

# Message from the President



The world faces various problems on a global level, such as global warming, water and other resource shortages, energy issues, and religious and regional conflicts. Such issues cannot be solved without the cooperation of all parties concerned. As seen in the Sustainable Development Goals (SDGs) and the Paris Agreement, the international community has taken a huge step forward toward the preservation of the global environment, upon which human beings depend for their existence, and realizing a sustainable society. On the other hand, some countries are reconsidering their relationships with other countries in order to pursue their own interests

In order to tackle these global issues, Kobe University considers it necessary to promote advanced research and develop new academic fields that go beyond the conventional humanities and sciences, while still adhering to the standards of our Charter on the Environment.

In April 2016 we established the Graduate School of Science, Technology, and Innovation. This graduate school combines humanities and sciences to provide education and research that can convert the research 'seeds' found in the study of natural science to social implementation using knowledge from the social sciences. It is our expectation that this new graduate school will contribute to solving the environmental and medical issues facing the planet.

Additionally, in April 2017, we established the 'Faculty of Global Human Sciences', our first new undergraduate faculty in 25 years. It aims to foster 'internationally cooperative and competitive personnel' who can take the lead in solving global issues by cooperating with professionals from diverse fields. The department is expected to make contributions to resolving global environmental issues as well.

Surrounded by the sea and the mountains, Kobe University boasts scenic views. The University is determined to tackle environmental issues, and we encourage all staff and students to take a proactive approach to preserving our beautiful environment.

The University, therefore, has included in its third-term objectives a commitment to implementing environmental conservation activities based on the basic philosophy of the Charter on the Environment. These include 3R activities for reducing our environmental impact, raising awareness surrounding harmful substances, energy saving, fostering students who will contribute to resolving environmental issues, and promoting environmental research projects. All these efforts require long-term commitments. We hope all corporations concerned and the people in our local communities, as well as the members of Kobe University, will understand and support our environmental activities.

# Kobe University Charter on the Environment

# **Environmental Philosophy**

As a world-class research and education institution, Kobe University pledges itself, through all of the university's activities, to the preservation of the global environment and to the creation of a sustainable society, the two most important challenges the world faces today.

Located between the Pacific Ocean and the Rokko Mountains, Kobe University utilizes this regional locality to its advantage for the fostering of environmentally-conscious students and the dissemination of knowledge gained from academic research to the world. Through these efforts, and by setting an example in the preservation of the environment, Kobe University pledges to build a path toward the realization of a sustainable society as a common goal of humanity.

# **Environmental Policies**

- **1.** To foster and support environmentally-conscious students.
- **2.** To promote research to create and sustain the global environment.
- **3.** To promote environmental preservation activities that set an example for others.

Enacted on September 26, 2006

# Environmental Education and Research, and Related Topics

Collaboration with corporations

<Topics>

PDF P.7

### Gomi-Japan's Reduced Packaging Shopping

NAKAYAMA Masato (Senior, Faculty of Economics) SHIBATA Yamato (3rd year, Faculty of Economics)

'Gomi-Japan is an NPO led by the members of Prof. Ishikawa' s seminar class, Faculty of Economics.'





Workshop on how to handle waste in our lives 20 years from now

Seikyo GI environmenta

<Topics>

PDF P.8

PDF P.9

# Kobe University Seikyo Gakusei linkai (GI) Activity Report 2016

MURAKAMI Yusuke (2nd year, Faculty of Maritime Sciences) 'Initiative active since 2009 promoting the recycling of used paper to prevent unnecessary leaflet distribution, in particular when the new academic year starts.





Goat recycling bin

Report in classes Use of the Environmental

### <Topics>

# **Environmental Studies using** the Environmental Report

http://www.kobe-u.ac.jp/info/public-info/environment/environmental.html





Naragakuen High School students Satoyama fieldwork with

### <Education>

PDF P.10

## Chemical analysis to discover the impact of forests on dissolved components in rain

ASAOKA Satoshi (Assistant Professor, Research Center for Inland Seas)

Together with high school students (staying at Kobe University for 2 nights), we conducted ion chromatography analysis on incident precipitation, canopy drip, and stemflow.





