CARBON CAPTURE AND STORAGE AS A MITIGATION AND ADAPTATION MEASURE FOR CONSTRUCTION SECTOR NDCs IN THE FIGHT AGAINST CLIMATE CHANGE

INTRODUCTION:

Projections appoint Housing as one of the main concerns in the fight against climate change, due to operational life energy consumption and manufacturing industry. To continue building and still be able to achieve a sustainable transition set in the UNFCCC Paris Agreement to limit warming well below 2C, We must take action now and discuss the immediate implementation of Carbon Capture Technologies developments for cement and concrete, to mitigate the negative effects of this climate emergency. As it is vital to reach a net zero carbon economy set out in our Nations Determined Contributions (NDCs).

METHODOLOGY:

Comprehensive Review on up to date technological developments that aim to decarbonize the construction sector up to a negative emissions economy.

STAGE 1: Define Construction Sector GHGs: -Cement. -Concrete.

STAGE 2: Define Carbon Capture and Storage (CCS) Methods. (Lit Review)

STAGE 3: Case studies: - Solidia Cement - Carbon Cure concrete (Lit Review)

STAGE 4: Impact of CCs technologies in NDCs 2030 target (Lit Review)

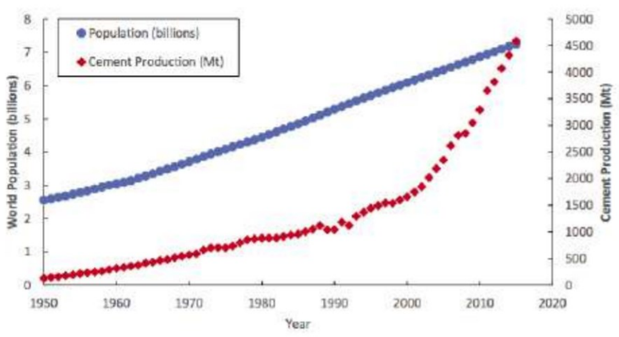

Figure 1. Global population growth and cement production from 1950 to 2015 .

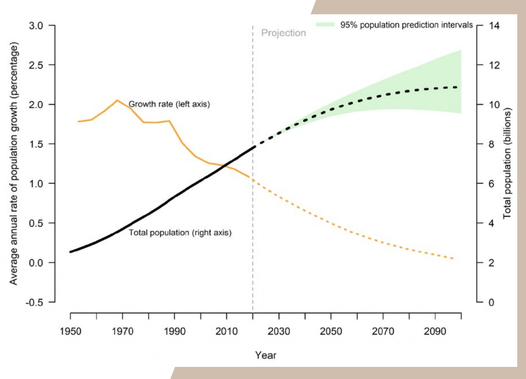

Figure 2. Population size and annual growth rate.

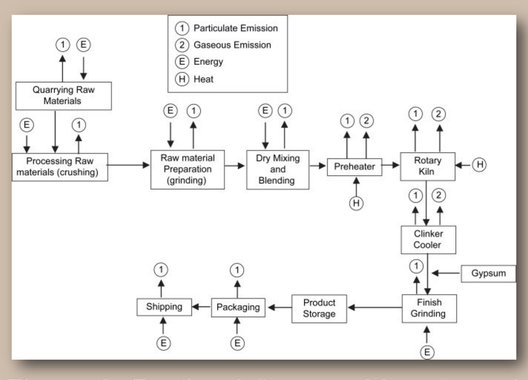

Figure 3. Portland Cement Manufacturing Flow chart.

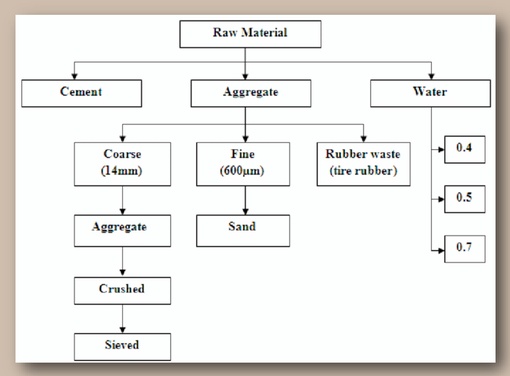

Figure 4. Portland Concrete Manufacturing Flow chart.

RESULTS:

- Calcium silicate-based cement (CSC) emits 30% less CO2 than the production of Portland cement.

- Done by reducing the CO2 emitted during production from 810 kg per ton of OPC clinker to 565 kg per ton of CSC clinker.

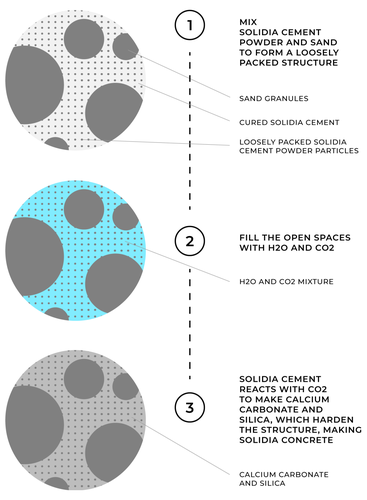

Figure 5. Solidia Cement manufacturing process.

