100年をつくる会社 鹿島

Kajima Corporation

Environmental Data 2018

Goals and Results in 3years (FY2015 - FY2017)

	Medium-term goals for FY2015 - 2017	Results	Assessment
Low Carbon	(Construction Operations) ● Reduce CO2 emissions per unit from sales to 17% below the FY 1990 level (excluding the effects of electric power consumption per unit)	16.9% reduction	○
	(Design Operations) ● Reinforce and strengthen based on full-scale enforcement of the Revised Rationalization in Energy Use Law from FY2015. ● CO2 in building operation: achieved internal energy-saving standards (20% reduction)	● FY2015: 25.5% reduction ● FY2016: 29.2% reduction ● FY2017: 20.7% reduction	○
Recycling Resources	(Construction Operations) ● Reduce the final disposal rate to less than 3% ● Reduce the construction sludge and promote effective use	● The final disposal rate: 2.08% (excluding sludge) ● 2.42% (including sludge)	○
	(Design Operations) ● Promote green procurement in Design Operations ● Propose 4 or more items from the 17 priority items	4.8 items	○
Natural Symbiosis	● Promote excellent projects in terms of biodiversity 6 projects or more per year	6 excellent projects	○
	● Promote public relations, education and popularization	HP: Ikimachi-newsletter, Kajima kids academy, etc.	○
Common Base	● Promote research and technological development for the preservation and sustainable use of environmental resources. ● The number of operation developed to work-site: more than 6 in 3years	The developed to work-site operation results: 6 in 3years	○
	● Manage hazardous substance ● Promote preventive measures (Priorities: soil contamination, asbestos)	● Accidents in managing hazardous substances: 0 ● Deficiencies in the procedures required by Waste Management and Public Cleansing Laws: 3	×
	● Promote managing chemical substances, etc.	Trained and confirmed the management of chemical substances in engineering projects	○

■**Scope: Kajima Corporation only**
・Construction sites: all domestic and overseas sites (excluding domestic affiliate companies and overseas subsidiaries)
・Offices: offices of Kajima corporation and overseas offices (excluding domestic affiliate companies and overseas subsidiaries)

■**Regarding third party verification**
・Environmental performance data for FY2017
Greenhouse gas emissions (Scope 1, 2, 3,), energy use, clean water use, hazardous materials and waste emissions were verified by Japan Quality Assurance Organization (JQA). (Verification document attached to the end page)
JQA acquired ISO14065 (certified as a greenhouse gas validation and verification body accredited by International Organization for Standardization) first in Japan.
Items indicated with ☑ were verified by the third party.

Material Flow

INPUT

Project sites

● Energy		
Electricity	10,831 ×10⁴kWh	☑
Diesel oil	67,234 kℓ	☑
Kerosene	3,823 kℓ	☑
● Water	86.5 ×10⁴m³	☑
● Main construction materials	223.3 ×10⁴t	☐

Office

● Energy		
Electricity	2,622 ×10⁴kWh	☑
Heavy oil	12 kℓ	☑
Kerosene	0 kℓ	☑
Gas	17.2 ×10⁴m³	☑
Heating, steam, cooling	15,077 GJ	☑
● Water	14.8 ×10⁴m³	☑

OUTPUT

Project sites

● CO_2 emissions	27.4 ×10⁴t	☑
● Construction surplus soi	83.7 ×10⁴m³	☑
● Hazardous materials recovered		
Materials containing asbestos	17,490.1 t	☑
CFCs and halon received	2.9 t	☑
Fluorescent tubes	41.8 t	☑
● Construction waste	198.8 ×10⁴t	☑
● Final disposal volume	4.8 ×10⁴t	☑

Office

● CO_2 emissions	1.4 ×10⁴t	☑
● Volume of waste	1,942.4 t	☑

Changes in CO_2 emissions attributable to construction

● Total emissions	27.4 ×10⁴t-CO_2	☑
● Basic unit	21.4 ×10²billion ¥	☑
● Reduction rate (compared with FY1990)	16.9%	☑

