

Realization of a Sustainable and Environmentally Friendly Society

Based on the “Environmental Policy” we work to reduce various environmental risks and impact and create a sustainable social infrastructure.

Promoting Environmental Management

Under the group philosophy “To Create a Vibrant Environment for All Members of Society,” Taisei Corporation, through its construction activities, strives for development of high-quality social infrastructure and improvement of the living environment in harmony with nature.

Moreover, considering the realization of a sustainable society to be the origin of environmental management, Taisei Corporation and its Group companies actively strive for an “environmentally friendly society,” while setting medium- to long-term targets and single-year targets in line with the Environmental Policy and pursuing environmentally friendly activities to achieve those targets.

Single-year environmental targets are set each year on a company-wide scale, based on our medium- to long-term targets.

Specifically, Taisei Corporation operates an environmental management system (EMS) in compliance with ISO14001:2015, and identifies risks and opportunities related to environmental problems taking into account compliance with environmental laws and regulations, various issues in the construction business and social demands and expectations related to climate change and other issues. We pursue environmental activities while implementing a PDCA (plan-do-check-act) cycle with a view to achieving our planned environmental targets.



* TGT 2050 ... TAISEI Green Target 2050

TAISEI Green Target 2050

Taisei Corporation revised its medium- to long-term targets in 2018 in light of the most recent developments such as the effectuation of the Paris Agreement and the adoption of the SDGs, which are attracting keen interest worldwide. Based on our Environmental Policy, we aim to realize a sustainable environmentally friendly society, which is one of the Taisei Group’s material issues (materiality).

TAISEI Green Target 2050

Environmental Targets of Taisei Corporation by 2050

<div style="text-align: center;"> <p>Low Carbon Society</p> </div> <ul style="list-style-type: none"> To realize a society with no climate change risk <div style="text-align: center; background-color: #e0e0e0; padding: 5px;"> <p>CO₂ emissions* Aim for</p> <h2 style="margin: 0;">-80%</h2> </div> <div style="background-color: #d0d0d0; padding: 5px; margin-top: 5px;"> <p>2030 Targets</p> <p>CO₂ emissions at construction stage -62% Predicted CO₂ emissions at operation stage -55%</p> </div>	<div style="text-align: center;"> <p>Recycling Oriented Society</p> </div> <ul style="list-style-type: none"> To realize a sustainable, resource recycling society <div style="text-align: center; background-color: #fff9c4; padding: 5px;"> <p>Aim for final disposal rate of construction waste of</p> <h2 style="margin: 0;">0%</h2> </div>	<div style="text-align: center;"> <p>Nature Co-existing Society</p> </div> <ul style="list-style-type: none"> To create a society where people co-exist with nature <div style="text-align: center; background-color: #e0f2f1; padding: 5px;"> <p>Minimizing impact on natural capital</p> </div>	<div style="text-align: center;"> <p>A Society Where Safety is Ensured</p> </div> <ul style="list-style-type: none"> To realize a society where safety is ensured <div style="text-align: center; background-color: #ffe0b2; padding: 5px;"> <p>Aim to provide value with zero environmental risk</p> </div>
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* Total CO₂ emissions at construction stage and predicted CO₂ emissions at operation stage
 • All CO₂ reduction rates are comparisons with FY1990.

Fiscal Year Environmental Targets and Results

Taisei Corporation's Fiscal Year environmental targets are set based on the Environmental Policy and on medium- to long-term targets. Aiming to realize an environmentally friendly society, we have set out methods for implementing company-wide measures in four areas and numerical targets thereof in FY2018.

We have published the "Guide for Achieving Targets," which explains in an easy-to-understand manner how to calculate the amount of CO₂ emissions, and provides examples of specific initiatives, their effects and how they relate to achieving those targets. The guide is used to understanding and environmental awareness of employees at all business sites that set out those targets.



"Guide for Achieving Targets"

FY2017 Results Against Environmental Targets and FY2018 Targets

Environmentally Conscious Society	Implementation Measures	Management Indicators	FY2017		FY2018 targets
			Targets	Results	
Low Carbon Society 	Reduction of CO ₂ emissions	At construction stage ^{*1} CO ₂ emissions per construction cost (intensity) KPI	-18%	-28.4%	-25%
		At construction stage ^{*1} Total CO ₂ emissions KPI	-47% or more	-48.4%	-51%
		At building operation stage ^{*1} Predicted CO ₂ emissions of design-build projects KPI	-37% or more	-48.1%	-38%
		Back-office departments ^{*2} Energy consumption (Intensity) KPI	-17% or more	-20.5%	-18%
Recycling Society 	Promotion of building designs that consider resource recycling	At building design stage Number of green (environmentally conscious) procurement items	9 per project or more	9.5 per project	10 per project or more
	Promotion of recycling construction waste	Final disposal rate KPI	4.0% or less	3.2%	3.7% or less
Society Coexisting with Nature 	Implementation of proposals that consider biodiversity	Number of proposals * KPI	30 or more	52	30 or more
	Implementation of biodiversity conservation activities at construction stage	Number of implemented projects	—	—	20 or more
Safety Secured Society 	Proper management of construction waste, construction waste water, polluted soil, harmful and / or chemical substances and radioactive materials	Zero environmental accidents (Implementation of management procedure based on "Operation Manual for Priority Environmental Issues") KPI		0	0

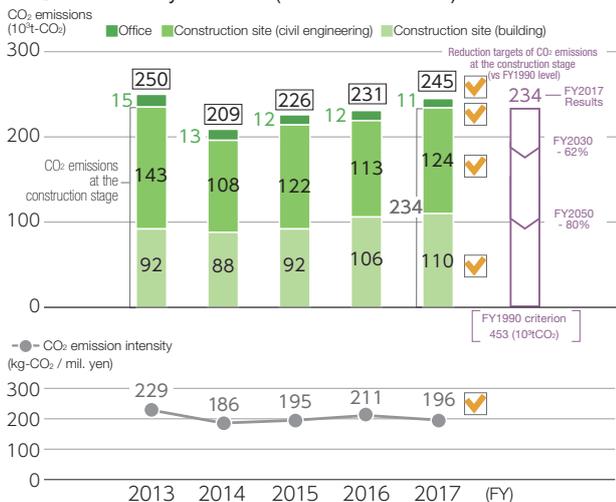
*1 Target base year : FY1990.

*2 Target base year : FY2010.

● KPI Key Performance Indicator

Realization of a Sustainable and Environmentally Friendly Society : Low Carbon Society

CO₂ Emissions by Business (Non-Consolidated)



Prediction of CO₂ emissions in the building operation stage and reduction percentage (Non-consolidated)



CO₂ emissions by scope (Non-consolidated)

(10 ⁴ t-CO ₂)	Scope3 (upstream)	Scope1+2	Scope3 (downstream)
GHG protocol criteria*1	Category 1 – 8 2,100	207	Category 11 and 12 4,300

Taisei Corporation calculates Scope 3 emissions for ten categories related to its business.

By promoting energy saving and Zero Energy in buildings that we design, we improve the reduction rates of predicted CO₂ emissions at the stage of building operations. This helps reduce the CO₂ emissions in Category 11 (use of products sold) in Scope 3 based on the GHG protocol criteria.

