Number：A-3-1E

PJ：C⁴S Reserach & Development Project

Theme name：Save the earth by producing new concrete solely from atmospheric CO_2 and waste concrete!

Responsible agency name：The University of Tokyo and Hokkaido University

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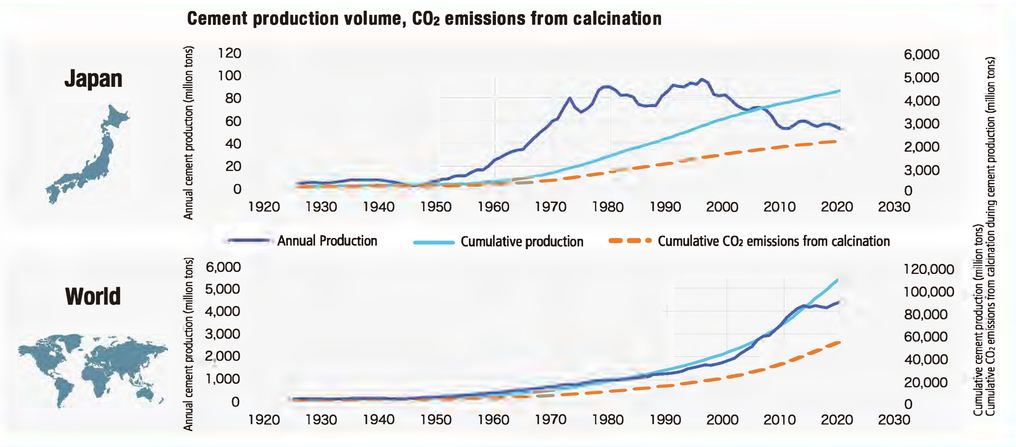
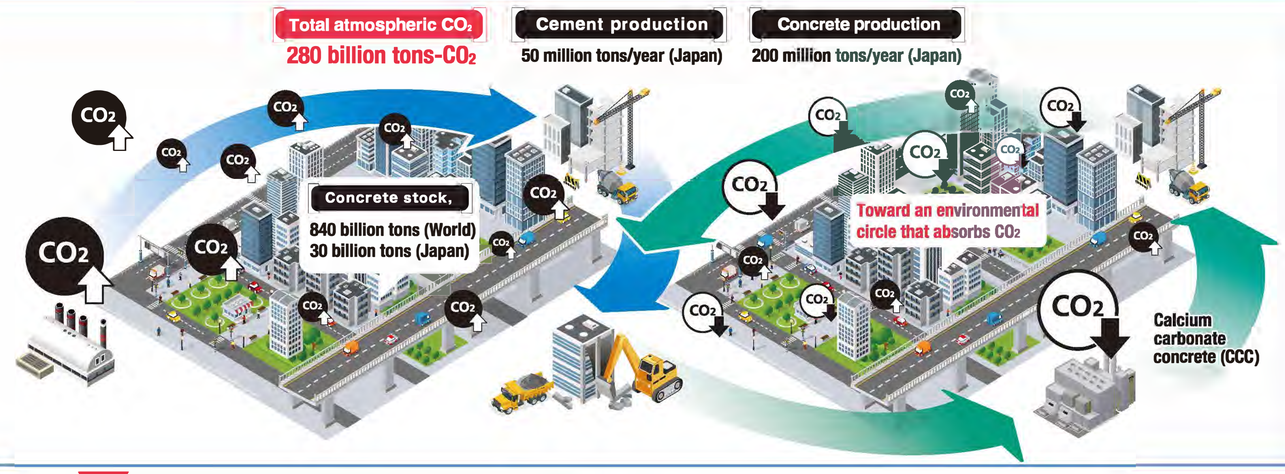
1 How much CO_2 has cement concrete emitted so far?

To date, the calcination of limestone during cement production has emitted a cumulative total of more than 50 billion tons of CO_2 worldwide (more than 80 billion tons cumulatively if calcination energy is included).



