



# KYOTO UNIVERSITY

## Environmental Report

### 2014

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Agency for Health, Safety and Environment
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#### Feature

Report on Campus Sustainability Efforts  
ÉCOle de Kyodai 2014 Implementation Report

#### Annual Report

Status of Environmental Initiatives at  
Kyoto University in the 2013 School Year

Photo: Kyoto University Seifuso



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## Editorial Policy

The Kyoto University Environmental Report 2014 has been put together and edited primarily by the newly formed Environmental Report 2014 Working Group based on extensive discussions.

Look for the feature report, which examines an important initiative begun in 2012 to develop sustainable campuses; the features also covers related participatory events that took place during Sustainability Month. We also report on environment-related education and research, plus various on-campus environmental initiatives.

The report is only able to cover in detail a portion of the university's undertakings, but we hope that it will stimulate awareness, ideas, and action amongst all readers and those with a stake in Kyoto University. An additional goal in producing the report is to further encourage environmental efforts both on and off campus into the future.

Reference guidelines: Environmental Reporting Guidelines, Japanese Ministry of the Environment (2012 version)

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## Message from the President: Our Commitment



Kyoto University was established in 1897, and since the school's earliest days open discussion based on a liberal academic culture has been highly valued. The school has cultivated a spirit of independence and contributed to society in many ways through high-quality advanced education and cutting-edge scholarship, as we equip graduates with the abilities needed for international collaboration that can contribute to peaceful coexistence throughout the global community.

Universities have a crucial role to play as a wellspring of knowledge—for developing human resources and producing research results to serve the future of humanity. In these times of rapid societal change, our mission is nothing less than to nurture the talent of individuals capable of breaking new ground and help to germinate pioneering technical innovations that can change people's lives across the planet.

The threat of global resource depletion lurks behind the abundance found in advanced nations, and a crisis of survivability looms large for the human race in the not too distant future. The number one issue that needs to be addressed for both the sustainability of the global environment and the survival of coming generations is energy consumption.

We base our university efforts on the premise that no area is off-limits in educational research on reducing environmental impact. We naturally promote reductions in energy consumption on campus through measures to save energy at laboratory facilities, the introduction of LED lighting, and improved building insulation. At the same time, we are working to actively introduce renewable energy facilities such as solar power systems.

In recent years, particularly as calls for a low-carbon society grow stronger, a need has developed for groundbreaking technological innovation in four areas—energy creation, storage, consumption, and recovery. We are taking strides to develop Kyoto University into a leader in advanced research on low-carbon systems.

This environmental report contains information on actions being taken by the university in sustainability education and research, as well as environmental conservation. The feature report examines our plan for promoting sustainable campuses that was initiated in 2012.

Kyoto University will continue to pave the way as a leading university on the world stage, aiming to create a new global future and overcome the myriad environmental problems we face. Your guidance and support as we tackle these issues is warmly appreciated.

(August 2014)

**Hiroshi Matsumoto**  
President, Kyoto University

# Outline of the University and Scope of this Report

## Outline of the University

University name	Kyoto University
Address	Yoshida-honmachi, Sakyo-ku, Kyoto 606-8501 Japan
Established	June 1897
President	Hiroshi Matsumoto
Staff and students	34,842

### Breakdown of staff and students

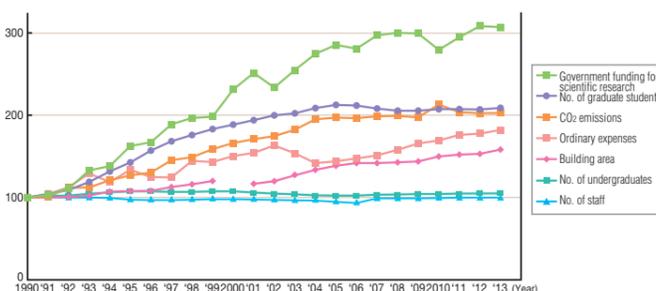
Staff		Undergraduates		Graduate students	
Faculty and administrative staff	5,442	Undergraduates	13,421	Master's	4,846
Part-time staff, etc.	6,492	Auditing students, etc.	164	Doctoral	3,682
				Professional degree	728
				Auditing students, etc.	67
<b>Total</b>	<b>11,934</b>	<b>Total</b>	<b>13,585</b>	<b>Total</b>	<b>9,323</b>

Campuses	Yoshida Campus	Yoshida-honmachi, Sakyo-ku, Kyoto
	Uji Campus	Gokasho, Uji, Kyoto
	Katsura Campus	Kyoto daigaku-katsura, Nishikyo-ku, Kyoto
	Kumatori Campus	Kumatori-cho, Sennan-gun, Osaka
	Inuyama Campus	Kanrin, Inuyama, Aichi
	Hirano Campus	Hirano-cho, Kamitanami, Otsu, Shiga
	And other facilities	

※ Reference: Home > Research and Collaboration > International Relations > Publications > Kyoto University Profile ([http://www.kyoto-u.ac.jp/ja/issue/ku\\_profile/index.htm](http://www.kyoto-u.ac.jp/ja/issue/ku_profile/index.htm))

## Scope of this Environmental Report

Period	April 1, 2013 to March 31, 2014 (Information on some undertakings extends to June 2014)
Staff and students	All (34,842 people)
Campuses	All (excluding environmental impact data for dormitories and lodging facilities)
Building floor area	1,293,173 m <sup>2</sup>



(Reference) Kyoto University annual indices based on 100 in 1990

# Status of Main Activities and Campus Improvements at the University

## Main activities at the university

Kyoto University has long fostered a tradition of academic freedom supported by high ethical standards, focusing on research that forms the backbone of scholarship—creative, leading-edge research. We are working to improve our functions as a world-class hub of research to take a leading role in key fields and train individuals to play vital roles in society.

In the 2013 school year the university established the Institute for Liberal Arts and Sciences in order to place under a single purview the design, coordination, and implementation of liberal arts and science courses. The Institute has set up a university-wide system to help plan and implement these courses, focusing on graduate schools that have a corresponding undergraduate faculty, as well as graduate schools without an undergraduate faculty, research institutes, and research centers. The Graduate School of Advanced Integrated Studies in Human Survivability (Shishu-Kan) was also established, with the mission of developing coming generations of global leaders.



Graduate School of Advanced Integrated Studies in Human Survivability (Shishu-Kan)

With regard to research activities, as part of the MEXT-sponsored program for promoting the enhancement of research universities, we have solicited and accepted 67 applications to join our supporting program for interaction-based initiative team studies (SPIRITS) in both international and interdisciplinary categories. This is a trans-border program consisting of interdisciplinary, international, and interpersonal areas, established to accelerate the internationalization of research at Kyoto University, support efforts in frontier research and emerging fields of science, and encourage interdisciplinary research. The John Mung Program was set up in the 2012 school year to encourage young researchers to study abroad. Its success has led to an expansion in the number of individuals being provided support for overseas study, leading to its being renamed the Super John Mung Program in the 2014 school year.

