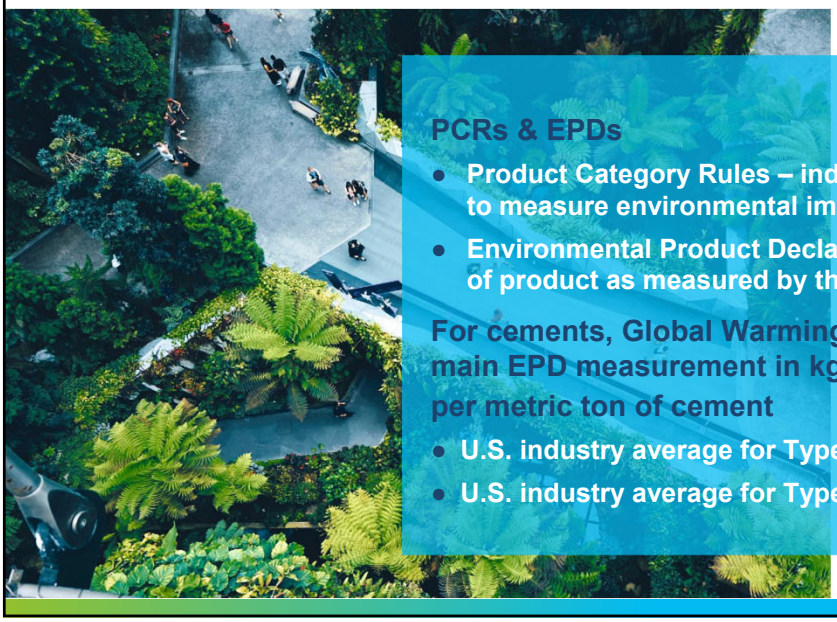
Carbon Capture Utilization and Storage (CCUS) captures CO_2 emissions from sources and either reuses it or stores it so it doesn't enter the atmosphere.

- CCUS is one of the core developing technologies to achieve Net Zero emissions, but is not sizeable or economical to fully implement today.
- We are currently spearheading over 20 projects in the US, Canada, and Europe.



REDUCING CO_2

MEASURING CO_2



PCRs & EPDs

- **Product Category Rules – industry rules that establish how to measure environmental impact**
- **Environmental Product Declaration – environmental impact of product as measured by the PCRs**

For cements, Global Warming Potential (GWP) is the main EPD measurement in kg of CO_2 per metric ton of cement

- **U.S. industry average for Type I/II is 922 kg CO_2 / mt**
- **U.S. industry average for Type IL is 846 kg CO_2 / mt**

TODAY AND MOVING FORWARD
LEADING THE GREEN TRANSFORMATION

Renovation of Gioia 22 with ECOPact, Milan, Italy

- Portland Limestone Cement (Type IL) **is the future**, and **the future is now**
  - **Lower carbon product** that **performs the same** as Portland Cement

Durability = Sustainability

- But **this is just the START**, there will be more blended cements that provide strong **technical solutions** (ASR & Sulfate mitigation) and ultra low CO_2 alternatives for a vast array of concrete applications
- More than **100 different materials** looked at in the last 12 months
  - The supplementary **cementitious material landscape is changing**, and the cement distribution network is perfect to move these materials

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TODAY AND MOVING FORWARD
LEADING THE GREEN TRANSFORMATION

Maggie Daley Park, Aggregates, Chicago, USA

- **Performance-based** concrete mixes needs to **accelerate**
- **Buy-Clean / Green Procurement** initiatives will continue and drive **Green Growth**
- There is **no waste** – everything is an ingredient in something else
- **ESG** (Environmental, Social, and Governance) becomes increasingly important in **attracting investment dollars**
- Digitalization will **accelerate**
- **We believe** in moving **fast**

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HOW DO WE HELP YOU
GET TO WHERE YOU WANT TO GO?

Lynwood Quarry, Aggregates Holcim Australia

- The **Specifying Community** Plays a key role in **reducing CO_2!**
- What can we do to **help each other** accomplish our mutual goal of **lower CO_2 concrete?**

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HOLCIM