



# Environmental Report 2009

**Abridged Edition**

**Kobe University** 



## Message from the President

The 21<sup>st</sup> century is often referred to as the “century of the environment”. Environmental problems are becoming a part of our lives; hardly a day passes by without one of the mass media writing or talking about environmental problems in newspapers, magazines, or on television.

The remarkable evolution of technology since the Industrial Revolution brought various benefits (affluence, convenience, comfort, etc.) to our society. However, it also left behind many serious problems, such as global warming from greenhouse gases, acid rain polluting our forests and lakes, and toxic substances emerging from waste. Faced with such environmental destruction, the 1997 COP3 conference in Kyoto adopted the Kyoto Protocol, whose purpose was to find ways to overcome the global warming crisis. It was ratified by 125 countries and took effect in February, 2005. The developed countries that signed the protocol are to aim at reducing the amount of CO<sub>2</sub> by 5.2% in total by 2012 compared to that of a standard year. The reduction goal for Japan is 6%.

Meanwhile, the energy consumption rate is becoming a very serious problem. The world population is estimated to reach 9 billion in 50 years. Accordingly, the demand for energy will markedly increase. If everyone were to use the same amount of energy as Japan, the energy need is estimated to be three to four times what it is now. We also face the most serious problem of exhausting energy resources. How to balance energy consumption with environmental preservation? That is another environmental related challenge we confront.

To solve such complex problems, and to build a sustainable society, it is necessary above all for each and everyone of us to become aware of the problems and initiate individual changes; followed by institutional changes.

Kobe University, as mentioned in this environmental report, adopted the Environmental Charter in 2006 which describes our basic concepts and policies on environmental management. Based on those policies, we have been steadily promoting such environmental management as energy saving, resources conservation, recycling, etc. In particular, our Center for Environmental Management (established in April,



2004, by reorganizing the old Environmental Quality Administrative Center, which is not only in charge of the treatment of experimental laboratory wastewater and the sorting of trash, but is also active in environmental education activities for our academic staff. In regards to educating our students, the Introductory Environment course will start this year as an interdepartmental course.

In addition to our long time efforts to educate people on environmental issues through various ways, we have also been conducting researches on CO<sub>2</sub> reduction from both the scientific and managerial standpoints, carrying out researches on health hazards, as well as promoting collaboration with local communities. I would also like to promote an interdisciplinary fusion research which integrates scholars from different academic fields to work together. My sincere hope is that we can contribute to the global and the local communities by disseminating knowledge gained from various educational and research achievements of Kobe University.

FUKUDA, Hideki  
President of Kobe University

## 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, which are the two most important challenges the world faces today.

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

### Environmental Principle

1. To foster and support ecological-minded students.

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2. To promote research that sustains the global environment.

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3. To promote environmental preservation activities that set an example for others.

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# Environmental education

## ESD and expansion of the concept of education

SUEMOTO, Makoto, Professor, Graduate School of Human Development and Environment

ESD (Education for Sustainable Development) approaches the making of a sustainable society from the standpoint of fostering human resources who will carry on that task. Since schools play an important role in education, the Ministry of Education, Culture, Sports, Science and Technology is attempting to disseminate ESD throughout the school system. For its part, Kobe University is looking for ways to spread ESD in venues other than the school system such as adult education, community education, and lifelong learning. Present day education is not limited to schools; it has expanded to include corporations, branches of government, nonprofit organizations, etc. Just as Pierre Dominicé pointed out in his book, "Learning from Our Lives", 21<sup>st</sup> century is the era of adult education. Only a small number of all students who graduate from universities become teachers and enter the world of school education. Most graduates enter the business world in order to engage in various businesses other than education. Therefore, human resources fostered by universities should be people who will be actively engaged in

structure in their lives. Educational staff who watch over the learners are not instructors like teachers, but will be new types of instructors, called supporters or accompanists. The new educational theories reflect a paradigm shift in the world of education, a shift which had begun in the latter half of the previous century, and which was ushered in by *Ilich's Deschooling* (1970), *Freire's Pedagogy of the Oppressed* (1970), and other works.