Volume of construction waste and final disposal volume

Volume	198.8 ×10⁴t	☑
Volume(excluding sludge)	123.4 ×10⁴t	☑
Final disposal volume	4.8 ×10⁴t	☑
Final disposal volume (excluding sludge)	2.6 ×10⁴t	☑
Final disposal rate	2.4%	☑
Final disposal rate(excluding sludge)	2.1%	☑

Zero Carbon

CO_2 emissions from construction sites

(FY)

		1990	2013	2014	2015	2016	2017
Emissions	×10⁴t-CO_2	46.8	22.8	26.2	26.2	25.8	27.4 ☑
basic unit	t-CO_2/10²million ¥	25.8	22.0	22.2	21.5	21.5	21.4 ☑
Reduction rate	%	-	14.8	14	16.5	16.6	16.9 ☑

Scope type CO2 emissions (construction sites and offices)

(FY)

		2013	2014	2015	2016	2017
Scope-1	×10⁴t-CO_2	17.3	20.4	20.4	18.5	19.0 ☑
Scope-2	×10⁴t-CO_2	7.3	7.3	7.4	8.8	9.8 ☑

Energy Consumption

(FY)

		2013	2014	2015	2016	2017
Total amount of energy consumption	×10⁴kWh	105.2	117.5	118.6	120.1	113.6 ☑
Fossil fuels consumption	×10⁴kWh	70.0	81.6	81.4	74	75.9 ☑
Construction sites	×10⁴kWh	69.7	81.3	81.2	73.7	75.6 ☑
Offices	×10⁴kWh	0.3	0.3	0.2	0.3	0.3 ☑
Purchased electricity	×10⁴kWh	12.5	12.8	13.1	16.4	13.5 ☑
Construction sites	×10⁴kWh	9.8	10.2	10.6	13.8	10.8 ☑
Offices	×10⁴kWh	2.7	2.6	2.5	2.6	2.7 ☑
Steam/heating/cooling consumption(only office)	×10⁴kWh	0.6	0.7	1.0	0.7	0.6 ☑

The total amount of energy consumption is different from the simple total value of each energy consumption, since it sums up the value obtained by converting the purchased electric energy into the primary energy.

Contribution amount of indirect CO_2 reduction

(FY)

		2013	2014	2015	2016	2017
Contribution amount of CO_2 reduction attributable to green procurement (blast furnace cement/concrete)	×10⁴t-CO_2	5.5	8.6	9.9	10.4	10.0 ☐
Contribution amount of CO_2 reduction attributable to energy-saving design of buildings	×10⁴t-CO_2	89.6	80.5	76.6	129.3	39.0 ☐
Total	×10⁴t-CO_2	95.1	89.1	86.5	139.7	49.0 ☐

*From FY2017, the CO2 emission amount is calculated by multiplying annual contribution of CO2 reduction attributable to energy-saving design of buildings, which are designed internally and completed in the FY, by the life-cycle of buildings (30years).
The previous year releases have been re-calculated using to align with this definition.

Zero Waste

Overseas construction sites are excluded from the calculation because standards and treatment methods for waste are greatly different from country to country.

Volume of construction waste and final disposal volume

(FY)

		2013	2014	2015	2016	2017
Volume	×10⁴t	263.4	197.5	248.6	230	198.8 ☑
Volume (excluding sludge)	×10⁴t	137.6	132.6	162.6	123.6	123.4 ☑
final disposal Volume	×10⁴t	18.2	13.9	16.1	13.2	4.8* ☑
final disposal Volume (excluding sludge)	×10⁴t	4.3	4.5	5.0	3.3	2.6 ☑
Final disposal rate	%	6.9	7.1	6.5	5.8	2.4 ☑
Final disposal rate (excluding sludge)	%	3.1	3.4	3.1	2.7	2.1 ☑

*Total waste disposal volume: total volume from construction sites (the table above) and offices (the table: volume of offices waste) is 50,039t

Waste treatment by category

(FY)