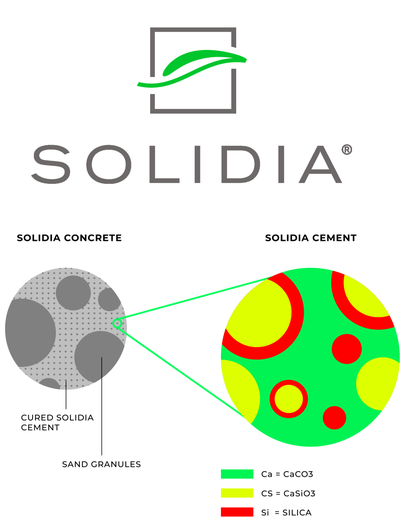

Figure 6. Solidia Cement chemistry.

CO2 Emissions from:	Per ton of OPC clinker:	Per ton of CSC Clinker:
Limestone decomposition	540 kg	375 kg
Fossil fuel combustion	270 kg	190 kg
Total CO2 emissions	810kg	566 kg

Figure 7. Solidia Cement C02 emissions.

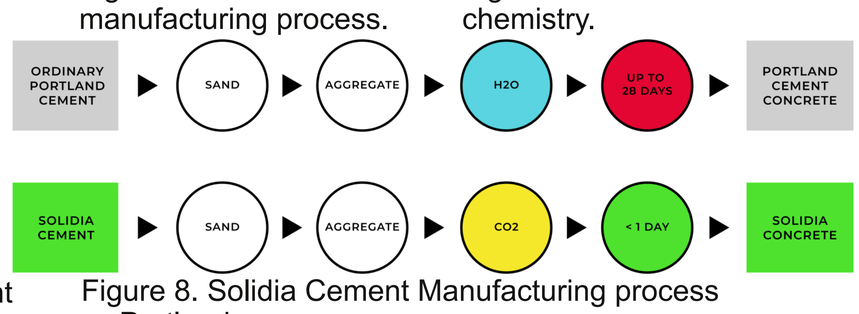

Figure 8. Solidia Cement Manufacturing process vs Portland.

- Direct CO2 Absorption.
- Average of 11 kg of CO2 per cubic yard of concrete are saved using the CarbonCure Technology.

- 28 days strength in 24hr by accelerating OPC process with injection of CO2.

- Lowers the amounts of cement needed.

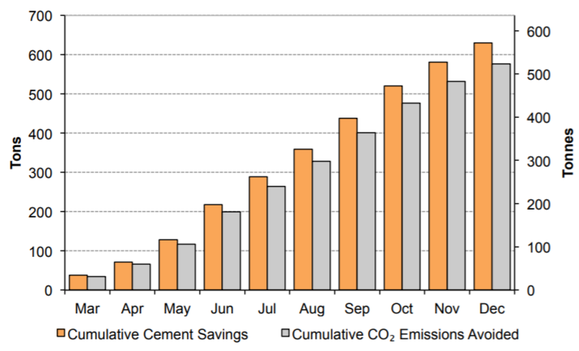

Figure 12. Cumulative cement savings (orange) and avoided CO2 emissions (gray).

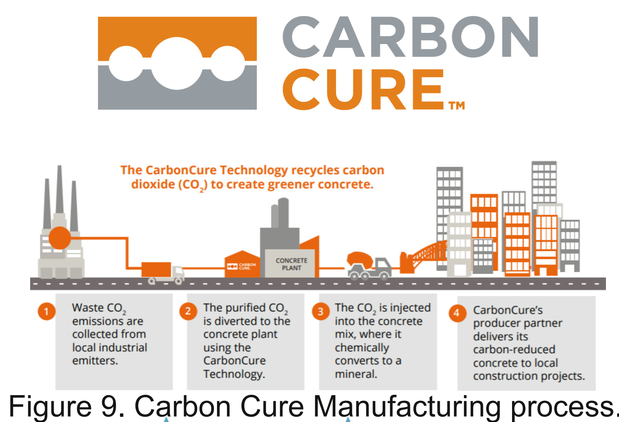

Figure 9. Carbon Cure Manufacturing process.

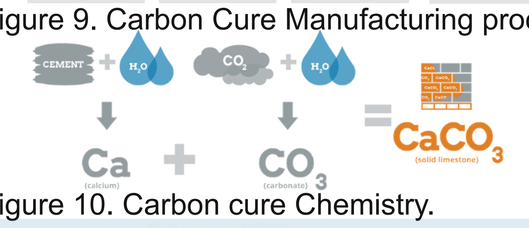

Figure 10. Carbon cure Chemistry.

