Options for Decarbonization in the Cement Industry

WORLD ENERGY COUNCIL MEETING, JUNE 12TH 2023

ROALD BROUWER / GROUP HEAD DECARBONIZATION

HOLCIM

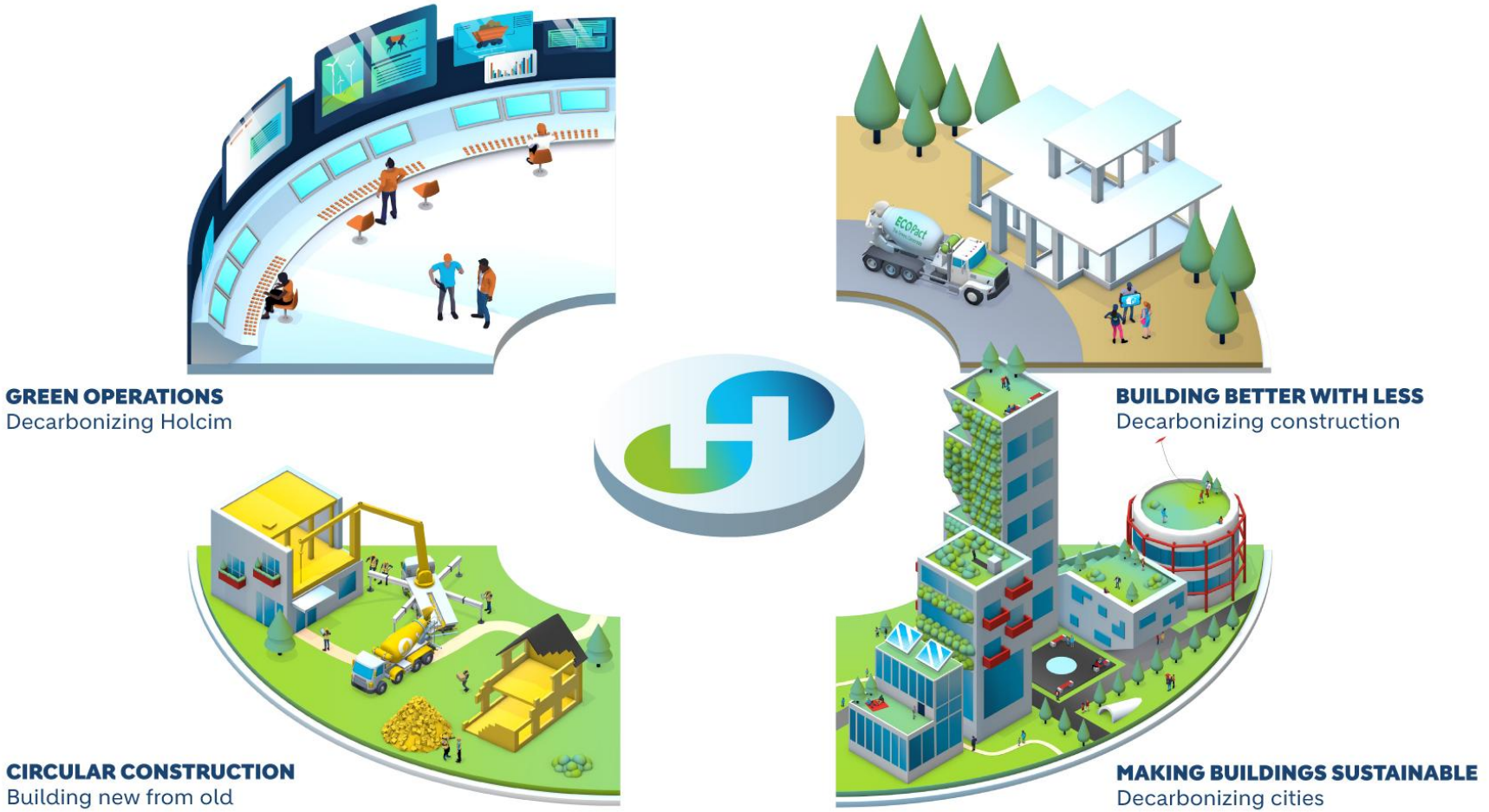
THE GLOBAL LEADER IN INNOVATIVE AND SUSTAINABLE BUILDING SOLUTIONS

WE ARE AT THE FOREFRONT OF DECARBONIZING BUILDING END-TO-END, IN LINE WITH OUR PURPOSE TO BUILD PROGRESS FOR PEOPLE AND THE PLANET

PRESENTATION CONTENTS

DECARBONIZING BUILDING ACROSS ITS LIFECYCLE

Holcim is on a mission to decarbonize building across its lifecycle: from its operations and solutions, to making buildings more sustainable in use, and driving circular construction.