As societal and economic globalization continues to advance at a rapid pace, bringing with it intensified global competition, Kyoto University aims to promote its further development as an institution of

higher learning that produces world-class knowledge. To consolidate our global position as a premier university, we are shifting from merely promoting international exchange to an approach that emphasizes practical achievement of numerical targets aimed at internationalization. Toward this end we have launched a new international strategy that sets basic targets for research, education, and international collaboration, delineating specific measures to achieve the goal of doubling our performance or internationalization indices by 2020.



Kyoto University's International Strategy

## Campus improvements

Infrastructure improvements are being made on campuses with a top priority placed on improving earthquake resistance and safety based on Kyoto University's earthquake-proofing promotion policy established in the 2006 school year to rehabilitate educational, research, and medical facilities in order to enhance safety and security. In the 2013 school year, construction was begun on earthquake-proofing 10 facilities as part of the school budget with the assistance of facility repair subsidies. Upon completion of these projects, 93% of the university's facilities will be compliant with earthquake resistance standards.

Further earthquake-proofing and other forms of renovations are being carried out for lifeline educational, research and medical facilities that are over 25 years old to prevent hazard risks in times of emergency. Such efforts are aimed at protecting people's lives, ensuring operational continuity, and safeguarding the university's assets. In addition, a new building is being built at Kyoto University for carrying out clinical research on iPS cell-based regenerative medicine, new pharmaceuticals, and the like, in line with the Japanese government's strategy to accelerate Japan's iPS cell research nationwide. This new facility will help to further improve educational and research efforts at the university.

As part of our plan to achieve sustainable campuses, we are also moving ahead with constructing a building for initiatives that focus on achieving innovations in international science, aiming to acquire LEED (Leadership in Energy & Environmental Design) certification, a first for a national university corporation in Japan.

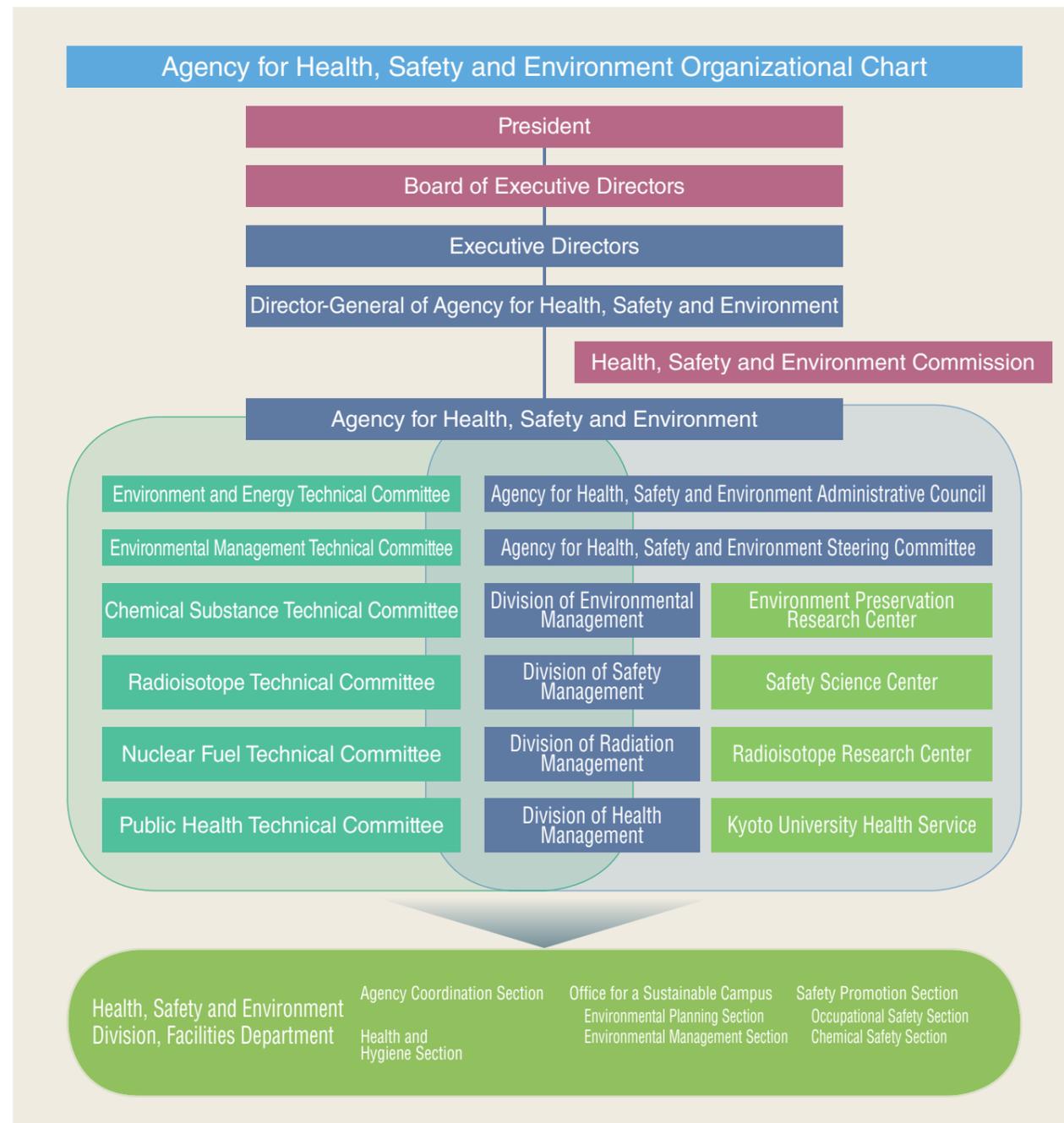


Rendering of International Science Innovation building

## Status of Environmental Management System and Measures to Reduce Environmental Impact

The mission statement of Kyoto University includes a declaration that the university will run its operations in an environmentally friendly way. To further clarify this statement, an environmental charter was drawn up in 2002, aimed at establishing an integrated environmental management system with the cooperation of all Kyoto University students, faculty, and staff.

### Organization



The Agency for Health, Safety and Environment was established as a university-wide support body for promoting actions related to environmental safety, safety management, safety education, and health and hygiene at the university. In April 2011 the agency was relaunched with the integration of three centers that form a support network for operations—the Environment Preservation Research Center, Kyoto University Health Service, and Radioisotope Research Center. The reorganization establishes a more

efficient, laterally organized system for carrying out efforts in health, safety and the environment.

The Agency for Health, Safety and Environment promotes and coordinates activities throughout the university related to health, safety and the environment. It also supports these activities at each workplace and department, and carries out education with regard to health, safety and the environment, including instructional training and seminars.

### Eco-oriented coordination

The Director-General of the Agency for Health, Safety and Environment has been working to promote education on environmental measures through personal visits to department heads at the university.

