Taiheiyo Cement Group's Carbon Neutral Strategy 2050:

Technology Development Roadmap and 2030 Interim Target

March 24, 2022

Significance of Carbon Neutrality in the Group's Mission

Mission of the Taiheiyo Cement Group

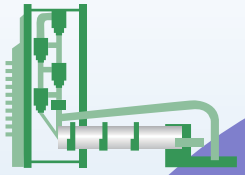
"Our mission is to contribute to social infrastructure development by providing solutions that are environmentally efficient, enhance our competitive position, and bring value to our stakeholders."

Carbon Neutral Strategy 2050

Total commitment to achieve carbon neutrality throughout the supply chain

- For the Taiheiyo Cement Group's sustainable growth, it is essential to achieve carbon neutrality while fulfilling the Group's role in both arterial and venous industries.
- One of the most important elements of the growth strategy is to quickly establish carbon-neutral technologies that can be implemented in society.

Supply Chain Initiatives for Carbon Neutrality



- Tankers and trucks: Made more energy-efficient, switch to EVs

- Heavy machinery: Switch to EVs
- Plant trees at mines and quarries

Cement manufacturing

Logistics

Limestone mining and distribution

- **Innovative CO_2 capture**
- **Low-CO_2 energy and efficiency**
- **Low-CO_2 cement**

Core initiatives

- **CO_2 utilization**

Raw materials procurement

Concrete manufacturing

Waste and by-product sourcing

- **Utilization of concrete waste**

- **CO_2 absorbed by concrete**

Aggregate production and distribution

- Contribute to the creation of circular economies

Recycling

Use/Demolition

- Trucks: Switch to HVs and EVs

From the Outline of the 23 Medium-Term Management Plan

Developments of Taiheiyo Cement Group's Initiatives

2015年

Incorporated the CSR Objectives for 2025, which included a target of reducing greenhouse gas emissions, into the Mid-Term Management Plan.
(10% reduction in net CO_2 emissions intensity compared to 2000)

2019年

- Endorsed the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD).
- Formulated the outline for the long-term vision of greenhouse gas emissions reduction towards 2050.

2020年

Developed specific measures for the long-term vision of greenhouse gas emissions reduction towards 2050.

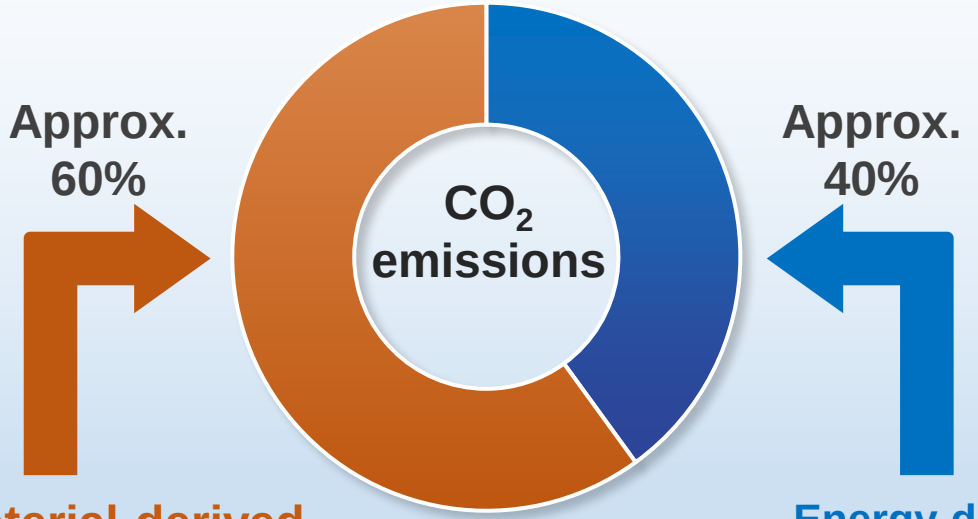
2021年

- Established a Carbon Neutral Technology Development Project Team to achieve carbon neutrality.
- Published the 2023 Mid-Term Management Plan in which the **Carbon Neutral Strategy 2050** was announced.

