Environmental Management

Closely Related SDGs

Environmental Management Policy

Our environmental management policy declares an active commitment to environmental issues facing society, including not only preventing pollution but also creating a recycling-based society, mitigating climate change, reducing environmental impacts, protecting water resources and conserving biodiversity as key management challenges. Under this policy we are focusing on improving our environmental performance.

Environmental Management Policy

In January 2006 we created an Environmental Management Policy, reflecting the fact that we consider an active commitment to the environmental issues facing society to be key management challenges. In addition to initiatives emphasizing these six items in all business operations, we strive to communicate with a wide range of stakeholders, from international society to local communities, and to seek the ideal form for a sustainable cement industry as a member of the WBCSD and GCCA (Global Cement and Concrete Association).

Created in January 2006
Revised in April 2019

1. **Pursuing Environmentally Conscious Business Activities**
   In pursuit of zero environmental impacts we target the impacts of our business activities, including those of the value chain, which are emitting GHGs, pollutants, noise and vibration, withdrawing water, degrading forest and others. We promote the introduction of eco-efficient technologies into our business and the development of eco-conscious products as a member of both the regional and global society.
2. **Compliance with Environmental Laws and Regulations**
   As a minimum, we comply with all environmental laws and regulations applicable to our business activities. Furthermore, beyond compliance, we meet environmental commitments undertaken through voluntary agreements.
3. **Contributing to a Recycling-based Society**
   Leveraging the inherent capabilities of the cement industry, we actively recycle industrial and municipal wastes as raw materials and fuels for cement production.
4. **Proactively Addressing the Issue of Climate Change**
   We promote greater energy reduction throughout the whole of our business activities and strive to develop technology to help reduce society's total greenhouse gas emissions.
5. **Promoting Global Technology Transfer**
   Through the worldwide transfer and deployment of our technology, we aid the development of greater energy conservation, environmental preservation and utilization of waste materials.
6. **Ecosystem Conservation**
   We strive to protect the ecosystem, including biodiversity, by providing products and technologies that contribute to harmonious coexistence with nature.

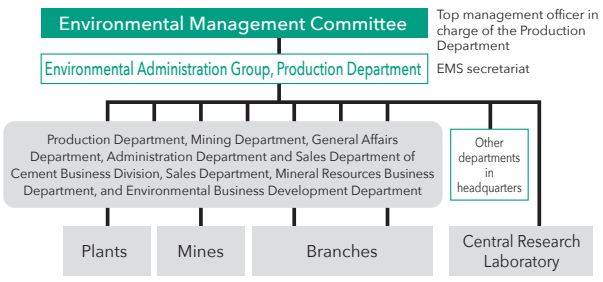
Company-wide Environmental Management System (EMS)

In June 1997 Taiheiyo Cement initiated ISO 14001 certification of each of its plants and attained 100% certification by 1999. Recognizing, however, that plant level management systems alone are insufficient to ensure comprehensive environmental protection through environmental management projects, we built a companywide environmental management system (EMS) and extended it beyond plants to cover our headquarters, branches and Central Research Laboratory. In April 2009 our EMS was ISO 14001 certified by the Japan Testing Center for Construction Materials, an independent third-party testing, standardization and certification authority. As part of the continuing certification the company-wide system underwent a renewal audit for the third time in March 2018.

■ EMS Readiness

Top management (officer in charge of the Production Department) chairs the Environmental Management Committee with ultimate decision-making authority for environmental management. Overseen by the Environmental Management Committee, the relevant headquarters division manages our plants, mines and branches using an "umbrella" system. Each group cement company in Japan and overseas is committed

Company-wide EMS Readiness



Taiheiyo Cement Group's Environmental Targets GCCA

CO_2 Emission Reduction Targets

Cement production-related CO_2 emissions from Taiheiyo Cement and group companies

Reduce specific net CO_2 emissions per tonne of cementitious product by 10% or more from FY2001 levels by FY2026 (CSR Objectives for 2025).

Reduction Target for Main Air Pollutants

Emissions of NOx, SOx and dust from the main stacks of kilns at the cement production sites of Taiheiyo Cement and group companies

Limit NOx, SOx and dust levels per tonne of clinker (g/t-clinker) to the target levels achieved in FY2011

to environmental preservation. Over 90% of the group's total cement output in FY2020 was produced in ISO 14001-certified plants. Facilities in countries where ISO is not adopted as the mainstream standard operate their own EMS.

■ Internal Environmental Audits

In FY2020 we conducted internal environmental audits at all our sites.

As priority items from this year's audit, confirmation of legal compliance reviews, external communications and corrective actions for unachieved items were identified as company-wide concerns. The status of a follow-up, including corrective and preventive actions for nonconformity with environmental requirements, and the status of responses to emergencies were identified as items that plants must deal with. Verifying the compliance status of a service stations was identified as an item that must be dealt with by branches.

The audit identified 21 findings including 6 for which improvements were requested. Corrective actions were taken for all 6 findings for which improvements were requested.

■ Environmental Education

During Environment Month each June we deliver a message from the president and provide educational materials on the environment page of our portal site to increase awareness and encourage learning about the environment, and about environmental preservation activities throughout the group. Each workplace also engages in a number of different activities, such as conducting training sessions related to accident response, viewing environment-related DVDs, holding lectures and taking part in local cleanup activities. In FY2020 more than 370 activities took place, including group companies' activities.

Oil spill training (Kumagaya plant)

Compliance with Environmental Laws

GRI307-1

■ Environmental Accidents

In FY2020 we had no legal or regulatory violations related to the environment that were subject to fines or penalties or significant accidents that affected the environment including animals or plants. However, we had two accidents (cement dust) and took measures to prevent these accidents from recurring.

■ Response to Environmental Accidents

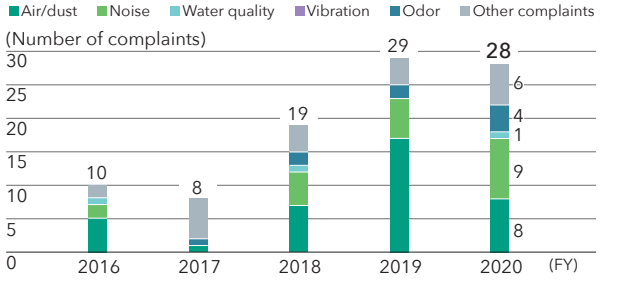
Each plant maintains emergency response plans in preparation for possible environmental accidents. They also conduct training, including periodic fire-fighting training in cooperation with local fire departments. Other training includes how to reduce environmental impact when an environmental accident occurs and how to report it to a government entity.

■ Environmental Complaints

As we increasingly utilize wastes and by-products and they become more diverse, the number of environmental issues we need to consider also increase. Therefore, we are ramping up our efforts to reduce environmental impact through activities such as introducing indoor storage and sealed containers for waste and by-products, and improving our flue gas stacks. When we receive an environmental complaint we quickly travel to the site in question, whenever possible, to check the situation, investigate the cause and provide an explanation. When we find that our activities are the cause, we implement improvements.

In FY2020 our cement plants received 104 environmental complaints. We responded to 28 of these, which were associated with our operations. The number of complaints received in FY2019 increased from the previous year due to a change in the counting method. However, the number in FY2020 remained unchanged from the previous year.

Number of Environmental Complaints Received Non-consolidated



Mitigating Climate Change

GRI103-2, 3, 12

Closely Related SDGs

Greenhouse Gas Emissions and Achievement of Our CSR Objectives for 2025

GRI102-11, 302-3, 305-1, 2, 4, 5

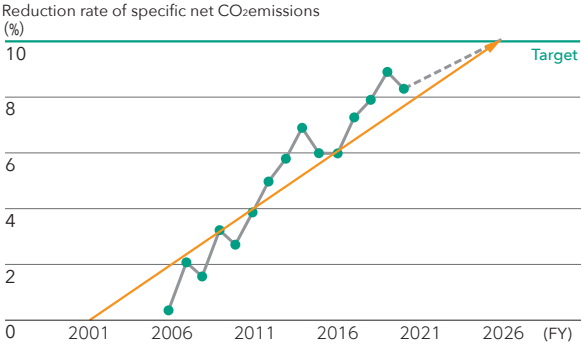
Among the total greenhouse gas emissions generated by our domestic group companies (excluding power generation companies) that are reporting their greenhouse gas emissions by business segment in accordance with the Act on Promotion of Global Warming Countermeasures, about 95% of greenhouse gas emissions were generated from cement production companies in FY2017.* The amount of greenhouse gas emissions associated with our service stations, headquarters, branches and shipping, as well as electricity purchased by the group, was around 5% in FY2020. Under Scope 3 (value chain) calculations for cement, for which downstream value is not calculated since cement is considered an intermediate product at this stage, the emissions were around 5.0% of Scope 1 and Scope 2 (direct air emissions) in FY2019.