The Agency for Health, Safety and Environment regularly encourages the promotion of environmental measures through a variety of educational efforts, but the uniform implementation of such measures has often been difficult due to varying departmental circumstances, which led to each department adopting its own approach for maintaining a balance between taking environmental measures and stimulating educational research.

Therefore, starting in the 2010 school year, the Director-General of the Agency has been visiting department heads himself to learn about each department's situation, to share information, and to discuss what measures might be effective. He has also been encouraging the departments to promote education for sustainability. At these visits he presents the results of the survey that each department

has participated in that reveals environmental impact data over time and environmental actions taken; he also presents an environmental tax system interim report, along with materials that detail upcoming plans. The Director-General shares examples of environmental measures being taken at the university and the best practices of other departments to provide the departments with information to encourage further action.

His planned visits have given priority to departments with high energy consumption per unit area and departments with large floor areas. Between the 2010 and 2012 school years, he visited nearly every department at the university. On his second round of visits in the 2013 school year, he visited 11 departments.

### Sustainability education at the University

At Kyoto University, education for sustainability includes an environmental science course offered as a common subject for all faculties and many other sustainability-linked courses.

The university offers many Global COE (Centers of Excellence) projects and units of study as programs to develop human resources for contributing to society. Daily efforts are being made to foster individuals capable of supporting society and the global environment in the future. (See p.14)

In addition, to reach all students, faculty, and staff at the university, education for sustainability is provided to all new enrollees and new academic and general staff; education is also provided to academic and general staff members and students with regard to greenhouse gases, waste, and chemicals—all of which have an especially high environmental impact.



## Overview of Environmental Impact in the 2013 School Year

### School year 2013 material flow (Supply and consumption of resources and energy; emission of waste, pollutants and other substances)

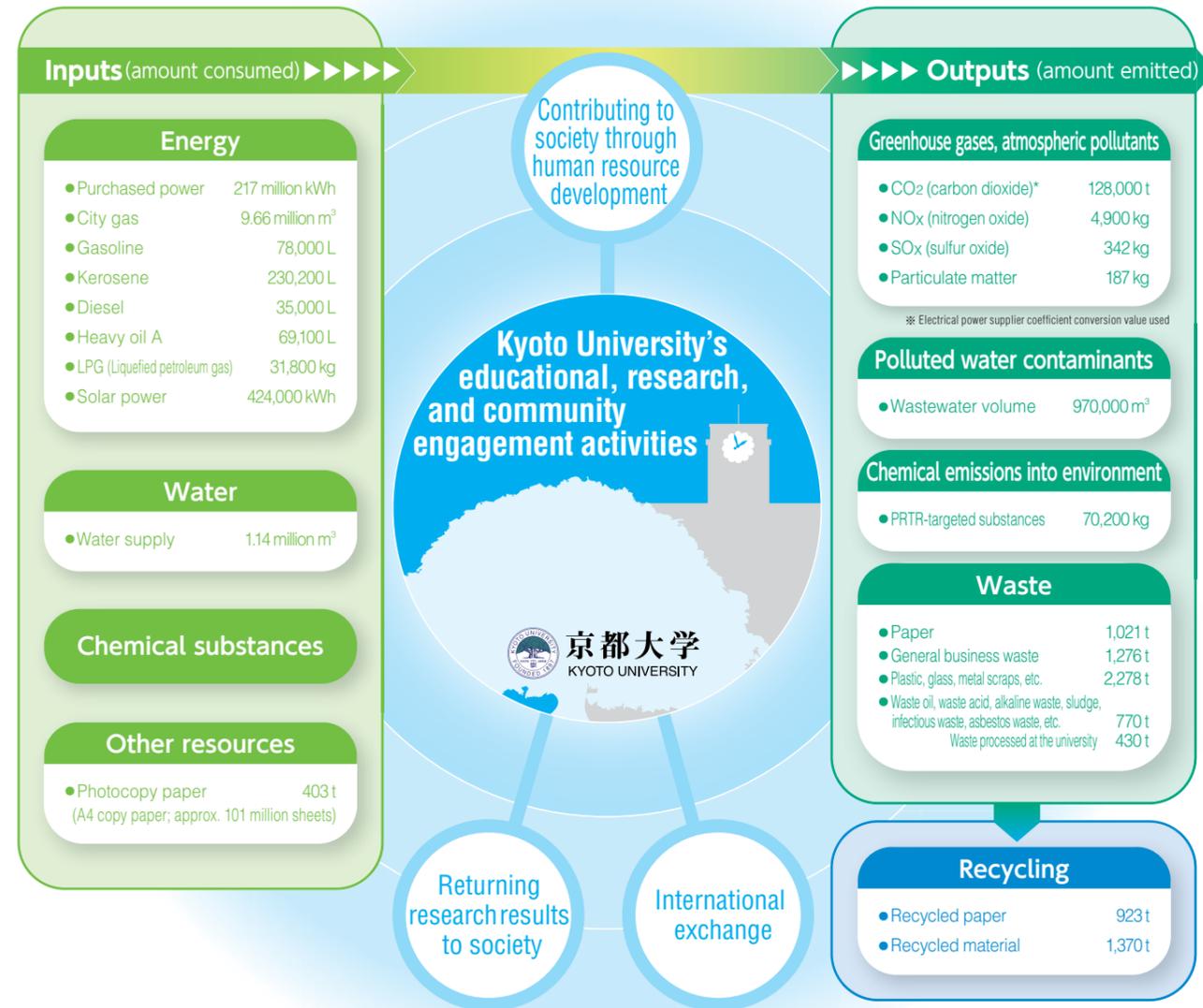
Kyoto University uses electricity, gas, and other energy and water resources within the scope of its educational, research, medical, and community engagement activities, inevitably producing greenhouse gases, waste, and wastewater.

Inputs represent energy, water, and other resources, while outputs show amounts of greenhouse gases, atmospheric

pollutants, waste, and wastewater. Also shown are amounts of recycled resources.

Data collection has covered all campuses since the 2008 school year.

Supply and consumption of resources and energy, and emission of waste, pollutants and other materials are shown below as material flow for the university in the 2013 school year.



## Feature 1 Report on Campus Sustainability Efforts

Creating sustainability in society is a long-term goal that institutions of higher education have started to work toward by establishing environmentally friendly campuses.