Dietary education and regional partnerships

Corporate responsibility

#### <Education>

**PDF P.11** 

# Supporting 'Dietary Education' with Kobe **University Elementary School (Akashi City)**

YAMASAKI Masanori

(Associate Professor, Food Resources Education and Research Center)

Provided classes for 2nd grade students to experience the entire rice growing process, from planting to harvesting.





<Education>

**PDF P.12** 

# Learning about environmental contribution based on CSR theory

BABA Shinichi (Associate Professor, Graduate School of Business Administration)

The Faculty of Economics offers a class called 'Introduction to CSR' (Corporate Social Responsibility), in which students can learn how the corporate sector is handling environmental issues



# Environmental Education and Research, and Related Topics

Waste policies in China

<Research>

**PDF P.13** 

## Mini Workshops on Waste Policies in China

ISHIKAWA Masanobu (Professor, Graduate School of Economics)
TAKEUCHI Kenji (Professor, Graduate School of Economics)

Analysis from an economic viewpoint of the civil action taken to promote recycling policy for urban waste and discussion of the separate waste policy in China.





Chinese point-purchasing program for household waste

Protecting cell metabolism from active carbon

#### <Research>

**PDF P.14** 

# In search of methods for protecting agricultural products in harsh conditions

MIYAKE Chikahiro (Associate Professor, Graduate School of Agricultural Science)

To secure agricultural business and protect products from abnormal climate conditions.

ROS generation mechanism at an PSI index



Environmentally friendly

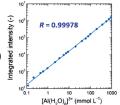
### <Research>

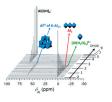
**PDF P.15** 

# Reaction analysis of environmentally-friendly aluminum coagulant for water

MAKI Hideshi (Associate Professor, Center for Environmental Management)
MIZUHATA Minoru (Professor, Graduate School of Engineering)

Introduction of an innovative new analysis method called 'Quantitative AI NMR'.





Plants condensing pollutants

#### <Research>

**PDF P.16** 

# Preventing and purifying crop pollution with cucurbitaceous plants

INUI Hideyuki (Associate Professor, Biosignal Research Center)

Cucurbitaceous plants accumulate over 100 times more lipophilic pollutants on their leaves or stems than other plants.





Supporting environmental activities in the community

### <Environmental Conservation Activities>

**PDF P.17** 

Supporting community involvement in resolving the pollution in the Toga River arising from fecal coliform bacteria

NAKAZAWA Minato (Professor, Graduate School of Health Sciences)
SUZAKI Toshinobu (Associate Professor, Graduate School of Science)
KOBAYASHI Mayumi (Academic Researcher, Graduate School of Science)
YOSHIMURA Chisato (Assistant Professor, Center for Environmental Management)
Community Activist Group 'Safe Toga River' Nada Ward Office, Town Development Unit





For details, please see the Environmental Report on the Kobe University website.

# Environmental Performance at Kobe University

### **Environmental Management Projects**

### Environmental Caravan and Environmental Improvement Caravan

Kobe University has been holding its annual Environmental Caravan since 2009, in which rooms are randomly selected from major campuses and checked for appropriate air conditioning temperature, correct waste separation, and energy preservation (whether lights are off when not in use). Through collecting this information it is possible to perceive the situation, understand the challenges facing each department, and create plans for improvement.

Since 2013, focus has been placed on lecture rooms, common rooms, offices, and outside spaces, and survey research is planned for multiple years. For FY2016, the survey was carried out on rooms for student use and outside garbage stations at Rokkodai 1, Tsurukabuto 1, Tsurukabuto 2, and Port Island 3.