The bulk of greenhouse gas emissions associated with the operations of our group companies is CO_2 from cement production. We are therefore working to reduce emissions from cement production, as indicated in our CSR Objectives for 2025, in order to achieve our long-term quantitative target of reducing specific net CO_2 emissions per tonne of cementitious product by 10% or more from FY2001 levels by FY2026.

Some of our plants are taking part in the target setting type emissions trading program for Saitama Prefecture and California's cap-and-trade program, striving to achieve the reduction targets. To support voluntary approaches we are also working in line with Keidanren's voluntary action plan and the measures to reduce greenhouse gas emissions established by the WBCSD and GCCA.

*Most of our overseas affiliated companies are cement production companies so the total CO_2 emissions from production overall is higher than that of domestic companies alone.

Progress in Meeting CO_2 Reduction Targets in our CSR Objectives for 2025



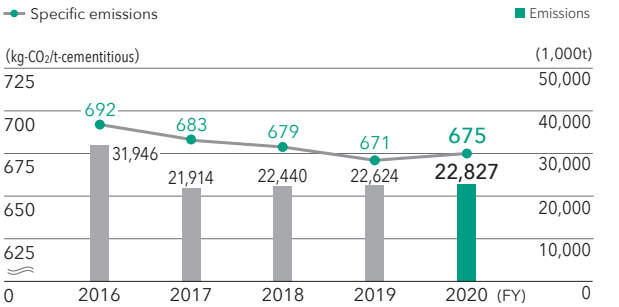
Efforts Related to the Cement Production Process

GRI302-1, 3, 4, 305-4, 5

Not a less amount of carbon dioxide is generated in the course of cement manufacture. This is because the production process requires a high temperature of 1,450°C and limestone, used as raw material, is decarbonated through a chemical reaction during the calcination process ($CaCO_3 \rightarrow CaO + CO_2$). About 35% of CO_2 emissions generated during cement production are from the consumption of energy, about 55% are from the calcination of raw materials and about 10% are from electricity use. To reduce CO_2 emissions we have been working to conserve energy by installing energy-efficient equipment and improving the stability and efficiency of our kiln operations. We have also been implementing measures such as using waste- and biomass-derived energy sources to decrease our rate of use of fossil fuels. Moreover, we are moving toward using recycled resources with less carbonate content to bring down CO_2 emissions from the calcination of the limestone used as raw material, and have started using WHR power generation to tackle CO_2 emissions associated with conventional electricity generation.

Specific heat consumption was reduced in FY2020 delivering a reduction in CO_2 emissions of 4-kg-CO_2/t cementitious product compared to FY2019, mainly as a result of a decrease in the clinker-to-cement ratio.

Specific Net CO_2 Emissions per Tonne of Cementitious Product GCCA

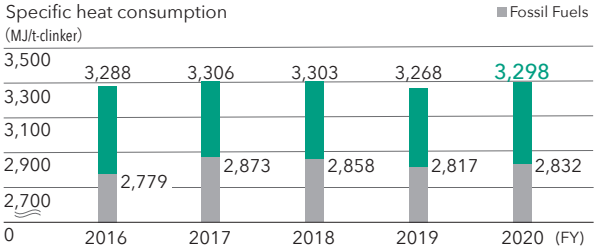


Guidelines: GCCA「GCCA Sustainability Guidelines for the monitoring and reporting of CO_2 emissions from cement manufacturing Ver. 0.1」

■ Efforts to Save Energy

Specific heat consumption of clinker production by the group's cement plants in FY2020 decreased by 30 MJ/t clinker from the previous year's level to 3,298 MJ/t-clinker.

Specific Heat Consumption of Clinker Production GCCA

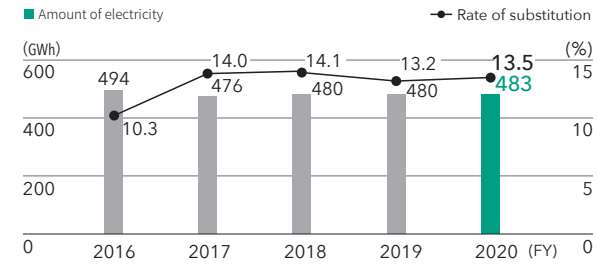


Guidelines: GCCA「GCCA Sustainability Guidelines for the monitoring and reporting of CO_2 emissions from cement manufacturing Ver. 0.1」

■ Use of WHR Power Generation Systems

Total electric power generated by WHR power generation systems at the group's cement production companies in FY2020 increased by 3 GWh from FY2019 to 483 GWh. Its ratio to all electricity consumed in the production of cement was 13.5%. We were therefore able to reduce CO_2 emissions by about 333 thousand tonnes in FY2020 compared to purchased power generated from coal-fired power plants (emission factor: 0.69 t-CO_2/MWh).

Electricity Generated by Waste Heat GCCA

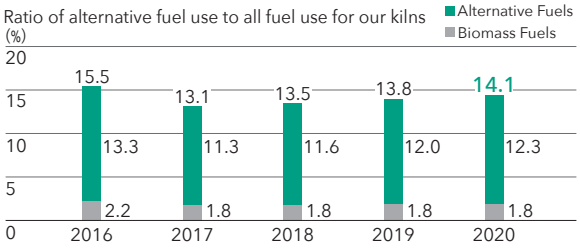


Guidelines: ：GCCA「GCCA Sustainability Guidelines for the monitoring and reporting of CO_2 emissions from cement manufacturing Ver. 0.1」

■ Use of Alternative Energy Resources and Alternative Raw Materials

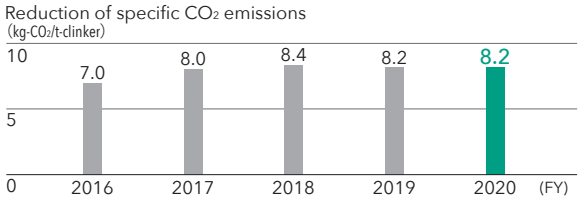
In FY2020 non-fossil energy and biomass energy accounted for about 14.1% of all energy used for group kilns. A decrease of about 8.2 kg-CO_2/t-clinker was also achieved by using alternative raw materials. As a result of using both alternative energy resources and raw materials, reductions in CO_2 emissions are expected to reach 1.47 million tonnes (emission factor for coal: 0.096 kg-CO_2/MJ).

Ratio of Alternative Fuels and Biomass Fuels GCCA



Guidelines: GCCA「GCCA Sustainability Guidelines for the monitoring and reporting of CO_2 emissions from cement manufacturing Ver. 0.1」

Reduction of Specific CO_2 Emissions by Replacing Limestone with Alternative Raw Materials GCCA



Guidelines: GCCA「GCCA Sustainability Guidelines for the monitoring and reporting of CO_2 emissions from cement manufacturing Ver. 0.1」

Reducing CO_2 Emissions during Transportation

GRI305-3

We contract the delivery of our raw materials and products to transportation companies and are striving to reduce CO_2 emissions as a specified consigner designated under the Japanese Energy Saving Act. Major efforts include implementing a plan to transport goods on return trips, encouraging drivers to eco-drive, and promoting energy efficient devices such as digital tachometers and eco-tires on vehicles. In shipping we continue to pursue energy efficiency technologies and operate new ships that are equipped with many energy-saving features. We are also supporting energy-saving operations for conventionally powered ships.