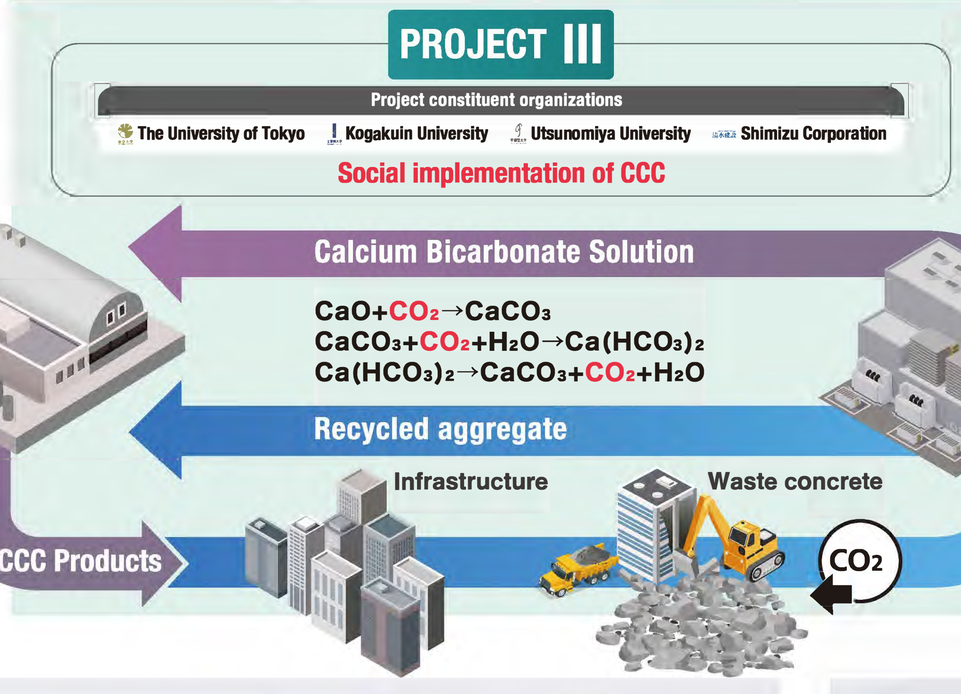
2 What are the goals of the project?

Cumulative CO_2 in the atmosphere emitted by the calcination of limestone during cement production will be captured to form calcium carbonate ($CaCO_3$), which will be used as a binder to make calcium carbonate concrete for construction of structures.



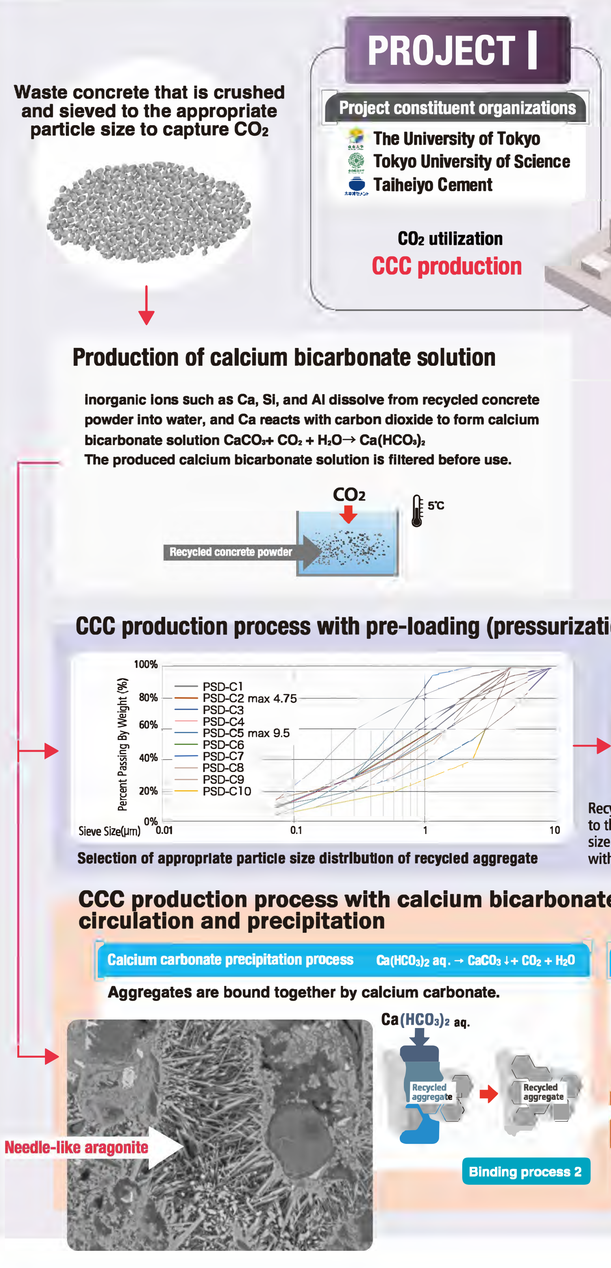
3 How would you describe the project in one word?

We produce calcium carbonate concrete (CCC) using only atmospheric CO_2 and waste concrete, which are ubiquitous, as raw materials, and permanently circulate CCC as a construction material.