The motivating force for ESD comes from current environmental problems, which are diverse and complicated. The Earth Charter (2000) mentions a wide range of concerns, which include poverty, peace, set of values, responsibility for the world and local communities, governance and democracy, justice, human rights, health, gender equity, cultural diversity, development of cities and the farming community, production and consumption pattern, environmental protection and the management of natural resources that gives due consideration to the diversity of living things and the surrounding landscape. This displays both the complicated nature of the problems and, at the same time, the wide range of possible approaches available. Currently, ESD is part of the curriculum in only three of our faculties. When we take into account such new movement as the broadening of the educational concept and the complicated nature of the environmental problems in recent years, it is clear that ESD should be the concern of the entire university. Currently, ESD courses are taught in three faculties; however there is a necessity to create a system that expands this to the entire university, which will allow students to major in their own specialty and minor in ESD.



sustainable development in a wider range of occupations.

In order to educate (if we can still call it that) mainly adults, we require a different perspective and method, from those needed to educate children and youth. In recent years, the area covered by lifelong learning and adult education has expanded; interest is now centered on finding ways to support adult education for those who are engaged in international occupations. There has been progress in adult learning studies with the introduction of new educational theories such as the reflective learning theory and self-directed learning theory. Unlike the traditional view of education, in which conveying knowledge was the axis, these theories emphasize the process through which learners themselves find meaning and



# Environmental activity at Kobe University

## Saving energy and preventing global warming

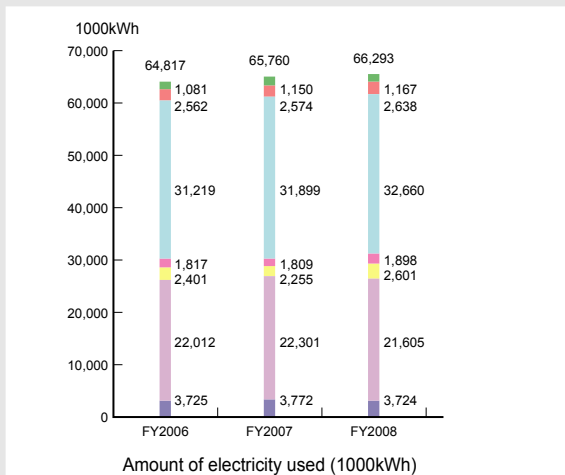
### 1. Goal

Kobe University aims at reducing 1% of CO<sub>2</sub> emissions by total floor area per year.

### 2. Amount of electricity used

Increased by 0.8% compared to that of the previous fiscal year (FY)

The chart shows the changes in the amount of electricity used from FY2006 to FY2008.



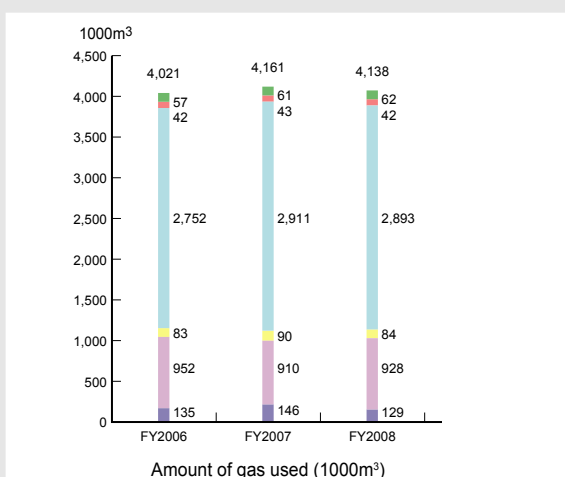
Total amount of electricity used in FY2008 increased by 533,000kWh (0.8%) compared to that of the previous fiscal year.

This was mainly due to increased use of electricity in the Kusunoki area: higher hospital bed occupancy rate, more outpatients.

### 3. Amount of gas used

Decreased by 0.6% compared to that of the previous fiscal year

The chart shows the changes in the amount of gas used from FY2006 to FY2008.



The total amount of gas used in FY2008 decreased by 23,000 m<sup>3</sup> (0.6%) compared to that of the previous fiscal year.