In FY2020 our CO_2 emissions decreased by about 3% compared to FY2019, mainly due to a 3% decrease in both the distance and tonnage transported.

CO_2 Emissions by Mode of Transportation (FY2020)

Non-consolidated

Mode of transportation	Tonnage transported (1,000t)	Average Distance Transported (km)	Transported Tonne × Kilometer (1,000t × km)	CO_2 Emissions (1,000t)
Ship	17,732	454	8,048,146	118
Truck	15,233	53	806,912	46
Railway	5,450	27	147,418	3
Total	38,415	234	9,002,476	167

Information Disclosure Based on the Recommendations of the TCFD (Scenario Analysis)

GRI102-11, 12, 103-2, 3, 201-2

In June 2019 we announced that we support the recommendations of the TCFD*.

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

*Task Force on Climate-related Financial Disclosures: Established in 2015 by the Financial Stability Board (FSB) to promote the disclosure of climate-related financial information. In 2017, for the appropriate investment decisions of investors, the TCFD published recommendations to promote disclosure of information on the financial impacts of climate-related risks and opportunities.

The Taiheiyo Cement Group has identified a response to climate change as a top priority. The Group's efforts are based on three scenarios for reducing CO_2 emissions: application, development and innovation to achieve the reduction target of cement-related CO_2 emissions that we state in our CSR Objectives for 2025 and long-term vision of greenhouse gas emissions reduction toward 2050.

In June 2019 we announced that we support the recommendations of the TCFD. Following its recommendations we conducted an evaluation and separate analyses, including scenario analysis, of the Group's climate-related risks and opportunities.

TCFD Content Index

Recommended disclosures	Our disclosure
Governance The organization's governance around climate-related risks and opportunities	● Corporate Governance (pages 45–46) ● Risk Management (pages 50–52) ● CSR Management Promotion System (page 56) ● Company-wide Environmental Management System (pages 60–61)
Strategy The actual and potential impacts of climate-related risks and opportunities for the organization's businesses, strategy and financial planning	● Top Commitment (pages 11–13) ● Recognition of Our Business Environment (Risks and Opportunities) (pages 16–17) ● Progress of the Medium-Term Management Plan and CSR Objectives (pages 20–21) ● Special Feature 1: Taiheiyo Cement Group Efforts to Mitigate Climate Change (pages 24–27) ● Business Activities (pages 30–41) ● Initiatives Based on the Recommendations of the TCFD (pages 64–65)
Risk Management How the organization identifies, assesses, and manages climate-related risks	● Risk Management (pages 50–52) ● CSR Management Promotion System (page 56) ● Company-wide Environmental Management System (pages 60–61) ● Initiatives Based on the Recommendations of the TCFD (pages 64–65)
Metrics and Targets Metrics and targets used to assess and manage relevant climate-related risks and opportunities	● Progress of the Medium-Term Management Plan and CSR Objectives (pages 16–17) ● Our Long-range Vision of Greenhouse Gas Emissions Reduction toward 2050 (pages 24–25) ● Mitigating Climate Change (pages 62–63) ● Environmental Accounting (page 73) ● GCCA Key Performance Indicators (page 92)

■ Setting Scenarios

We focused our scenarios, evaluation and analysis on the business risks and opportunities that climate change will pose to the Group by the year 2050. We sorted out events that will materially impact climate-related risks and opportunities, based on climate-related, long-term scenarios founded on science, such as the World Energy Outlook (WEO) and Energy Technology Perspectives (ETP) published by the IEA and The Fifth Assessment Report (AR5) published by the IPCC. Then we created two climate-related scenarios, 4°C and 2°C, that will have impact on the business operations of the Group. To follow up, we analyzed the business impacts in every scenario by size and time horizon (short, medium and long).

Process of Selecting Material Climate-related Risks and Opportunities and Scenarios

STEP 1 Conduct a benchmark survey on recognizing climate-related risks and opportunities for the cement sector and identify relevant drivers.

↓

STEP 2 Determine the causal relationships between climate-related drivers, interim outcomes and implications. Then identify key drivers.

↓

STEP 3 Create climate-related scenarios for each key driver, referring to the published climate-related long-term scenarios that were developed based on scientific grounds.

↓

STEP 4 Evaluate the anticipated business impacts in each scenario.

↓

STEP 5 Review responses to the business impacts, which are, in our view, positively or negatively significant to our evaluation.

Scenario Overview

Negative impacts ↓ Large ↓ Medium ↓ Small　Positive impacts ↑ Large ↑ Medium ↑ Small　Unknown —

Category	Drivers	4°C		2°C	
		Negative	Positive	Negative	Positive
Policies for mitigating climate change	● Carbon pricing (carbon taxes, emissions trading program)	↓		↓	
	● Reinforcement of regulations on CO_2 emissions	↓	↑	↓	↑
	● Reinforcement of recycling-related regulations ● Including the regulations on export/import of waste		↑		↑
Technologies	● Progress in the development of technology for CCUS (carbon capture, utilization and storage)		↑	↓	↑
	● Increased competition in developing new cement materials and low-carbon technologies ● Systemize design methods that incorporate CO_2 recovery by concrete	—	—	↓	—
Population, economy and geopolitics	● Growing population in emerging markets; urbanization and trend toward compact cities in Japan due to declining birthrate and aging population. ● Such as dissemination of EVs and autonomous driving	↓	—	↓	—
	● Declining utilization rate of coal-fired power stations		—	↓	
Society and Infrastructure	● Improved awareness of recycling				
Rise in average temperature and changes in rainfall pattern	Long term Rises in average atmospheric temperature and seawater temperature and sea level rise. ● A larger number of animals that transmit infectious diseases in wider areas ● More frequent urban heat island effects due to changes in urban conditions ● Reduction in national land due to sea level rise	↓	↑	↓	↑
	Short term More frequent heavy rains, drought, typhoons and flooding		↑		↑

Policies for Mitigating Climate Change

4°C

Renewable energy is more widely used in developed countries. For example, no new coal-fired power stations have been constructed in those nations. Coal-fired power generation, however, continues to grow globally. Priority is placed on economic activities while restrictions on greenhouse gas emissions stay lax and the cost of emitting greenhouse gases (carbon price) is set low. There is no significant change in cement manufacturing. The recycling of mineral resources, such as fly ash, slag and other by-products further increases at home and abroad.

2°C

Efforts to mitigate climate changes are taken toward realizing a decarbonized society; however, efforts are not sufficient. Greenhouse gas emissions slowly increase.
In terms of efforts toward zero greenhouse gas emissions, the operation of coal-fired power stations decline due to system reforms related to energy supply and demand. A shift takes place toward renewable energy and low-carbon energy such as LNG. Carbon taxes and emissions trading programs become popular.

Technologies, Society and Infrastructure

4°C

Global cement demand continues to grow due to growing populations, urbanization and the increased scale and frequency of natural disasters. In renewing cement manufacturing facilities, energy-saving equipment is introduced and capacity for the production of blended cement using less clinker is increased. Moderately low carbon taxes and market emissions prices discourage businesses from introducing CCUS (CO_2 capture, utilization and storage). The process-derived CO_2 emissions* per unit of cement output stay at the same level as the present.

2°C

Costs related to carbon emissions rise due to carbon pricing and the reinforcement of regulations on CO_2 emissions. The cement industry promotes research on low-CO_2 cement production and development of new technologies including those for saving energy while continuing investments to meet demand. The proportion of cement manufacturing facilities featuring CCS (CO_2 capture and storage) increases through the government's policy for promoting CCS. Thus process-derived CO_2 emissions* per unit of cement output drop.

Rise in Average Temperature and Changes in Rainfall Pattern

4°C

Greenhouse gas emissions continue to grow, which makes it difficult to mitigate climate change. Flood damage associated with overflowing rivers and storm surges increases due to the rise in global average temperature and sea level. Flooding occurs more frequently worldwide due to torrential rains and massive typhoons. While our manufacturing and supply systems must be reinforced, demand remains strong for cement and concrete to strengthen urban and national resilience.