In 2011, the Environmental Improvement Caravan began to report the results of Environment Caravan to all concerned departments, facilitate discussion, and offer proposals for resolving problems. Subsequently, each department is tasked with implementing improvement measures and reporting the outcomes. In doing so, we are following the PDCA cycle.

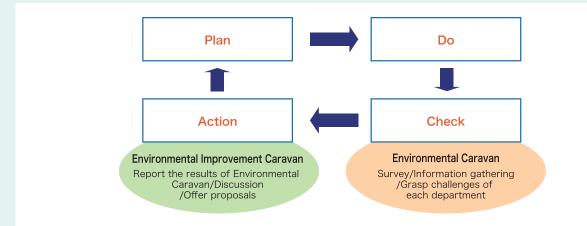
As a result of these proactive and continuous efforts, every year brings further positive outcomes, such as moderate air conditioning temperature and organized outdoor garbage spaces.



Environmental Caravan



**Environmental Improvement Caravan** 



# Paper Waste Reduction

The Environmental Caravan found that garbage boxes and garbage spaces have a large quantity of recyclable paper. To facilitate separate recyclable paper collection, an appeal was made directly to the attendees of the Environment Report debriefing session, letters were sent to all departments, and containers exclusively for recyclable paper were placed at garbage collection points.





# Environmental Performance at Kobe University

### Saving Energy and Preventing Global Warming

### (1) Energy Usage

The total amount of energy used at Kobe University, including electricity, gas, fuel oil, etc. in FY2016 reached approx. 900,000 GJ (\*1). CO2 emissions by energy reached approx. 35,000 tons. (\*1 This is an energy value converted based on Article 4 'Regulations for the Enforcement of a Law Concerning the Rationalization of Energy Usage')

Total energy usage increased by 2.8% from FY2015. Energy use on Port Island 3 has increased due to the opening of an Annex building with a total floor area of 4.540m, and use in other areas has slightly increased as well. Energy usage per unit area (divided by the total floor area) has increased by 2.7% from FY2015.

Under severe financial restrictions, we declared the need for upgrades such as new air-conditioning units, changing to LED lights both within and outside the University, etc., however, we have yet to secure the budget for this. We will commit ourselves to securing the budget and promoting further energy saving activities.

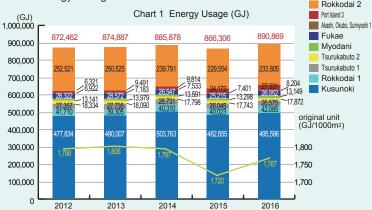


Table 1 Energy Emission by Region(GJ)

	FY2012	FY2013	FY2014	FY2015	FY2016		
Rokkodai 1	41,710	39,305	40,310	40,023	42,085		
Rokkodai 2	252,521	250,525	239,791	229,554	233,805		
Tsurukabuto 1	27,357	27,735	26,731	26,045	26,575		
Tsurukabuto 2	18,334	18,090	17,798	17,743	17,872		
Kusunoki	477,834	480,007	503,763	482,855	495,596		
Myodani	13,141	13,979	13,591	13,298	13,149		
Fukae	28,322	28,572	26,547	25,215	26,052		
Akashi, Okubo, Sumiyoshi 1	6,922	7,183	7,533	7,401	8,204		
Port Island 3	6,321	9,491	9,814	24,172	27,531		
Total	872,462	874,887	885,878	866,306	890,869		
(GJ/1000m <sup>2</sup> )	1,798	1,806	1,797	1,720	1,767		

FY2015 1,720 GJ/1000m<sup>2</sup>

FY2016 1,767 GJ/1000m<sup>2</sup>

### (2)CO<sub>2</sub>Emissions

CO<sub>2</sub> emissions and CO<sub>2</sub> emissions per unit area across 11 locations increased slightly from the previous year.