Construction waste		Concrete remnants			Asphalt Concrete remnants			Wood scrap		
		2015	2016	2017	2015	2016	2017	2015	2016	2017
Recycled volume	t	1,063,349.2	869,383.6	827,177 ☑	162,247.9	109,495.3	135,460 ☑	41,459.1	39,520.8	31,011.3 ☑
Reduction volume	t	66.6	8.4	119.4 ☑	28.7	21.7	23 ☑	611.0	528.6	506.3 ☑
Final disposal volume	t	1,723.1	1,444.2	830.8 ☑	94.2	317.5	490 ☑	494.3	185.3	288.0 ☑
Total volume	t	1,065,138.9	870,836.2	828,127 ☑	162,370.8	109,834.5	135,972 ☑	42,564.4	40,234.7	31,805.6 ☑

Construction waste		Construction sludge			Mixed waste		
		2015	2016	2017	2015	2016	2017
Recycled volume	t	673,907.1	892,614.6	647,646 ☑	28,105.6	23,540.2	27,741.5 ☑
Reduction volume	t	71,861.4	70,268.1	76,445.4 ☑	2,746.4	2,412.6	2,412.6 ☑
Final disposal volume	t	111,151.3	99,168.1	22,403.9 ☑	17,949.7	8,232.4	7,442.1 ☑
Total volume	t	859,919.8	1,062,050.8	746,495.3 ☑	48,801.7	34,185.2	37,596 ☑

Recycle rate by waste category

(FY)

Construction waste		Concrete remnants			Asphalt Concrete remnants			Wood scrap		
		2015	2016	2017	2015	2016	2017	2015	2016	2017
Recycled rate	%	99.8	99.8	99.9 ☑	99.9	99.7	99.6 ☑	97.4	98.2	97.5 ☑
Reduction rate	%	0.0	0.0	0.0 ☑	0.0	0.0	0.0 ☑	1.4	1.3	1.6 ☑
Final disposal rate	%	0.2	0.2	0.1 ☑	0.1	0.3	0.4 ☑	1.2	0.5	0.9 ☑
Total	%	100	100	100 ☑	100	100	100 ☑	100	100	100 ☑

Construction waste		Construction sludge			Mixed waste		
		2015	2016	2017	2015	2016	2017
Recycled rate	%	78.7	84.0	86.8 ☑	57.6	68.9	74.6 ☑
Reduction rate	%	8.4	6.6	10.2 ☑	5.6	7.1	5.3 ☑
Final disposal rate	%	12.9	9.3	3.0 ☑	36.8	24.1	20.0 ☑
Total	%	100	100	100 ☑	100	100	100 ☑

Emissions by waste category (FY 2017)

Construction waste	Volume	Percentage of waste volume
Concrete remnants	828,217t ☑	41% ☑
Asphalt Concrete remnants	135,972t ☑	7% ☑
Wood scrap	31,806t ☑	2% ☑
Construction sludge	753,630t ☑	38% ☑
Mixed waste	37,168t ☑	2% ☑
Others	200,880t ☑	10% ☑
Total volume	1,987,585t ☑	100% ☑

Emissions by construction type (FY 2017)

Construction waste	New construction		Demolition		Others	
	Volume	Percentage of waste volume	Volume	Percentage of waste volume	Volume	Percentage of waste volume
Concrete remnants	181,809t ☑	17% ☑	599,841t ☑	76% ☑	46,478t ☑	31% ☑
Asphalt Concrete remnants	58,340t ☑	6% ☑	46,040t ☑	6% ☑	31,592t ☑	21% ☑
Wood scrap	18,485t ☑	2% ☑	10,761t ☑	1% ☑	2,560t ☑	2% ☑
Construction sludge	651,558t ☑	62% ☑	50,710t ☑	6% ☑	51,362t ☑	34% ☑
Mixed waste	20,550t ☑	2% ☑	13,365t ☑	2% ☑	3,254t ☑	2% ☑
Others	114,690t ☑	11% ☑	69,830t ☑	9% ☑	16,483t ☑	11% ☑
Total volume	1,045,432t ☑	100% ☑	790,546t ☑	100% ☑	151,728t ☑	100% ☑

Volume of offices waste (FY)

		2013	2014	2015	2016	2017
Offices	t	1,892.4	974.6	1,389.6	1,414.8	1,942.4 ☑

Water consumption (FY)