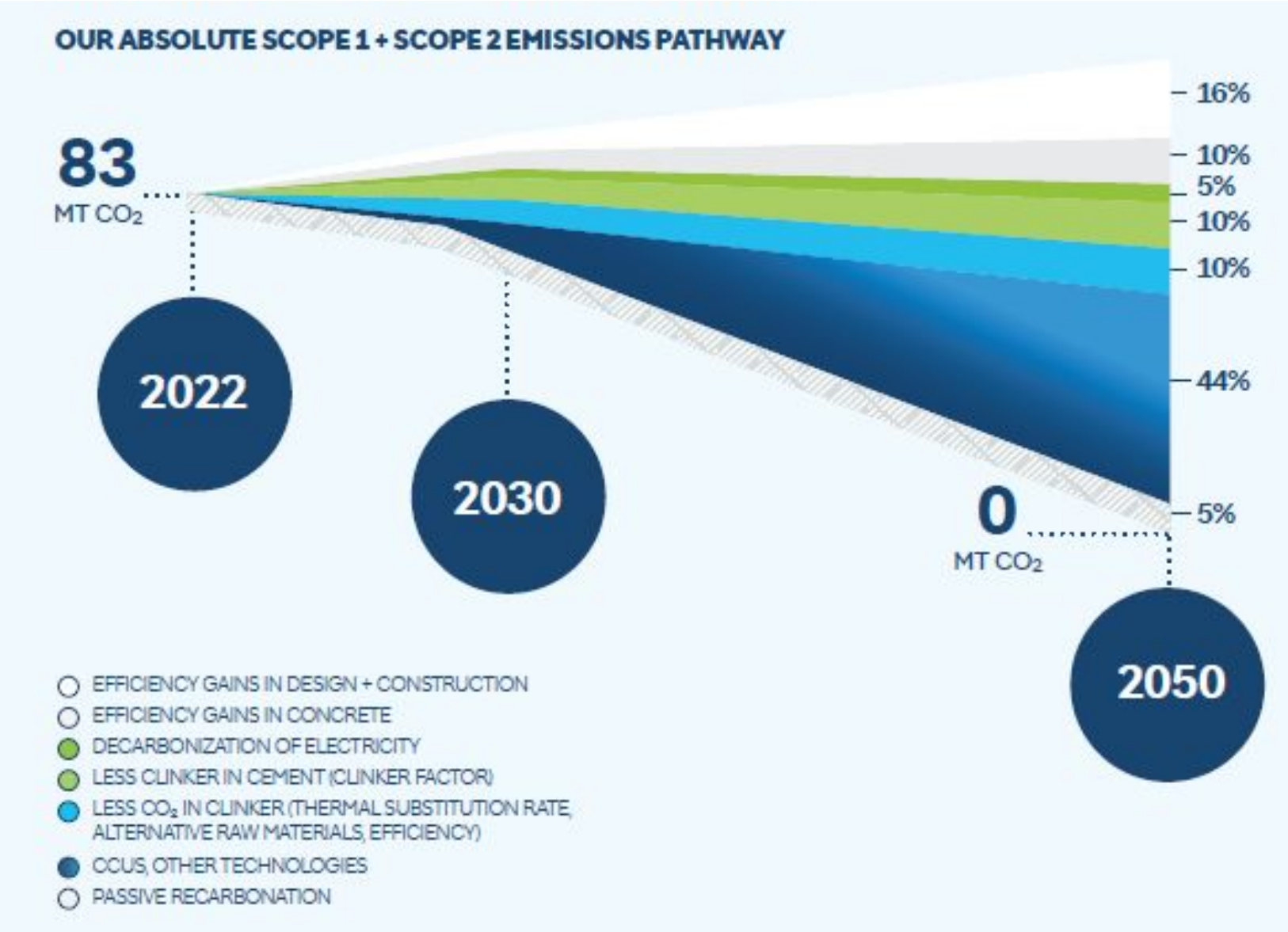


GREEN OPERATIONS: CEMENT MANUFACTURING

COMPRISES MAJORITY OF SCOPE 1,2, 3 EMISSIONS OF HOLCIM GROUP

GREEN OPERATIONS
Decarbonizing Holcim

HOLCIM NET ZERO PATHWAY



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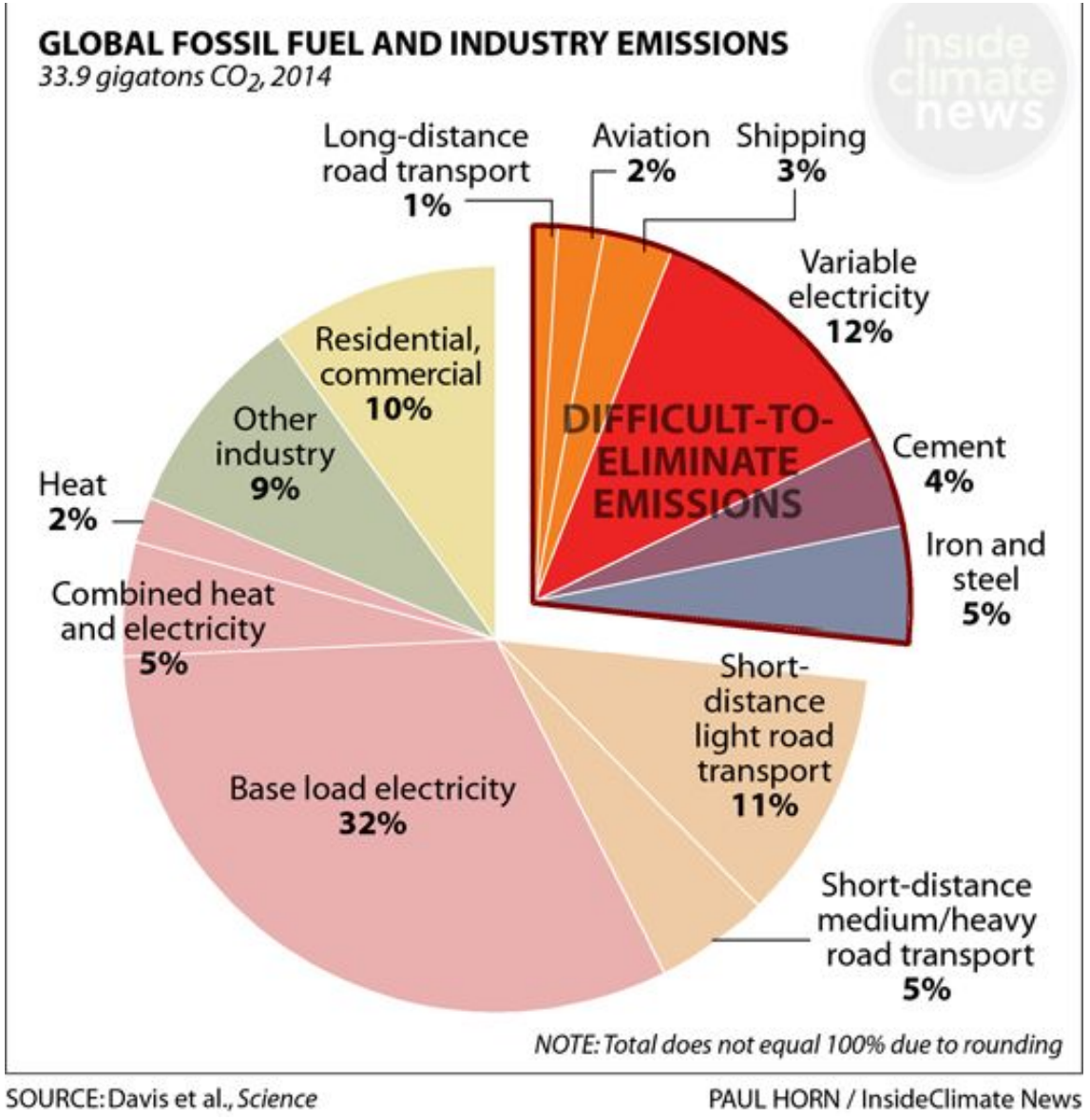
HARD TO ABATE SECTORS
GHG EMISSIONS THAT ARE DIFFICULT TO AVOID

Hard to abate emissions: Prohibitively costly or impossible to reduce with current technology.