2°C

Greenhouse gas emissions are limited to the level that their concentration meets the 2°C target. Physical impacts due to a 2°C rise in average temperature, however, cannot be avoided. Changes in rainfall patterns also continue. Consequently, the production and supply system for cement and concrete must be enhanced. In parallel with mitigation actions, adaptive measures are required for enhancing urban and national resilience as well as the resilience of islands and low-lying coastal areas.

*CO_2 emissions do not include those derived from energy sources since they are generated by the calcination of limestone.

Recycling Waste and Other Materials

GRI103-2, 3, 203-1, 413-1

Closely Related SDGs

Resource Recycling with Industries

■ Electric Power Utilities

We accept coal ash produced at coalfired power plants and use it as a substitute for clay as a raw material in cement. In addition, we operate ash centers* to use more ash effectively. We also supply the power plants with limestone powder which is used as a flue-gas desulfurization material to scrub the harmful sulfur oxide from the exhaust produced by the burning of coal. The reaction of the flue-gas desulfurization material with sulfur oxide forms gypsum, which we use effectively as a raw material for cement.

*Ash centers are distribution sites with collection/transportation (transshipment and storage) and intermediate-processing (powder mixing) functions. They receive coal ash from coal-fired power plants and ensure a stable supply to our cement plants, while enabling effective utilization of coal ash and supplying diverse products that meet user needs.

■ Steelmakers

In the iron and steelmaking process, impurities are removed from iron ore to make iron. We supply the limestone powder and quicklime used as purifying materials in the refining process. We also use by-products such as blast furnace slag and steel slag that remain after the refining process as raw materials for cement and mineral components.

■ Construction Soil

Conventionally this soil had been dumped into landfills. By making effective use of it as an alternative raw material for cement we contribute to the material recycling of construction soil as well as to the extension of the lifetime of landfills. We have also set up intermediary facilities that organically link sites where construction soil is produced to our nationwide plants.

Resource Recycling with Communities

Although most municipal waste is incinerated and the ash is buried in landfills, finding new landfill sites has become very difficult. Waste treatment has particularly become a source of concern for Japan's major city governments and the situation is expected to get worse. We have three systems for recycling municipal waste and strive to make effective use of such resources and resolve environmental issues.

● Incineration Residues Recycling System

A system for recycling municipal waste incineration ash (bottom ash and fly ash) as a raw material for ordinary Portland cement.

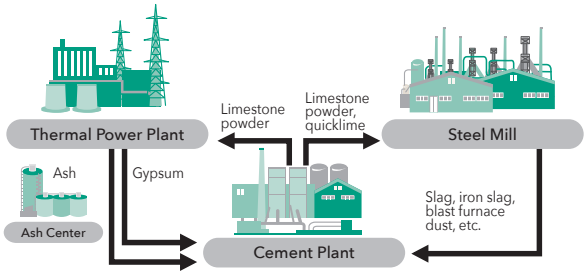
● AK System

A system for recycling household waste and general business waste as alternative raw materials and fuels for cement manufacture. The waste is pre-processed through biological breakdown (fermentation) using a waste recycling kiln.

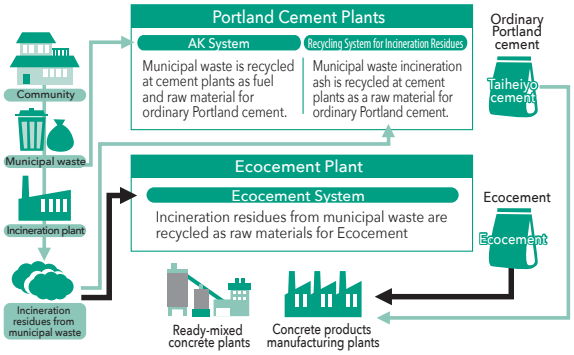
● Ecocement System

Ecocement is a new type of cement made primarily from the municipal waste incineration ash. More than 500 kg of ash and other waste materials are used per tonne of Ecocement.

Mineral Resource Cycle with Electric Power Utilities and Steelmakers



Municipal Waste Recycling Systems for Cement Production



Performance of Recycled-Waste-to-Cement System GRI301-1, 2

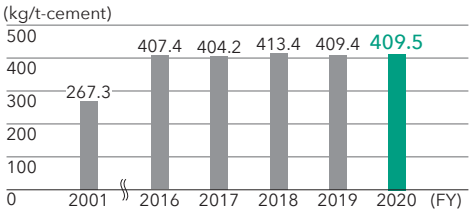
All of our directly operated cement plants in Japan recycle waste and by-products into alternative raw materials and fuels for cement. This helps to extend the lifetime of landfills, prevent the depletion of natural mineral resources, limit greenhouse gas emissions and reduce emissions of pollutants into the atmosphere.

In FY2020 we recycled 6.387 million tonnes of waste and by-products, a decrease of approximately 178,000 tonnes compared to the amount in FY2019 This was due to a decrease in the amounts of blast furnace slag, by-product gypsum, unburned ash, soot and dust we accepted, which offset the increased volumes of coal ash, waste plastic, waste oil, water treatment plant sewage sludge and ash. This means we recycled 409.5 kg of waste and by-products per tonne of cement produced.

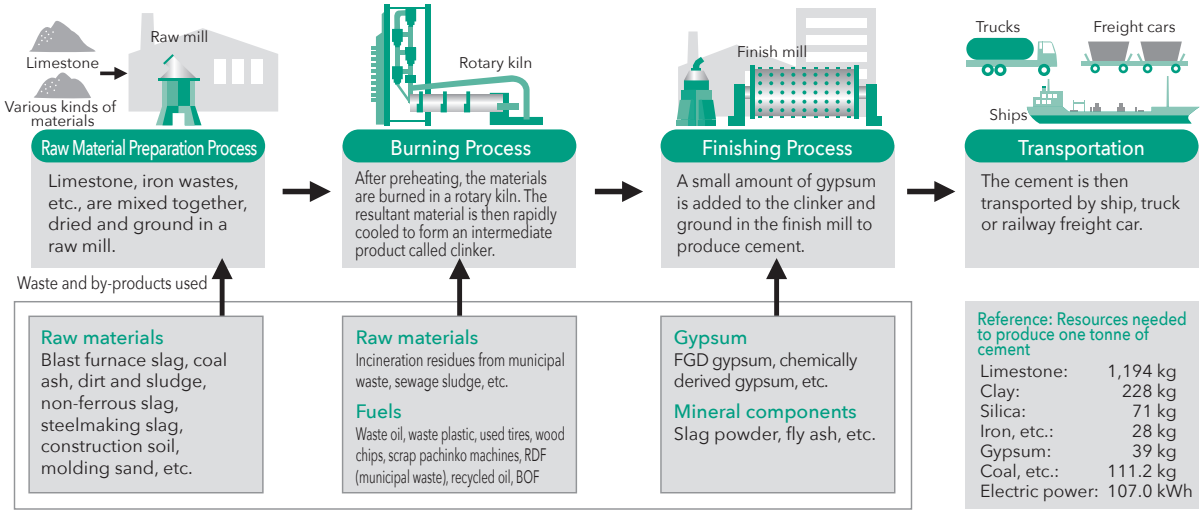
In addition, all of the group's cement plants in Japan accept waste and by-products for recycling.