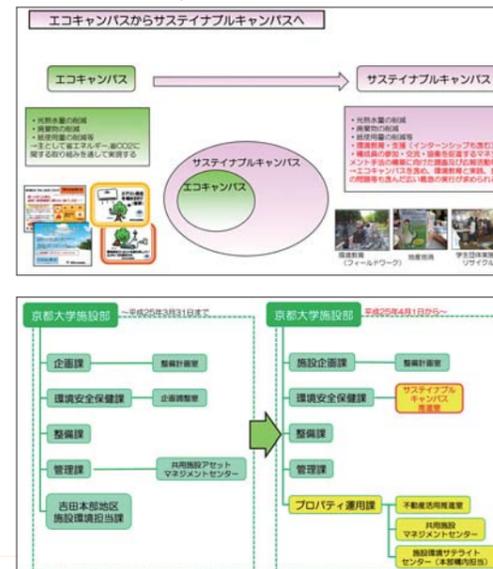
Kyoto University began "sustainable campus" efforts in the 2012 school year; these developed further under the umbrella of an "eco-campus" initiative. In the 2013 school year the university began to focus more seriously on sustainable campus-related activities and building inter-university networks in this regard both nationwide and internationally to promote these efforts. (Further details on sustainable campus building efforts are available in the Environmental Report 2013.)

### The Office for a Sustainable Campus established

Sustainable campus efforts begun in the 2012 school year are being carried out in a more expanded form through an initiative to build eco-campuses.

A sustainable campus is a campus in which environmental efforts are pursued in terms of both the "hard" aspects of university operations, such as energy conservation, reduction of CO<sub>2</sub> emissions, transportation planning and waste management, and the "soft" aspects such as sustainability education and research, community engagement, food issues, and administrative procedures.

To promote sustainable campus activities at Kyoto University and connect with outside networks, participate in surveys, and so on, a dedicated organization within the university was deemed necessary, and the Office for a Sustainable Campus was thus established in April 2013 within the Facilities Department.



### Participating in and building relationships with sustainable campus networks

In the 2013 school year, for a second consecutive year Kyoto University participated in relationship-building activities with overseas sustainable campus networks. In June 2013 the university sent representatives to the annual conference of the International Sustainable Campus Network (ISCN), held in Singapore, and to the annual conference of the Association for the Advancement of Sustainability in Higher Education (AASHE) in North America in October 2013. We reported on the initiatives being taken at Kyoto University and communicated with other participating schools.

At the AASHE conference in particular, we were impressed with the active participation of students in the discussions and realized once again the importance of student participation in university efforts.

June 2013: Participating in the annual conference of the International Sustainable Campus Network (ISCN)



Pre-conference informal discussion Conference (panel discussion)



All participants of ISCN

October 2013: Participating in the annual conference of the Association for the Advancement of Sustainability in Higher Education (AASHE)



Kyoto University presentation

Keynote speech by Mr. Raj Patel



Product displays of supporting firms

**Sustainability Tracking, Assessment & Rating System (STARS) Assessment report for international pilot project submitted and approved**

Kyoto University joined an international pilot project on sustainability assessment carried out by AASHE, requiring registration by December 31, 2012. The project provided an opportunity for institutions of higher education outside of the United States to participate in STARS to measure their sustainability performance. AASHE is using the project to assess the global compatibility of its evaluative system, while Kyoto University intends to use STARS to assess its current performance and help determine a course for the future.

To create the performance report, a working group at the university comprised of academic staff held extensive discussions and enlisted the cooperation of every department. The report was submitted in December 2013.

Kyoto University was the second Japanese university to participate after Hokkaido University. As this was an international pilot project (free of charge), a STARS Reporter status was granted, the equivalent of a Silver rating.



Guidelines for STARS International Pilot Project

STARS Technical Manual



STARS Certificate

**CAS-Net JAPAN (Campus Sustainability Network in Japan) established; Inaugural general meeting and first work sessions held**

CAS-NET JAPAN (Campus Sustainability Network in Japan), a nationwide organization of universities and groups promoting campus sustainability, held an inaugural general meeting and work sessions at the Kyoto University Clock Tower Centennial Hall on March 26 and 28, 2014, respectively.

Four meetings were held in 2013, the first in March, to prepare for the establishment of CAS-Net JAPAN, and Kyoto University temporarily served as the organization's secretariat. At the inaugural general meeting, CAS-Net JAPAN was officially launched with the goal of accelerating campus sustainability at Japanese universities. Members of CAS-Net JAPAN at the time of establishment included 23 organizations consisting of national, public, and private universities, environment-related student organizations and NPOs, cooperative associations, and others; plus 56 individuals among faculty, staff members, and students at national, public, and private universities around Japan.

Forty-four people joined the CAS-Net JAPAN inaugural general meeting, both individuals and persons representing their institutions. Following procedure, after nominations by the steering committee, a chairperson and vice chairperson were elected. The annual plan and activities of the subcommittees were then explained, and animated discussions followed.

On March 28, 78 people attended the first work sessions, including experts from around Japan and overseas, as well as researchers, students, and representatives from private-sector firms. The efforts of the Kyoto University Co-op were introduced; a report was given by the Hokkaido University Office for a Sustainable Campus on establishing a sustainable campus assessment system; a report was given by the Chiba University Student Committee for Environmental Management Systems, an NPO, on the possibilities inherent in student participation; and another report highlighted efforts being made to save energy at Kyoto University. These presentations were listened to attentively and stimulated vigorous Q&A sessions.



Inaugural general meeting  
Chairperson: Kyoto University  
Executive Director Noboru  
Nishisaka gives speech

Inaugural general meeting Explanation  
of annual activities plan (Kyoto University,  
Prof. Rajib Shaw)



Work session: Building an Assessment  
System (Dr. Maki Ikegami, Hokkaido  
University)

Work session: The Possibilities  
Inherent in Student Participation  
(Chiba University: Mr. Taro Uekusa)

**International Symposium for the Establishment of Sustainable Campuses: Combining "hard" and "soft" networks to establish sustainable, environmentally conscious campuses**

The International Symposium for the Establishment of Sustainable Campuses was held for two days from March 26 to 27, 2014, at the Kyoto University Clock Tower Centennial Hall.

The aim of the forum was to introduce efforts being made by progressive universities inside and outside of Japan, to discuss best practices and directions, and to draw upon existing expertise to work out future directions for building sustainable campuses. The promotion of sustainable campuses at universities in Europe and the

United States has been accelerating in recent years, and this symposium was held to strengthen and expand the inter-university network for achieving sustainable campuses by bringing together experts, researchers, students, and others for lectures and a panel discussion. Approximately 190 individuals participated—interested professors from universities in and outside of Japan, students, and representatives from private-sector firms.

On the first day, guest speeches were given and policies were introduced by the Ministry of Education, Culture, Sports, Science and Technology, and the Ministry of the Environment; the keynote speech was given by the executive director of the Association for the Advancement of Sustainability in Higher Education (AASHE) from the United States.

On the second day, lectures were given to introduce leading efforts and examples by specialists from The University of British Columbia (Canada), Universiti Malaysia Sabah (Malaysia), University of California, Berkeley (USA), Macquarie University (Australia), and the University of Nantes (France), as well as from Kyoto University, Hokkaido University, Chiba University, and Mie University within Japan.