2022年

Set up the **Technology Development Roadmap** and the **2030 Interim Target** for the **Carbon Neutral Strategy 2050.**

CO_2 Emissions from Cement Production Process



Raw material-derived (decarbonation*)

Energy-derived (fossil energy and electricity consumption)

*$CaCO_3 \Rightarrow CaO + CO_2$

Need for Innovative Technologies for Carbon Neutrality

Existing technologies

Raw material-derived

Main strategies

- Low-CO_2 cement
- Alternative raw materials

+

Energy-derived

Main strategies

- Energy efficiency
- Waste-derived energy
- Renewable & Low-CO_2 energy

To reduce CO_2 emissions originating from decarbonation of raw materials, innovative technologies need to be developed.

Innovative technologies

Main strategies

CO_2 capture, utilization, and storage

Initiatives for 2030 and 2050

Target for 2030

Domestic and overseas group targets (compared to 2000)
2030 Interim Target*: Reduce CO_2 emissions intensity by 20% or more throughout the supply chain*1

* Reduction of CO_2 emissions (domestic): 40% or more compared to 2000

1. Develop and introduce technologies to pursue carbon neutrality

- Maximum use of existing technologies (energy conservation, low-CO_2 energy and cement)*2
- Completion of innovative technology development (CO_2 capture and utilization)

2. Investment of 100 billion JPY (approx. 800 million USD) toward carbon neutrality

Carbon neutrality by 2050

1. Sequential deployment of innovative technologies
2. Achievement of carbon neutrality throughout the supply chain

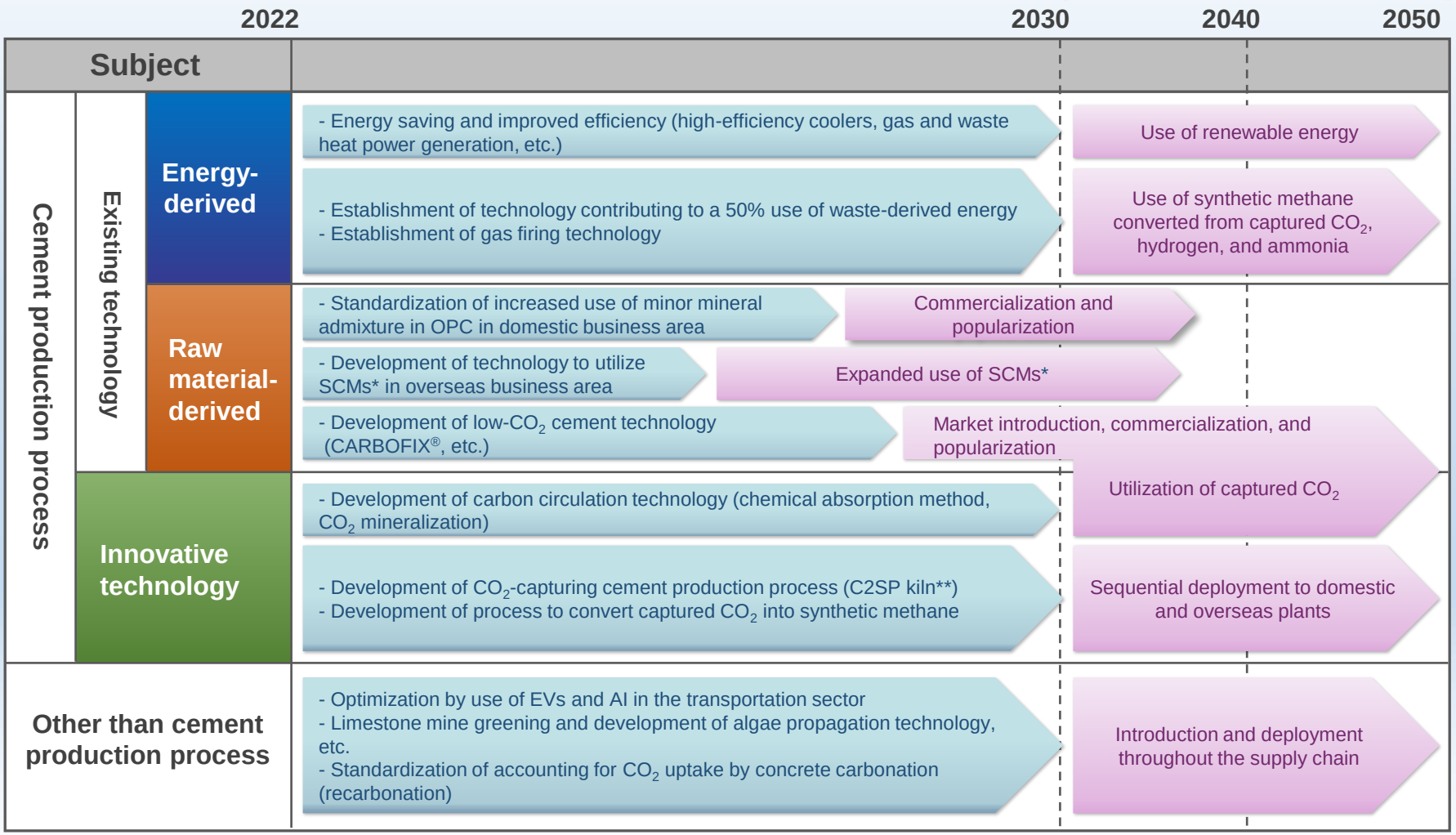
*1 Supply chain: A series of processes involving cement as a commodity, such as raw cement material procurement, production, distribution, use of concrete, and recycling (see p. 3), including scopes 1, 2, and 3 (subject to change due to scope expansion, etc.)
*2 Low-CO_2 cement: Cement using low-CO_2 clinker, blended cement, cement using carbonation process, and the like