Trends in Use of Waste and By-products per Unit Production

Non-consolidated



Waste and By-products Used in the Cement Manufacturing Process



Reference: Resources needed to produce one tonne of cement

Limestone:	1,194 kg
Clay:	228 kg
Silica:	71 kg
Iron, etc.:	28 kg
Gypsum:	39 kg
Coal, etc.:	111.2 kg
Electric power:	107.0 kWh

Waste and By-products Used in Cement Plants (FY2020)

Non-consolidated

Waste and By-products		Total Amount (t)	Rate (kg/t-cement)
Industrial	Coal ash (including JIS fly ash)	1,988,807	127.5
	Blast furnace slag	1,145,277	73.4
	By-product gypsum	509,220	32.6
	Unburned ash, soot emissions, dust	503,350	32.3
	Dirt and sludge	383,618	24.6
	Construction soil	228,442	14.6
	Waste plastic	180,889	11.6
	Waste oil	155,430	10.0
	Wood chips	73,721	4.7
	Other	666,704	42.7
	Subtotal	5,835,458	374.1
Household	Water treatment plant sewage sludge and ash	380,938	24.4
	Municipal waste incineration residues	142,134	9.1
	Municipal waste, etc.	28,468	1.8
	Subtotal	551,539	35.4
Total		6,386,997	409.5
	Raw material-related	5,808,924	372.4
	Fuel-related	578,073	37.1

Conserving Biodiversity GRI103-2, 3

Closely Related SDGs

Environmental Impact of Our Operations

GRI304-1, 2, MM1, MM2

■ Environmental Impact of Our Operations

Cement production starts with quarrying limestone, the primary raw material for cement. We also quarry other raw materials such as aggregates and other minerals.

Since quarrying requires the removal of topsoil, quarry development has an impact on the biodiversity of the development area. However, the limestone, rocks and sand we quarry only require crushing for particle size adjustment and sorting, and do not require any refining processes. Consequently, our operations are unlikely to cause chemical contamination to surrounding areas. In addition, we minimize the amount of waste stones generated during our limestone quarrying by using them as construction materials.

■ Limestone Quarries of the Group

The group operates 19 major limestone quarries around the world, most of which are near our integrated cement plants. The total site area* of the quarries is 4,327 ha (Japan: 2,409 ha; U.S.A.: 1,281 ha; other regions: 637 ha).

*The area where we conduct quarrying operations as measured by our in-house standard.

Limestone Quarries of the Group

Region	Number of sites	Site area (ha)	Require consideration* (number of quarries)
Japan	11	2,409	1
U.S.A.	3	1,281	0
Other regions	5	637	0

*Require consideration refers to quarries that fall under category IV or higher in terms of the IUCN's Protected Area.

Using the Integrated Biodiversity Assessment Tool (IBAT) provided by BirdLife International, we checked whether any of our limestone quarries are in any of the protected areas defined by the International Union for Conservation of Nature (IUCN). We found that none of our quarries are within or adjacent to Protected Area Category III or lower categories. However, In Japan, one quarry is within a Category IV area and two are adjacent to Category IV areas.

All these quarries have obtained the necessary licenses and conduct environmentally friendly quarrying operations. They have no pending litigations concerning biodiversity or other environmental issues.

Outline of Protected Area Categories of the IUCN

IUCN Categories	Outline
I a: Strict Nature Reserve	Areas that have outstanding or representative ecosystems or have geographical or physiological features or species.
I b: Wilderness Area	Large unmodified or slightly modified areas.
II: National Park	Areas set aside to protect the environmental integrity of the ecosystem.
III: Natural Monument or Feature	Areas that have outstanding features of nature or cultural values.
IV: Habitat/Species Management Area	Areas that require active interventions to maintain habitats or address the requirements of particular species.

Activities to Reduce Environmental Impact

GRI103-2, 3, 304-1, 2, 3, 4, MM1

Throughout the group we believe that balancing the conservation of ecosystems in communities and development of the communities themselves is important in quarry operations. With this belief, we hold discussions with local governments, communities and academics while operating quarries. This helps to ensure we not only prevent pollution but also conserve biodiversity and water resources while minimizing our environmental impact.

■ Environmental Impact Assessment

In developing quarries we conduct ex-ante assessments of environmental impact of the development of quarries based on environmental research of the development area such as on biodiversity and water resources. We then discuss the results of the research with local governments, communities, academics, and other stakeholders toward finalizing a development plan. Moreover, we regularly monitor the surrounding environment during the development and operations of quarries and report to our stakeholders on the environmental impact that the quarries have in these areas.

For instance, in the new development of a quarry in the Ofunato Quarry, Iwate Prefecture, we conducted environmental assessment for approximately ten years. We focused on

Raptors survey

preserving rare wildlife species in cooperation with external experts and local residents. Furthermore, we minimized noise and vibration during the development work and also limited the traffic hours for trucks used in construction work. In addition, even after development work begins, we carry out regular ex-post assessments and environmental protection measures.

■ Biodiversity Protection

When environmental impact assessments determine that protection is required, we protect rare species through the installation of protective measures, transplanting and restricting development work.

Since 1972, at the Minowa Quarry of Chichibu Taiheiyo Cement Corporation, we have been protecting and nurturing rare species of native plants on Mt. Buko, which is on the border of Chichibu City and Yokoze Town in Saitama Prefecture. We created a botanical garden at the quarry and, together with local experts and other people, we preserve 68 native plant species there while increasing the plant population. Additionally, our Central Research Laboratory continues to research and develop ways to preserve and grow endangered plants, and to verify genetic diversity of native plant species using biotechnology. Since 2016, in the course of developing the Ofunato Quarry, we have been working with experts to preserve and cultivate various rare plant species in their native biospheres by creating a botanical garden on the side of the office of Ryushin Mining Co., Ltd.

Botanical garden

Rare plant

■ Greening Quarries

In working quarry areas, rocks and soil are exposed leaving no flora coverage. However, we continuously restore greenery to the quarry slopes on terraces formed during the quarrying process as early as possible, particularly if no quarrying work is expected for some time. We also plant vegetation in stockyards for excavated topsoil where no construction work is expected. At some quarries, at the request of the community, we restore greenery if operations have been suspended for several months.

We usually plant vegetation that is native to the region. Group greening of quarries in Japan in FY2020 involved a 20,630 m² area where seeds were sprayed and 1,726 tree seedlings planted.

Other efforts include participating in an annual tree planting campaign with contractors and local residents to improve awareness of quarry development and greening activities.

Greening quarry slopes

■ Water Resource Conservation

In quarrying we also pay close attention to protecting not only terrestrial plants but also water resources such as rivers and natural springs in an effort to protect biodiversity. From the perspective of conserving water resources, spring water discharged from quarrying and rainwater is directed into retention basins to minimize impact outside of the quarrying area. In some quarries we drill wells for domestic water and supply this water to local communities for everyday use.

■ Use of Old Quarry Sites

We reuse old quarry sites where operations have completely ended after consultation with the local community. When greening a site we strive to restore the original natural environment.

Reducing Environmental Impact GRI103-2, 3

Closely Related SDGs

Preventing Environmental Pollution

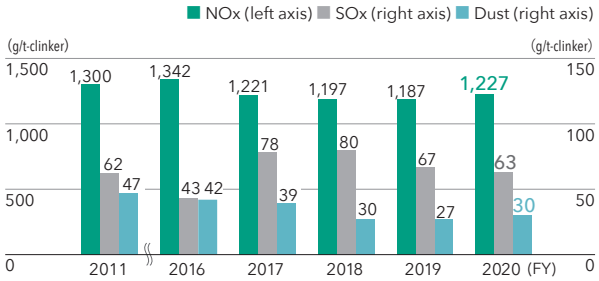
GRI305-7

■ Air Pollution

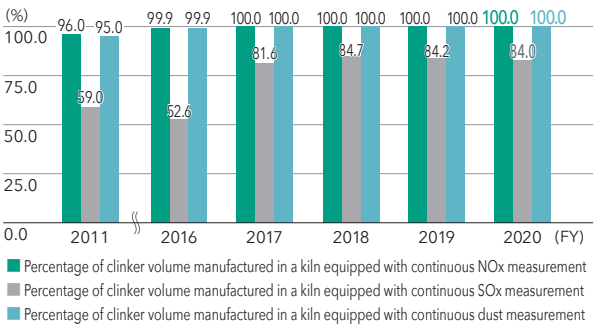
Air pollutants generated from cement production are primarily NOx, SOx and dust in combustion gases emitted from cement kilns. To ensure the proper management of these substances we remain committed to reducing air pollutant emissions through measures such as continuously monitoring emission concentrations, improving NOx reduction systems and installing bag filter equipment to capture dust emissions. With such measures we focus on controlling the emission of air pollutants with the goal of maintaining FY2011 emission levels.