Reducing Environmental Impact at Construction Sites

Taisei Corporation has been implementing “CO₂ Zero Action,” an initiative to reduce environmental impact in the construction stage, at all construction sites in Japan and at some construction sites overseas in cooperation with many companies in the supply chain. Specifically, seven items including energy saving, rainwater use, and fuel-economical driving for heavy machinery and vehicles have been implemented as basic activities to be implemented at the construction sites.



Calculation Standards for CO₂ Emissions

Objective	Item	Calculation Method & Standard
Material flow-related	Classification by business type	Classification into civil engineering and building construction (sites), offices (excluding development projects and others), and factories
	CO ₂ emissions Scope classification*2	Scope 1: CO ₂ emissions associated with the combustion of fossil fuels Scope 2: Indirect CO ₂ emissions associated with the use of electricity, steam, and chilled and hot water Scope 3: CO ₂ emissions associated with the transport of construction waste off construction sites and the outward and return transport of soil from construction (off-site emissions)
	CO ₂ emissions	CO ₂ emission coefficient: Calculated using the emission coefficient in accordance with the Act to Rationalize the Use of Diesel, Heavy Oil, and Energy and the Act on Promotion of Global Warming Countermeasures. For offices, the actual emission coefficient for FY2016 according to the electrical power company is used. Electrical power: Calculated using the 2016 emission coefficient on the user end announced by the Federation of Electrical Power Industries of Japan (before reflecting the Kyoto credit), 0.518t-CO ₂ /MWh. City gas: Calculated using the standard calorific value of the gas supply company and the emission coefficient of the Act on Promotion of Global Warming Countermeasures.
Prevention of global warming	Estimated CO ₂ emissions and reduction rate in the building operation stage	Calculated using the “Energy Efficiency Plan” for each of 48 projects, each with a total floor area of 300 m ² or more and with a total area of about 1,170,000 m ² , of Taisei Corporation building construction projects.
	CO ₂ emissions and reduction rate in the construction stage	CO ₂ emissions at Taisei Corporation construction sites and percentage of CO ₂ emissions reduced from FY1990 emissions. In some cases, temporary or special construction that has a major effect on the date continuity has been excluded from the calculation.

* Energy Efficiency Plan: A plan that summarizes the measures for the efficient use of energy such as building thermal insulation, air conditioning facilities, etc., which is required to be submitted when designing buildings with a total floor area of 300 m² or more in accordance with the Act on the Rational Use of Energy.

KPIs

		FY2018 Targets	
KPIs	At construction stage CO ₂ emissions per construction cost (intensity)	25% (compared with FY1990)	Environment Division
	At construction stage Total CO ₂ emissions	51% (compared with FY1990)	
	At building operation stage Design-build estimated CO ₂ emissions*3	38% (compared with FY1990)	

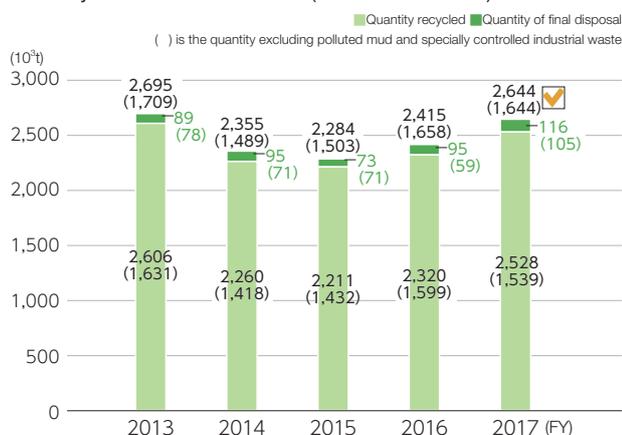
*1 Global standard for calculation and reporting of Greenhouse Gas (GHG) emissions (URL: <http://www.ghgprotocol.org/>). *2 Calculation range criteria set by the Japan Federation of Construction Contractors.

*3 Predicted CO₂ emissions at operation stage of design and construction projects (including popularization and promotion of ZEB).

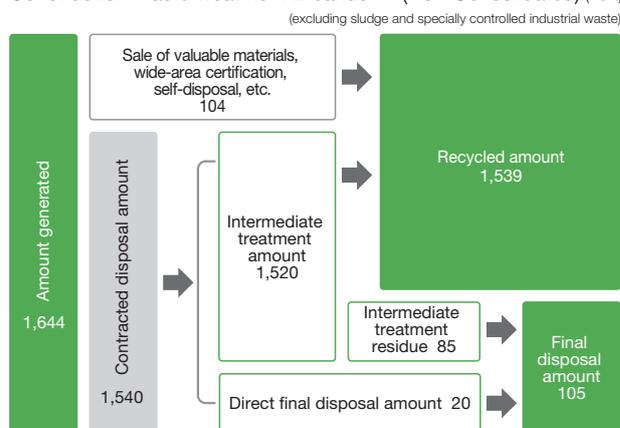
● The calculated total values may not be consistent with the total values due to data rounding. ● Third-party assured values (independent assurance report on E-12) are indicated with the mark.

Realization of a Sustainable and Environmentally Friendly Society : Recycling Oriented Society

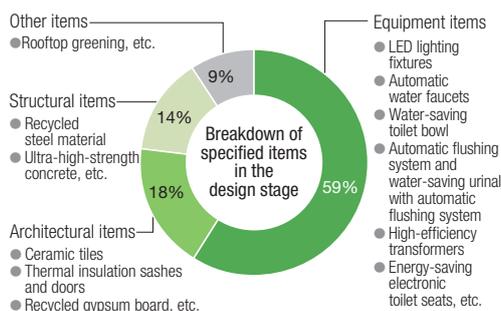
Quantity of Construction Waste (Non-Consolidated)



Construction Waste Treatment Breakdown (Non-Consolidated) (10³t)



Adoption of Green Procurement Items (Construction Design: Non-Consolidated)



Emissions and Recycling Rate by Construction Waste Category (Non-Consolidated) Unit: 10³t

Construction waste	Civil engineering	Building construction			Total	Recycling rate
		New construction	Demolition	Subtotal		
Concrete remnants	197	532	377	909	1,106	100.0%
Asphalt-concrete remnants	64	52	12	64	128	100.0%
Construction site sludge	480	483	19	501	982	—
Mixed waste	13	55	12	67	80	67.5%
Wood scrap	21	9	3	12	34	95.0%
Metal scrap	9	53	41	94	103	99.8%
Miscellaneous	65	114	31	145	210	58.8%
Total	850	1,299	496	1,792	2,644	—

Reducing Environmental Impact in the Supply Chain

Taisei Corporation annually publishes the “Taisei Corporation Green Procurement Guidelines” which set out designated procurement items for public works under the Act on Promoting Green Procurement (Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities) as well as its proprietary environmentally friendly construction methods, technologies and initiatives.

These guidelines are used at each stage of design, procurement and construction by employees in the related divisions. Design departments set targets for the adoption of green procurement items based on these guidelines. In FY2017, we adopted 9.5 items per project (compared to the target of 9 or more items).