A panel discussion was also held on the topic, "The Outlook for Achieving Sustainable Campuses." After the presentations given by Macquarie University (Australia), the AASHE executive director (USA), Rikkyo University, the Japan Youth Ecology League (an NPO), and Kyoto University, a lively discussion ensued and the symposium concluded on a high note.



Symposium speakers and panelists

Symposium poster



Symposium keynote speech (Ms. Stephanie A. Herrera, AASHE Executive Director)

## Fact-finding mission on progressive efforts to build sustainable campuses outside of Japan

In 2013, Kyoto University carried out another fact-finding mission outside of Japan to learn about leading initiatives being taken toward sustainable campuses and networking.

October 2013: Fact-finding mission to three universities in North America



Simon Fraser University (Canada): Meeting with directors and personnel involved with sustainable campus efforts

The University of British Columbia (Canada): Meeting with personnel involved with sustainable campus efforts



University of California, Berkeley (USA): Meeting with personnel involved with sustainable campus efforts

In October 2013 a team from Kyoto University visited three universities in North America—Simon Fraser University (Canada), The University of British Columbia (Canada), and the University of California, Berkeley (USA). Kyoto University also participated in an international symposium in Nantes, France, in November 2013.

November 2013: International symposium participation (Nantes, France)



Kyoto University report presentation

Opening ceremony



Thematic session: The role of the university student as a social responsibility

## Feature 2 ÉCOle de Kyodai 2014 Implementation Report

ÉCOle de Kyodai Secretariat (Kyoto University Environment Preservation Research Center)

ÉCOle de Kyodai 2014 was a series of events organized to involve people in sustainable campus efforts to reduce environmental impacts. Arranged for the month of June, Environment Month, many planned events were held from June 2 to 30, primarily on the Yoshida Campus, with students, faculty, and staff members working in concert.

“ÉCOle de Kyodai” is a coined term combining the word “Eco” and the French word for “school,” so it also means hosting a “school within Kyoto University” for a limited time for learning about ecological activities.

To kick off the event, a group of over 100 students, faculty, and staff members wearing event t-shirts gathered on June 2 to declare the start of the one-month campaign.

From June 2 to 13, an “open lab” was held by Kyoto University environmental science researchers on the ground floor of the Co-op Renais building, offering people the chance to easily engage with them over a cup of tea or coffee. From June 9 into the second half of the month, a dozen or so extracurricular groups at the university took turns giving performances every day to promote ÉCOle de Kyodai. There was singing, dancing, and many other skills on display; even a chance to interact with animals. This unique event made numerous passersby stop to watch.

On June 15, the middle day of the month-long event, a flea market was held by the students and others, including a booth selling vegetables grown on campus and a Fair Trade booth, drawing throngs of visitors.

The second part of the month was packed with events that offered a deeper look at environmental issues or

encouraged new ideas to emerge. First, over two Saturdays, June 21 and 28, a Green Film Festival was held, promoting films that brought environmental issues to the attention of viewers. On the final two days, June 29 and 30, a mini-symposium was held, dubbed the Sempai Sustainability Salon. Approximately 20 teams of graduate students introduced their environmental research or ideas through oral presentations, videos, and the use of other media. On the afternoon of the 30th, an Eco-Competition was held with presentations and judging of ideas for achieving campus sustainability. Many powerful ideas were presented. The winners were awarded financial support for domestic or overseas conference presentations or implementation costs.

Over the course of the month, a “point rally” was held. Individuals were awarded gifts according to the number of points, up to eight points (from participating in most events)—an overnight stay in old Japanese-style house, prepaid cards for public transportation, or other prizes donated by cooperating firms and organizations.

The many events held during the month were a success, raising awareness toward environmental issues or environmental activities for a large number of people. We need to build on this energy and direct it toward the achievement of campus sustainability.

### The Association for Advancement of Sustainability in Higher Education (AASHE)

This association, established in 2006 in the United States to advance sustainability at colleges and universities, has a membership of approximately 2,000 institutions of higher education. Its aim is to lead the way toward campus sustainability and boost the quality of higher education.

### International Sustainable Campus Network (ISCN)

This association, founded in January 2007, has 59 participating organizations from 26 countries in all of the major continents—the Americas, Europe, Asia, Africa, and Australia. It aims to provide a global forum to support exchanges of information, ideas, and best practices for achieving sustainable campus operations and integrating sustainability in teaching and research.

### Sustainability Tracking Assessment & Rating System (STARS)

This standardized evaluative system for sustainability performance at North American institutions of higher education is run by AASHE. Approximately 500 colleges and universities in North America are registered in the system. The categories assessed include: (1) Teaching and research (educational programs, research, etc., with regard to sustainability); (2) Operations (buildings, energy, waste treatment, transportation planning, etc.); and (3) Planning, management, and regional cooperation (adaptive planning, community engagement, etc.). Results are scored, and the points earned lead to a STARS rating of Platinum, Gold, Silver, or Bronze, Platinum being the highest. For the international pilot project, AASHE extended participation in STARS to colleges and universities outside of North America to evaluate their sustainability efforts. AASHE aims to use the project for extending the global compatibility of its evaluative system. (The pilot project was limited to 50 schools, and 49 joined from around the world—Hokkaido University and Kyoto University from Japan.)



Kicking off the event on June 2 in front of the Clock Tower!

## Promoting Education for Sustainability

Research and education pertaining to sustainability issues plays a vital part in the overall sustainability efforts being taken at the university. While training and research are taking place dynamically in specialized fields, we consider it essential for students to become aware of and learn about a wide range of sustainability issues, starting as soon as they enter the university. A number of different courses are therefore being offered to provide such opportunities.

### Initiatives up to the present

As part of a commitment to the important value of environmental education in the liberal arts education curriculum, beginning in the 2011 school year a number of sustainability-related courses were selected to be offered throughout the university (primarily to first- and second-year students). This initiative was begun by clarifying through a student questionnaire what students were interested in studying. Starting with the 2012 school year, common coursework was established as Environmental Science I & II, a revised two-part course that provides a broad overview of environmental issues. The Environmental Education Promotion Exploratory Committee was formed in 2011 at the university to discuss such developments. The committee meets twice a year to actively discuss education for sustainability and make decisions that are reflected in future undertakings. One such

new development was begun in the 2013 school year with the establishment of the new Environmental Studies category within the D Group (Courses for Life in Modern Society), creating a new opportunity for teaching sustainability-related subjects.

### University-wide Sustainability Courses

As of the 2014 school year, there are 37 courses in the Environmental Studies category of the D Group (Courses for Life in Modern Society) (30 courses in the 2013 school year).

Limiting the number of courses has simplified the program but at the expense of a broader perspective, it has been pointed out, so the university needs to continue to improve the guidelines for taking courses, aimed at deepening knowledge or advancing skills.

### Eco Code 2014 for New Students

We have created a sustainability handbook entitled Eco Code to communicate the environmental conditions on

campus and outline eco-friendly actions that anyone can take based on that information. It also contains messages from faculty and students, all in an easy-to-understand booklet covering various topics.