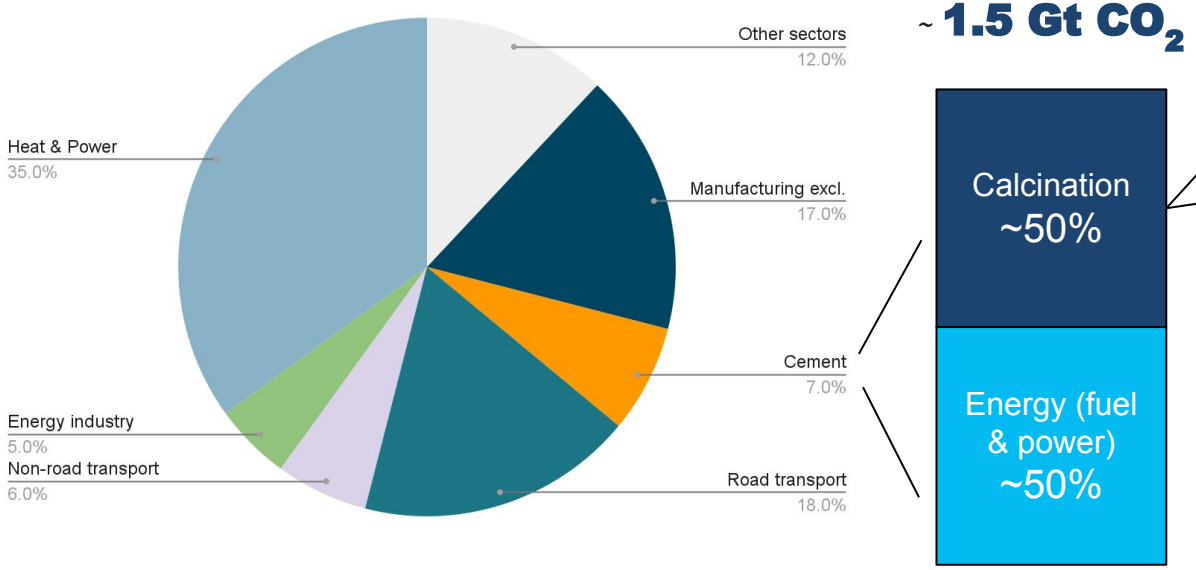
- heavy industry (e.g. cement, steel, and chemicals manufacture),
- heavy-duty transport (e.g. trucking, shipping, and aviation).