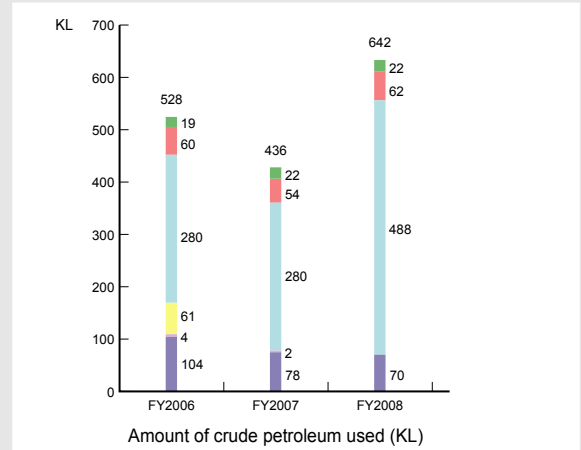
The minute amounts of gas used at Tsurukabuto 2 campus is not included in this chart.



### 4. Amount of crude petroleum used

Increased by 47.2% compared to that of the previous fiscal year

The chart shows the changes in the amount of crude petroleum used from FY2006 to FY2008.



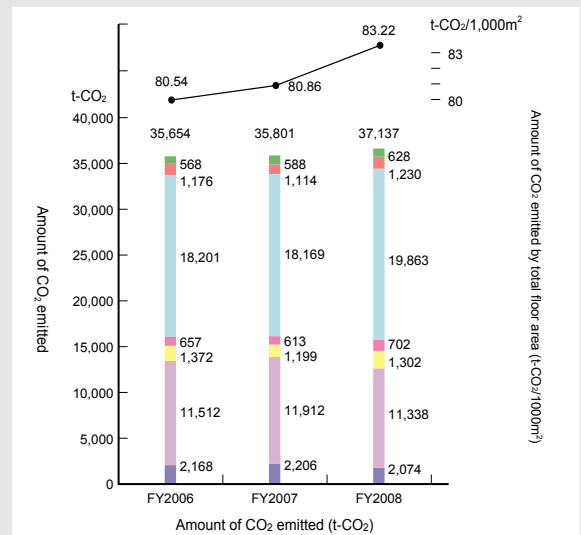
The total amount of crude petroleum used in FY2008 increased by 206kl (47.2%) compared to that of the previous fiscal year.

This was mainly due to the maintenance of animal facilities in the Kusunoki area. In the future, we plan to use the lower CO<sub>2</sub> emitting city gas boilers for heating.

### 5. Amount of greenhouse gas emitted

Increased by 3.7% (2.9% by total floor area) compared to that of the previous fiscal year

The chart shows the changes in the amount of CO<sub>2</sub> emitted from FY2006 to FY2008.



The total amount of CO<sub>2</sub> emitted in FY2008 increased by 1336 t-CO<sub>2</sub> (3.7%) compared to that of the previous fiscal year.

By total floor area, it increased by 2.36 t-CO<sub>2</sub>/1000m<sup>2</sup> (2.9%) in total compared to that of the previous fiscal year.

The amount of energy used at Kobe University showed an increase. However, the factor that changed the amount of CO<sub>2</sub> emitted is greatly influenced by the CO<sub>2</sub> conversion coefficient of the purchased electricity (published value). (It decreased in the Rokko area and increased in other areas.)

In regards to boilers used for heating in the Kusunoki area, we plan to shift from crude petroleum to less CO<sub>2</sub> emitting city gas.

Our university has placed strong emphasis on energy saving measures. All employees and students are asked to comply in order to reduce CO<sub>2</sub> emissions by more than 1% per year.

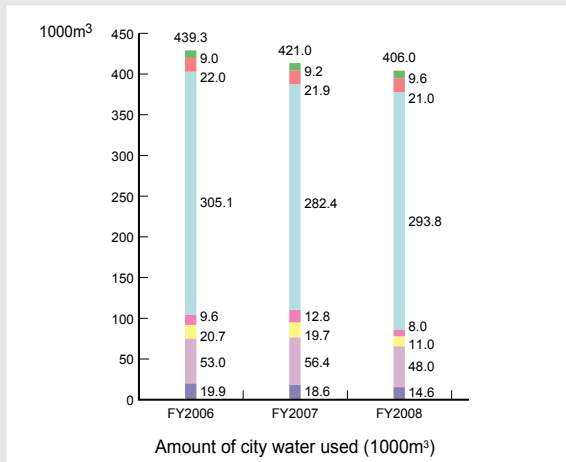
# Conserving resources and recycling

## 1. City water / general servicewater

### City water

Decreased by 3.6% compared to that of the previous fiscal year

The chart shows the changes in the amount of city water used from FY2006 to FY2008.