Calculation Standard for Quantity of Construction Waste

Objective	Item	Calculation Method & Standard
Material-flow related	[Civil engineering, building construction (sites), and factories] Calculation of construction and industrial waste emissions	Construction by-products (waste and valuable resources) emitted at the sites of the Taisei Group's individual construction projects, joint venture construction for which Taisei Group is the representative, and factories owned by Taisei Group.
Resource recycling	Results for adoption of green procurement items	Calculated the quantities based on the design specifications by Eco Sheet CASBEE introduced to buildings designed by Taisei Corporation
	Final disposal rate (%)	(final disposal quantity / quantity arising) × 100 (excluding construction sludge and quantities not attributable to Taisei Corporation) Recycle rate = 100 - final disposal rate

KPIs

		FY2018 Targets	
KPIs	Promotion of recycling construction waste Final disposal rate	3.7%	Environment Division

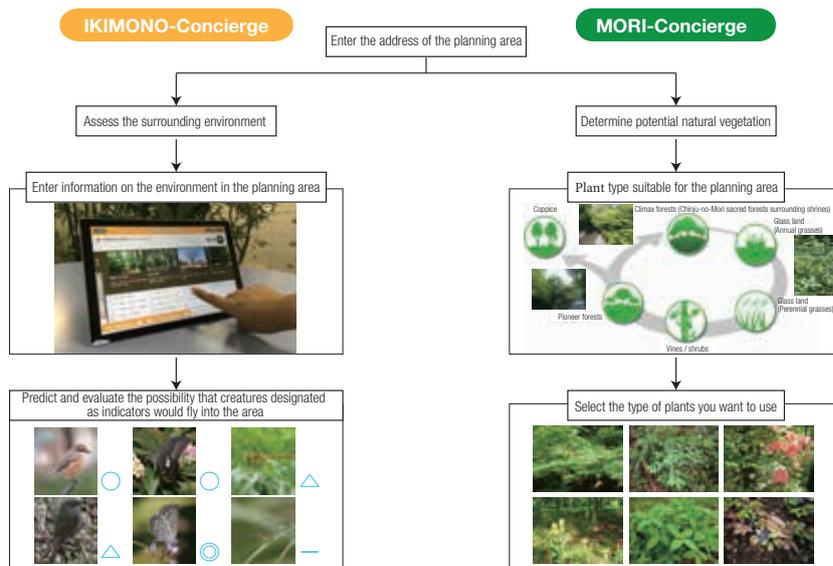
* The final disposal rate for construction waste of KPIs is not consistent with the numerical values calculated based on figures in the above graph and chart due to the difference in calculation methods.
 ● The calculated total values may not be consistent with the total values due to data rounding. ● Third-party assured values (independent assurance report on E-12) are indicated with the ✓ mark.

Realization of a Sustainable and Environmentally Friendly Society : Nature Co-existing Society

Taisei Corporation is continuously working to develop technologies with the aim of promoting the creation of a richer natural environment. We are developing a wide range of projects using those technologies, from planning and construction of facilities to support for operation and management after completion.

To realize a society with a richer natural environment, it is important to “visualize” the effects of initiatives on biodiversity. In 2014, we developed a biodiversity assessment tool “IKIMONO-Concierge®,” which enables us to easily confirm such effects by assessing the impact on living creatures visiting the planning area as an indicator. This has been used widely in greening plans and biotope creation.

In 2017, we developed the second tool of the concierge series, “MORI-Concierge®.” In order to further deepen our approach to biodiversity, this tool evaluates a site and shows an ideal green space for the regional environment in order to increase the diversity of the green space in the area. Focusing on the green transition process in which grasses grow first, then shrubs and eventually forests, this tool enables us to propose various types of green space suitable for the environment of the planning area. We have already begun to apply the tool to actual projects and created an environment with rich biodiversity.



Environmental Contribution Activities and Environmental Education

The Taisei Group has implemented various educational and environmental activities, including volunteer activities that we have continued for more than 10 years. We also support NGOs working to protect small animals and forests, for the purpose of helping employees and their families better understand the importance between the connection of the construction

business, social life, and the natural environment. In addition, we conducted seminars on the environment regarding environmental management as a whole including biodiversity (lecture on risk management required for companies) and e-learning for all employees (on environmental management: what does it mean to be conscious of the environment?).



• Volunteer activities to protect rural communities (Tokyo Greenship Action)



• Volunteer activities to make dormouse nest boxes



• Environmental contribution activities by volunteer employees “TAISEI 1ton CLUB” (Support for forest reconstruction activities by Kamaishi Forest Owner’s Association)

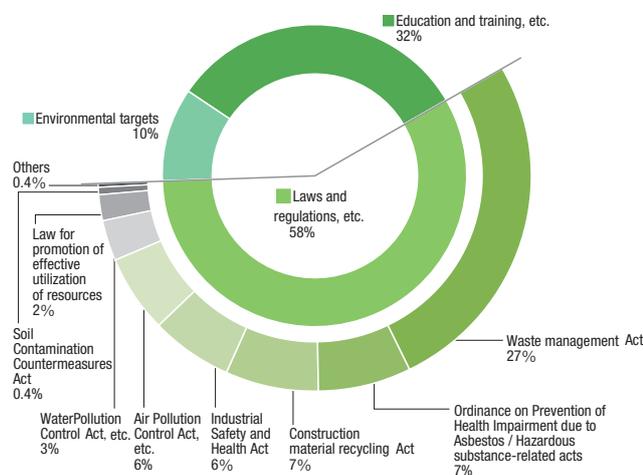
KPIs

		FY2018 Targets	
KPIs	Implementation of proposals that consider biodiversity Number of proposals	30 or more	Environment Division

Realization of a Sustainable and Environmentally Friendly Society : A Society Where Safety is Ensured

Risk Management at Construction Sites and Offices

Proportion of Observation Items



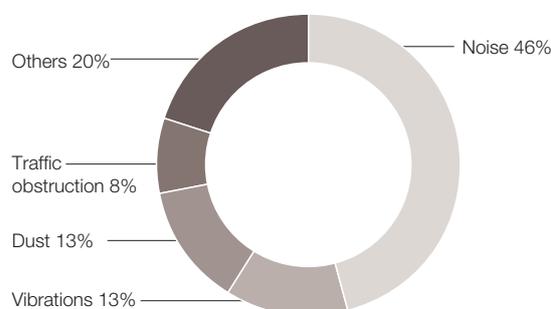
At Taisei Corporation, Site Environmental Patrols are implemented by the environmental departments at head office and branches to survey compliance with environmental laws and regulations on construction sites throughout the Company. Corrective actions and preventative measures are taken in response to observations in order to achieve continuous improvement.

At construction sites, we provide our employees and subcontractors with environmental education based on the “Operation Manual for Prioritized Environmental Issues” to help them understand the importance of environmental management and prevent environment-related accidents, through measures such as sharing cases leading to environmental accidents, raising awareness of the proper management of harmful chemicals such as asbestos and PCBs, and thoroughly implementing appropriate management and processing of contaminated soil.

In FY2017, no accidents or legal violations related to the environment occurred.

