100年をつくる会社 鹿島

Kajima Corporation

Environmental Data 2017

Medium-term goals and Results of FY 2016

	Medium-term goals for FY2015 - 2017	Action goals for FY2016	Results	Assessment
Low Carbon	(Design Operations) Reinforce and strengthen based on full-scale enforcement of the Revised Rationalization in Energy Use Law from FY2015.	(Construction Operations) ● Reduction of primary energy consumption during building operation : BEI≦0.8 (equivalent to 20% reduction of CO_2 in building operation) ● Obtain Five Star certification under the Building-Housing Energy-Efficiency Labeling System (BELS)	● Achievement of BEI≦0.8 in the projects where over half of design and construction was done (29.2% reduction of CO_2 in building operation) ● Obtained Five Star certification for a design and construction project, and achieved the first ZEB Ready designation for an office building in Japan	○
Low Carbon	(Construction Operations) Reduce CO_2 emissions per unit from sales to 17% below the FY1990 level	(Construction Operations) ● Reduce CO_2 emissions per unit from sales to 16% below the FY1990 level	16.6%	○
Recycling Resources	Reduce the final disposal rate to less than 3%	● Reduce the final disposal rate to less than 3% ● Reduce the construction sludge and promote effective use	2.7%	○
Recycling Resources	Promote green procurement in Design Operations Propose 4 or more items from the 17 priority items	● Promote green procurement at the design phase: Out of 17 standard construction materials/supplies, propose at least 4 to clients in each design ● Promote longer service life for buildings: Attain a score of at least 3.6 for evaluations based on in-house check sheet	● Achievement rate 92% Average 5.3 items ● Average3.70	○
Natural Symbiosis	Promote excellent projects in terms of biodiversity 6 projects or more per year	● Promote excellent projects in terms of biodiversity 6 projects or more per year	5 projects	△
Common Base	Manage hazardous substance Promote preventive measures (Priorities: soil contamination, asbestos)	● Manage hazardous substance Promote preventive measures (Priorities:soil contamination, asbestos)	● 1 environmental accident (petroleum spill)	×
Common Base	Promote managing chemical substances, etc.	● Management of environmental risk to prevent environmental accidents ● Risk assessment of chemical substances (640 substances)	● Confirmed the proper management in all projects ● Conducted education	○

2017.08

Material Flow

INPUT

Project sites

● Fossil fuels

- Diesel oil: 66,310 kℓ
- Kerosene: 4,205 kℓ

● Electricity 13,834 $\times 10^4$kWh

● Construction materials 183.2 $\times 10^4$t

● Water 159.7 $\times 10^4 m^3$

Office

● Electricity 2,587 $\times 10^4$kWh

● Material

- Heavy oil: 11.8 kℓ
- Kerosene: 12.4 kℓ
- Gas: 18.7 $\times 10^4 m^3$
- Water: 12.7 $\times 10^4 m^3$

OUTPUT

Project sites

● CO_2 emissions

- Construction: 25.8 $\times 10^4$t

● Construction surplus soil 86.0 $\times 10^4 m^3$

● Hazardous materials

- Materials containing asbestos: 13,250.5 t
- CFCs and halon received: 0.1 t
- Fluorescent tubes: 34.9 t

● Construction waste 229.8 $\times 10^4$t

● Final disposal volume 13.3 $\times 10^4$t

Office

● CO_2 emissions 1.5 $\times 10^4$t

● Volume of waste 1,414.9 t

[Scope]
Construction sites: All domestic and overseas sites (Local subsidiary is excluded)
Offices: All domestic and overseas offices (Local subsidiary is excluded)
The scope of following data is the same unless otherwise noted

Changes in CO_2 emissions attributable to construction

● Total volume

- Total emissions: 25.8 $\times 10^4$t-CO_2
- Value of construction: 11.4 $\times 10^2$billion ¥

● Reduction rate

- Basic unit: 21.5 t-CO_2/10^2million ¥
- Reduction rate (compared with FY1990): 16.6%