The amount of city water used per year decreased after the peak in FY 2006. The total amount of city water used in FY2008 decreased by 14,984 m³ (3.6%) compared to that of the previous fiscal year.

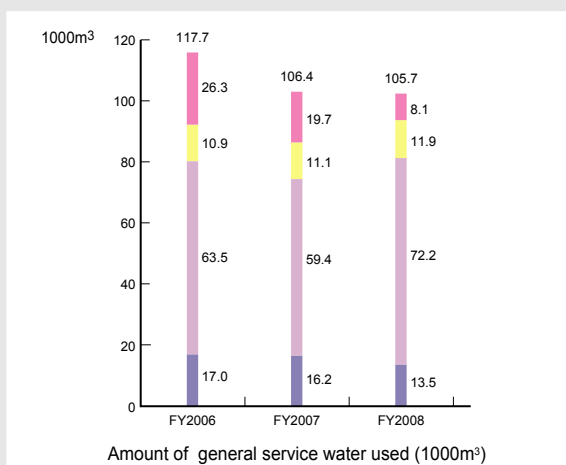
The main reason may be because of the automatic faucets and water-saving toilets that were installed at the time of renovation.

In addition, to protect water resources in the Rokkodai area, we use general service water.

### General service water

Decreased by 0.9% compared to that of the previous fiscal year

The chart shows the changes in the amount of general service water used from FY2006 to FY2008.



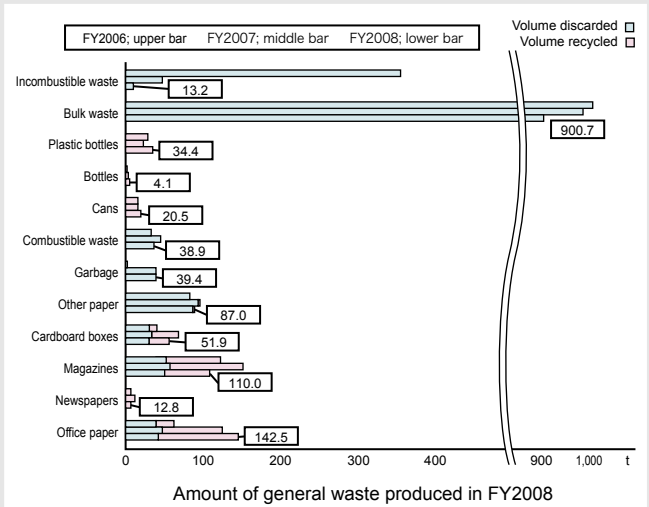
For the conservation of resources in the Rokkodai area, we use river water flowing from the Rokko mountain as general service water in various places including toilets tanks, laboratories, etc.

The amount of general service water used in FY2008 decreased by 910 m³ (0.9%) compared to that of the previous fiscal year.

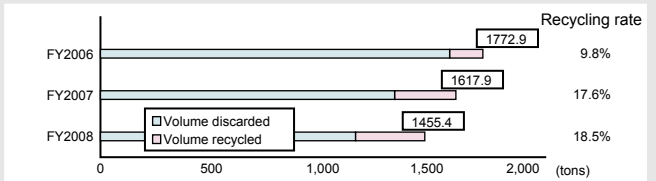
When renovating the school buildings, water-saving toilets were installed to conserve water.

## 2. General waste

The chart below shows the amount of general waste produced from FY2006 to FY2008.



Some of the general waste (plastic bottles, cans, office paper, etc.) discharged in FY2008 increased slightly compared to that of the previous fiscal year. However, the volume of incombustible and bulky waste discarded dropped remarkably. Although the total volume of office paper (volume generated) increased, because the volume recycled also increased, the actual volume discarded decreased.