Complaints on Construction Sites and Responses Taken

Portion of Complaint Types



Types	Response measures (examples)
Noise	In response to complaints about noise from night-time work using an engine cutter, the noisy work period was changed to daytime.
Vibrations	In response to complaints about vibrations during night-time when shield machines were passing under community roads, the construction time was reduced and the work period was changed to only in daytime.
Dust	In response to complaints about the dust produced by dump trucks and other work vehicles, immediate watering with a water spray car was carried out.
Traffic obstruction	In response to complaints about work vehicles waiting in the vicinity of the site, directions were given to the drivers of such vehicles and guards to not park vehicles in such area.

Taisei Corporation takes the appropriate measures regarding complaints related to the environment reported to its construction sites, etc., and maintains records and reports using communication sheets based on the EMS procedures and communicates across the relevant departments and companywide when necessary.

We also responded appropriately to opinions from citizen groups and other organizations.

KPIs

		FY2018 Targets	
KPIs	Zero environmental accidents (Implementation of management procedure based on “Operation Manual for Priority Environmental Issues”)	0 cases	Safety Administration Division

Promote Development of Technologies

Technologies and Initiatives That Are Useful for Solving Environmental Issues

Technologies and initiatives to reduce risks and solve issues concerning the environment are developed and deployed at various stages of the Taisei Group’s business activities, from planning and design to construction, operation, and demolition, and these contribute to reducing the impact on the global environment.

Environmental risks and issues influence each other and are

profoundly interrelated in various fields such as low carbon, resource recycling, and co-existence with nature (biodiversity). For that reason, the development and deployment of environmentally friendly technologies in any one of these fields contributes to reducing the environmental impact in all, and Taisei Corporation has an important role to play as a socially responsible company involved in the formation of social capital.

Environment Related Technologies and Initiatives

A:TAISEI ROTEC CORPORATION; B:Taisei-Yuraku Real Estate Co., Ltd.; C:TAISEI U-LEC CO., LTD.; D:TAISEI SETSUBI CO., LTD.; E:TAISEI HOUSING CORPORATION; F:SEIWA RENEWAL WORKS CO., LTD.
Titles in blue are externally awarded technologies and initiatives