Eco Code

## Introducing Environmental Research

Many types of environmental research are carried out at Kyoto University. For this report we introduce research on plant response to changes in the global climate and research on power and energy systems, summarized from the Japanese version.

### Predicting Plant Response to Changes in the Global Climate

Center for Ecological Research  
Professor Hiroshi Kudoh

Plants flower in a specific season, which is how people get a sense of the seasons when they see cherry blossoms or hydrangea, for example. From a human perspective, flowers always seem to bloom when it turns to the right season, but from the plant's perspective, blooming is a phenomenon that is synchronized for reproduction. From a biological viewpoint, flowering is a synchronized phenomenon to ensure cross-fertilization. The timing of flowering, therefore, is a critical matter that determines propagation success or failure. Even a slight change in timing can lower the efficiency of pollination and lead to a failure of reproduction. For this reason, it is critical for plant scientists to understand the mechanism by which plants adjust the timing of flowering.

Recent studies have indicated that the synchronous seasonal response in plants is highly sensitive to changes in the global climate. Disturbances to the plant phenology have been reported around the world, and increasingly early flowering in spring-flowering plants has been observed over the last several decades. Phenology is closely linked to propagation, so any disturbance could have a negative effect that impacts both natural and agricultural ecosystems. It is becoming increasingly crucial to clarify how phenology is influenced and to learn how to forecast plant responses from meteorological data.

### R&D on Power and Energy Systems to Create a Society with a Small Ecological Footprint

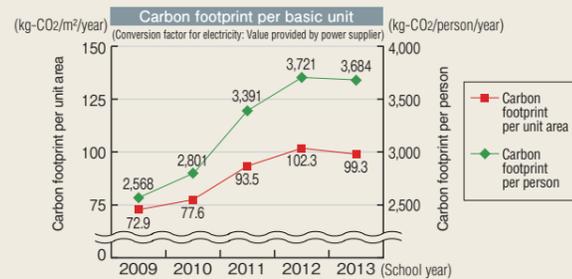
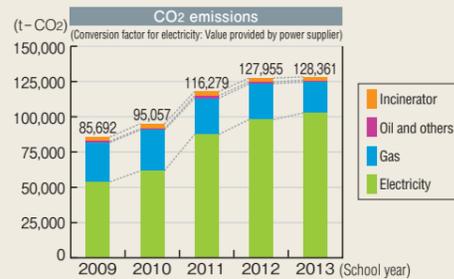
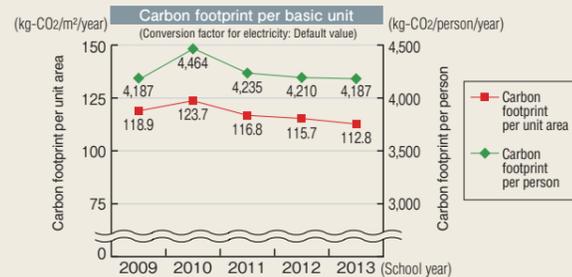
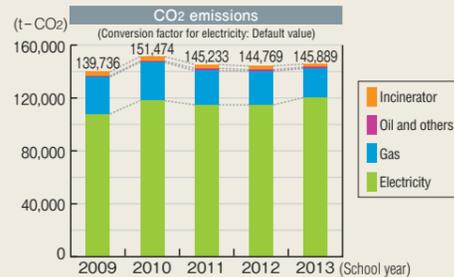
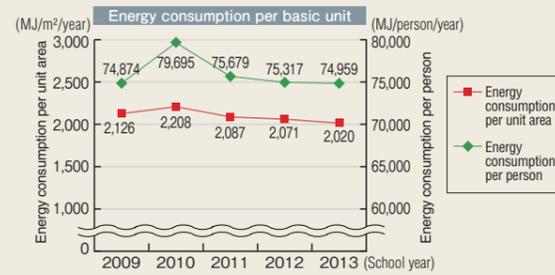
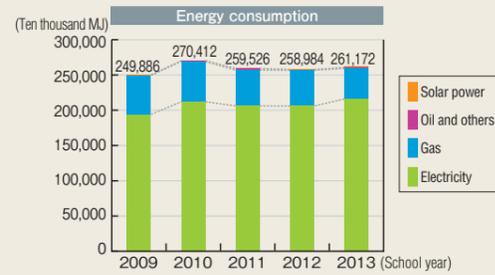
Graduate School of Engineering  
Lecturer Yoshihiko Susuki

The author conducts research on electrical power and energy systems at the Advanced Electrical Systems Theory Lab (PI: Prof. Takashi Hikiyama), in the Department of Electrical Engineering, Graduate School of Engineering. As with research to develop smart grid systems, R&D work on energy supply systems is currently being pursued through an interdisciplinary approach that crosses over academic disciplines. The goal is to establish new systems technologies that bring multifunctional capabilities and high environmental efficiency to energy supply, thereby addressing various social issues. Such issues include:

maximal use of different energy resources to achieve a low-carbon society; coordination with lower-capacity distributed energy sources and conventional energy systems; and ensuring energy system stability, including during times of emergency. The author conducts research and development on next-generation power and energy systems from the perspective of nonlinear dynamics and possible engineering applications. In this report he presents his latest results, outlining stability diagnosis technologies for large-scale power systems.

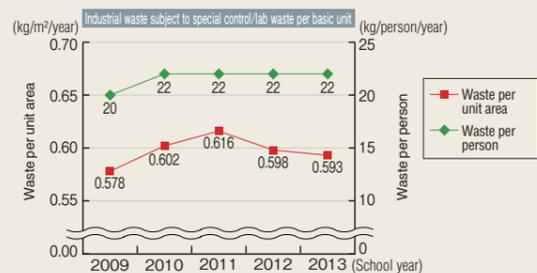
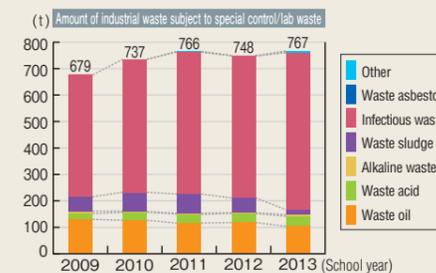
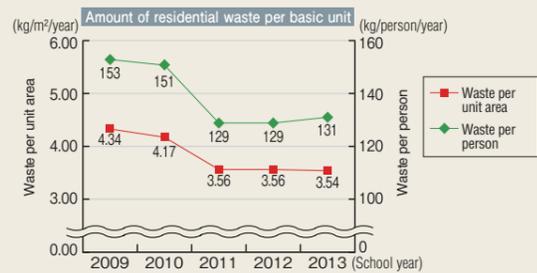
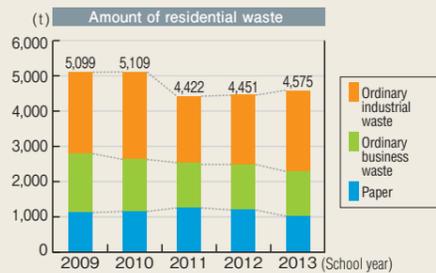
# Environmental Impact Data and Reduction Efforts