Indirect reduction (total) 34.3 $\times 10^4$t-CO_2

CO_2 emissions reduction attributable to green procurement (blast furnace cement/concrete) 10.4 $\times 10^4$t-CO_2

CO_2 emissions reduction attributable to energy-saving design of buildings* 23.9 $\times 10^4$t-CO_2

*Contribution amount of CO_2 reduction in building operation of which we provided design and construction (provided after FY 2008)

Volume of construction waste and final disposal volume

- Volume: 123.6 $\times 10^4$t
- Volume (including sludge): 229.8 $\times 10^4$t
- Final disposal volume: 3.3 $\times 10^4$t
- Final disposal volume (including sludge): 13.2 $\times 10^4$t
- Final disposal rate: 2.7%
- Final disposal rate (including sludge): 5.8%
- Total mixed waste volume: 3.4 $\times 10^4$t

Zero Carbon

From FY 2016, Scope 2 emissions are calculated in the market-based and the past figures have been recalculated.

CO_2 emissions at the construction stage

(FY)

		1990	2012	2013	2014	2015	2016
Emissions	$\times 10^4$t-CO_2	46.8	22.9	22.8	26.2	26.2	25.8
Value of construction work	$\times 10^2$billion ¥	18.2	10.1	9.7	11.0	11.5	11.4
basic unit	t-CO_2/10^2million ¥	25.8	22.0	22.0	22.2	21.5	21.5
Reduction rate	%	–	14.4	14.8	14.0	16.5	16.6

Scope type CO_2 emissions

(FY)

		2012	2013	2014	2015	2016
Scope-1	$\times 10^4$t-CO_2	15.9	17.3	20.4	20.4	18.5
Scope-2	$\times 10^4$t-CO_2	8.6	7.3	7.3	7.4	8.8

Total energy usage

(FY)

		2012	2013	2014	2015	2016
Total amount of energy consumption	$\times 10^4$kWh	111.0	105.2	117.5	118.6	120.1
Purchased electricity	$\times 10^4$kWh	16.7	12.5	12.8	13.1	16.4
Fossil fuels consumption	$\times 10^4$kWh	64.4	70.0	81.6	81.4	74.0
Heating/steam/cooling consumption	$\times 10^4$kWh	0.5	0.6	0.7	1.0	0.7

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)

		2012	2013	2014	2015	2016
Contribution amount of CO_2 reduction attributable to green procurement (blast furnace cement/concrete)	$\times 10^4$t-CO_2	5.2	5.5	8.6	9.9	10.4
Contribution amount of CO_2 reduction attributable to energy-saving design of buildings	$\times 10^4$t-CO_2	11.4	14.4	17.1	19.6	23.9
Total	$\times 10^4$t-CO_2	16.6	19.9	25.7	29.5	34.3

*Contribution amount of CO_2 reduction in building operation of which we provided design and construction (provided after FY 2008)

Purchased electricity (offices)

(FY)

		2012	2013	2014	2015	2016
Purchased electricity	万MWh	2.8	2.7	2.6	2.5	2.6

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)

		2012	2013	2014	2015	2016
Volume	$\times 10^4$t	165.3	137.6	132.6	162.6	123.6
Volume (including sludge)	$\times 10^4$t	324.9	263.4	197.5	248.6	230.0
final disposal Volume	$\times 10^4$t	4.6	4.3	4.5	5.0	3.3
fina disposal Volume(including sludge)	$\times 10^4$t	22.4	18.2	13.9	16.1	13.2
Final disposal rate	%	2.8	3.1	3.4	3.1	2.7
Final disposal rate(include sludge)	%	6.9	6.9	7.1	6.5	5.8
Total mixed waste Volume	$\times 10^4$t	4.6	4.7	4.7	4.9	3.4

Waste treatment by category

(FY)

Construction waste		Concrete remnants			Asphalt Concrete remnants			Wood scrap		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
Recycled volume	t	841,251.3	1,063,349.2	869,383.6	150,799.0	162,247.9	109,495.3	54,613.0	41,459.1	39,520.8
Reduction volume	t	4.2	66.6	8.4	1.6	28.7	21.7	1,152.2	611.0	528.6
Final disposal volume	t	5,118.3	1,723.1	1,444.2	360.7	94.2	317.5	620.9	494.3	185.3
Total volume	t	846,373.8	1,065,138.9	870,836.2	151,161.3	162,370.8	109,834.5	56,386.1	42,564.4	40,234.7