Technology Development Roadmap

Taiheiyo Cement Group's CO_2 reduction targets

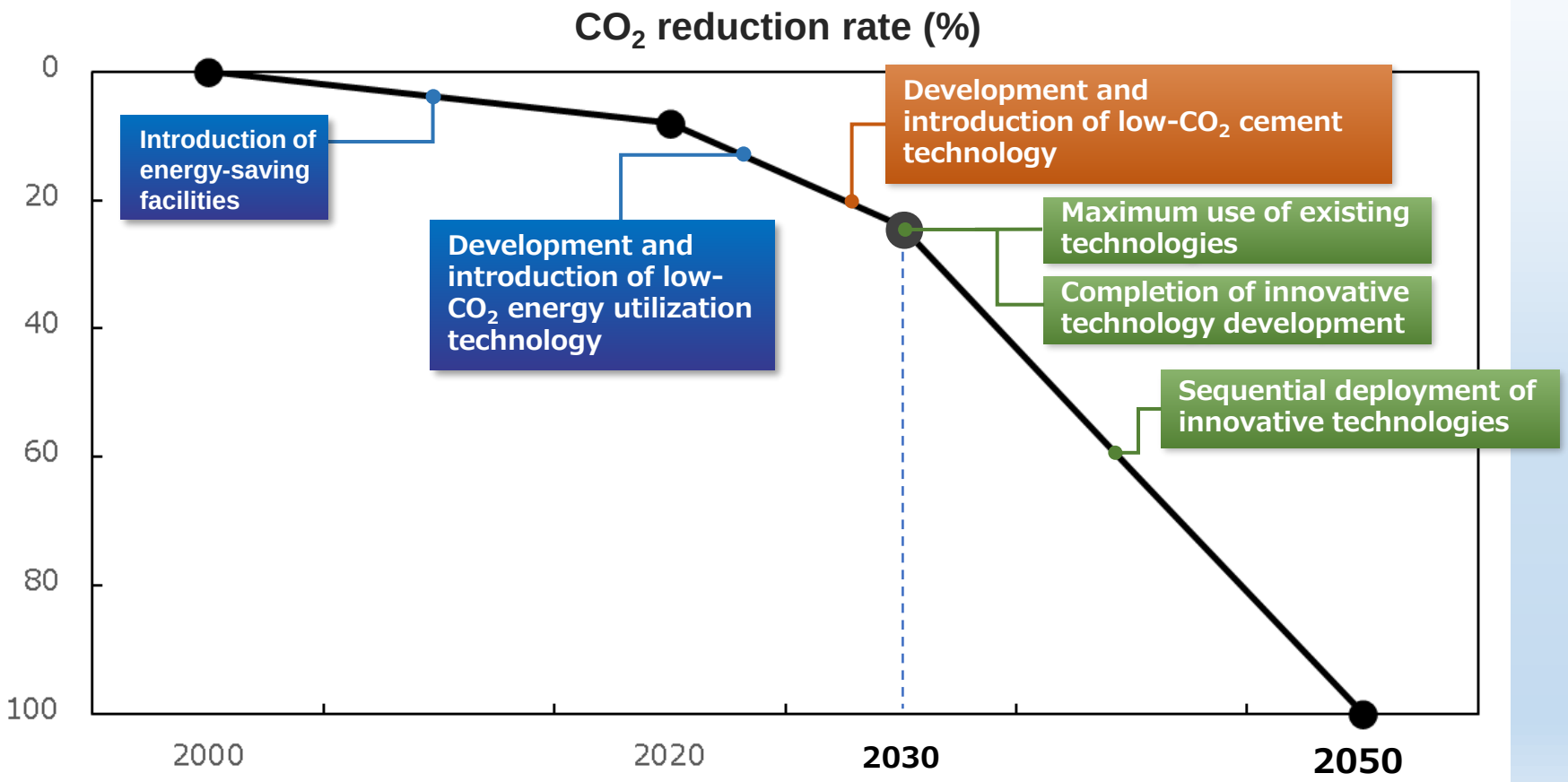
2030 interim target
(reduction of emissions intensity by 20% or more throughout the supply chain compared to 2000)

