

## Environment Friendly Concrete Mixtures

### Why in news?

Bendable concrete and other CO<sub>2</sub>-infused cement mixes could dramatically cut global emissions.

### What is the issue?

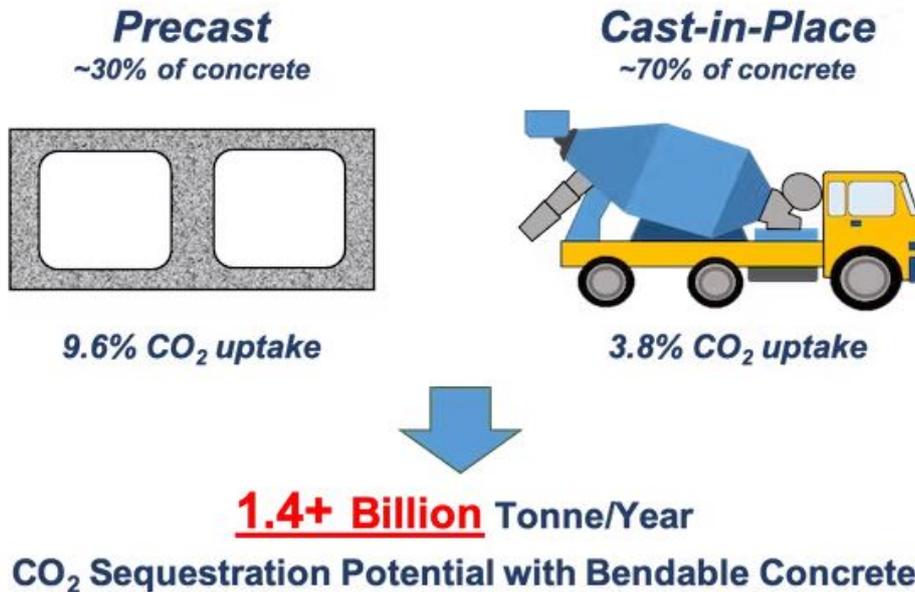
- The production of cement, the binding element in concrete, accounted for 7% of total global carbon dioxide emissions in 2018.
- Concrete is one of the most-used resources on Earth, with an estimated 26 billion tons produced annually worldwide.

### How is the industry moving towards a sustainable path?

- **Concrete** - It is made up of aggregate materials, primarily rocks and sand, along with cement and water and about 80% of concrete's carbon footprint comes from cement.
- **Industrial by products** - Iron slag and coal fly ash are now frequently used to reduce the amount of cement needed.
- The resulting concrete can have significantly lower emissions because of that change.
- **Alternative binders** - Limestone calcined clay can also reduce cement use.
- **Usage of CO<sub>2</sub>** - CO<sub>2</sub> makes up a significant percentage of concrete mass.
- It can be added in the form of aggregates or injected during mixing.
- **Carbonation curing** - It can also be used after concrete has been cast.
- These processes turn CO<sub>2</sub> from a gas to a mineral, creating solid carbonates that may also improve the strength of concrete.
- **Bendable Concrete Material** - It allows thinner, less brittle structure that require less steel reinforcement, further reducing related carbon emissions.
- The material can be engineered to maximize the amount of CO<sub>2</sub> it can store by using smaller particles that readily react with CO<sub>2</sub>, turning it to mineral.
- Bendable concrete was used in the 61-story Kitahama tower in Osaka, Japan, and Roadway Bridge slabs in Ypsilanti, Michigan.
- That means structures may need less cement, reducing the amount of related emissions.

## How much CO<sub>2</sub> can concrete store?

Carbon dioxide uptake refers to the total amount of CO<sub>2</sub> that a concrete mix can sequester through carbonation. The percentages, based on laboratory testing at the University of Michigan, describe how much of the concrete's total mass can be made up of CO<sub>2</sub>.



### What are the challenges and how can they be addressed?

- **CO<sub>2</sub> curing** - CO<sub>2</sub> curing can improve concrete's strength and durability.
- Research can improve the conditions and the timing of steps in the curing process to increase concrete's performance.
- **Electricity use** - It is the largest emissions source during curing.
- It can be reduced by streamlining the process, by using waste heat.
- Advanced concrete mixes, bendable concrete in particular, already begin to address these issues by increasing durability.

### Why infrastructure should be merged with climate policy?

- Government investment and procurement policies are still needed to transform the construction industry.
- In New York and New Jersey, lawmakers have proposed state-level policies that would provide price discounts in the bidding process to proposals with the lowest emissions from concrete.
- These policies could serve as a blueprint for reducing carbon emissions from concrete production and other building materials.

## References

1. [The Hindu | Bendable concrete and other CO<sub>2</sub>-infused cement mixes](#)
2. [The Washington Post | Bendable concrete, other CO<sub>2</sub>-infused cement mixes](#)



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