	Planning and Design	Construction	Operation, Renovation, Demolition	Application of Research and Development Technology
Low Carbon Society	<ul style="list-style-type: none"> Low-carbon Building <ul style="list-style-type: none"> Urban-type ZEB <ul style="list-style-type: none"> Energy simulation technique Energy-saving and ZEB technology <ul style="list-style-type: none"> T-Zone Saver T-Personal Air III North Country Air Conditioning Photovoltaic system for building Site installing pile using geothermal conditioning Organic EL Task Lighting Duct-capping air conditioning system Natural air ventilation system (T-Fresh Air) Ground Source Heat Pumps Task and ambient system for lighting and air-conditioning Zero Energy House Technology Smart community related technology <ul style="list-style-type: none"> Smart thermal/electrical storage system Application of renewal energy Fuel Cell System of Hydrogen Miscellaneous <ul style="list-style-type: none"> CO₂ underground sequestration simulation Wide area landscape evaluating system BIM and VR/CIM^{*2} coupled functionality Prediction system for strong wind stream among high building Verification of Smart Wellness Office Outside-air supply system of Data Center T-Flexible Clean room, T-Smart Clean room 	<ul style="list-style-type: none"> CO₂ Zero Action <ul style="list-style-type: none"> Application of energy-saving construction methods <ul style="list-style-type: none"> Continuous belt conveyor tunnel construction method Upward shield construction method <ul style="list-style-type: none"> Fiber-reinforced ferro concrete segments Harmonica method <ul style="list-style-type: none"> Paving using Visco-Mix Improvement of transport methods <ul style="list-style-type: none"> Modal shift (surplus soil, industrial waste) Reduced transport distance Education in fuel-economical driving Reduce CO₂ by shortening construction periods <ul style="list-style-type: none"> Continuous long-distance boring by shield machine with double bits <ul style="list-style-type: none"> The continuous cutting of the gravel ground by multi-layered of cemented carbide tip Adopt energy-saving machines and equipment <ul style="list-style-type: none"> Electric-powered backhoe, LED lighting, solar power Use biodiesel fuel Simple foundation method for a frame with solar photovoltaic generation panels(T-Root) 	<ul style="list-style-type: none"> General renovation work <ul style="list-style-type: none"> Extending building life, installing information telecommunications capability, conversion to barrier free Energy-saving renovation work Energy management <ul style="list-style-type: none"> T-Green BEMS Demand response technology^{*1} ESCO business Recovery of fluorocarbons Recovery of SF6 ZEB renovation technology District heat plant renovation 	<ul style="list-style-type: none"> Use renewable energy <ul style="list-style-type: none"> Mega-solar power generation system Concentrated solar power generation system Geothermal utilization system Develop liquefied CO₂ storage facilities Light-modulating ceiling system Heat-recovering solar battery louvers BIM and VR/CIM^{*2} coupled functionality Aquarium using artificial seawater Breeding water recycling system Wind power generation Methane hydrate gas leak monitoring CO₂ underground sequestration <ul style="list-style-type: none"> CO₂ underground sequestration related facilities, CO₂ transportation Electric power stabilization by electric power storage evaluation system (NaS battery^{*7}) Distributed energy network technology Mega-Solar power generation system using the top of final landfill site T-BIM Cloud system T-Light Duct 100 T-Light Blind
Recycling Oriented Society	<ul style="list-style-type: none"> Long-life design (develop materials, construction methods) <ul style="list-style-type: none"> T-RESPO construction method T-Grid, T.G-WALL, T.T-WALL T-RESQ F T-Feels U.F.C Automatic warehouse rack seismic vibration control system Ultra high-strength concrete construction planning technology Resource-saving <ul style="list-style-type: none"> Eco-friendly concrete T-POP construction method TAS-Clean 	<ul style="list-style-type: none"> Reduction of construction waste, recycling <ul style="list-style-type: none"> Recycling cutter bits of shield machines E-DAM(environmental data management system) Recycle wood building materials generated by construction Construction method using reduced-slurry soil cement columns in rows Efficient use of soil generated by construction Use tree cuttings go mulch, compost, charcoal Reuse of soil generated by construction Resource-saving <ul style="list-style-type: none"> Precasting ultra high-strength concrete Fc 200N precast column application Ultra high-strength concrete with 300 N compressive strength Reuse of existing pilings during building reconstruction LNG tank dual PC dike Wall PC Structure with Seismic isolation (PALLOUGE X Premium) Manufacturing precast products with rapid-hardening concrete Manufacturing concrete segments with fine powder of blast-furnace slag Joint molding of PC formwork using recycled plastic board Green procurement 	<ul style="list-style-type: none"> Life extension of buildings <ul style="list-style-type: none"> Conversion Renovation Earthquake resistance, base isolation, seismic vibration control Embankment structure anti-seismic reinforcement method Short stroke seismic isolated system for an urban area Anti-seismic reinforcement by Post-Head-bar Use of ground flex mole method (flexible boring) for anti-seismic reinforcement of tank conforming to old law TASS-Flex FRAME <ul style="list-style-type: none"> (Anti-seismic construction method for high-rise RC residential buildings) Pipe refreshing method Measures against liquefaction of existing facilities with the groundwater level lowering method Measures against liquefaction of existing facilities with the WinBLADE method Efficient use of concrete debris Health Monitoring System for Foundations Post-Head-Anchor 	<ul style="list-style-type: none"> TAISEI super concrete T-POP construction method Super green concrete Reusing shield tunneling cutter bits Reuse demolished concrete as aggregate Use tree cuttings for charcoal, compost Use dehydrated cake produced after chitosan flocculant treatment for planting base Produce ethanol from rice straw Business of improving and operating final disposal sites through PFI, DBO^{*8} Business of restoring final waste disposal sites Biogas fermentation of domestic animal waste, garbage, and use for electric power generation Methane fermentation without dilution by water T-WOOD OA Floor T-WOOD column-exposed wall, drop-in wood wall Construction waste cyclic collecting system for project sites Use of sewage and sludge in agriculture Production of biomass fuels from energy crops
Nature Co-existing Society	<ul style="list-style-type: none"> Ecological Planning <ul style="list-style-type: none"> T-Heats Turf Eco-system conservation, Environmentally co-existing planning Urban forest developing technology <ul style="list-style-type: none"> Mitigation, biotope Wetland environment impact assessment Nature-friendly greening, green space ecology planning Wetland environment restoration Natural environment conservation and disaster mitigation design method using GIS^{*3} Water purification using high-density oxygen water IKIMONO-Concierge^{*4} (Simplified biodiversity assessment tool) MORI-Concierge (Plant biodiversity assessment tool)^{*5} 	<ul style="list-style-type: none"> Rooftop greening, wall greening, rooftop vegetable garden Association mat^{*10} Friendly to raptors and other rare organisms Bottom sediment purification method Urban forest creation <ul style="list-style-type: none"> Pre-Forest Transport rare plants Conservation technology of ecosystem of animals and plants (Mitigation) Manufacturing PC products with demolding agents using soybean oil 	<ul style="list-style-type: none"> Relocation and preservation of historic building Inherit and develop local culture Conservation of cultural assets Forest saver project Research on eco-system Eco-system friendly environmental education 	<ul style="list-style-type: none"> Eco-system survey following biotope construction Biodegradable slope frame made of "Biohard" Greening plan based on cluster analysis Technology for spraying local wild grasses Aquatope Improving water environment with LED Aquatic environment restoration <ul style="list-style-type: none"> Restoration of tidal flats and Zostera beds Restoration technology of coral reef Placement and promotion of animal pathways on existing roads
Safety Secured Society	<ul style="list-style-type: none"> Environmental Assessment T-Heats TSounds-Ambience, TSounds-Floor TWinds Low-carbon city block simulator Closed system disposal site Remediation of contaminated soil Groundwater remediation Healthful housing plans Radiation decontamination Energy Saving Diagnosis 	<ul style="list-style-type: none"> Environmentally Friendly Construction Temporary enclosure greening Water retaining pavement technology with water supply functionality Cool Road, Cera Cool Cool Way Guidance regarding MSDS^{*5} Technology for accelerating decontamination work Large-diameter curved pipe roof method Weeds ad vegetation volume reduction Automatic noise and vibration monitoring system UD-HOMET construction method Application of photocatalytic air purifier in underground construction ICT-based management technology for dam construction (4D-DIS) Tunnel Blasting noise reduction system Unmanned construction equipment system Remediation of contaminated soil, in situ remediation <ul style="list-style-type: none"> Water injection bio-sparging method Naturally derived heavy metals treatment Groundwater remediation <ul style="list-style-type: none"> Permeable purifying barrier (Multi-barrier) method Biodegradation method (T-Bio Treat) Non-welding method for Precast Concrete panel joint 	<ul style="list-style-type: none"> Environmentally friendly demolition planning and method <ul style="list-style-type: none"> TECOREP system, TECOREP Light Method of dismantling smokestacks "TECOREP Stack" Incinerator demolition system compliant laws Laser non-slip work method Remediation of contaminated soil, in situ remediation Asbestos countermeasures <ul style="list-style-type: none"> Robot to remove spray-on asbestos inside elevator shafts Asbestos removal in subways using specialized wagon <ul style="list-style-type: none"> Asbestos leaking monitoring system Proper storage of PCBs Radiation decontamination 	<ul style="list-style-type: none"> Local environment assessment system Vibration analysis system Forecasting floods from localized severe rainstorms Sick house countermeasures Indoor air pollution prevention Robot to remove spray-on asbestos On-site asbestos abatement detoxification system Decontamination technology for radioactive cesium-enriched fly ash Technology for collecting radioactive cesium from contaminated soil Soil and groundwater remediation Water purification system using photocatalytic air purifier <ul style="list-style-type: none"> In situ remediation of soil contaminated with benzene/cyanogen activating microorganisms Water purification system using photocatalytic air purifier Microorganism-based purification of contaminated water "1,4-Dioxane Degrading Technology" Compact drainage processing system Bioremediation of Groundwater Contaminated by Chlorinated Ethenes <ul style="list-style-type: none"> Using Rhodococcus jostii Strain RHA1 Purification technology of the groundwater contaminated by chlorination ethylene

*1 A system that varies the energy demand to achieve a balance between supply and demand.

*2 BIM: building information model; VR: virtual reality (both 3D technologies); CIM: Construction Information Modeling

*3 Geographic information system

*4 Assesses effects of creating a space that considers biodiversity by showing the organisms that may potentially visit.

*5 Material safety data sheet

*6 Business providing comprehensive services including energy-saving proposals, provision of facilities, maintenance, and management.