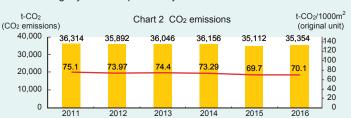


Table 2 CO<sub>2</sub> Emissions(t-CO<sub>2</sub>)

	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Rokkodai 1	1,881	1,822	1,753	1,783	1,768	1,614
Rokkodai 2	11,178	11,080	11,201	10,683	10,206	9,044
Tsurukabuto 1	1,208	1,183	1,225	1,177	1,146	1,010
Tsurukabuto 2	481	490	483	475	474	653
Kusunoki	19,760	19,526	19,583	20,195	19,354	20,156
Myodani	448	420	442	428	415	517
Fukae	943	878	907	815	776	1,028
Sumiyoshi 1	137	152	96	164	170	162
Akashi	115	126	75	127	103	103
Okubo	87	45	26	45	54	51
Port Island 3	76	170	255	264	646	1,016
Total	36,314	35,892	36,046	36,156	35,112	35,354
Original unit	75.1	73.97	74.4	73.29	69.7	70.1

<sup>\*</sup>CO2 emissions = Usage x emission coefficient

Hyogo Prefecture has had a Specific Substances (greenhouse gas) emission control plans and measures report system in place since October 1, 2003. Under the provisions of Article 142(2) concerning environmental conservation and creation, the concrete policies are set out. It sets FY2005 as a base year and FY2020 as a target year for calculating specific substance emission.

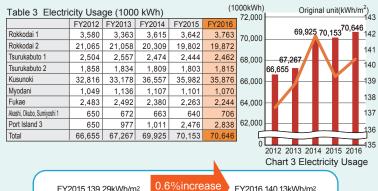
Kobe University has a duty to report its activities, and submitted plans and reports to Hyogo Prefecture with FY2004 (first year of national university cooperation) as the base for measurement and FY2020 as the target year to achieve a 15% decrease. As of 2016, the University marked a 14.4% decrease from 2004.

FY2015 69.7 CO2 tons /1000 m2 FY2016 70.1 CO<sub>2</sub> tons /1000 m<sup>2</sup>

CO<sub>2</sub> emissions per 1000 m<sup>2</sup>

### (3) Electricity Usage

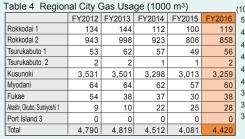
The total amount of electricity used in FY2016 increased by 0.7% from the previous fiscal year. This was due mainly to climate change and the opening of a new laboratory building in the Port Island 3 area that started operation in June of FY2015.

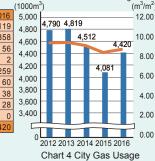


FY2015 139.29kWh/m<sup>2</sup>

(4) City Gas Usage

Total gas usage in FY2016 increased by 8.3% from the previous fiscal year. This was mainly due to unusual climate.





Original unit

FY2016 140.13kWh/m<sup>2</sup>

8.3%increase FY2016 8.77 m<sup>3</sup>/m<sup>2</sup>

### (5) Fuel Oil Usage

FY2015 8.10 m<sup>3</sup>/m<sup>2</sup>

Total fuel oil usage in FY2016 increased by 12.2% from the previous fiscal year. The fuel oil is mostly used in heating boilers in the Fukae area, which increased in the summer season.

Table 5 Fuel Oil Usage (kiloliter)

Table 5 Tuel Oil Osage (kiloliter)							
	FY2012	FY2013	FY2014	FY2015	FY2016		
1Rokkodai 1	0	0	0	0	0		
Rokkodai 2	0.17	0.24	0.22	0.49	0.12		
Tsurukabuto 1	0	0	0	0	0		
Tsurukabuto 2	0	0	0	0	0		
Kusunoki	0	0	0	0	0		
Myodani	0	0	0	0	0		
Fukae	39.60	62.72	40.90	44.00	49.80		
Akashi, Okubo, Sumiyoshi 1	0	0	0	0	0		
Port Island 3	0	0	0	0	0		
Total	39.77	62.96	41.12	44.49	49.92		



FY2015 0.088 liters/m<sup>2</sup>

12.5%increase FY2016 0.099 liters/m<sup>2</sup>

<sup>\*</sup>CO2 emissions per area are calculated by multiplying emission coefficients for electricity, gas, oil usage.