Emissions of NOx and dust in FY2020 were lower than in FY2011, whereas emissions of SOx were higher than in FY2011 (base year) because we accepted waste with high sulfur content. Nonetheless, the level of SOx emissions was very low compared to the limit set under the Air Pollution Control Act.

Specific Emissions per Tonne of Clinker for Selected Pollutants GCCA



Monitoring Rate GCCA

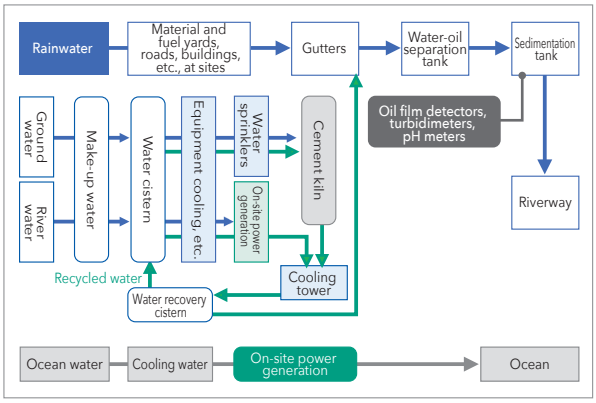


Guidelines: "GCCA Sustainability Guidelines for the monitoring and reporting of emissions from cement manufacturing Ver. 0.1"

■ Water Contamination

Most of the water discharged from our plants to public waterways is cooling water and not polluted as defined in the Water Pollution Control Act. At our cement plants all water resources are reused as circulation water to minimize the impact of water discharge into public waterways. Also, we are working to prevent the leakage of potential pollutants by installing bunds around our oil tanks and acid/alkali tanks. Moreover, we are installing sedimentation tanks, water-oil separation tanks, oil film detectors, pH meters and suspended solid sensors on water discharge routes that connect to public waterways.

Example of Water Circulation Flow at a Cement Plant



■ Soil Contamination

In FY2001 Taiheiyo Cement evaluated the risks associated with cement plants that may be sited on contaminated ground by appointing an expert consultant to undertake a soil history survey. We are continuing to conduct drilling surveys, starting with the higher-risk locations, to verify whether or not the soil is contaminated. Actions have been taken as necessary based on the findings.

We are also working to eliminate the possibility of soil contamination by preventing the leakage of wastewater from scrapyards and fluid from oil tanks, acid/alkali tanks, pipes and so forth.

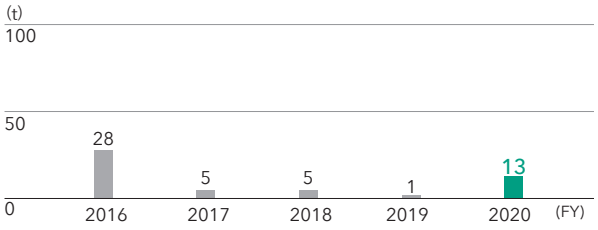
Reducing Waste

GRI306-2

■ Initiatives at Plants and Quarries

Our cement plants and quarries reduce the amount of waste handled by disposal contractors by reusing waste from operations as material for cement production. We also endeavor to reduce the volume of waste to landfill through recycling made possible using chromium-free kiln bricks.

Volume of Waste to Landfill

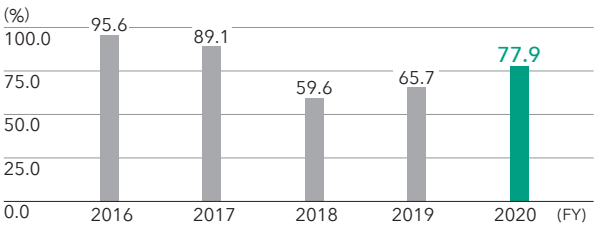


■ Initiatives at Service Stations

Service stations reduce the waste handled by waste disposal contractors by returning any residual cement that remains in silos after switching the cement products. Returned cement is recycled and used as raw material.

In FY2020 the recycling rate was 77.9%, up 12.2% from the previous fiscal year.

Recycling Rate of Residual Cement Non-consolidated



■ Initiatives at Offices

Our special purpose subsidiary, Taiheiyo Service Corporation, installed a paper recycling machine to recycle the company's used copy paper, and in FY2020 we recycled approximately 410,000 sheets of A4 size paper.

Appropriate Management of Chemical Substances

GRI306-2

■ Pollutant Release and Transfer Register (PRTR)

The PRTR Law requires that we report on equipment installed at our Kumagaya plant for the washing of municipal waste incineration ash. This washing process uses water, and our total discharge of dioxins and ferric chloride into public waterways are as follows.

Reported Levels of Dioxins and Ferric Chloride Emissions

Non-consolidated

Emissions	Reported Levels		
	FY2018	FY2019	FY2020
Dioxins (mg-TEQ)	0.0	0.0	0.0
Ferric chloride (kg)	170	170	152

■ Management of PCB Waste

We properly store and dispose of high and low concentrations of PCB waste in accordance with the "Amendment to the Law concerning Special Measures for Promotion of Proper Treatment of PCB Wastes" (revised in 2016).

For high-concentration PCB waste with an early disposal deadline as stipulated by law, we signed a processing contract with the Japan Environmental Safety Corporation (JESCO) in 2006 and have prioritized processing.

In FY2020 capacitors stored in the Saitama plant and our Chubu Hokuriku branch, as well as pollutants such as electrical ballasts stored in the Oita, Fujiwara, Kumagaya and former Chichibu plants, were processed.

In FY2021 pollutants such as electrical ballasts stored in the Fujiwara plant and the former Kawara, Tosa and Osaka plants as well as the Chichibu quarry and a packaging site are scheduled for processing.

Status of High-concentration PCB Waste Disposal Non-consolidated

(Number of machines)

Waste	Stored in FY2019 (as of March 31, 2019)	New Target for FY2020	Processed in FY2020	Stored in FY2020 (as of March 31, 2020)	Planned Processing for FY2021
Capacitors	1	4	5	0	0
Transformers	0	0	0	0	0
Electrical ballasts	2,707	1,487	2,444	1,750	1,117
Total	2,708	1,491	2,449	1,750	1,117

Appropriate Use of Water Resources GRI103-2, 3

Closely Related SDGs

Water Risk Analysis

GRI303-1

According to the results of the water risk analysis conducted using the Water Risk Filter*, the average score for the total basin risk for all our plants (weighted average taking into account the cementitious production volume) was 2.8 (the maximum score is 5.0, with a higher score indicating a greater risk). The highest total basin risk score was 3.5, higher than that of the previous year. The volume of cement produced at the plant with the highest score accounted for about 15% of the production volume of all the plants. However, when we analyzed conditions at that plant, no imminent issues were identified.

*This is a water risk mapping tool developed by the World Wide Fund for Nature and used to evaluate impacts on businesses related to water scarcity, flooding, drought, seasonal variation, physical water quality risks, regulatory risks, etc.

Status of Water Consumption

GRI303-1, 2, 3, 4, 306-1

Most of the water used at our cement plants is for the cooling of production equipment, exhaust gas and in-house power generators. Therefore, the water discharged from the plants is mostly cooling water, which is not polluted as defined in the Water Pollution Control Act. Our plants near the ocean use seawater to cool in-house power generation equipment. We circulate and reuse all freshwater at these facilities (except for household wastewater) in order to reduce water withdrawal and prevent water pollution by the discharged water.

The total withdrawal of freshwater for FY2020 was about 27.61 million m^3 and the total seawater withdrawal for the same year was about 147 million m^3. The seawater was used to cool in-house power generation equipment at our plants near the ocean and then released back into the sea after use. The amount of freshwater discharged was approximately 13.67 million m^3, meaning that about 13.93 million m^3 of freshwater was used at the plants. However, it is not used as a raw material input but for the cooling of equipment so is consequently released into the atmosphere through evaporation.

In FY2020 we withdrew 0.817 m^3 of freshwater (withdrawal per unit of production) to produce 1 tonne of cement. Moreover, there was little change in our water consumption efficiency.