*7 Sodium-sulfur batteries

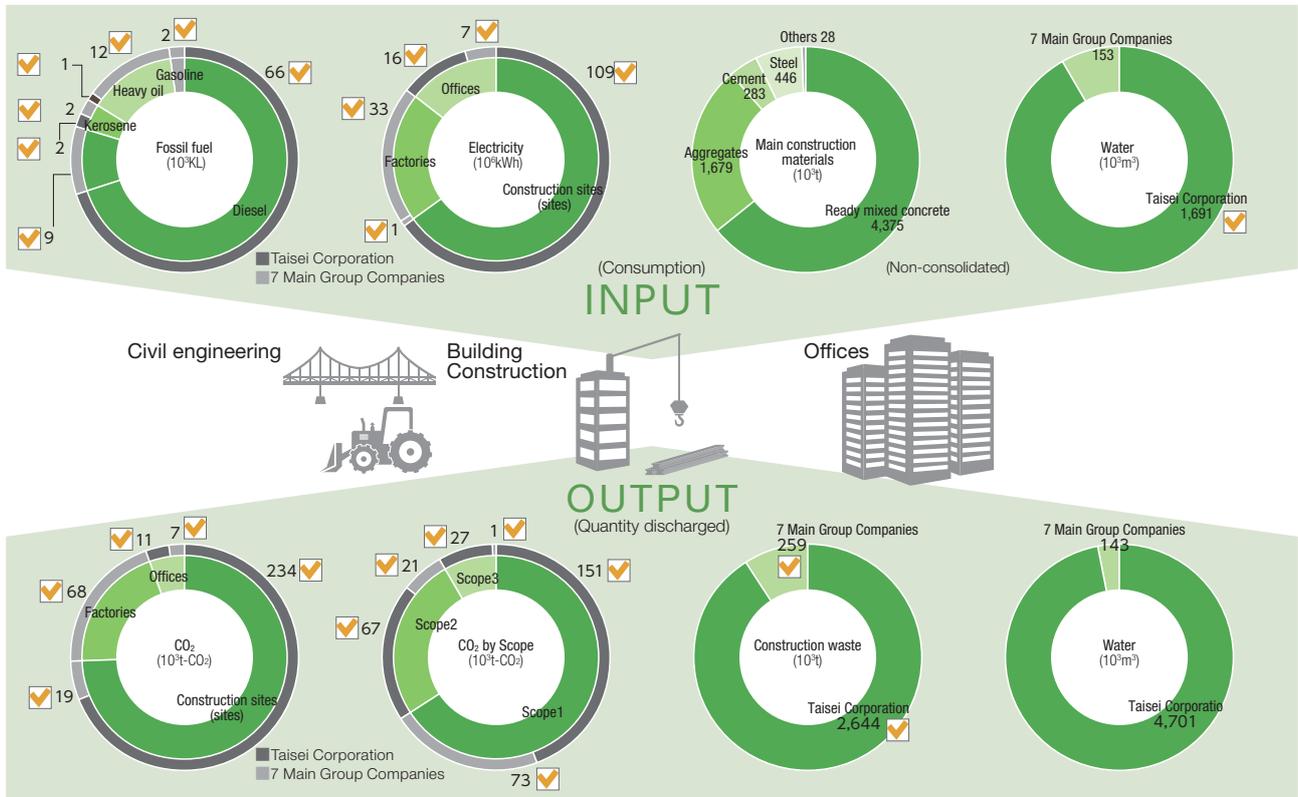
*8 A business method similar to the private finance initiative (PFI) in which the public sector takes on fund-raising and contracts design, construction, and operation to the private sector.

*9 Technology to select plants suitable for the environment of the planning area from the plant succession perspective.

*10 Plant mat combining native plants suitable for the environment of the planning area.

Material Flow and Third-Party Assurance

Material Flow of Taisei Group



Calculation Standard for Material Flow Data

objective	Item	Calculation Method & Standard
Material flow-related	Classification by business type	Classification into civil engineering and building construction (sites), offices (excluding development projects and others), and factories
	CO ₂ emissions Scope classification	Scope 1: CO ₂ emissions associated with the combustion of fossil fuels Scope 2: Indirect CO ₂ emissions associated with the use of electricity, steam, and chilled and hot water Scope 3: CO ₂ emissions associated with the transport of construction waste off construction sites and the outward and return transport of soil from construction (off-site emissions)
	CO ₂ emissions	CO ₂ emission coefficient: Calculated using the emission coefficient in accordance with the Act to Rationalize the Use of Diesel, Heavy Oil, and Energy and the Act on Promotion of Global Warming Countermeasures. For offices, the actual emission coefficient for FY2016 according to the electrical power company is used. Electrical power: Calculated using the 2016 emission coefficient on the user end announced by the Federation of Electrical Power Industries of Japan (before reflecting the Kyoto credit), 0.518t-CO ₂ /Mwh. City gas: Calculated using the standard calorific value of the gas supply company and the emission coefficient of the Act on Promotion of Global Warming Countermeasures.
	[Offices and Factories] Energy-related and water consumption	The annual quantities purchased and used by the offices and factories of the Taisei Group are calculated in monthly units.
	[Civil Engineering and building construction (sites)] Energy-related and water consumption	Calculated for each company based on the Taisei Group environmental data manual. Consumption in a two-month period in FY2017 is sampled at 199 construction sites to calculate the consumption per unit of construction turnover (basic unit). Annual consumption is calculated by multiplying this basic unit by the construction turnover for the year. For civil engineering, this calculation is performed for each construction type.
	[Civil Engineering and building construction (sites)] Calculation of the main construction materials and other materials (concrete formworks and alternative formworks) purchased.	The quantities of the main construction materials and other materials purchased directly through individual construction of Taisei Corporation and joint venture construction for which Taisei Corporation is the representative. The same calculation method applies to the consumption of concrete formworks and alternative formworks.
	[Civil engineering, building construction (sites), and factories] Calculation of construction and industrial waste emissions	Construction by-products (waste and valuable resources) emitted at the sites of the Taisei Group individual construction projects, joint venture construction for which Taisei Group is the representative, and factories owned by Taisei Group.

- Organizations covered: the Taisei Group (Taisei Corporation, TAISEI ROTEC CORPORATION, Taisei-Yuraku Real Estate Co., Ltd., TAISEI U-LEC CO., LTD., TAISEI SETSUBI CO., LTD., TAISEI HOUSING CORPORATION, SEIWA RENEWAL WORKS CO., LTD., and J-FAST Co., Ltd.), which are all within Japan only. Environmental data cover more than 90% of the sales made by the entire Taisei Group.
- Calculation standard: Calculated based on in-house standards and the Taisei Group's environmental data calculation manual for the management of environmental information, complying with the Act on the Rational Use of Energy, the Act on Promotion of Global Warming Measures, the Waste Disposal and Public Cleansing Act, and the GHG Protocol, etc. In calculation of CO₂ emissions, Taisei Corporation uses the value of the fuel consumption of the Japan Construction Mechanization Association, from which the fat content is excluded. Energy-related: Fossil fuels (heavy oil, diesel, gasoline, kerosene), electrical power, city gas, and LPG consumption and their energy-equivalent values.

● Third-party assured values (independent assurance report on E-12) are indicated with the mark.

Taisei Corporation Material Flow

Third-party assured values are indicated with the mark

INPUT	Units	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Total energy use	10 ⁹ MJ	3.84	3.26	3.57	3.67	3.90
Construction Site (building)	10 ⁹ MJ	1.41	1.34	1.40	1.61	1.72
Construction Site (civil engineering)	10 ⁹ MJ	2.16	1.67	1.93	1.81	1.95
Offices	10 ⁹ MJ	0.27	0.25	0.24	0.24	0.23
Total fossil fuel use	10 ³ KL	71	55	58	61.9	68.9
Diesel	10 ³ KL	70	54	57	60.0	66.3
Kerosene	10 ³ KL	0.8	0.7	0.6	1.4	2.0
Heavy oil	10 ³ KL	0.2	0.1	0.2	0.5	0.6
Total electricity	10 ⁶ kWh	110	115	134	129	125
Construction Site (building)	10 ⁶ kWh	37	40	33	35	49
Construction Site (civil engineering)	10 ⁶ kWh	53	56	82	76	60
Offices	10 ⁶ kWh	20	19	18	18	16
City gas (offices)	10 ³ m ³	140	103	91	94	227
Total quantity of the main construction materials (following 6 items)	10 ³ t	7,702	10,472	7,638	7,738	6,811
Ready mixed concrete	10 ³ t	6,441	8,249	4,321	4,833	4,375
Aggregates (gravel, crushed stone, etc.)	10 ³ t	519	1,095	2,411	1,979	1,679
Cement	10 ³ t	102	326	190	262	283
Steel	10 ³ t	606	765	690	638	446
Timber	10 ³ t	31	27	21	15	24
Asphalt	10 ³ t	4	10	2	11	4
(of which the green procurement quantity)*	10 ³ t	2,701	2,946	1,152	681	995
Total concrete formwork use	10 ³ m ²	5,640	5,085	3,473	3,042	4,082
Tropical plywood formwork	10 ³ m ²	3,712	3,219	2,514	1,801	2,850
Alternative formwork	10 ³ m ²	1,928	1,866	959	1,241	1,233
Alternative formwork percentage	%	34.2	36.7	27.6	40.8	30.2
Water (consumption)	10 ³ m ³	5,231	1,383	1,970	2,338	1,691