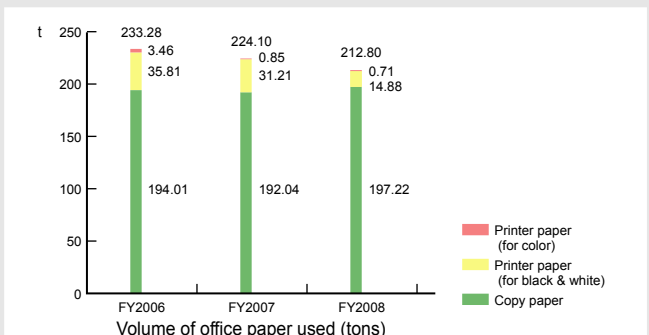
The chart above shows the total volume of general waste discharged from FY2006 to FY2008. The total volume discharged (total of amounts discarded and recycled) decreased by approximately 10% in FY2008 compared to FY2007. The recycling rate was 18.5%, which is an approximate 1% improvement compared to that of the previous fiscal year.

Each department at the university is making efforts to reduce general waste, including those who are decreasing the number of trips to the waste disposal section and those who assign people to monitor trash disposals. All their efforts are evident in this report.

## 3. Office paper

Decreased by 5.0% compared to that of the previous fiscal year

The chart shows the change from FY 2006 to FY 2008 in the amount of office paper used.



The volume of office paper used decreased by 11.30 tons (5.0%) compared to that of the previous fiscal year.

Main reasons are because it is now a common practice to hold paperless meetings, lectures, etc.; to use both sides of the paper when copying; and for reusing the blank side of the copies for memo.



# Environmental research

## Introduction to Innovative Bioproduction Kobe (Special Coordination Funds for Promoting Science and Technology)

OGINO, Chiaki, Associate Professor, Department of Chemical Science and Engineering, Graduate School of Engineering

In July, 2008, our project, "Innovative Bioproduction Kobe," was selected to be a part of the FY2008 Ministry of Education, Culture, Sports, Science and Technology's (MEXT) consignment project, "Creation of Innovation Centers for Advanced Interdisciplinary Research", which is funded by the Special Coordination Funds for Promoting Science and Technology. The purpose of the MEXT project is to establish Centers for research and development from the basic level to practical utilization through the cooperation of industry-academic-government.

At the same time, from a long term perspective, it aims to foster the next generation researchers and technical experts in the interdisciplinary fields, which are regarded as especially important for the creation of innovation. In principle, the lifespan of the project is ten years. The first three years from FY2008 constitute a stage-gate period. Only those ideas that have passed interim evaluations will be permitted to continue on for the remaining seven years; it is, in other words, quite a rigorous project.

