

Taiheiyo Cement Group Efforts to Mitigate Climate Change

GRI102-11, 103-2, 201-2, 203-1

Significantly reducing CO₂ and other greenhouse gas emissions toward mitigating climate change has been underway following the adoption of the Paris Agreement at the COP21 in 2015 as a common challenge across the world. The cement industry, which by-produce not a less amount of CO₂ in the course of manufacture, must take action. The Taiheiyo Cement Group is developing and introducing technologies to reduce their CO₂ emissions from a medium- to long-term perspective in order to mitigate global warming and ensure its sustainable development.

CO₂ Emissions Reduction Roadmap for Achieving Long-term Vision

2020

Formulating a long-term vision



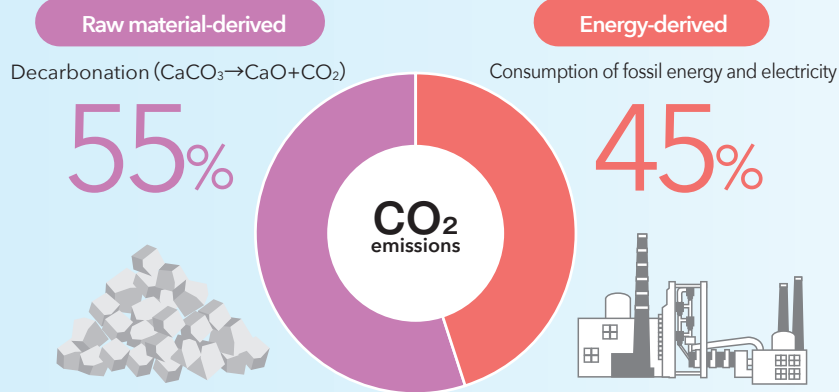
Scenario for Contributing to Avoided CO₂ Emissions through the Value Chain

- Use/reuse of cement** Development of concrete technology to contribute to CO₂ reduction/evaluation of the amount of CO₂ absorbed by cement products
- Power generation for cement production** Biomass power generation and waste heat power generation
- Transportation** Continuously encouraging the introduction of energy-efficient equipment and energy-saving technologies in the raw materials/products transportation divisions
- Others** Promoting measures and products for absorbing CO₂ such as the conservation of biodiversity and technology to grow algae

Applications Scenario (Maximum Application of Existing Technologies)

- Energy-derived** Promoting the introduction of energy-efficient equipment and increased use of alternative energy sources
- Raw material-derived** Design of low-CO₂ cement within the current standards (e.g., improvement of clinker and use of admixtures)

CO₂ Emissions from Cement Production Process



Taiheiyo Cement's Countermeasures to Mitigate Climate Change

The cement industry is estimated to generate CO₂ emissions equivalent to about 6% of total man-made greenhouse gas emissions. Of the CO₂ produced in the course of cement manufacture, approximately 45% is derived from the thermal energy used to heat the raw materials and the consumption of electricity for cement, and 55% from the decarbonation of limestone used as raw material during the calcination process. We must therefore focus on those two areas in order to reduce CO₂ produced in the course of cement manufacture.

Since the 1990s we have focused on introducing energy-efficient equipment to reduce our CO₂ emissions. We have also promoted the use of recycled resources without decarbonation as raw materials and are aggressively

responding to the demands of the international community. We added the CSR Objectives for 2025 to the Medium-Term Management Plan in 2015, the year the Paris Agreement was adopted. Included in the objectives is the goal of reducing greenhouse gas emissions. Having declared our support for the Task Force on Climate-related Financial Disclosures (TCFD) in June 2019, we are committed to a strategic implementation of countermeasures to reduce CO₂ emissions. In addition, we formulated a framework in July 2019 for our long-range vision of greenhouse gas emissions reduction toward 2050 and positioned it as a group-wide goal.