INPUT	Units	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Total CO ₂ emissions	10 ³ t-CO ₂	250	209	226	231	245
Construction Site (building)	10 ³ t-CO ₂	92	88	92	106	110
Construction Site (civil engineering)	10 ³ t-CO ₂	143	108	122	113	124
Offices	10 ³ t-CO ₂	15	13	12	12	11
Total CO ₂ emissions	10 ³ t-CO ₂	250	209	226	231	245
Scope1	10 ³ t-CO ₂	163	124	128	138	151
Scope2	10 ³ t-CO ₂	65	67	76	71	67
Scope3	10 ³ t-CO ₂	22	18	22	22	27
NO _x	t	1,215	931	989	1,040	1,151
SO _x	t	182	139	148	158	175
Quantity of Chlorofluorocarbon and halon recovered	t	12	7	11	18	12
Construction waste	10 ³ t	2,695	2,355	2,284	2,415	2,644
Quantity recycled and given intermediate processing	10 ³ t	2,660	2,312	2,261	2,372	2,609
Quantity of direct final disposal	10 ³ t	35	43	22	43	20
(of which, asbestos quantity disposed)	10 ³ t	8	5	8	11	8
Water (discharged)	10 ³ m ³	964	1,839	3,003	8,172	4,701

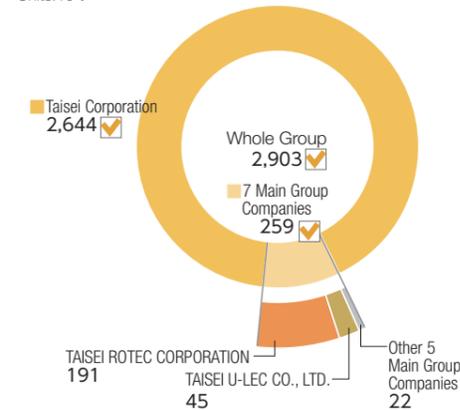
CO₂ Emissions of the Taisei Group (FY2017)

Units:10³t-CO₂



Construction Waste Amount of the Taisei Group (FY2017)

Units:10³t



Material Flow for Group Companies

Third-party assured values are indicated with the mark

INPUT	Units	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Total energy use	10 ⁹ MJ	1.90	1.91	1.73	1.61	1.53
Sites (construction sites)	10 ⁹ MJ	0.32	0.42	0.40	0.37	0.29
Factories	10 ⁹ MJ	1.43	1.33	1.19	1.10	1.12
Offices	10 ⁹ MJ	0.16	0.16	0.14	0.14	0.13
Total fossil fuel use	10 ³ KL	33	35	30	27	25
Diesel	10 ³ KL	9	15	12	11	9
Kerosene	10 ³ KL	3	3	3	2	2
Heavy oil	10 ³ KL	19	16	14	12	12
Gasoline	10 ³ KL	2	2	2	2	2
Total electricity use	10 ⁶ kWh	48	46	44	42	41
Sites (construction sites)	10 ⁶ kWh	1	1	1	1	1
Factories	10 ⁶ kWh	38	36	35	34	33
Offices	10 ⁶ kWh	10	9	8	7	7
City gas	10 ³ m ³	3,181	2,592	2,888	3,622	3,794
LPG	t	255	92	58	92	63
Water (consumption)	10 ³ m ³	138	142	137	132	153

INPUT	Units	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Total CO ₂ emissions	10 ³ t-CO ₂	121	124	111	101	95
Sites (construction sites)	10 ³ t-CO ₂	22	29	27	26	19
Factories	10 ³ t-CO ₂	90	85	75	67	68
Offices	10 ³ t-CO ₂	10	10	8	8	7
Total CO ₂ emissions	10 ³ t-CO ₂	—	—	—	101	95
Scope1	10 ³ t-CO ₂	—	—	—	77	73
Scope2	10 ³ t-CO ₂	—	—	—	23	21
Scope3	10 ³ t-CO ₂	—	—	—	2	1
NO _x	t	259	325	277	249	211
SO _x	t	153	148	128	109	106
Quantity of Chlorofluorocarbon and halon recovered	t	2	1	2	2	2
Total industrial waste emissions	10 ³ t	397	321	391	352	259
Quantity recycled	10 ³ t	389	312	365	333	248
Final disposal quantity	10 ³ t	8	9	26	19	11
Water (quantity discharged)	10 ³ m ³	138	142	137	121	143

Third-party Assurance of Environmental Data within the Taisei Group

Over the past five years, we have standardized and manualized the method of collecting and aggregating environmental data such as the quantity of energy consumed, the quantity of CO₂ emissions and the volume of industrial waste for the 7 main group companies participating in the Taisei Group Environmental Promotion Conference. In FY2017, continuing from the previous year, the 7 main group companies received third-party assurance for their actual performance data.

Among the group companies, TAISEI ROTEC CORPORATION, TAISEI HOUSING CORPORATION, Taisei-Yuraku Real Estate Co., Ltd. and SEIWA RENEWAL WORKS CO., LTD. were inspected by auditors visiting their head offices, major offices and factories.

Third-party assurance not only guarantees the data reliability but also leads to a review and improvement of the management structure and initiatives of each group company.

Calculation Standard for Material Flow

Item	Calculation Method & Standard
NO _x and SO _x emissions	Calculation of NO _x and SO _x emissions originating from diesel, heavy oil, and kerosene of the Taisei Group. Calculated using the emission coefficient of the Architectural Institute of Japan's "Guide to Building LCA - Evaluation Tool for Measures against Global Warming, Resource Consumption, and Waste - Revised Version."
[Civil engineering and building construction (sites)] Calculation of chlorofluorocarbons and halon recovered.	Recovered quantity of chlorofluorocarbon and halon processing commissioned by the Taisei Group.
[Civil engineering and building construction (sites)] Calculation of construction soil emissions	Surplus construction soil removed from construction sites of Taisei Corporation.

* The quantity used as green procurement products out of the main construction materials
 ● The calculated total values may not be consistent with the total values due to data rounding.
 ● Third-party assured values are indicated with the mark.
 ● For calculation standards other than those for material flow above, please refer to E-3, 4 and 8.