		2013	2014	2015	2016	2017
Construction sites	$\times 10^4 m^3$	192.0	164.2	141.7	159.7	86.5 ☑
Offices	$\times 10^4 m^3$	16.2	15.0	13.6	12.7	14.8 ☑
Total	$\times 10^4 m^3$	208.2	179.2	155.3	172.4	101.3 ☑

Usage rate of recycled materials (FY2017) (FY)

Material			2015	2016	2017
Cement	Total usage	t	1,304,000	1,250,000	1,270,000 ☐
	Recycled material usage	t	387,000	409,000	390,314 ☐
	Usage rate of recycled materials	%	30	33	31 ☐
Aggregate	Total usage	t	787,000	565,000	909,000 ☐
	Recycled material usage	t	238,000	209,000	278,000 ☐
	Usage rate of recycled materials	%	30	37	31 ☐
Asphalt	Total usage	t	99,000	17,000	54,000 ☐
	Recycled material usage	t	89,000	13,000	43,000 ☐
	Usage rate of recycled materials	%	90	76	80 ☐
Total	Total usage	t	2,191,000	1,832,000	2,233,000 ☐
	Recycled material usage	t	714,000	631,000	711,000 ☐
	Usage rate of recycled materials	%	33	34	32 ☐

Management of Hazardous Materials

Recover amount of CFCs & halons (FY)

		2013	2014	2015	2016	2017
Recover amount	t	2.3	6.8	3.4	0.1	5.3 ☑

Recover amount of used florescent lamp (FY)

		2013	2014	2015	2016	2017
Recover amount	t	85.3	47.3	48.1	34.9	42.2 ☑

Disposal volume of PCB include equipment (FY)

		2013	2014	2015	2016	2017
Number of items		48	940	52	24	8 ☑

Disposal volume of hazardous materials (published from FY2017) (FY)

			2017
Number of items	t	Fluorocarbon/ halon, fluorescent lamps (mercury), asbestos and other hazardous materials	162,442 ☑

Recover amount of materials containing asbestos (FY)

		2013	2014	2015	2016	2017
Recover amount	t	8,247.5	13,946.3	21,329.2	13,250.5	17,490.1 ☑

Number of soil contamination surveys (FY)

	2013	2014	2015	2016	2017
Number of surveys as a designated institution	10	5	5	17	16 ☐
Number of law investigation included in above number	2	1	0	5	5 ☐

Air pollutant emissions (FY)

	2013	2014	2015	2016	2017
NOx(t)	1,150	1,340	1,340	1,220	1,250 ☑
SOx(t)	170	200	200	180	185 ☑

2017 Environmental accounting report

1. Overview

Kajima has shifted to the segment accounting, which was limited to the construction waste the subject of environmental accounting in the FY 2010.

- Construction waste is managed by manifest system, together with high accuracy of numerical value (product category of emissions and disposal amount).
- Construction waste revealed to be the largest cost factor, which accounts for half of the total environmental cost based on the survey results of environmental accounting.
- Waste disposal is evaluated from both aspects of cost and environmental impact, and use it as an incentive for zero emissions.

2. Result on major construction waste

Constriction waste	Volume of waste (193×10^4t)	Processing cost (121.1×10^2million ¥)	CO_2 emissions (1.2×10^4t)
Construction sludge	746,495t	7,125×million ¥	4,790t
Concrete remnants	978,041t	2,635×million ¥	5,286t
Asphalt concrete remnants	135,972t	355×million ¥	343t
Mixed waste (organic)	35,033t	1,122×million ¥	1,236t
Mixed waste (inorganic)	2,135t	68×million ¥	89t
Wood scrap	31,806t	801×million ¥	443t
Total	1,929,483t	12,106×million ¥	12,188t
reference: All construction waste	1,959,875t	–	13,081t
Percentages of major wastes	98%		93%

Characteristics of the construction industry include the following.

- Wood scrap & mixed waste have large impact on treatment costs compared to emissions.
- Concrete remnants & asphalt concrete remnants are easily recycled, and, the impact on CO_2 emissions and the cost are small compared to the emissions.