Formulating Our Long-term Vision toward 2050

In March 2020 the Taiheiyo Cement Group published details about its measures stated in its Long-range Vision of

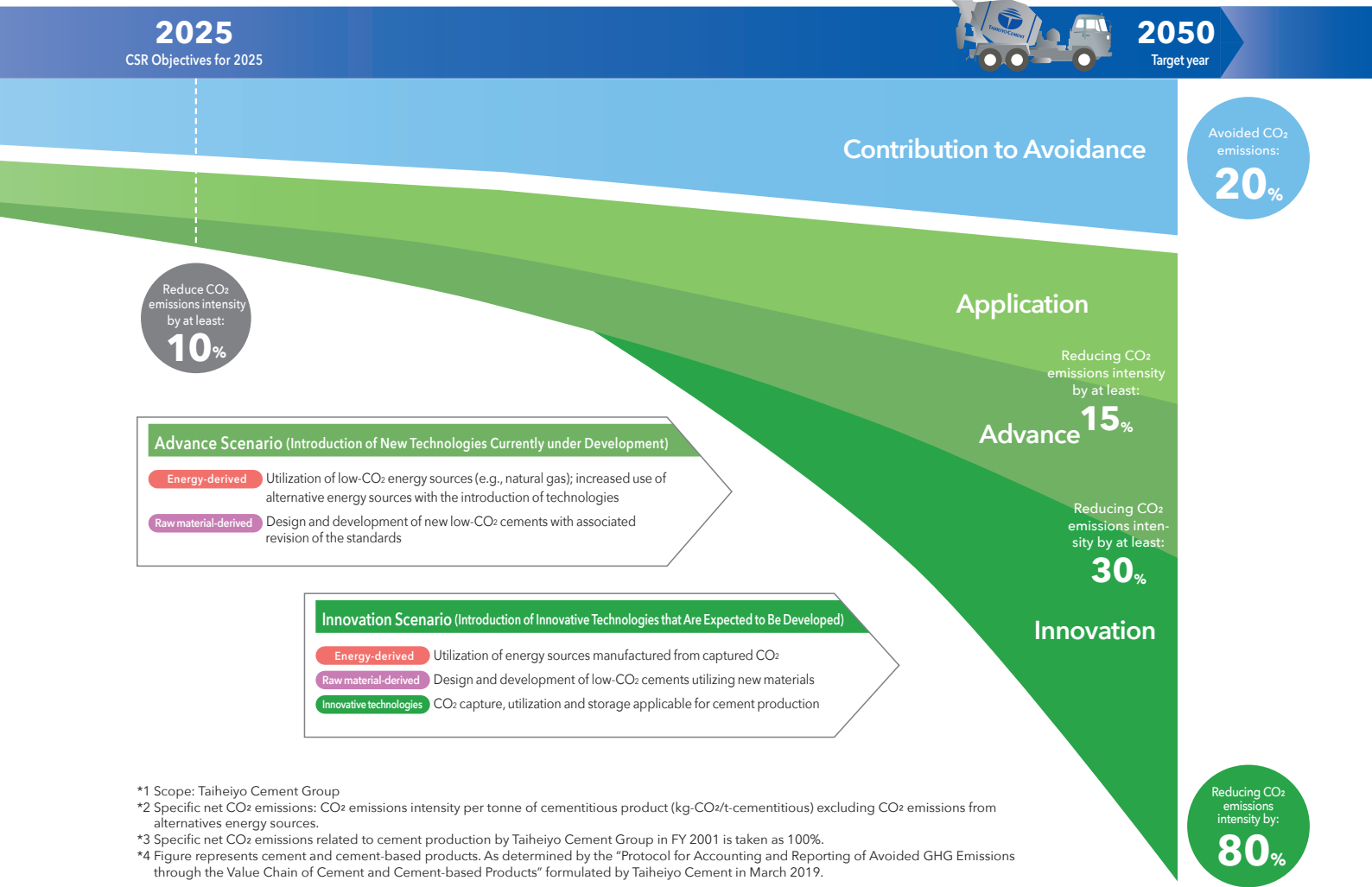
Our long-term vision of greenhouse gas emissions reduction toward 2050^{*1}

Reduced specific net CO₂ emissions
in cement production^{*2}

80%^{*3} reduction
by 2050

Contributing to avoided CO₂ emissions
through the value chain^{*4}

Avoided emissions
equivalent to **20%**^{*3} CO₂ emissions
by 2050



*1 Scope: Taiheiyo Cement Group

*2 Specific net CO₂ emissions: CO₂ emissions intensity per tonne of cementitious product (kg-CO₂/t-cementitious) excluding CO₂ emissions from alternatives energy sources.