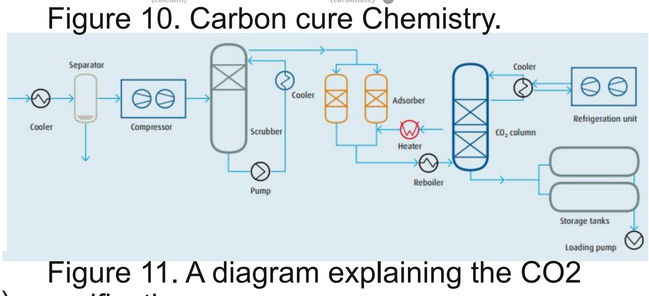

Figure 11. A diagram explaining the CO2 purification process.

DISCUSSION: CO2 REDUCTION POTENTIAL IN CONSTRUCTION SECTOR NATIONAL DETERMINED CONTRIBUTIONS

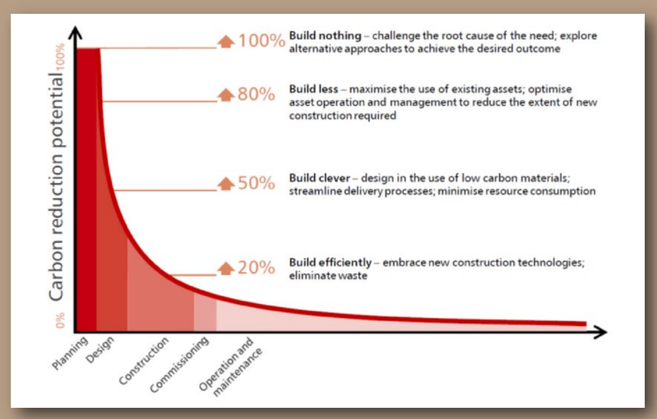

Figure 13. Tackle carbon early.

1. What Does It Mean to Reach Net-Zero Emissions?
2. When Does the World Need to Reach Net-Zero Emissions?
3. How Do We Achieve Net-Zero Emissions?

CONCLUSION:

-Implementation of CCS technologies can help meet sustainable development goal number 9.
-CO2 sequestration technologies key to offsetting emissions and to meet 2030/50 targets.
-Carbon Dioxide Sequestration in concrete requires 0 amounts of water by injecting C02 on the ready to mix stage.
-CO2 sourcing for the purposes of Carbon cured products can create a whole new market that benefits a net zero economy.

Literature Reviewed:

https://www.worldgbc.org/sites/default/files/2019%20Global%20Status%20Report%20for%20Buildings%20and%20Construction.pdf
https://pdfs.semanticscholar.org/1884/cb1e21403f0f6df1e06246bfc818cb216c7a.pdf?_ga=2.95909397.807669846.1585708484-1407132341.1585708484
https://www.scientific.net/KEM.761.197
Solidia Cement™ – Transforming Concrete Globally with a CO2-Sequestering Binder
http://go.carboncure.com/rs/328-NGP-286/images/Calculating%20Sustainability%20Impacts%20of%20CarbonCure%20Ready%20Mix.pdf
http://go.carboncure.com/rs/328-NGP-286/images/FAQs%20by%20Engineers%20-%20CarbonCure%20Ready%20Mix.pdf
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https://www.carboncure.com/concrete-corner/2019/3/5/co2-supply-1
http://go.carboncure.com/rs/328-NGP-286/images/Calculating%20Sustainability%20Impacts%20of%20CarbonCure%20Ready%20Mix.pdf
https://www.nrcan.gc.ca/science-data/funding-partnerships/funding-opportunities/current-investments/co2-utilization-concrete-new-circular-economy-model/22621

Images Sources:

Figure 1. Global population growth and cement production from 1950 to 2015 (population data from (U.S. Census Bureau, 2016), cement data to 2013 from (U.S. Geological Survey, 2016), cement data after 2013 from (CEMBUREAU, 2016)).

Figure 2. Population size and annual growth rate. United Nations Department of Economic and Social affaires. Population Division (2019). World Population Prospects 2019.

Figure 3. Cement Manufacturing Flow chart. Google images (2019).

Figure 4. Concrete Manufacturing Flow chart. Google Images (2019).

Figure 5. Solidia Cement manufacturing process. Solidia (2019)

Figure 6. Solidia Cement chemistry. Solidia (2019)

Figure 8. Solidia Cement Manufacturing process vs Portland.Solidia (2019)

Figure 7. Solidia Cement C02 emissions. 17th EMABM, University of Toronto, Toronto, Canada, May 20-23, 2019

Figure 9. Carbon Cure Manufacturing process. Carbon cure (2019)

Figure 10. Carbon cure Chemistry. Carbon cure (2019)

Figure 11. A diagram explaining the CO2 purification process. MOS Techno Engineers. Carbon cure (2019)

Figure 12. Cumulative cement savings (orange) and avoided CO2 emissions (gray). Carbon cure (2019)

Figure 13. Tackle carbon early.HM Treasury (2013) and Green Construction Board (2013), reproduced under the terms of the Open Government Licence (Crown Copyright 2013)

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