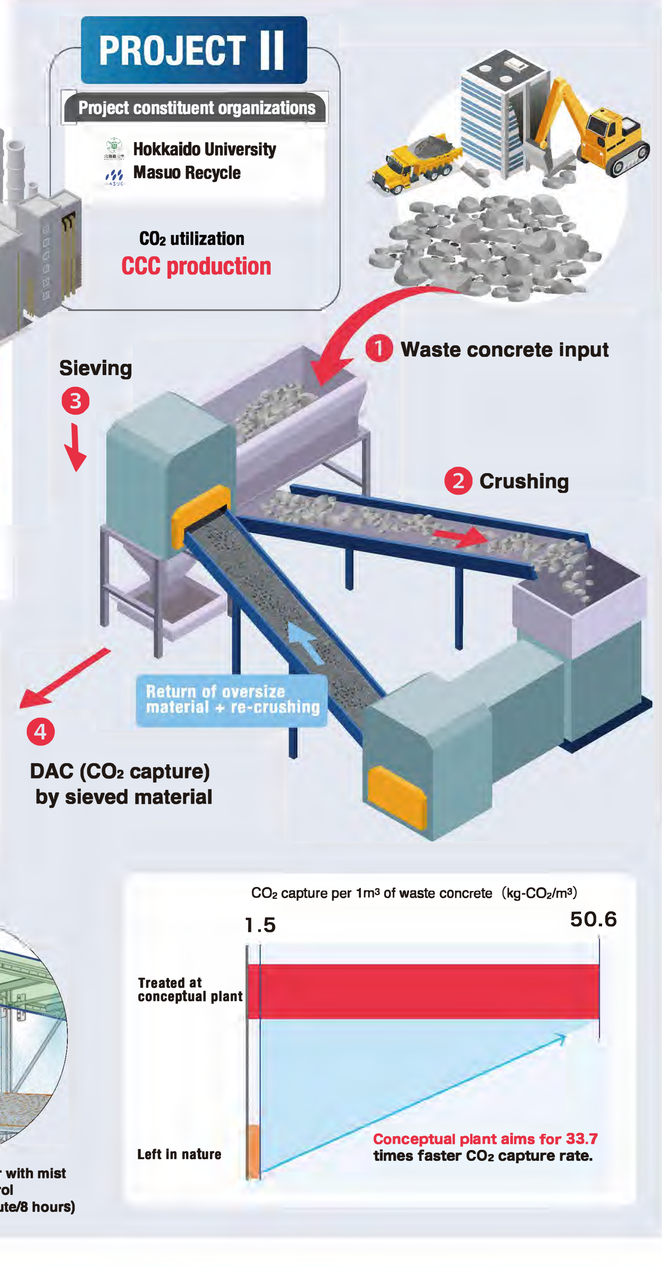
4 How do we produce CCC?

By densely connecting the particles of carbonated waste concrete (recycled aggregate) with fine crystals of calcium carbonate ($CaCO_3$), a hardened body of calcium carbonate concrete (CCC) that can withstand the construction of structures is produced.



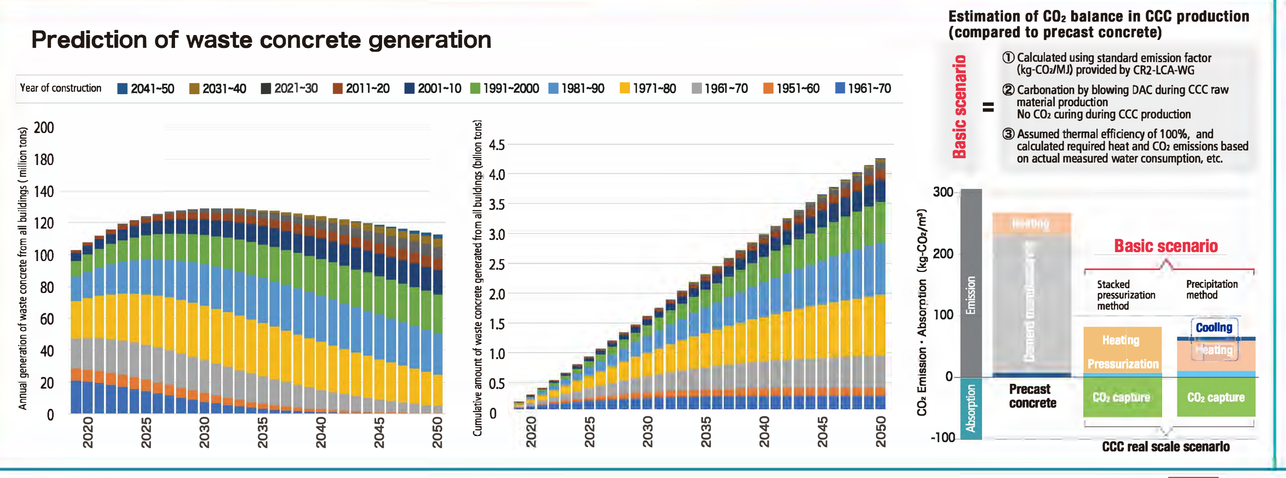
5 How do we capture the CO_2?