*3 Specific net CO₂ emissions related to cement production by Taiheiyo Cement Group in FY 2001 is taken as 100%.

*4 Figure represents cement and cement-based products. As determined by the "Protocol for Accounting and Reporting of Avoided GHG Emissions through the Value Chain of Cement and Cement-based Products" formulated by Taiheiyo Cement in March 2019.

Greenhouse Gas Emissions Reduction toward 2050. In order to achieve the goal of an 80% reduction in CO₂ emissions by 2050, we need to develop innovative technologies as well as to advance the application and development of existing technologies. To this end, the group formulated three reduction scenarios for lowering CO₂ emissions in cement production. Specifically, we will continue to develop and expand the technologies we currently own to reduce energy-derived and raw materials-derived CO₂ emissions whilst also developing and introducing new innovative technologies. Furthermore, we aim to avoid emissions equivalent to 20% of CO₂ emissions through the value chain of cement and cement-related products. These reductions will be in the areas of use/reuse of cement, power generation for cement production and transportation, and the reductions

evaluated based on the "Calculation and Reporting Protocol for Accounting and Reporting of Avoided GHG Emissions through the Value Chain of Cement and Cement-based Products" which we formulated in 2019.

In order to realize the Long-term Vision, we must address challenges such as social acceptance of our businesses and the development and implementation of new technologies to avoid, capture, utilize and store CO₂. The associated financial burden of such technologies will need to be shared as will the technologies themselves. We have positioned the Long-term Vision as a goal we must achieve, and we will continue our efforts in light of our future sustainable growth as well as changes in social systems.

The Ofunato Plant **Launching the Biomass Power Generation Business to Brighten the Future of the Community**



Contribution to Avoided CO₂ Emissions

308 thousand tonnes/year

Electric power generation **520** GWh/year

Equivalent to the electricity consumption of approximately **119,000** ordinary households

Company	Ofunato Power Inc.
Total project costs	23.5 billion yen
Capital contribution ratio	65% Taiheiyo Cement, 35% Iriha Co., Ltd.
Output	75 MW

The Ofunato plant, in Ofunato City, Iwate Prefecture, began producing cement in 1937 as one of the company's major manufacturing sites and it has reliably supplied high-quality cement products since then. It installed a waste heat power generation system in 1986 and has actively taken action to save energy. Unfortunately, the plant was significantly damaged by the tsunami following the Great East Japan Earthquake in March 2011. While it was able to quickly resume cement production, including restarting of the waste heat power generation system, its in-house power generation system was severely damaged and did not resume operation. To address this the Ofunato Power Generation Project Team was set up in 2016.

The Ofunato Biomass Station was constructed on the premises of the Ofunato cement plant over a period of three years and started commercial operations in January 2020. The power station can supply all of the electricity required by the plant as well as for the community. It uses palm kernel shell (PKS) and a small amount of coal as fuels with an output of 75 MW, making it one of Japan's largest

biomass power stations. Annual electric power generation is approximately 520 GWh, equivalent to the electricity consumption of around 119,000 ordinary households, and the associated CO₂ emissions reduction is 308,000 tonnes/year.

The Ofunato Biomass Power Station is environmentally sound. The plant concluded an Agreement on Environmental Conservation with the Ofunato City government in 2017, under which it constrains NO_x and SO_x emissions to below specified values. Furthermore, the exhaust chimneys are twice the height of ordinary facilities to minimize the effects of the emissions on the surrounding environment. The design of the power station minimizes its environmental impacts such as by recycling industrial water for cooling. In terms of fuel, the small amount of coal currently used will be reduced in the future to make the plant solely dependent on biomass fuel.

The Taiheiyo Cement Group is working to increase the use of environmentally sound, renewable energy through the launch of its biomass power generation business while also contributing to job creation and the economic revitalization of the local community.