Approximately 30% of global emissions

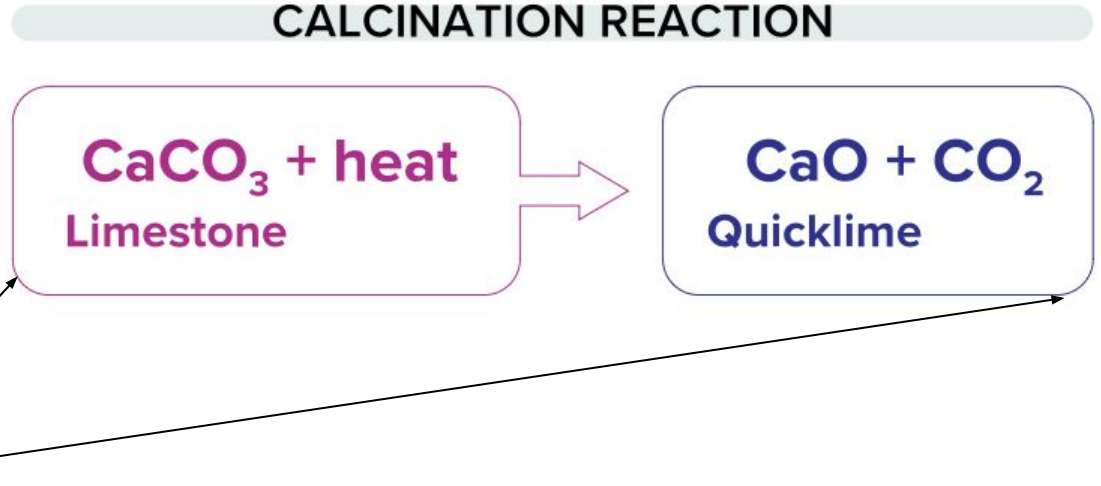


CEMENT INDUSTRY CO2 FOOTPRINT VERY HARD TO ABATE
ABOUT HALF OF IS FROM ENERGY, THE OTHER HALF FROM LIMESTONE

GLOBAL INDUSTRIAL CO2 FOOTPRINT



Cement
~ 1.5 Gt CO_2



LIMESTONE IS MAIN MATERIAL FOR CEMENT, THERE IS NO ALTERNATIVE

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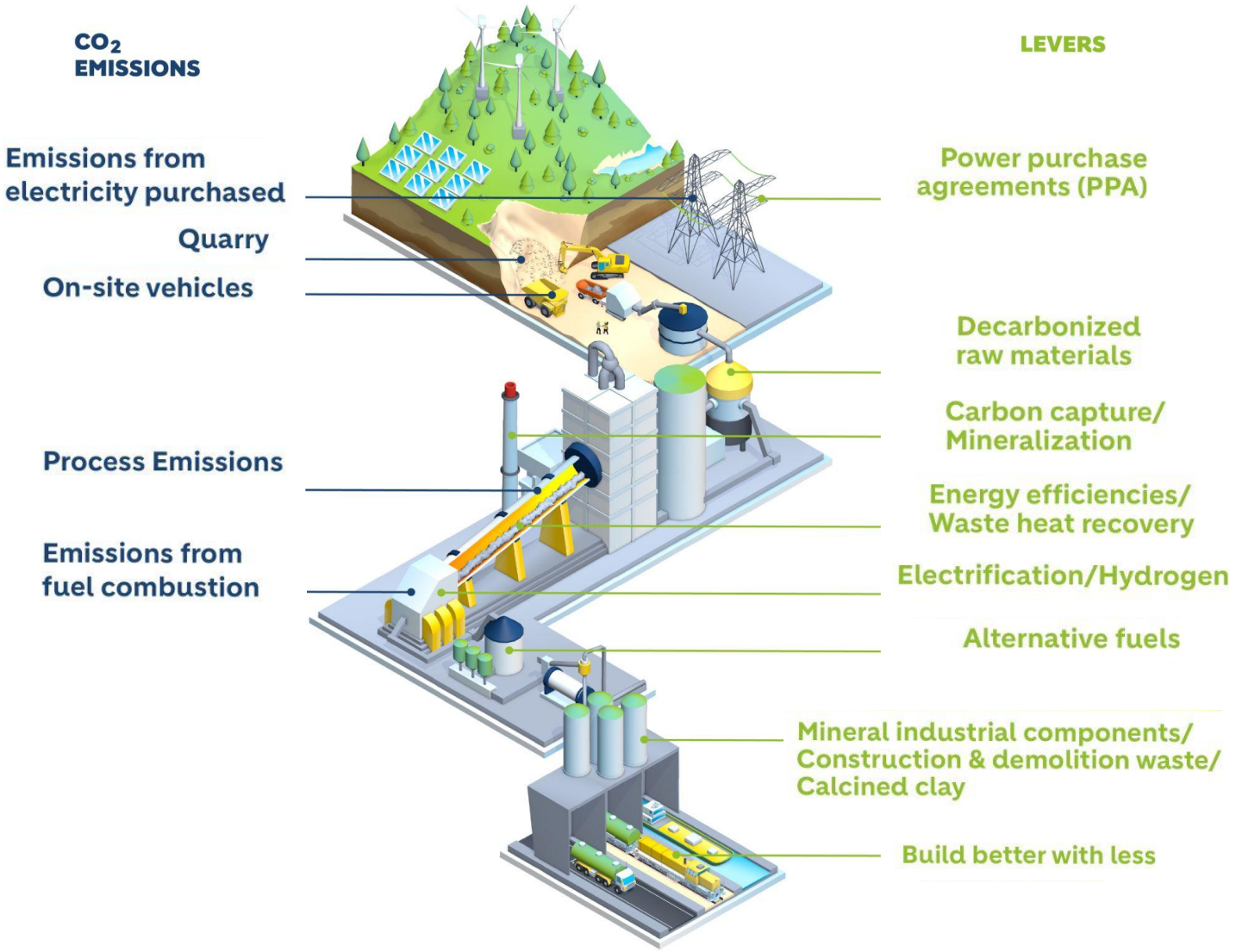
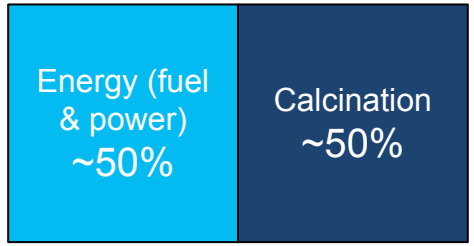
GREEN OPERATIONS: DECARBONISATION OPTIONS





→ **Decarbonizing energy:**
Minimize CO2 intensity of energy

→ **Decarbonizing materials:**
Minimize CO2 intensity of materials

→ **Developing carbon capture utilization and storage:**
Address CO2 emissions that cannot be avoided