Status of Water Consumed GCCA

(Unit: 1,000 m^3)

		FY2016	FY2017	FY2018	FY2019	FY2020
	Surface water	13,717	7,505	8,130	6,521	5,626
	Ground water	18,329	16,232	16,370	16,884	18,656
	Industrial water	3,037	2,983	3,095	3,251	3,325
	Other	0	0	0	0	0
Total freshwater withdrawal (I)		35,083	26,719	27,596	26,656	27,607
Total seawater withdrawal		148,836	146,097	149,056	149,776	147,372
Total withdrawal		183,918	172,816	176,652	176,432	174,979
Total freshwater discharge (O)		13,871	12,964	12,294	12,167	13,674
Total seawater discharge (O)		148,836	146,097	149,056	149,781	147,377
Total discharge		162,707	159,061	161,350	161,948	161,051
Total freshwater used (I-O)		21,212	13,755	15,302	14,489	13,933

Guidelines: "GCCA Sustainability Guidelines for the monitoring and reporting of water in cement manufacturing Ver. 0.1"

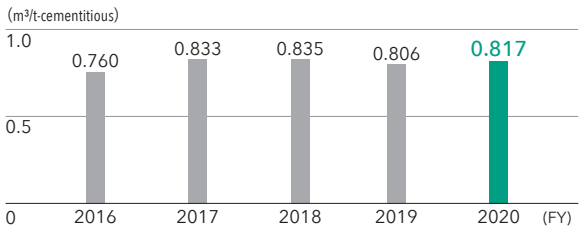
Appropriate Use of Water Resources

GRI203-1, 303-1, 2, 3, 4, 5, 306-1, 413-1

At present there are no foreseeable specific concerns regarding water resources that may be raised by local communities. We therefore remain focused on reducing the amount of water withdrawal from the perspective of improving production efficiency. Also, we will continue to contribute to promoting the appropriate use of water resources for local communities by maintaining close communication with them.

As for Taiheiyo Cement Philippines, it supplies clean water to local communities in the Philippines from a well drilled by the company.

Fresh Water Withdrawal per Unit of Production GCCA



Environmental Accounting GRI103-2, 3

Closely Related SDGs

Environmental Conservation Costs Non-consolidated GRI201-2

(Unit: million yen)

Category		Main Activities	Investment			Cost		
			FY2018	FY2019	FY2020	FY2018	FY2019	FY2020
Business area costs			1,490	2,161	3,624	15,783	10,632	10,834
Details	Pollution prevention	Water pollution prevention	673	1,537	2,128	7,932	3,996	3,927
	Global environmental conservation	Waste pretreatment facilities	779	381	1,352	7,314	6,197	6,427
	Resource recycling	Waste treatment	38	243	144	537	439	481
Upstream and downstream costs		Recycling waste and by-products as alternative raw materials and fuels for cement	1,313	3,933	3,020	4,933	4,955	5,741
Administrative costs		Implementation of the environmental management system	31	65	113	173	141	149
R&D costs		Innovations to the cement production process	256	556	539	774	812	770
Social activity costs		Plant tours	0	2	0	19	28	33
Environmental remediation costs		Emission levies	169	0	97	53	87	109
Total			3,259	6,717	7,393	21,735	16,655	17,636

(Unit: million yen)

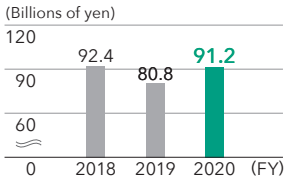
	FY2018	FY2019	FY2020
Total investment	14,526	20,020	20,975
Total R&D expenditure	1,192	1,195	1,154

External Economic Benefits Derived from the Recycled-Waste-to-Cement System

Taiheiyo Cement uses the external economic benefit (EEB) evaluation method to express, in monetary terms, its evaluation of socioeconomic benefits from environmental impact reduction due to the increase in recycling of wastes accepted from outside the company. As a type of deemed benefit, an EEB of 91.2 billion yen was identified for FY2020, representing a 13% increase on the previous year as a result of an increase in the total amount of waste and by-products used.

External Economic Benefits (FY2020) Non-consolidated GRI201-1

Impact	Inventory	Reduction (t)	Inventory Market Price (Yen/t)	Economic Benefit (Billions of Yen)
Climate change mitigation	CO_2	1,838,421	818	1.5
Depletion of energy resources	Crude oil	112,098	18,400	2.1
Depletion of mining resources	Natural resources	4,805,295	1,000	4.8
Shortage of landfills	Waste	5,517,698	15,000	82.8
Total				91.2



About Taiheiyo Cement's External Economic Benefit Evaluation

- Taiheiyo has developed a unique evaluation method to estimate the contribution to overall environmental benefit to society by utilizing waste materials from other industries.
- We use information, including data collected for the GCCA Cement CO_2 Protocol, to calculate the reduction in consumption of fossil energy and natural resources associated with the use of waste and by-products.
- EEBs are calculated by multiplying the reduced volumes of CO_2, crude oil, natural resources and waste (resulting from the utilization of waste and by-products in the cement production process compared to cement production without using waste and by-products) by market prices for each of the four items. The prices, assumed to be kept constant at year 2000 levels, are estimated as follows: CO_2: 3,000 yen/t (a hypothetical CO_2 emission tax rate); crude oil: import price; natural resources: estimated price; waste: controlled landfill cost in the Tokyo area.
- A portion of the EEB, such as the waste treatment fee, is accounted for in Taiheiyo's profit and loss statement.

Environmental Accounting for One of Our Projects

Introduction of a Highly Efficient Clinker Cooler for the No. 5 Kiln at the Oita Plant GRI201-2

A clinker cooler uses air to cool clinker, an intermediate product of cement that is burned at a high temperature of 1,450°C in a rotary kiln. The hot air generated by heat exchange during the cooling process is effectively used as combustion air for the rotary kiln.

The clinker cooler introduced for the No. 5 kiln at the Oita plant in FY2020 is a new type of cooler that only requires a small amount of air and is significantly more efficient in heat recovery than conventional units. Requiring less heat energy for clinker burning, the new cooler will further reduce CO_2 emissions and environmental impact.

Investment: Approximately 740 million yen

Reduction in CO_2 emissions: 12,313 tonnes/year

No. 5 kiln at the Oita plant

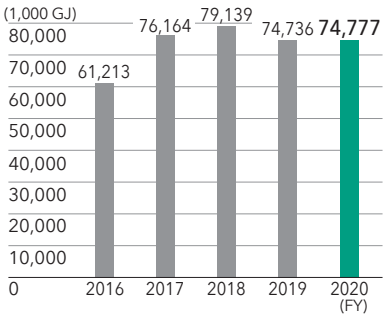
Material Balance of Business Activities

GRI102-6, 7, 45, 301-1, 2, 302-1, 305-1, 2, 7, 306-1, 2

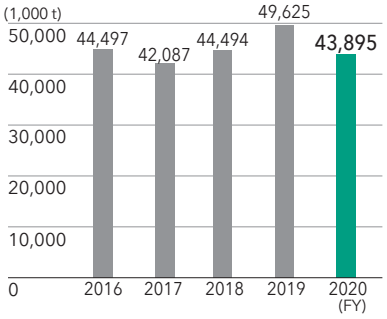
INPUT

Energy		Raw Materials			Other Materials		Water	
Coal (t)	2,192,325	Natural Resources	Limestone (t)	36,550,209	Additives, etc. (t)	8,823	Water total (1,000 m³)	167,314
Petroleum coke (t)	275,462		Silica (t)	1,707,189	Explosives (t)	3,996	Tap water (1,000 m³)	1,836
Heavy oil (kl)	20,011		Gypsum (t)	119,361	Refractory material (t)	14,671	Industrial water (1,000 m³)	3,316
Diesel oil (kl)	20,753	Wastes/By-products	Iron wastes (t)	226,404	Grinding media/ Steel casing (t)	3,174	River water (1,000 m³)	5,123
Kerosene, other (kl)	10,373		By-product gypsum (t)	461,690			Ground water (1,000 m³)	11,125
Recycled fuels (t)	679,702		Coal ash (t)	2,090,550	Lubricants/ Chemicals (kl)	6,259	Rainwater (1,000 m³)	354
Purchased electricity (MWh)	591,471		Blast furnace slag (t)	837,738			Seawater (1,000 m³)	145,561
			Other (t)	1,831,071	Other (t)	33,938		