Carbon neutrality by 2050



*Supplementary cementitious materials, **Trademark registration in process

Scenario for Achieving Carbon Neutrality



Our Efforts to Develop Innovative Technologies

CCS Demonstration Project funded by Ministry of the Environment (since 2019)

Development of Carbon Circulation Technology for the Cement Industry as a project funded by NEDO* (since 2020)

CO_2 capture technology	**Chemical absorption method using amine-based solvent** (Capture of high-purity CO_2)

Demonstrative application of the amine method, a method widely used to capture CO_2 from combustion gases, to the cement process

CO_2 utilization technology	**CO_2 mineralization in cement and concrete materials**

Demonstrative application of efficient CO_2 mineralization in various calcium sources such as **waste concrete (demolished concrete, concrete sludge)** and **low-CO_2 cement (CARBOFIX®)**

Development of CO_2Capture Technology for the Cement Production Process as a NEDO-funded project under the Green Innovation Funding Program (since 2021)

CO_2 capture technology	**CO_2-Capture cement production process** (CO_2 recovery using a compact facility)

Development and demonstration of a technology to capture CO_2 at the calciner **(C2SP kiln**)** that **efficiently recovers CO_2** from cement production process

CO_2 utilization technology	**Methanation** (CO_2 conversion into thermal energy source)

Demonstration of methanation system suitable for cement production process

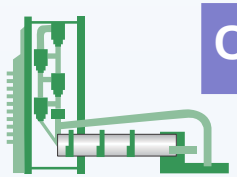
*New Energy and Industrial Technology Development Organization
**Trademark registration in process

Deployment of Innovative Technologies

Waste concrete

Chemical absorption

Cement plant



CO_2 capture

CO_2

Calciner

Raw material-derived CO_2

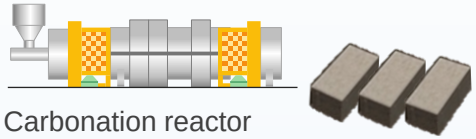
Energy

Combustion-aiding gas

CO_2 capture at the calciner

C2SP kiln*

CO_2 mineralization



Carbonation reactor

Low-CO_2 cement: CARBOFIX®

CO_2 utilization

Carbon dioxide (CO_2)

Hydrogen (H_2)