Construction waste		Construction sludge			Mixed waste		
		2014	2015	2016	2014	2015	2016
Recycled volume	t	498,437.2	673,907.1	892,614.6	32,265.7	28,105.6	23,540.2
Reduction volume	t	55,248.1	71,861.4	70,268.1	4,592.8	2,746.4	2,412.6
Final disposal volume	t	94,701.2	111,151.3	99,168.1	10,393.5	17,949.7	8,232.4
Total volume	t	648,386.5	859,919.8	1,062,050.8	47,252.0	48,801.7	34,185.2

Recycle rate by waste category

(FY)

Construction waste		Concrete remnants			Asphalt Concrete remnants			Wood scrap		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
Recycled rate	%	99.4	99.8	99.8	99.8	99.9	99.7	96.9	97.4	98.2
Reduction rate	%	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.4	1.3
Final disposal rate	%	0.6	0.2	0.2	0.2	0.1	0.3	1.1	1.2	0.5
Total	%	100	100	100	100	100	100	100	100	100

Construction waste		Construction sludge			Mixed waste		
		2014	2015	2016	2014	2015	2016
Recycled rate	%	76.9	78.7	84.0	68.3	57.6	68.9
Reduction rate	%	8.5	8.4	6.6	9.7	5.6	7.1
Final disposal rate	%	14.6	12.9	9.3	22.0	36.8	24.1
Total	%	100	100	100	100	100	100

Emissions by waste category (FY 2016)

Construction waste	Volume	Percentage of waste volume
Concrete remnants	870,836t	38%
Asphalt Concrete remnants	109,835t	5%
Wood scrap	40,235t	2%
Construction sludge	1,062,051t	46%
Mixed waste	34,185t	1%
Others	180,858t	8%
Total volume	2,297,999t	100%

Emissions by construction type (FY 2016)

Construction waste	New construction		Demolition		Others	
	Volume	Percentage of waste volume	Volume	Percentage of waste volume	Volume	Percentage of waste volume
Concrete remnants	206,425t	16%	621,462t	71%	42,949t	37%
Asphalt Concrete remnants	58,834t	4%	33,978t	4%	17,022t	15%
Wood scrap	28,430t	2%	8,408t	1%	3,397t	3%
Construction sludge	897,163t	68%	133,530t	15%	31,358t	27%
Mixed waste	17,612t	1%	12,699t	1%	3,875t	3%
Others	103,569t	8%	59,339t	7%	17,950t	15%
Total volume	1,312,033t	100%	869,415t	100%	116,551t	100%

Water consumption

(FY)

		2012	2013	2014	2015	2016
Offices	×10⁴m³	17.5	16.2	15.0	13.6	12.7
Construction sites	×10⁴m³	209.3	192.0	164.2	141.7	159.7
Total	×10⁴m³	226.8	208.2	179.2	155.3	172.4

Volume of offices waste

(FY)

		2012	2013	2014	2015	2016
Offices	t	1,944.6	1,892.4	974.6	1,389.6	1,414.8

Usage rate of recycled materials (FY2016)

Material	Total usage	Recycled material usage	Usage rate of recycled materials
Cement	50.3×10⁴t	25.1×10⁴t	50%
Ready-mixed concrete*	74.7×10⁴t	15.8×10⁴t	21%
	(981.9)×10⁴t	(103.8)×10⁴t	
Aggregate	56.4×10⁴t	20.9×10⁴t	37%
Asphalt	1.7×10⁴t	1.3×10⁴t	77%
Total	183.1×10⁴t	63.1×10⁴t	35%
	(674.3)×10⁴t	(116.8)×10⁴t	

* The figures for ready-mixed concrete only include the cement portion.
* Figures in parentheses represent the total amount of concrete.
* Steel materials have been excluded from the aggregation target since FY2014 because blast furnace and electric furnace steel as a whole has excellent recyclability.