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DECARBONIZING ENERGY
GREEN POWER IS AT THE HEART OF THIS

CCUS

Plants of Tomorrow

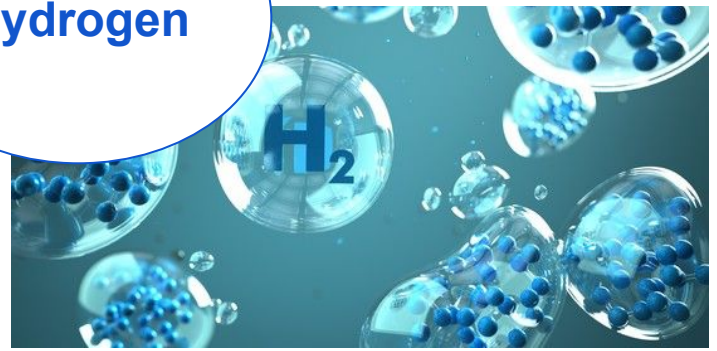
Green Mobility

Green Power

Electrical Calcination

Quarry decarboniza tion

Hydrogen



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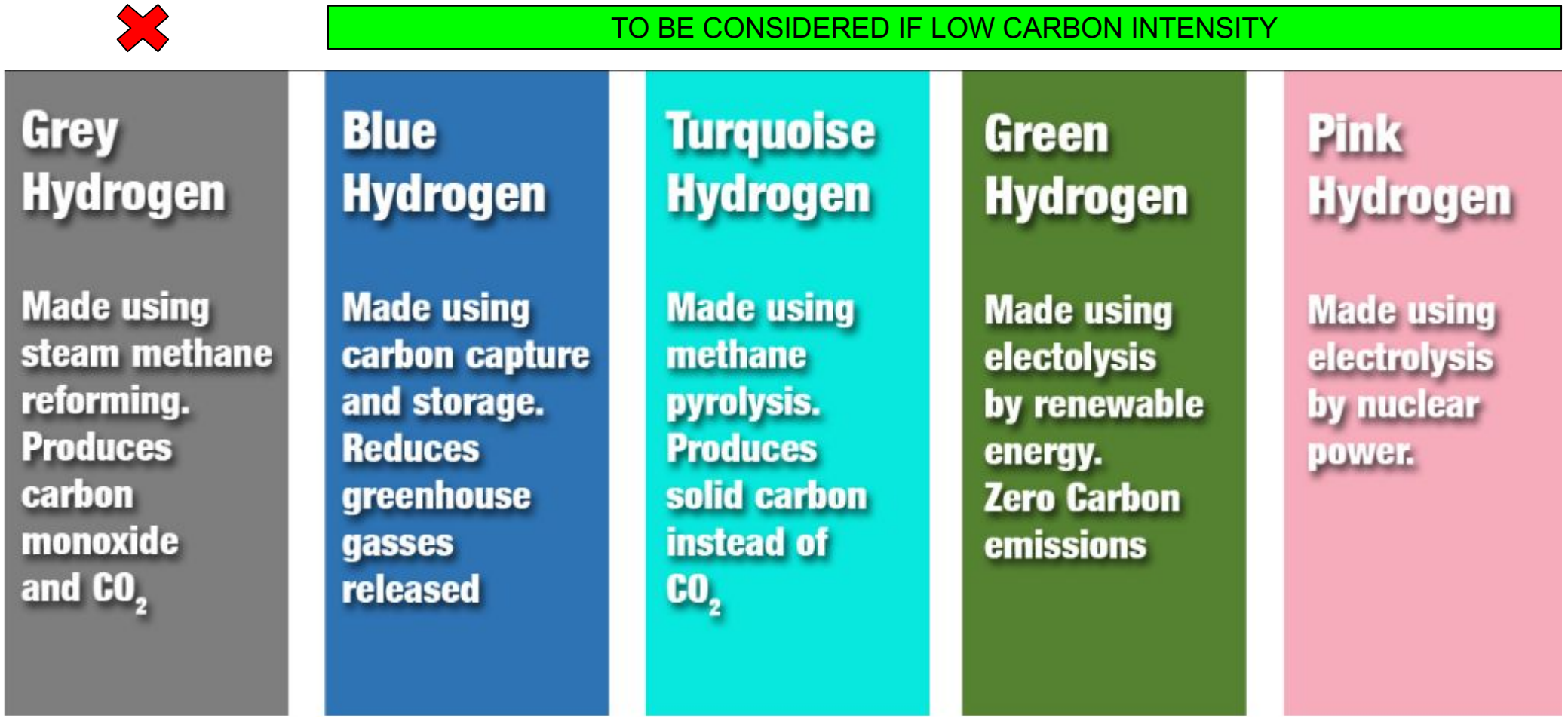
HYDROGEN
LOW CARBON INTENSITY IS THE FOCUS



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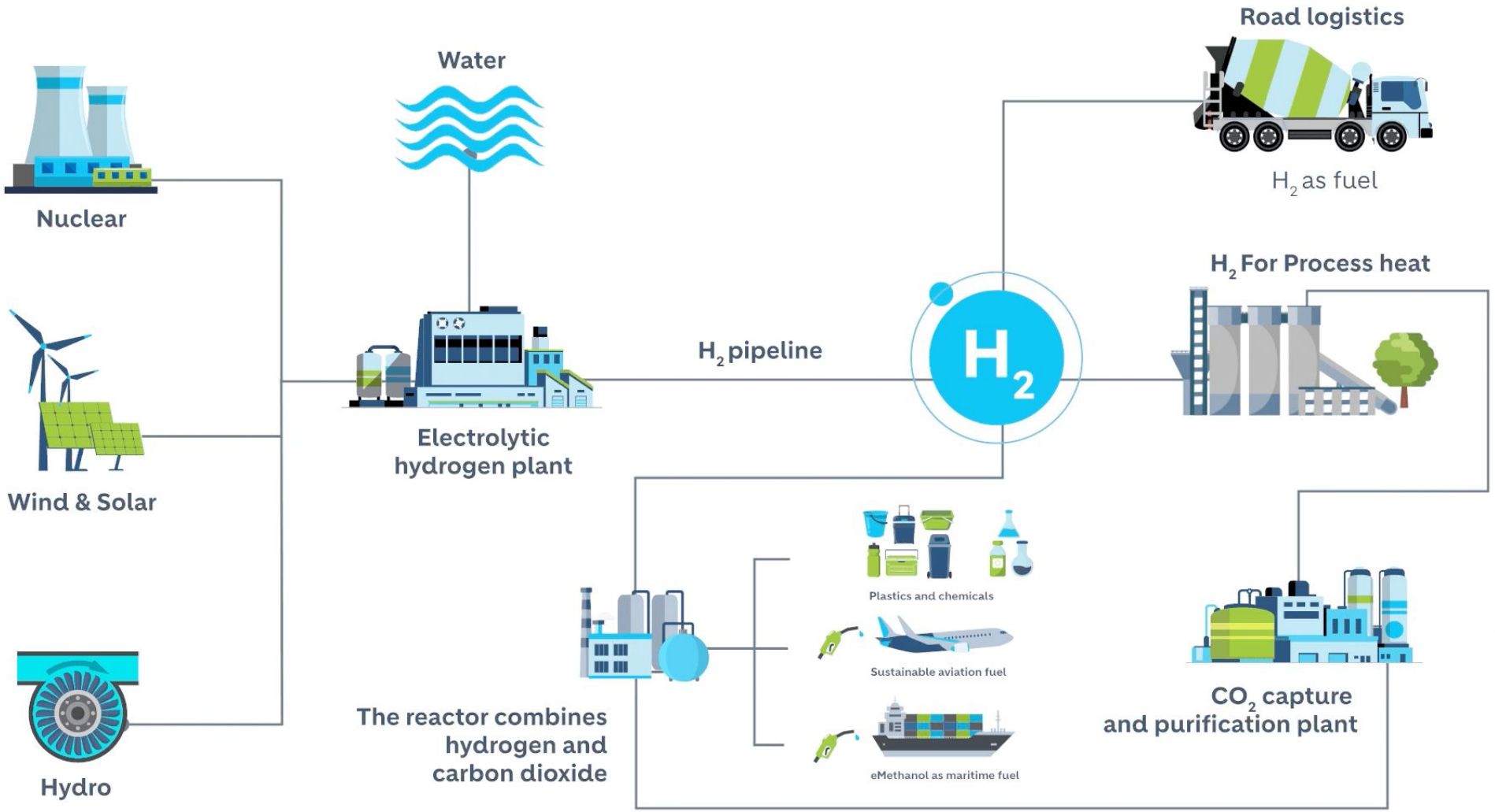
DECARBONIZING ENERGY: HYDROGEN APPLICATIONS