# Environmental Performance at Kobe University

### **Conserving Resources and Recycling**

### Water Usage

Total water usage in FY2016 decreased by 46,000 m<sup>3</sup> (10.1%) from the previous fiscal year. In the Rokkodai area, water resources have been conserved by using Rokko Mountain river water as reclaimed wastewater for flushing toilets, in laboratories, and elsewhere. In addition, the Kusunoki area started using well water in February 2012. Efforts toward the efficient use of water resources, including water-saving toilets and automatic flushing systems, will continue.

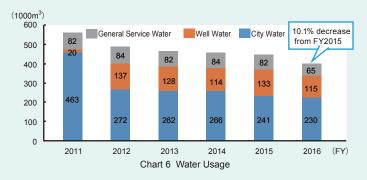


Table 6 Water Usage ( m3)

		FY2011		FY2012	2	FY2013	3	FY2014	l .	FY2015	5	FY2016	;
			Total		Total	1	Total		Total		Total		Total
Rokkodai 1	City water	14,431	29.563	13,429	28.614	10,971	26.621	11,617	26.563	10,290	24.410	5,953	19.815
campus	General service water	15,132	2 29,505 15,185 28,014 15,650 20,021 1	14,946	20,505	14,120		13,862	19,015				
Rokkodai 2	City water	46,231	93.009	43,458	93.766	45,937	93.595	41,738	92.509	42,077	89,253	24,426	58,559
campus	General service water	46,778	93,009	50,308	93,700	47,658	93,393	50,771	92,509	47,176	09,233	34,133	56,559
Tsurukabuto	City water	10,455	22.348	11,651	21.813	10,338	20.194	11,119	21.096	13,562	25.402	8,896	18,235
1 campus	General service water	11,893	22,340	10,162	21,013	9,856	20, 194	9,977	21,090	11,840	25,402	9,339	10,233
Tsurukabuto	City water	7,168	15.320	6,523	15.333	5,928	14.709	6,850	15.380	7,440	16.103	5,957	13.614
2 campus	General service water	8,152	15,320	8,810	10,333	8,781	14,709	8,530	15,380	8,663	10,103	7,657	13,614
Kusunoki	City water	270,972	290.753	152,921	289.517	143,131	270.920	153,229	267.155	128,892	261.614	146,582	261,700
area	Well water	19,781	290,753	136,596	269,517	127,789	270,920	113,926	207,100	132,722	201,014	115,118	261,700
Myodani	City water	6,705	6.705	6,796	6.796	7,112	7.112	6,000	6.000	5,877	5.877	5,079	5.079
area	General service water	0	0,705	0	0,790	0	/,112	0	0,000	0	3,011	0	5,079
Fukae area	City water	22,424	22.424	21,157	21,157	20,093	20.093	17,709	17.709	17,915	17,915	16,962	16,962
i unuc urcu	General service water	0	22,424	0	21,137	0	20,093	0	17,709	0	17,913	0	10,902
Sumiyoshi	City water	67,913	67.913	3,869	3.869	3,876	3.876	3,664	3.664	4,508	4.508	4,186	4.186
1 area	General service water	0	67,913	0	3,009	0	3,676	0	3,004	0	4,506	0	4, 100
Akashi area	City water	12,488	10 100	8,286	0.000	9,911	0.044	9,554	0.554	6,389	0.000	7,832	7,000
7 Washii arca	General service water	0	12,488	0	8,286	0	9,911	0	9,554	0	6,389	0	7,832
Okubo area	City water	3,787	0.707	3,849		4,112		3,439		3,560		3,411	
Onabo arca	General service water	0	3,787	0	3,849	0	4,112	0	3,439	0	3,560	0	3,411
Port Island	City water	117		434		583		944		843		265	
3 area	General service water	0	117	0	434	0	583	0	944	0	843	0	265
	City water	462,691		272,373		261,992		265,863		241,353		229,549	
Total	Well water	19,781	564,427	136,596	493,434	127,789	471,726	113,926	464,013	132,722	455,874	115,118	409,658
	General service water	81,955		84,465		81,945		84,224		81,799		64,991	

#### Non-Industrial Waste

Chart 7 shows the amount of non-industrial waste produced from FY2012 to FY2016. In FY2016, it decreased by 13% from the previous year.