VOICE



Working Together to Realize a Sustainable Society

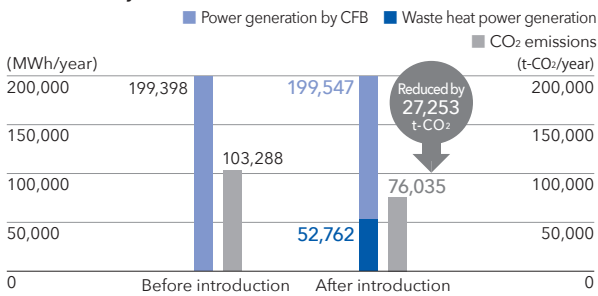
Kimiaki Toda
Mayor of Ofunato City

When I learned the Taiheiyo Cement Ofunato plant would be a biomass power station using palm kernel shells as fuel I was deeply impressed with the company's decision to carry out an environmentally sound project. I have

always believed that the problems associated with climate change were our responsibility, not those of someone else. With the designation of Ofunato City as a Future City by the national government, we have been working to create a sustainable community through such efforts as introducing renewable energy with a focus on solar power. Reducing carbon emissions is an urgent concern for all humankind, and governments and businesses must cooperate to address it. We hope Taiheiyo Cement's biomass power generation business will serve as a foundation for creating a prosperous future.

Since introducing a WHR power generation system at its Kumagaya plant in Kumagaya City, Saitama Prefecture in 1982, the company has installed similar facilities in its other plants in Japan. These systems generate power by recovering thermal energy from high-temperature exhaust gas generated in the cement calcination process and contribute significantly to the reduction of CO₂ emissions. In October 2019 the company decided to install a WHR power generation facility incorporating a cutting-edge waste heat recovery boiler at its Saitama plant in Hidaka City, Saitama Prefecture. This facility is scheduled to begin operations in September 2022, marking the completion of the initiative to install waste heat power generation systems at all six company plants. The operation of these facilities is expected to help reduce CO₂ emissions by approximately 27,000 tonnes per

Reduction in CO₂ Emissions by Introducing a Waste Heat Power Generation System at the Saitama Plant



year, and the percentage of energy generated by waste heat of the total power consumption at all six company's plants is estimated to be 18.4%.

In our overseas operations we completed the installation of waste heat generation systems in all our joint ventures plants in China in 2012. Also, in December 2019 we made a decision-making to conduct a feasibility study to install WHR power generation at Nghi Son Cement Corporation, Vietnam, and we consider this a first step toward

installing WHR power generation systems at all our cement plants in North America and South East Asia. The introduction of WHR power generation systems is one scenario for contributing to reliable and significant CO₂ reductions throughout the entire value chain. We will complete the installation of these systems in our plants and continue our efforts to realize our vision for the future of the cement business.



WHR power generation system (waste heat boiler on the kiln preheater system at the Kamiiso plant H-8)

FOCUS

Promoting the Regional Treatment of Disaster Waste

Cement plants are contributing to regional restoration by accepting waste such as the debris generated by natural disasters. We started to accept disaster waste following the Chuetsu Earthquake in Niigata Prefecture in 2004. Since then we have concluded a comprehensive partnership agreement with several local governments in areas where our plants are located to prepare for future disasters.

In June 2019 we concluded a comprehensive partnership agreement with the Miyagi prefectural government where the company does not operate any plants. Taking into consideration the maximum use of prefectural port facilities along with additional new routes, more of our plants would be able to accept disaster waste. Three months after the conclusion of the agreement, typhoon No. 19 made landfall in October 2019 and caused severe damage in the Tohoku



Waste rice straw in Miyagi Prefecture



Waste tatami mats at Higashimatsuyama City in Saitama Prefecture

region. Under the agreement with the Miyagi prefectural government, our Ofunato plant accepted a large volume of waste rice straw that had been generated immediately after the harvest and treated 23,000 tonnes by the end of March 2020. Our Saitama and Kumagaya plants also treated materials such as straw mats and quail droppings that were destined after use in a digester after drying but had become sodden in the typhoon. We plan to establish a system for treating disaster waste regionally by leveraging our plants across Japan as well as our land and marine transport network.