## Reductions in energy consumption and greenhouse gas emissions

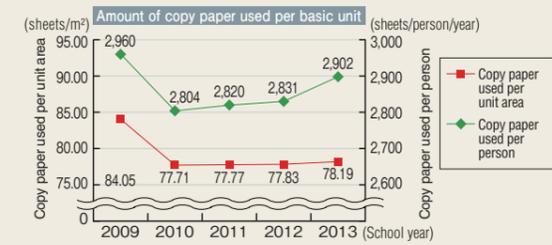
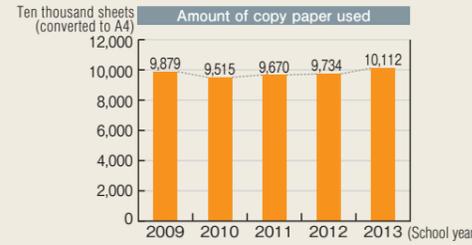


Note: Includes renewable energies such as solar power

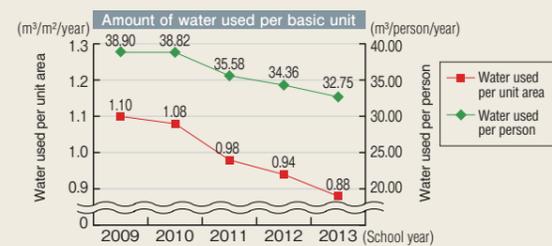
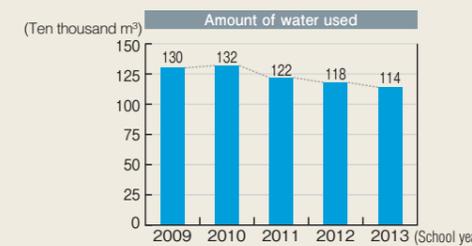
## Lowered environmental impact through waste reduction and recycling



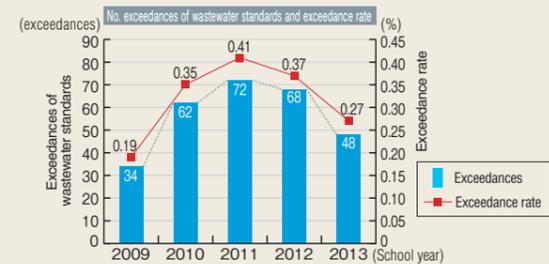
## Trends in paper usage



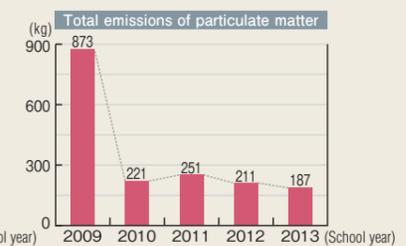
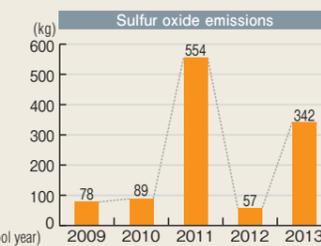
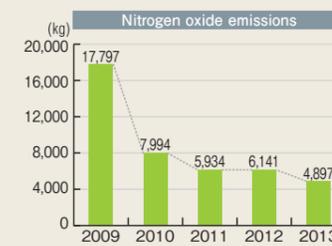
## Trends in water usage



## Trends in wastewater contaminant emissions



## Trends in atmospheric pollutant emissions



## Environmental Tax System (2013 report)

Construction work to reduce energy consumption as part of the 2013 Environmental Tax System was carried out, costing approximately 221 million yen. As a result, a guaranteed ESCO project for the Yoshida Campus and other energy-saving construction measures are forecast to reduce primary energy consumption by 26,803 GJ and greenhouse gas emissions by 1,357 t-CO<sub>2</sub>. (See chart below)

2013 Kyoto University Environmental Tax System results

■ Annual Environmental Tax levied 234,760,000 yen

Campus	Item	Reduction measure		Amount of primary energy reduction (GJ/year)		Amount of CO <sub>2</sub> reduction (t-CO <sub>2</sub> /year)		Notes
		Location	Description	① Reduction target	② Reduction estimate	③ Reduction target	④ Reduction estimate	
Yoshida Campus	On Main Campus, other		Guaranteed ESCO project	21,762	25,419	988.2	1300.0	
	Expedient measures for buildings		Window screens, west sun blocking measures, upgraded insulation		64		2.7	
			Upgraded lighting fixtures, upgraded power transformers	656	262	29.8	11.1	
			Upgraded air conditioning, heating/cooling control, etc.		0		0.0	
Uji Campus	Nuclear Engineering Lab		Upgraded lighting	532	213	24.2	9.0	
Katsura Campus	Administration Bldg., others		Upgraded lighting	1,715	811	77.9	32.3	
Inuyama Campus (Primate Research Institute)				0	0	0.0	0.0	
Hirano Campus (Center for Ecological Research)	Research Lab Buildings I and II			0	0	0.0	0.0	
Tatekurabashi Campus (Fukui Institute for Fundamental Chemistry)	Research Center Main Building		Upgraded air conditioning	237	34	10.7	1.5	
Total				24,902	26,803	1,131	1,356.7	

### 1. Summary of the ESCO Project for the Environmental Tax System

For the 2013 guaranteed ESCO project, contractors were solicited for construction work on various facilities—the Graduate School of Agriculture/Graduate School of Biostudies Bldg. on the North Campus; Faculty of Letters Main Bldg. and Faculty of Engineering Bldg. No. 11 on the Main Campus; the General Research Bldg. and clinics for outpatients on the University Hospital Campus. Azbil Corporation was selected to carry out a series of upgrades and improvements: efficiency upgrade for heat-source system; conversion to LED lighting; solar power system installation; inverter upgrade for pumps; introduction of variable air volume control for air conditioners; and addition of insulation to steam valves. In particular, the steam-driven absorption refrigerating machine at the clinics for outpatients was upgraded to an air-cooled heat pump module chiller, together with load dispatching control over

multiple units, to create a high-efficiency heat-source system. The ESCO project overall is expected to reduce primary energy consumption by 25,419 GJ/year and greenhouse gas emissions by 1,300 t-CO<sub>2</sub>/year.

#### Note: What is an ESCO project?

ESCO stands for Energy Service Company. An ESCO provider offers comprehensive services for saving energy in buildings, factories, and the like, through such steps as energy-saving diagnosis, design, construction, and maintenance of installed equipment. The provider financially guarantees the energy savings from its project installation work. Two types of contractual forms are available for an ESCO project—a guaranteed system and a cost-sharing system. With the guaranteed system, the university covers the initial investment, paying the ESCO provider for design and construction; the provider then financially guarantees the savings. With the cost-sharing system, the ESCO provider raises funds for the project and the university pays remuneration for the services rendered from the amount of costs saved on energy bills.