Table 7 Non-Industrial Waste Production

Table 7 Non-industrial Waste Froduction								
	Total waste(t)	Bulk waste(t)	Volume recycled(t)	Recycled ratio(%)				
2012	3255.1	2882.0	373.2	11.5%				
2013	3149.1	2779.2	369.9	11.7%				
2014	2725.1	2380.1	345.0	12.7%				
2015	1585.3	1227.7	357.6	22.6%				
2016	↑ 1379.2	1102.8	276.4	20.0%				
13.0% decrease 10.2% decrease								

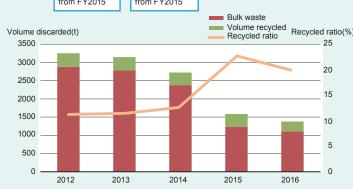
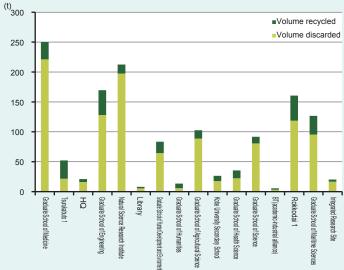


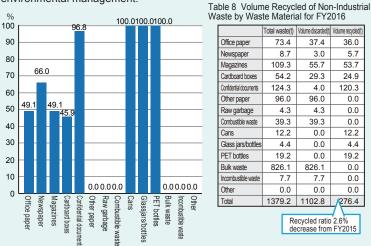
Chart 7 Changes in Non-Industrial Waste Production from FY2012 to FY2016

Chart 8 shows the volume of non-industrial waste recycled in each faculty in FY2016. The recycled ratio was 11.5% in FY2012, 11.7% in FY2013, 12.7% in FY2014, 22.6% in FY2015, 20.0% in FY2016. The faculties and campuses that have larger amounts of bulk waste and/or non-combustible waste displayed a lower recycled ratio.



Volume Recycled of Non-Industrial Waste by Faculty/Campus for FY2016

Chart 9 shows the recycled ratio of non-industrial waste by waste material for FY2016, revealing that the recycled ratios of newspapers, magazines and cardboard boxes are considerably low. If the recycled ratio for paper waste can be increased to 90% the entire recycled ratio will see a boost from 20% to 27% (based on FY2016 volume). Further efforts to improve the recycled ratio will continue in accordance with the basic policies for environmental management.



	Total waste(t)	Volume discarded(t)	Volume recycled(t)
Office paper	73.4	37.4	36.0
Newspaper	8.7	3.0	5.7
Magazines	109.3	55.7	53.7
Cardboard boxes	54.2	29.3	24.9
Confidential documents	124.3	4.0	120.3
Other paper	96.0	96.0	0.0
Raw garbage	4.3	4.3	0.0
Combustible waste	39.3	39.3	0.0
Cans	12.2	0.0	12.2
Glass jars/bottles	4.4	0.0	4.4
PET bottles	19.2	0.0	19.2
Bulk waste	826.1	826.1	0.0
Incombustible waste	7.7	7.7	0.0
Other	0.0	0.0	0.0
Total	1379.2	1102.8	/276.4

Recycled ratio 2.6%

decrease from FY2015

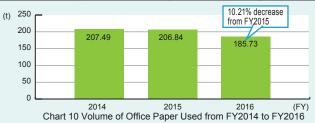
Chart 9 Recycled Ratio of Non-Industrial Waste by Waste Material for FY2016