3. Evaluation

- CO_2 emission caused by waste disposal in general is equivalent to over 4% of 27.4k tons, the CO_2 emissions from the construction work. (FY2016: 0.9%)
- Waste disposal cost accounts for 1.1% of value of construction work. (slightly increased from FY 2016: 0.9%)

4. R&D investment on addressing environmental issues

- R&D investment for addressing environmental issues in fiscal 2017 amounted to 2,375 million yen.
- Among them, R&D investment in construction waste and resource circulation amounted to 950 million yen.

Calculation method

【Quantity】

- All quantity data of waste manifests are aggregated at Kajima's environmental information system.

【Cost】

- The processing unit price of each project was aggregated and set the average unit cost for each branch by-item.

【CO_2 emission】

- In the Kanto area, waste disposal sites are selected for each item, then CO_2 emissions per treatment volume are calculated based on processing costs, energy consumption, maintenance / expendable items and facility construction costs.
- As for managed waste disposal sites, CO_2 emissions are estimated based on the existing survey literatures.
- The boundary is set to intermediary processing facilities and disposal sites which are first delivered from construction sites. Subsequent facilities are excluded.
- Project sites outside of Japan are excluded since applicable standards and treatment methods of construction waste vary widely from country to country.

Independent Verification Report

No.1811003361

Independent Verification Report

To: Kajima Corporation

1. Objective and Scope

Japan Quality Assurance Organization (hereafter "JQA") was engaged by Kajima Corporation (hereafter "the Company") to provide an independent verification on "Kajima Corporation -Calculation Results for FY2017 environmental performance data" (hereafter "the Report"). The content of our verification was to express our conclusion, based on our verification procedures, on whether the statement of information regarding the FY2017* environmental performance data in the Report was correctly measured and calculated, in accordance with the "Kajima Corporation -Calculation rule for environmental performance data" (hereafter "the Rule"). "The FY 2017 environmental performance data" includes: greenhouse gas (hereafter GHG) emissions; energy use; clean water use; waste emissions; emissions of the 13 specified chemical substances under Chemical Substances Control Law; and NOx and SOx emissions. The purpose of the verification is to evaluate the Report objectively and to enhance the credibility of the Report.

*The fiscal year 2017 of the Company ended on March 31, 2018.

2. Procedures Performed

JQA conducted verification in accordance with "ISO 14064-3" for GHG emissions calculated using energy use data, and with "ISAE3000" for clean water use, waste emissions, the specified chemical substances emissions, and NOx and SOx emissions, respectively. The scope of this verification assignment covers GHG emissions attributable to the Scope 1, 2 and the Scope 3 categorized No. 1-9, 11-13, clean water use, waste emissions, the specified chemical substances emissions, and NOx and SOx emissions. The verification was conducted to a limited level of assurance and quantitative materiality was set at 5 percent of the total emissions and total amount of energy use and clean water use in the Report. The organizational boundaries of this verification are domestic bases, international offices and construction and civil engineering sites in Kajima Corporation.

Our verification procedures included:

- Visiting the Company's head office to perform validation to check the Rule prior to check the data.
- On the basis of JQA's sampling procedure, sampling 4 office sites each out of 80 sites to verify energy use and the GHG emissions, clean water use and waste emissions attributable to administrative activity at all the offices.
- On the basis of JQA's sampling procedure, sampling 3 sites each out of 35 construction sites and 54 civil engineering sites to verify the GHG emissions, clean water use, waste, the specified chemical substances, and NOx and SOx emissions data attributable to construction.
- On-site assessment to check the report scope and boundaries, GHG sources and monitoring points for Scope 1, 2; calculation scenario and allocation method for Scope 3; and monitoring and calculation system and its controls for overall.
- Vouching: Cross-checking the GHG emissions data against evidence.

3. Conclusion

Based on the procedures described above, nothing has come to our attention that caused us to believe that the statement of the information regarding the Company's he FY 2017 environmental performance data in the Report, is not materially correct, or has not been prepared in accordance with the Rule

4. Consideration

The Company was responsible for preparing the Report, and JQA's responsibility was to conduct verification of the FY 2017 environmental performance data in the Report only. There is no conflict of interest between the Company and JQA.

Sumio Asada, Board Director
For and on behalf of Japan Quality Assurance Organization
1-25, Kandasudacho, Chiyoda-ku, Tokyo, Japan
June 20, 2018