Methane CH_4

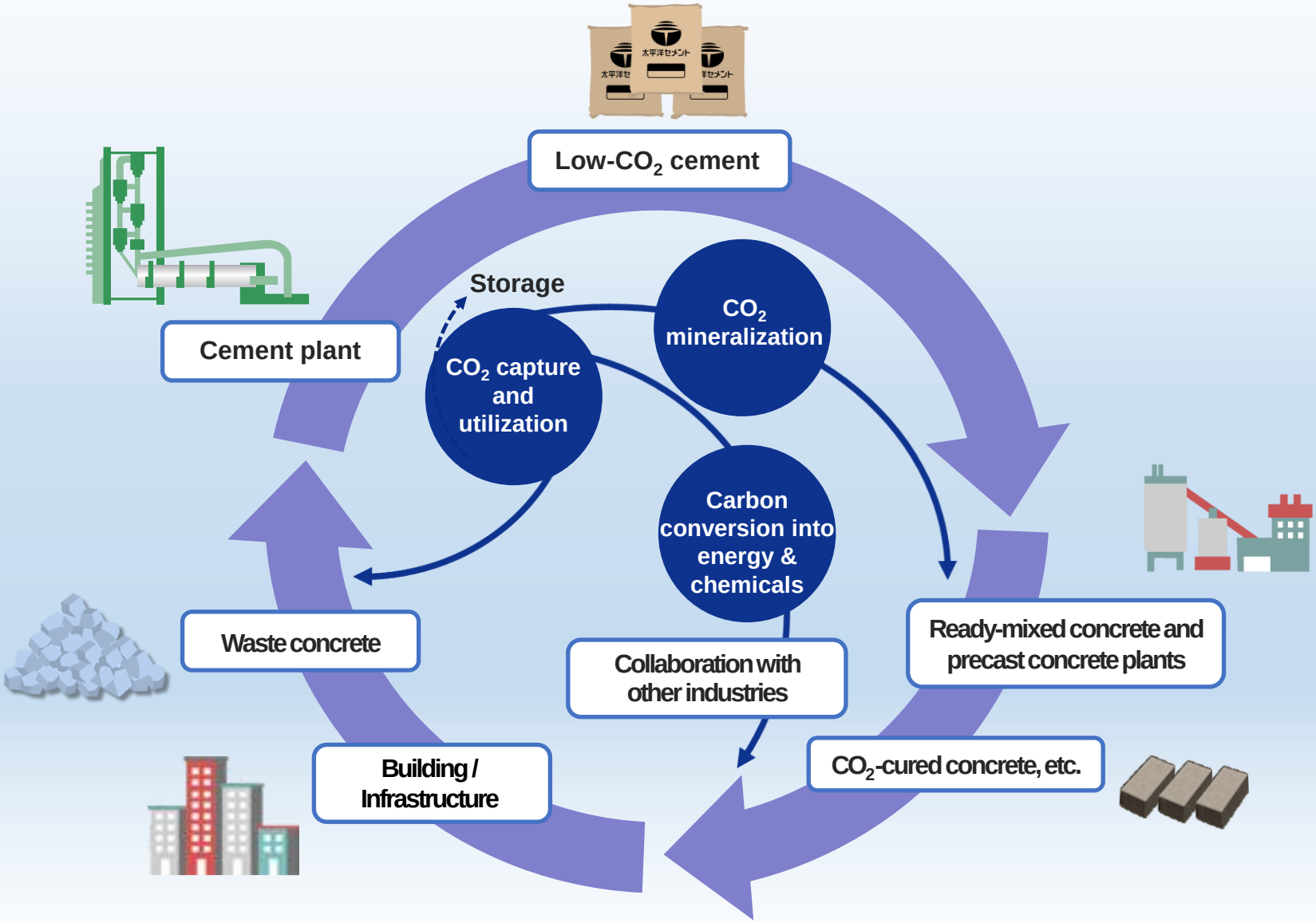
Methanation

* Trademark registration in process

Green hydrogen and clean energy

Realization of carbon neutrality

Innovative Technologies in the Supply Chain



Initiatives Other Than Cement Production Process

Optimization of transportation and distribution

- Realization of an optimal logistics system through introduction of AI vessel allocation and automated vehicle allocation
- Introduction of EV trucks and environmentally friendly vessels

Marine cement transportation

Creation of CO_2 sinks

- Greening of limestone mines
- Kelp forest formation and tideland improvement
- Calcium carbonate concrete
  (URL: https://moonshot-c4s.jp/en/)

Greening of limestone mines

Calcium carbonate concrete

CO_2 absorption by concrete

- Jointly with the Global Cement and Concrete Association (GCCA), we will study appropriate assessment methods and promote certification by an international assessment body.

Final remarks

The **Taiheiyo Cement Group** has developed specific measures including the **Technology Development Roadmap** and the **2030 Interim Target** for the **Carbon Neutral Strategy 2050** in order to **achieve carbon neutrality throughout its supply chain by 2050**. Based on this strategy, the Group will **progress toward achieving** carbon neutrality with pursuing further **growth** of the Group and **sustainable development of society**.

In the meantime, by **working with governments** and **collaborating with other industries,** the Group will address issues such as **social acceptability**, **sharing of economic burden**, **green energy supply**, and **infrastructure development** which need to be solved for the social implementation of **innovative technologies essential** for the realization of carbon neutrality.

Reference: Relevant SDGs

The plans and forecasts contained in this document are based on judgments made in accordance with information available at the time the document was prepared and are subject to risks and uncertainties. Therefore, we do not promise or guarantee future realization of any planned figures or measures presented.