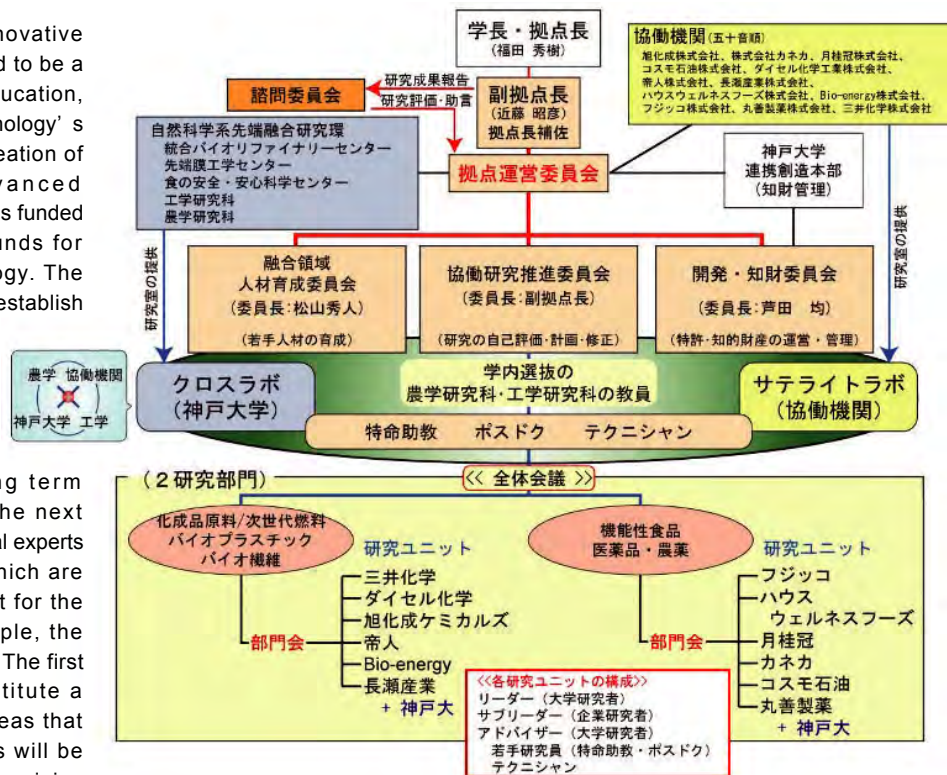


Chart 1: Structure and system of the project, "Innovative Bioproduction Kobe"

The concept for establishing the Center is to build a post-petrochemical society by uniting the disciplines of agriculture and engineering. This interdisciplinary approach will unite the agricultural expertise of genetic resources and biomass with specialized fields of engineering such as fermentation technology, reaction engineering, and separation engineering for producing (bioproduction of) a number of alternative materials from biomass. The true merits of uniting the disciplines are in the exchange of knowledge between the researchers of both disciplines. Engineering researchers can deepen their knowledge of biomass in agriculture and forestry while agricultural researchers can share the knowledge in chemical engineering reactors, and concepts of

segregation characteristics and mass balance. Corporate researchers can also gain by developing new technology from the core technology offered by the university.

*Project details:* Core technology of whole cell biocatalysts and cell surfaces, which was developed by FUKUDA, KONDO and other researchers at the Center received high praises worldwide. We aim at making the Center a research base for the expansion of core technology and bioproduction in the fields of chemical raw materials / next-generation fuels; bioplastics / biofiber; functional foods; and drugs / agrichemicals. In short, a Center for the effective use of biomass (see Chart 1). Subjects covered by the Center include the

entire range of biorefinery research, starting from upstream "raw materials", such as genetic and plant resources used to convert biological resources into useful materials, to downstream "products" which involve the development of a production system. Our research center is the first of its kind in Japan (Chart 2) and is considered to have the competitive edge in comparison with the biorefinery or "white" biotechnology approaches that are being promoted in Western countries.

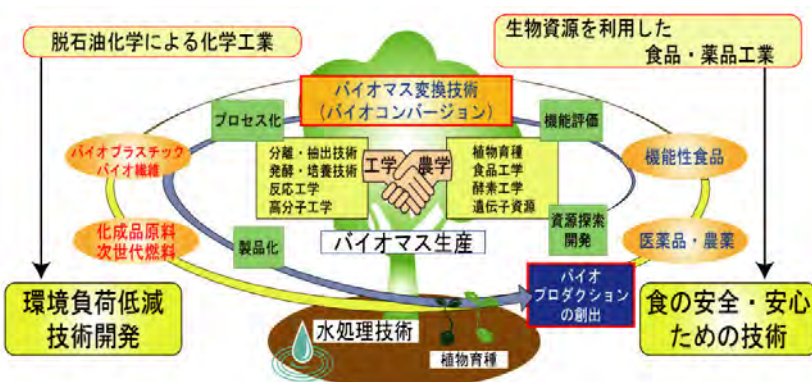


Chart 2: Research fields in which Innovative Bioproduction Kobe aims to pioneer

Detailed information is updated on our website.

Please visit the address below.

"Innovative Bioproduction Kobe" website:

<http://www.org.kobe-u.ac.jp/bioproduction/index.html>

## A review from the outside

The *Kobe University Environmental Report* has been published every year since 2006; this is its fourth appearance. The contents of the report have improved with each successive year; I would therefore begin by declaring my admiration for that accomplishment.

According to the *Environmental Report* of 2006, the number of environment-related courses taught exceeded 170. Now, in addition to all those courses, the Introductory Environment course will start in fiscal 2009 as a general interdepartmental course, and we can expect that environment-related education will be the better for it.