Usage rate of recycled materials

(FY)

Material		2013	2014	2015	2016
Asphalt	%	97	90	89	75
Aggregate	%	65	49	30	37
Cement & ready-mixed concrete*	%	21	28	33	33
Total average	%	48	39	40	34

* The figures for concrete only include the cement portion.

Management of Hazardous Materials

Recover amount of CFCs & halons

(FY)

		2012	2013	2014	2015	2016
Recover amount	t	3.0	2.3	6.8	3.4	0.1

Recover amount of used florescent lamp

(FY)

		2012	2013	2014	2015	2016
Recover amount	t	111.2	85.3	47.3	48.1	34.9

Disposal volume of PCB include equipment

(FY)

	2012	2013	2014	2015	2016
Number of items	46	48	940	52	24

Recover amount of materials containing asbestos

(FY)

		2012	2013	2014	2015	2016
Recover amount	t	13,103.3	8,247.5	13,946.3	21,329.2	13,250.5

Number of soil contamination surveys

(FY)

	2012	2013	2014	2015	2016
Number of surveys as a designated institution	23	10	5	5	17
Number of law investigation included in above number	8	2	1	0	5

■**Regarding third party verification**

Environmental performance data for FY 2016
Greenhouse gas emissions(Scope 1, 2, 3), energy use, clean water use and waste emissions were verified by Japan Quality Assurance Organization (JQA). (Verification document attached to the end page)

2016 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 (223×10⁴t)	Processing cost (103×10²million ¥)	CO_2 emissions (1.8×10⁴t)
Construction sludge	1,058,316t	5,137×million ¥	10,537t
Concrete remnants	991,748t	2,795×million ¥	5,548t
Asphalt concrete remnants	109,835t	458×million ¥	274t
Mixed waste (organic)	32,577t	1,001×million ¥	1,236t
Mixed waste (inorganic)	1,608t	48×million ¥	64t
Wood scrap	40,158t	876×million ¥	550t
Total	2,234,242t	10,315×million ¥	18,209t
reference: All construction waste	2,267,637t	–	19,242t
Percentages of major wastes	99%		95%

Characteristics of the construction industry include the following.

- Wood scrap & mixed waste have large impact on treatment costs compared to emissions.
- Construction sludge has a significant impact on both CO_2 emissions & treatment costs. This is due to the fact that its recycling rate is low compared to other items and must be disposed into the managed disposal sites.
- 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 7% of 25.8k tons, the CO_2 emissions from the construction work. (FY2015: 8%)
- Waste disposal cost accounts for 0.9% of value of construction work. (slightly reduced from FY 2015; 1.1%).
- Value of construction is almost flat compared to the previous fiscal year, but waste emissions, disposal costs, and CO_2 emissions are on a downward trend overall.

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】

- The selected waste treatment facilities of the standard treatment method for each item in the Kanto district, then, processing unit CO_2 emissions has been set basis of waste disposal amount, the energy usage, maintenance and consumables, 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.

No.1811002925

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 FY2016 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 FY2016* greenhouse gas (hereafter GHG) emissions, energy use, clean water use and waste emissions in the Report was correctly measured and calculated, in accordance with the "Kajima Corporation -Calculation rule for environmental performance data (dated April 24, 2017)" (hereafter the Rule). The purpose of the verification is to evaluate the Report objectively and to enhance the credibility of the Report.

*The fiscal year 2016 of the Company ended on March 31, 2017.

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 and waste 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 and waste 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 the site visit and to check the data attributable to construction.
- Site visits to 4 offices selected by Kajima Corporation for verifying 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 34 construction sites and 48 civil engineering sites to verify the GHG emissions, clean water use and waste emission 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 FY2016 GHG emissions, clean water use and waste emissions 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 energy use and the GHG emissions, clean water use and waste emissions in the Report only. There is no conflict of interest between the Company and JQA.

Tadayuki Yano, Board Director
For and on behalf of Japan Quality Assurance Organization
1-25, Kandasudacho, Chiyoda-ku, Tokyo, Japan
June 26, 2017