Environmental Accounting

Environmental Conservation Cost

Units: million yen

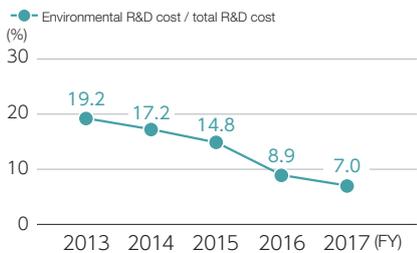
Classification	Details of main initiatives	FY 2017						
		Investment amount		Cost				
		Total	Ratio of previous year	Civil engineering	Building	Offices	Total	Ratio of previous year
1. Cost in business areas		—		7,319	16,993	44	24,356	(4,215)
(1) Pollution prevention cost	● Cost of temporary works on sites to prevent air pollution, water contamination, noise, vibration, etc.	—		0	0	14	14	(318)
(2) Global environmental conservation cost	● Cost of recovery of CFC and halon, green electricity procurement cost	—		0	56	0	57	(33)
(3) Resource recycling cost	● Waste processing cost on site, resource recycling cost, asbestos and PCBs recovery and processing cost	—		7,319	16,937	30	24,286	(3,865)
2. Upstream and downstream cost	● Personnel cost and management cost for environmentally friendly design and engineering	—		0	0	2,279	2,279	(27)
3. Administration cost	● Personnel cost, education cost, and inspection cost for EMS, greening around construction sites, cooperation communities, etc.	—		0	0	1,201	1,201	66
4. Research and development cost	● Personnel cost and management cost for environmental research and development (includes biodiversity conservation related cost of 26 mil. yen)	5	(7)	0	0	1,479	1,479	651
5. Social activity cost	● Donation to environmental NGOs, etc.	—		0	0	3	3	(6)
6. Environmental remediation cost	● Soil survey and decontamination cost for real estate for sale by the Company, cost of land subsidence, and repair of roads and other neighboring repairs, etc.	—		0	0	167	167	140
Total		5	(7)	7,319	16,993	5,173	29,486	(3,392)

Economic Effect Associated with Environmental Conservation Measures

Units: million yen

Economic Effect Associated with Environmental Conservation Measures			Amount
Economic Effect Associated with Environmental Conservation Measures (substantial effect)	Earnings	● Recycling of waste produced by the main business activities	2,737
	Cost reduction	● Reduction in office energy cost due to energy efficiency	(1)
		● Reduction in construction site energy cost	(604)
		● Reduction in waste processing cost associated with resource conservation and recycling	3,472
Economic Effect Associated with Environmental Conservation Measures (estimated effect)	Reduction of environmental impact converted to monetary amount	102	

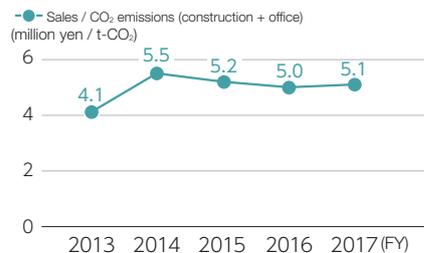
Environmental Research and Development Cost Ratio



Environmental Impact Ratio (only derived from Taisei Corporation)



Environmental Efficiency



● The calculated total values may not be consistent with the total values due to data rounding.



Translation

The following is an English translation of an independent assurance report prepared in Japanese and is for information and reference purposes only. In the event of a discrepancy between the Japanese and English versions, the Japanese version will prevail.

Independent Assurance Report

July 6, 2018

TO:

Mr. Yoshiyuki Murata
President and Chief Executive Officer
Taisei Corporation

Kenji Sawami
Engagement Partner
Ernst & Young ShinNihon LLC

We, Ernst & Young ShinNihon LLC., have been commissioned by Taisei Corporation (hereafter the "Company") and has carried out a limited assurance engagement on the environment data and indices (hereafter the "Indicators") of the Company, Taisei Rotec Corporation*, TAISEI U-LEC CO.,LTD.*, Taisei-Yuraku Real Estate Co.,Ltd.*, TAISEI SETSUBI CO.,LTD.*, TAISEI HOUSING CORPORATION*, SEIWA RENEWAL WORKS Co.,Ltd*. and J-FAST Co., Ltd.* for the year ended March 31, 2018 as included in "Environment – Environmental Information and Data" on the Company's website (hereafter the "Web Report"). The scope of our assurance procedures was limited to the Indicators marked with the symbol "🔍" in the Web Report.

1. The Company's Responsibilities

The Company is responsible for preparing the Indicators in accordance with the Company's own criteria, that it determined with consideration of Japanese environmental regulations as presented in the Web Report. Greenhouse gas (GHG) emissions are estimated using emissions factors, which are subject to scientific and estimation uncertainties given instruments for measuring GHG emissions may vary in characteristics, in terms of functions and assumed parameters.

2. Our Independence and Quality Control

We have met the independence requirements of the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants in January 2017, which is based on the fundamental principles of integrity, objectiveness, professional competence and due care, confidentiality, and professional behavior.

In addition, we maintain a comprehensive quality control system, including documented policies and procedures for compliance with ethical rules, professional standards, and applicable laws and regulations in accordance with the International Standard on Quality Control 1 issued by the International Auditing and Assurance Standards Board in April 2009.

3. Our Responsibilities

Our responsibility is to express a limited assurance conclusion on the Indicators included in the Web Report based on the procedures we have performed and the evidence we have obtained.

We conducted our limited assurance engagement in accordance with the *International Standard on Assurance Engagements: Assurance Engagements Other than Audits or Reviews of Historical Financial Information* ("ISAE 3000") (Revised), issued by the International Auditing and Assurance Standards Board in December 2013, *Practical Guidelines for the Assurance of Sustainability Information*, revised in December 2014 by the Japanese Association of Assurance Organizations for Sustainability Information and, with respect of GHG emissions, *Assurance Engagements on Greenhouse Gas Statements* ("ISAE 3410"), issued by the International Auditing and Assurance Standards Board in June 2012.

The procedures, which we have performed according to our professional judgment, include inquiries, document inspection, analytical procedures, reconciliation between source documents and Indicators in the Web Report, as well as the following:

- Making inquiries regarding the Company's own criteria that it determined with consideration of Japanese environmental regulations, and evaluating the appropriateness thereof;
- Inspecting relevant documents with regard to the design of the Company's internal controls related to the Indicators, and inquiring of personnel responsible thereof at the headquarters and sites visited (1 construction site, 1 office and 1 factory);
- Performing analytical procedures concerning the Indicators at the headquarters and sites visited (1 construction site, 1 office and 1 factory);
- Testing, on a sample basis, underlying source information¹ and conducting relevant re-calculations at the headquarters and sites visited (1 construction site, 1 office and 1 factory);
- Re-calculating CO₂ emissions intensity from the construction stage, as set out in the Web Report, with reference to source documents.

The procedures performed in a limited assurance engagement are more limited in nature, timing and extent than a reasonable assurance engagement.

As a result, the level of assurance obtained in a limited assurance engagement is lower than would have been obtained if we had performed a reasonable assurance engagement.

4. Conclusion

Based on the procedures performed and evidence obtained, nothing has come to our attention that causes us to believe that the Indicators included in the Web Report have not been measured and reported in accordance with the Company's own criteria that it determined with consideration of Japanese environmental regulations.

* CO₂ emissions, Energy use, Fossil fuel use, Electricity use, City gas, LPG, Industrial waste emissions only