### Trends in Paper Usage Across the University

Chart 10 shows trends in the amount of office paper used from FY2014 to FY2016. The volume of office paper used decreased by 10.21% (approx. 21.11 tons) from the previous fiscal year. We must continue our efforts to reduce office paper use by making it common practice to have paperless meetings and lectures, to make copies using both sides of the paper, to make consolidated printings, and to use the blank side of paper that has been used on only one side

Table 9 Volume of Office Paper Used

The state of the s									
	FY2	014	FY2	015	FY2016				
Item	Used(t)	Up/Down %	Used(t)	Up/Down %	Used(t)	Up/Down %			
Copy Paper	206.93	3.4%	206.00	-0.45%	185.16	-10.21%			
Printing paper (for black & white)	0.49	-9.3%	0.36	-36.11%	0.16	-55.56%			
Printing paper (for color)	0.07	0.17%	0.48	85.42%	0.41	-14.58%			
Total	207.49	3.4%	206.84	-0.31%	185.73	-10.21%			



## Third-Party Review

I would like to express my sincere respect for all those who helped compile the Kobe University Environmental Report 2017. Reading through it, I got the impression that it clearly explains the broad range of activities that Kobe University has embarked upon taking advantage of its strengths—for example, the collaborative project between the Graduate School of Agriculture and the affiliated elementary school. As has been pointed out in previous third-party reviews, the fact that the report is used as lecture material, etc., to provide feedback to university members is particularly impressive. I would like my own institution, Osaka University, to apply the same efforts.

As head of the Department of Environment and Energy Management at Osaka University for the past few years, I would like to make several suggestions.

First is a more active partnership with local government and other neighboring universities. Kobe University is the largest university in Kobe City, as well as a leading business site. Therefore, other universities and companies can learn a lot from the projects carried out within Kobe University . Osaka

University is one of the universities listed as a greenhouse gas emitter by our local government in Suita City. We have, therefore, organized a joint project: 'Working Group on Energy Saving within Universities and Research Institutes', which meets on a regular basis to share our experiences with energy saving projects. I believe Kobe University can play a similar leading role in environmental activities for the whole of Kobe City.

Second is taking more concrete action toward reducing greenhouse gas emissions. Under Japan's Global Warming Countermeasures, based on the Paris Agreement, Japan aims to reduce CO<sub>2</sub> emissions by 26% by 2030 compared to the 2013 standard. As the private sector, including universities, is tasked with achieving a 40% decrease in the plan, all universities will need to take more drastic measures to reduce greenhouse gas. Unfortunately, state-run universities face severe financial conditions as mentioned in this report. Despite such financial limitations, I believe that together we can come up with ideas that will lead to a breakthrough in energy saving measures.



#### SHIMODA Yoshiyuki

Professor in the Department of Sustainable Energy and Environmental Engineering, Graduate School of Engineering Osaka University

Director of Environment and Energy Management Division, Campus Sustainability Office, Osaka University

<Profile>

Completed degree in Environmental Engineering at the Graduate School of Engineering Osaka University, specializing in research on urban civilian energy systems, urban climate, environmental assessment for energy systems, etc. Author of several publications on the energy system. He is also a temporary member of the Ministry of the Environment, Central Environment Council (Global Environment Committee) and the Japan Gas Association, Energy System Assessment Committee, etc.

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Kobe University Environmental Report 2017



### Cover



KOYAMA Ryota, Freshman, Faculty of Engineering Location: In front of the Faculty of Engineering building

When designing the cover page, we collected photos from undergraduate and graduate students and affiliated schools with the aim of making them familiar with the Environmental Report. This image was awarded first prize by the evaluation committee of the Center for Environmental Management. Thank you to all applicants for your participation.

At the reception after the 7th Report Meeting of the Center for Environmental Management, the recipient was granted a commendation and a bookstore gift card.

#### Comment

I took this photo wanting to capture the big green trees as much as possible just in front of the Faculty of Engineering building.



KOYAMA Ryota