A large amount of carbon dioxide (CO_2) is captured from the atmosphere by bringing the calcium component (CaO) in crushed waste concrete into contact with atmospheric carbon dioxide (CO_2) as fast and as much as possible to produce calcium carbonate ($CaCO_3$).



6 How much CCC raw material is generated? How much CO_2 can be captured?

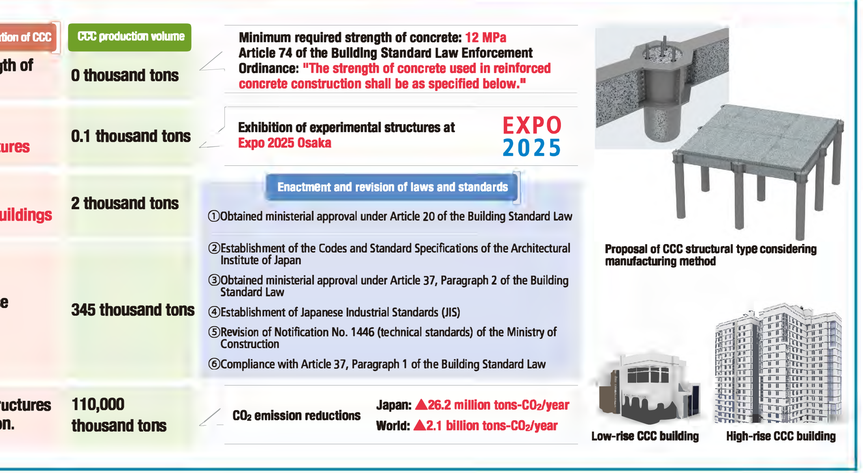
In the future, structures will be demolished as they reach the end of their service lives, generating approximately 100 million tons or more of waste concrete each year, reaching a cumulative total of approximately 4 billion tons by 2050.
For every 1 m³ of CCC produced, more than 50 kg of CO_2 (target 124 kg) will be captured from the atmosphere.

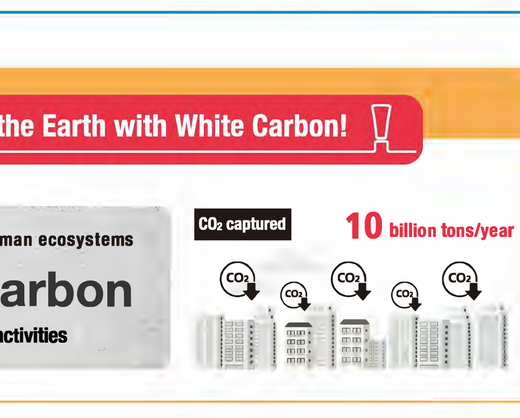


7 What will the CCC structure look like? How widespread will it be?

We envision a prestressed structure that is a composite of CCC and steel.
We aim to have several CCC buildings constructed in 2030, and half of all concrete structures will be CCC by 2050.

Fiscal year	Development and dissemination of CCC	CCC production volume	
2022	Compressive strength of 12 MPa achieved	0 thousand tons	Minimum required strength of concrete: 12 MPa Article 74 of the Building Standard Law Enforcement Ordinance: "The strength of concrete used in reinforced concrete construction shall be as specified below."
2024	Construction of experimental structures	0.1 thousand tons	Exhibition of experimental structures at Expo 2025 Osaka
2029	Construction of 2-3 low-rise CCC buildings	2 thousand tons	Enactment and revision of laws and standards ①Obtained ministerial approval under Article 20 of the Building Standard Law
2040	1.725 times increase annually	345 thousand tons	②Establishment of the Codes and Standard Specifications of the Architectural Institute of Japan ③Obtained ministerial approval under Article 37, Paragraph 2 of the Building Standard Law ④Establishment of Japanese Industrial Standards (JIS) ⑤Revision of Notification No. 1446 (technical standards) of the Ministry of Construction ⑥Compliance with Article 37, Paragraph 1 of the Building Standard Law
2050	50% of concrete structures are CCC construction.	110,000 thousand tons	CO_2 emission reductions Japan: ▲26.2 million tons-CO_2/year World: ▲2.1 billion tons-CO_2/year





8 Concrete to be white carbon!

"White Carbon" following Green Carbon and Blue Carbon reduces global warming.

Concrete can create carbon capture and storage in human ecosystems in addition to continental and marine ecosystems.

Save the Earth with White Carbon!