Estimated 1.07 times targeted reduction

Estimated 1.2 times targeted reduction

### Examples of construction to save energy in guaranteed ESCO project

#### ■ Upgrade of existing steam-driven absorption refrigerating machine to high-efficiency air-cooled heat pump module chiller at clinics for outpatients

- Estimated reduction in primary energy: Approx. **20,387** GJ/year
- Estimated reduction in CO<sub>2</sub> emissions: Approx. **1,064** t-CO<sub>2</sub>/year
- Estimated cost reduction for utilities: Approx. **45,204,000** yen/year



Steam-driven absorption refrigerating machine (1,050 kW)



High-efficiency air-cooled heat pump module chiller (150 kW x 7 units, made by Daikin)

#### ■ Conversion from gas heat pump to high-efficiency electric heat pump at Graduate School of Agriculture/Graduate School of Biostudies Bldg. and General Research Bldg.

- Estimated reduction in primary energy: Approx. **1,465** GJ/year
- Estimated reduction in CO<sub>2</sub> emissions: Approx. **91** t-CO<sub>2</sub>/year
- Estimated cost reduction for utilities: Approx. **3,400,000** yen/year



GHP



EHP

#### ■ Conversion to LED light fixtures at clinics for outpatients and other buildings (2,098 units)

- Estimated reduction in primary energy: Approx. **1,713** GJ/year
- Estimated reduction in CO<sub>2</sub> emissions: Approx. **72** t-CO<sub>2</sub>/year
- Estimated cost reduction for utilities: Approx. **2,800,000** yen/year



Clinics for outpatients



Faculty of Letters Main Bldg.

### 2. Summary of energy-saving construction work in the environmental tax program not connected to ESCO project

On the Yoshida Campus, some measures taken included LED lighting fixtures installed at the Yoshida-South Campus Academic Center Bldg. and other buildings, and infrared-absorbing film applied to windows in the University Head Office.

On the Katsura Campus, lighting fixtures were converted to LED at the Funai Tetsuro Auditorium and other buildings, and infrared-absorbing film was applied to windows.

On the Uji Campus, measures included converting

lighting fixtures and outdoor lighting to LED at the Nuclear Engineering Lab.

On the Tatekurabashi Campus, air conditioning equipment was upgraded for efficiency, among other measures.

The annual savings to be realized by energy-saving construction not connected to the ESCO project are estimated to be 1,384 GJ/year in primary energy consumption and 57 t-CO<sub>2</sub>/year in greenhouse gas emissions.

### Reductions from Phase 1 of Environmental Tax System

The reductions achieved in energy consumption and CO<sub>2</sub> emissions from the five-year period of 2008 to 2012 in Phase 1 of the Environmental Tax System are shown in the chart below. As can be understood

from the chart, over 1% in energy and CO<sub>2</sub> reductions are being achieved on an annual per unit area basis through energy-reduction construction work and other "hard" facilities-related measures.

#### Reductions from Phase 1 of Environmental Tax System

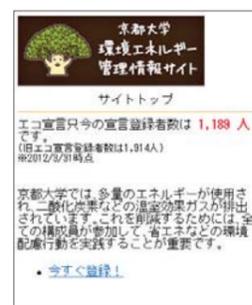
Item	School year					Average over 5 years
	2008	2009	2010	2011	2012	
Environmental tax levied (1,000 yen)	245,421	246,988	243,679	253,916	248,825	247,766
Reduced amount of energy (GJ)	23,654	27,795	25,791	51,921	35,474	32,927
● Percentage of energy reduction (by unit area)	1.00%	1.17%	1.09%	2.00%	1.40%	1.33%
Reduced amount of CO <sub>2</sub> (t-CO <sub>2</sub> )	1,129	1,518	1,349	3,023	1,625	1,729
● Percentage of CO <sub>2</sub> reduction (by unit area)	1.24%	1.57%	1.44%	3.27%	1.78%	1.77%

Kyoto University regularly carries out education for sustainability and appeals to departments to take environmental action through the Agency for Health, Safety and Environment.

### Eco-declaration website

Kyoto University's Eco-Declaration website was launched in the 2009 school year, and by the end of the 2011 school year had 1,914 registrations, including 1,202 by the end of the 2010 school year, indicating steady expansion. The site was redesigned in 2011 to attract more registrants, with a mobile site added to enable eco-declaration registration from mobile devices. The new site had reached 1,189 registrants by the end of the 2013 school year.

Many people who were registered before the redesign are not currently registered, so efforts continue to promote registration on the site for the purpose of raising awareness among members.



Kyoto University Energy and Environmental Management Information Site  
<http://www.eco.kyoto-u.ac.jp/>

Mobile site  
<http://www.eco.kyoto-u.ac.jp/m>

### On-campus campaigns and educational activities

Campaign posters were created and distributed on campus to raise awareness of various sustainability issues. These included a campaign to unplug computers usually kept plugged in if they would be left unused for an extended period of time; a campaign recommending the cleaning of air conditioner filters before the summer or winter season; and the recommendation to switch to Cool Biz clothing in the summer or Warm Biz clothing in the winter (extended one month at the start and end of each season since the 2012 school year).



### Real-time information on energy usage

A website for viewing energy usage data was created in the 2012 school year for the major campuses.

Totals for energy usage are displayed in chronological order for all of the university campuses together, and separately for five campuses (Yoshida–Main, Yoshida–South, Katsura, Uji, and Kumatori). To indicate general usage levels, the tree character (EcoKky) changes its facial expression in three stages, according to the university's set targets for power usage—when usage is less than 95%, between 95% and 98%, and over 98%—to quickly show levels of energy usage.

This data is intended to allow everyone to check their own usage of electricity in campus and reconsider conservation measures.

Real-Time Information on Energy Usage  
<http://electricity.sisetu.kyoto-u.ac.jp/>





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● **Cover photo: Kyoto University Seifuso**

Seifuso is an early modern Japanese-style work of architecture owned by Kyoto University that was built between the end of the Meiji and Taisho periods (around 1910) as a private residence for the honored statesman Kinmochi Saionji; it was registered as an Important Cultural Property (Building) on July 9, 2012.

Seifuso was donated, along with its garden, to Kyoto University by the Sumitomo family in June 1944, and has been used for educational purposes, guest receptions, and conferences.

On June 9, 1951, the garden was designated by the national government as a Special Place of Scenic Beauty. On May 15, 2007, Seifuso was registered as a Tangible Cultural Property (Building), becoming the first registered Important Cultural Property (Building) on Kyoto University's premises.

Kyoto University now has 11 other facilities registered as tangible cultural properties (buildings). These are maintained properly to preserve history, while being utilized as university facilities.

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