DECARBONIZING ENERGY: GREEN MOBILITY

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DECARBONIZING ENERGY: GREEN MOBILITY
FOCUS ON FLEET ELECTRIFICATION, SOME ROLE FOR HYDROGEN EXPECTED

OFF ROAD (QUARRY)

Quarry on Road Trucks

Up to 50%

Battery-Electric Wide-Body Trucks

Up to 70%

Autonomous.-Battery-Electric trucks

Up to 75%

Battery-Electric Quarry on Road Trucks

Up to 70%

Technology	
CO2 Reduction	

ON ROAD

BioDiesel

Up to 60%

BioGas

Up to 60%

Electric

Up to 80%

Hydrogen Fuel Cell

Up to 75%

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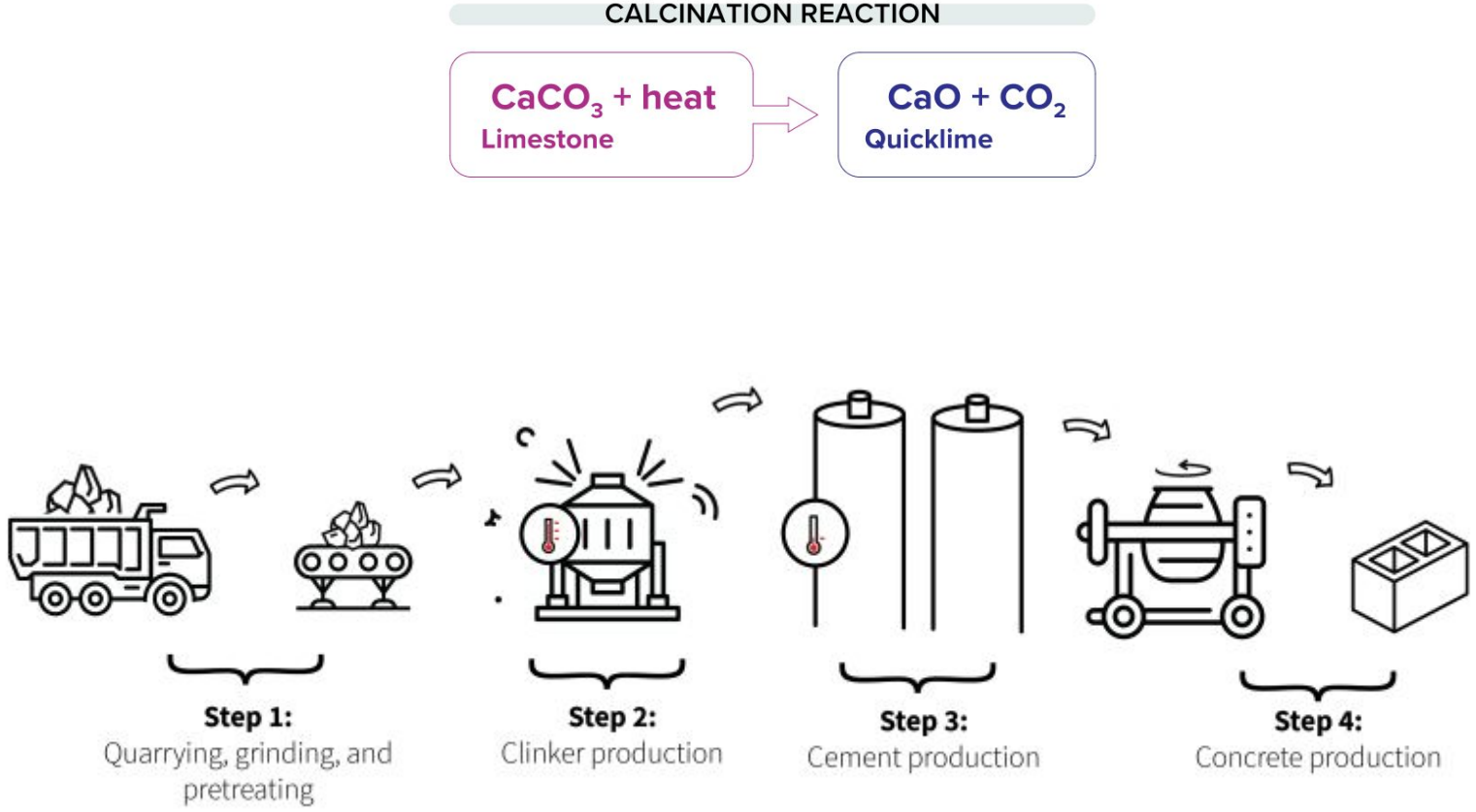
DECARBONIZING MATERIALS
FOCUS ON MINIMIZING LIMESTONE RELATED EMISSIONS

STEPS IN CONCRETE MANUFACTURING PROCESS

- **Make clinker**
  (limestone+ correctives)
- **Make cement**
  (clinker+mineral components)
- **Make concrete**
  (cement + aggregates)

DECARBONIZATION APPROACH.
Minimize use of

- **limestone in clinker**
- **clinker in cement**
- **cement in concrete**



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DECARBONIZING MATERIALS
EXAMPLES

Ash


Coal fly ash


Wood biomass ash


Rice flakes ash


Sugar cane ash

SIlica


Silica fume


Silica fume


Silica powder


Fumed silica

Slag


Steel slag


Copper slag


Zinc slag


Ferronickel slag

Sludge


Red mud


Sewage sludge


Paper sludge


Stone sludge

Other


Metakaolin


Limestone filler


Phosphogypsum


Cement kiln dust

Calcined clays

Construction Demolition Materials (CDM)