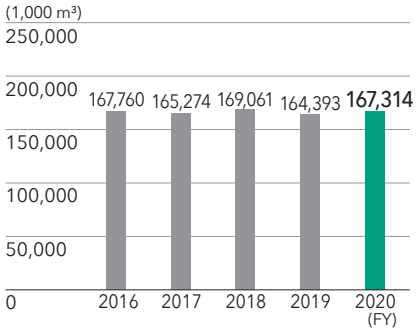
Total Energy Input

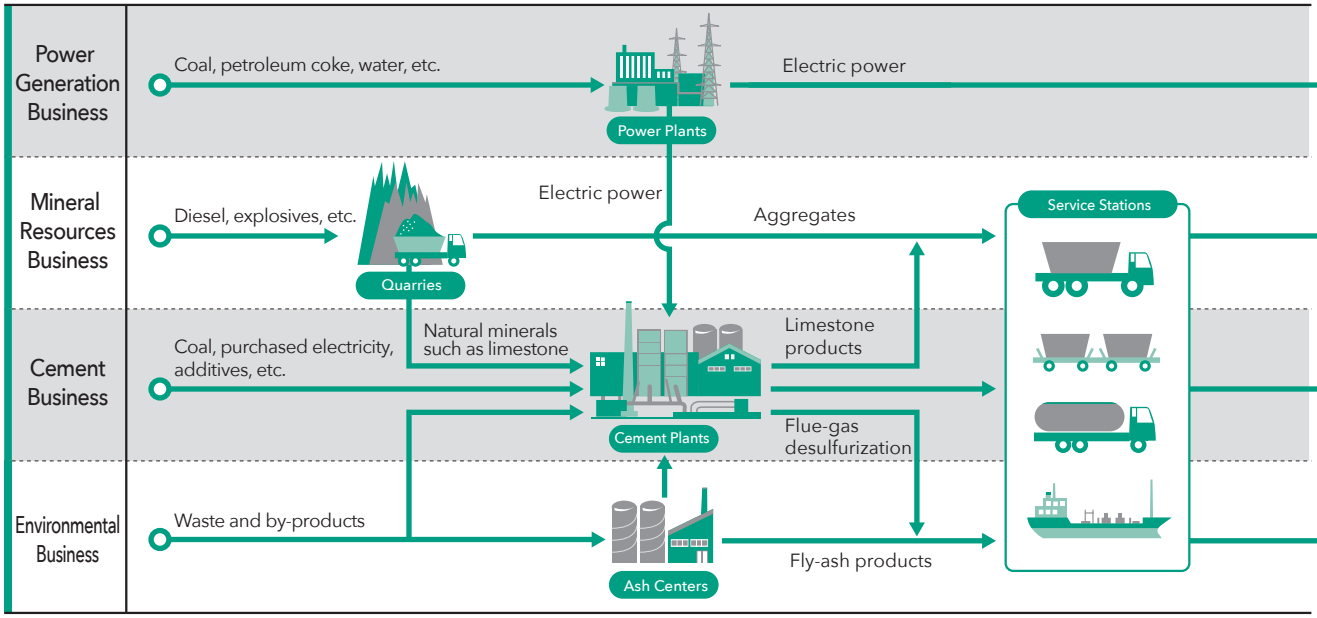


Total Material Input



Water Withdrawal





● Scope of reporting organizations

The scope of reporting organizations includes our four business segments (cement, mineral resources, environment and power generation) at our (non-consolidated) quarries and plants and the following quarries of our subsidiaries that supply material to us (9 quarries of 8 companies) and power plants of our affiliated companies (2 plants).

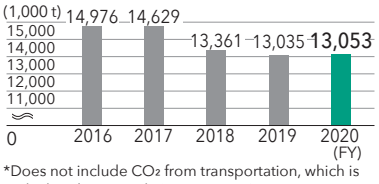
Ofunato Quarry (Iwate Prefecture)
Buko Quarry (Saitama Prefecture)
Mido Quarry (Saitama Prefecture)
Fujiwara Quarry (Mie Prefecture)
Shin-Tsukumi Quarry (Oita Prefecture)
Toumi Quarry (Niigata Prefecture)
Ryushin Mining Co., Ltd.
Buko Mining Co., Ltd.
Chichibu Mining Co., Ltd.
Ishizaki Co., Ltd.
Oita Taiheiyo Mining Corporation
Myojo Cement Co., Ltd.
Miwa Quarry (Saitama Prefecture)
Kanouyama Quarry (Gunma Prefecture)
Tosayama Quarry (Kochi Prefecture)
Tosa Power Plant (Kochi Prefecture)
Itoigawa Power Plant (Niigata Prefecture)
Chichibu Taiheiyo Cement Corporation
Chichibu Taiheiyo Cement Corporation
Tosayama Taiheiyo Mining Corporation
Tosa Power Inc.
Itoigawa Power Inc.

OUTPUT

CO_2 Emissions

CO_2* (1,000 t)	13,053
From purchased electricity (1,000 t)	205

CO_2 Emissions

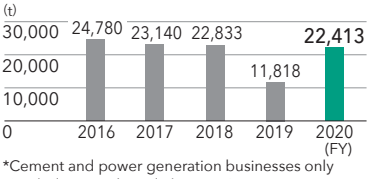


*Does not include CO_2 from transportation, which is calculated separately (see page 63)

NOx Emissions

NOx* (t)	22,413

NOx Emissions

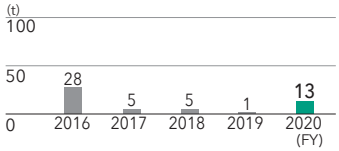


*Cement and power generation businesses only (excluding purchased electricity)

Waste Emissions

Waste externally consigned for treatment (t)	3,021
Amounts to landfill (t)	13
Valuables such as scrap metals (t)	3,807

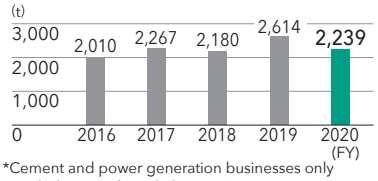
Amounts to Landfill



SOx Emissions

SOx* (t)	2,239

SOx Emissions

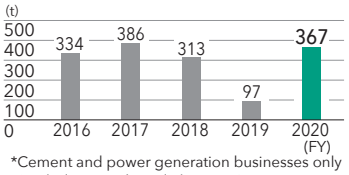


*Cement and power generation businesses only (excluding purchased electricity)

Dust Emissions

Dust* (t)	367

Dust Emissions

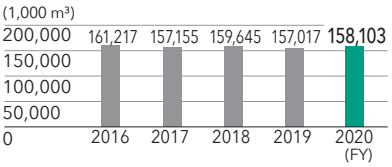


*Cement and power generation businesses only (excluding purchased electricity)

Water Discharge

Total water discharge (1,000 m³)	158,103
Seawater (1,000 m³)	145,561
Fresh water (1,000 m³)	12,274
Household waste water (1,000 m³)	267

Water Discharge



Dioxin Emissions

Dioxins* (g-TEQ/year)	0.15

*Cement and power generation businesses only (excluding purchased electricity)

	FY2018	FY2019	FY2020
Number of kilns covered by the study	12	12	12
Average exhaust gas concentration (ng-TEQ/m³N[O_2=12%])	0.005	0.005	0.004
Total emissions (g-TEQ/year)	0.17	0.23	0.15

Products by Business

Power Generation	Electric power (sales of electricity) (MWh)	1,903,870
Mineral Resources	Aggregates (t)	8,413,475
	Limestone products (t)	4,988,852
	Other (t)	336,086
Cement	Portland cement (t)	12,852,306
	Blended cement (t)	2,139,201
	Cement based soil stabilizers (t)	581,192
	Clinker (for export) (t)	1,890,704
Environment	Flue-gas desulfurization (t)	122,718
	Fly-ash products (t)	216,204