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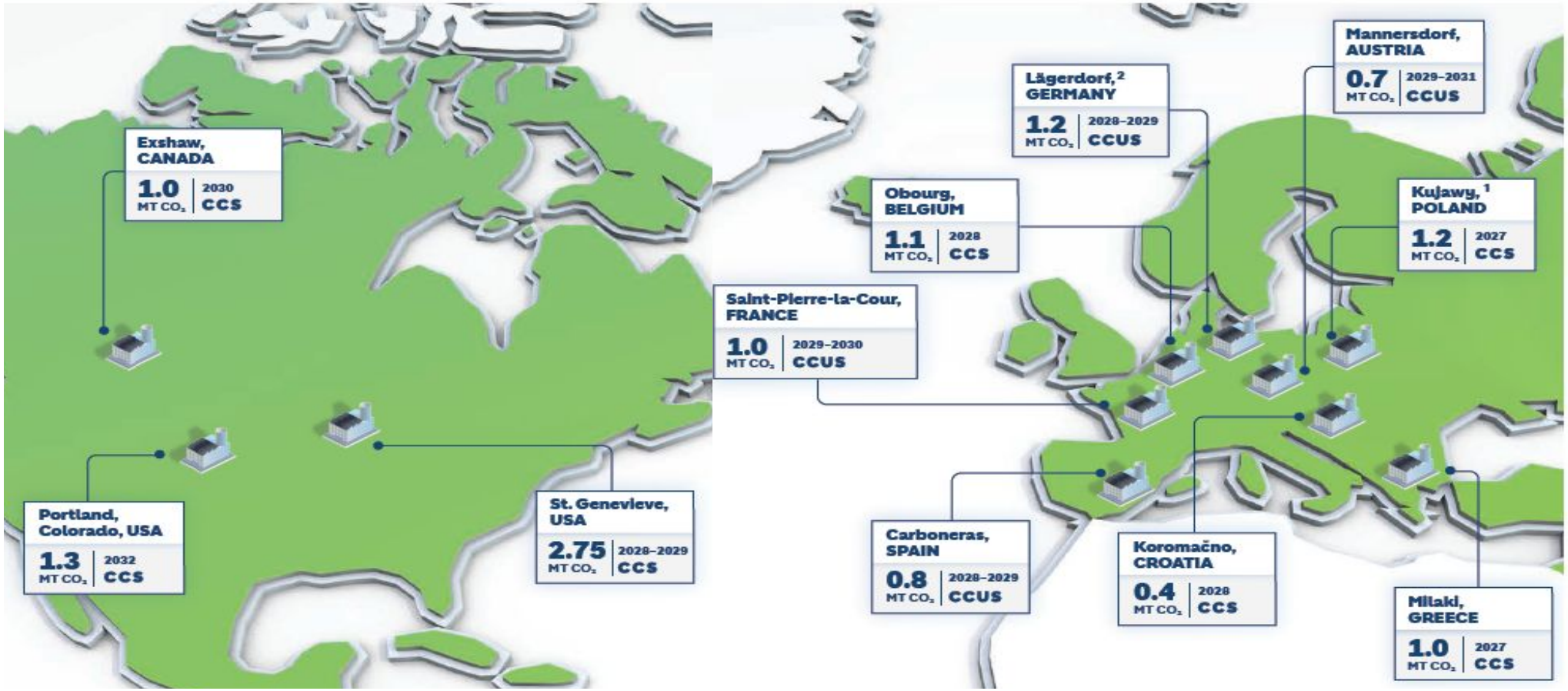
DEVELOPING CARBON CAPTURE UTILIZATION AND STORAGE

OVER 50 CCUS PROJECTS: CHF 2 BLN CAPEX & OVER 5M TONS OF CO2/YEAR BY 2030

11 FLAGSHIP PROJECTS TO START CAPTURING +5 MT CO2 BEFORE 2030
From storage and utilization, including mineralization and carbonation



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CCUS: 2 EU INNOVATION FUND GRANTS AND SOLID PARTNERSHIPS

PUBLIC FUNDING TO SUPPLEMENT HOLCIM'S CHF 2BN INVESTMENT

Go4ECOPlanet Kujawy, Poland

€ 228M
EU Innovation Fund grant

- End-to-end CCS chain for **offshore storage**
- Goal to be a **net-zero plant by 2027**
- Air Liquide's Cryocap™ FG technology to **capture 100% of CO_2 emissions** from clinker production
- **+10.2 million tons of CO_2 captured in 10 years**, lowering Poland's cement sector emissions by 10%

Carbon2Business Lägerdorf, Germany

€ 110M
EU Innovation Fund grant

- Captured CO_2 to be repurposed as **industrial raw material**
- **Industrial-scale prototype for decarbonizing cement production**
- **Second-generation oxyfuel technology**
- **Capture +1 million tons of CO_2 emitted annually:** Lägerdorf to become net-zero plant by the end of the decade

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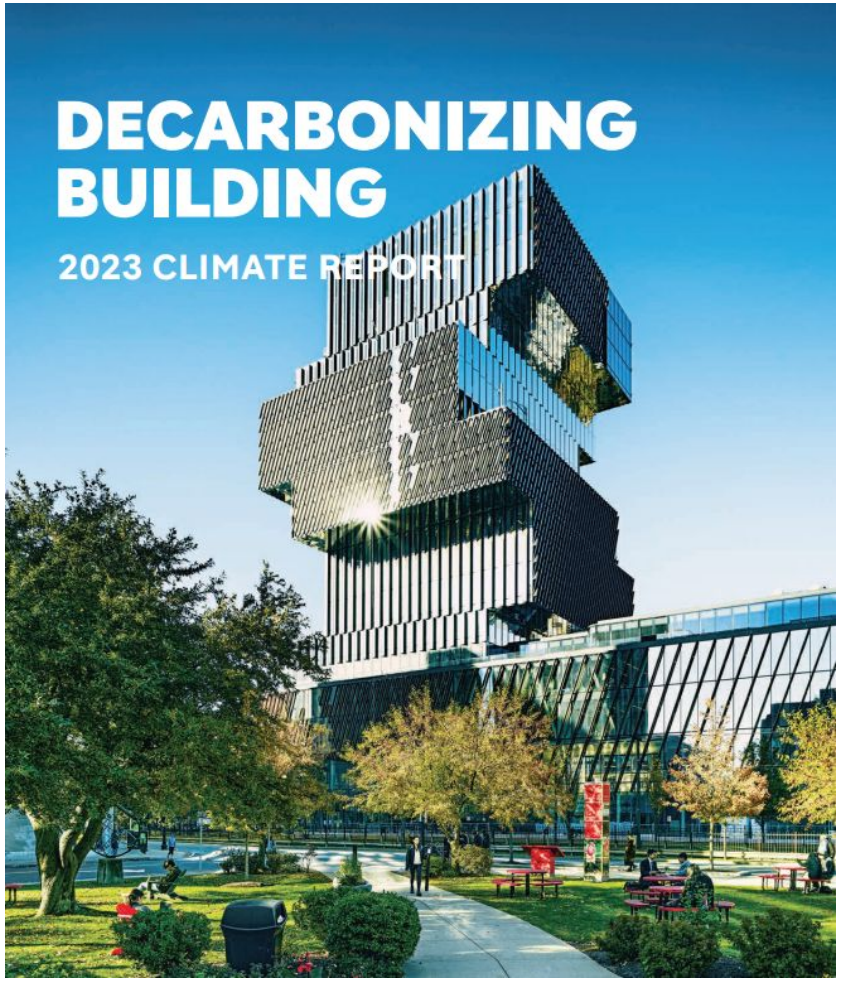
HOLCIM ACCELERATES CLIMATE ACTION
2022 HIGHLIGHTS

- CO_2 per net sales reduction of 21% in 2022 with goal to reduce by over 10% in 2023
- Upgraded 2030 climate targets in line with SBTi 1.5°C framework, validated by Science Based Targets initiative
- CHF 2 billion investment in carbon capture, utilization and storage projects by 2030 to capture +5 million tons CO_2 per year
- Advancing decarbonization ambition with 420 kg CO_2 Net per ton of cementitious by 2030
- 6.8 million tons of construction and demolition waste recycled into new building solutions in 2022, on track to exceed 2025 target of 10 million tons
- Publication of second climate report, giving shareholders a say on the company's climate strategy



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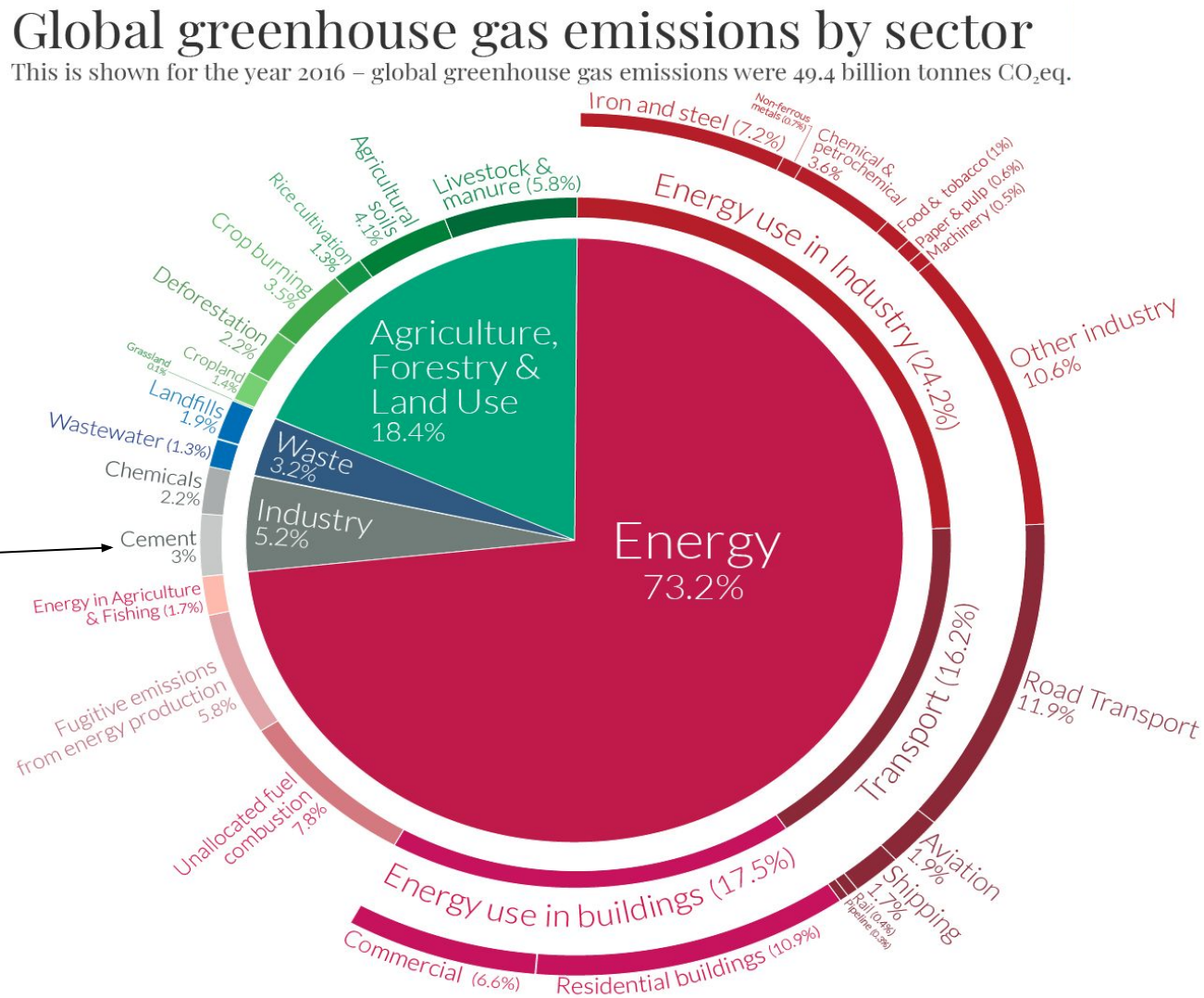
GLOBAL CONTEXT GREENHOUSE GAS EMISSIONS (GHG)
MAJORITY ASSOCIATED WITH ENERGY AND LAND USE, CEMENT ABOUT 3 % OF TOTAL

CEMENT



source: https://ourworldindata.org/emissions-by-sector