Year after year, publication of the *Environmental Report* seems to have been the occasion for delivering the message both inside and outside the university that Kobe University educates people about and conducts research on environmental problems, and that it possesses the skills (and the “seeds” of skills) to cope with them — and on a world-class level of which the university can be proud. Compiling and publishing those reports in the future may lead to further collaboration with students, citizens, corporations, administrators, etc. [For example, *Approaching Environmental Sciences at Kyoto University* (edited by Masashi Kamon and others, Kyoto University Research Promotion Department, April, 2008) includes (1) a list of research projects at Kyoto University in the environmental science field, and summaries of those projects; (2) subjects of research and development that the Ministry of Education, Culture, Sports, Science and Technology should promote; and (3) goals and policies for the Science and Technology Basic Plan for the Third Term].

The *Environmental Report* tells of the students’ ongoing activities towards the environment. In recent years, “campus eco” — students enjoying ecological activities on the campus — has been reported in the news. The circles of this sort of activity can be expected to widen, while the activities themselves heighten the students’ awareness of the environment, produce trained environmental workers, and encourage students to become valuable members of society.

In the section entitled “Efforts of each department and related organizations” (under “Environmental activity”), this year’s report introduces energy-saving activities carried out by the Graduate School of Engineering work group. Their activities included inspection tours to save energy, energy-saving measures, and automatic metering of electrical consumption with cost assessments. Those efforts are taken as models for subsequent action by each department; as such, they are to be regarded as invaluable.

“Saving energy and preventing global warming,” “Conserving resources and recycling,” and “Managing toxic substances” (all under “Environmental activity”) give actual figures. If, in addition to such graphic presentation, those figures were shown in chronological sequence, I feel that there would be a clearer demonstration of the projects’ effects, and that future goals would thus be easier to set.

There is a line in “Saving energy and preventing global warming” (under “Environmental activity”) that states, “Kobe University aims at reducing CO<sub>2</sub> emissions by total floor area by 1% per year.” Kobe University is a multi-faceted institution with many departments; promoting activities that involve the entire university would be a real task. Still, I cannot help but feel that the target figure of 1% reduction per year is small, considering the figures for Japan (6% reduction in the Kyoto Protocol, later modified to a 15% reduction based on 2005 conditions). If possible, instead of taking the “forecasting” method that sees the future in terms of projections from present conditions, I would like to see the goal set and efforts toward it based on the “back-casting” method, i.e., the method that first outlines the ideal future conditions to be achieved, then determines the measures to be taken now.

In order to achieve its goals, environmental management needs continuous improvements based on the PDCA (plan, do, check and act) cycle. There is an obvious need to devise some sort of system in the future to make those improvements happen. I hope that Kobe University, located in the international city of Kobe, will accomplish this task, thus marking a new environmental frontier for universities in Japan and throughout the world.



**Name:** NAKAMARU, Hironobu

**Present occupation:** Professor, Faculty of Business Administration, Konan University

**Profile:**

1976 Kobe University: withdrew from doctoral program (with credits acquired) of Graduate School of Business Administration  
1976- The International University of Kagoshima: 1980-Nagasaki Prefectural University:  
1992- present occupation  
President of the promotion council for reduction of waste, etc., of Takarazuka City.  
Major publication: *Global Warming and Environmental Management — new approaches to a solution* (2009, Chikura Publishing Company; won a Sustainable Management Forum of Japan prize in 2009 for its academic contribution); *Global Environment and Corporate Innovation — toward a fundamental solution* (2002, Chikura Publishing Company)

## What went into this Environmental Report

The purpose of this environmental report is to provide public access to the *Kobe University Environmental Report 2009*, which is a summary of environmental activities achieved on the Kobe University campuses for a one year period from Apr. 1, 2008 until Mar. 31, 2009.

The Kobe University Environmental Report 2009 was put together in accordance with the following:

- Reference guidelines ● Environmental Reporting Guidelines, Fiscal Year 2007 Version (Ministry of the Environment, June 2007)  
Guidelines for items to be mentioned in environmental reports, second edition (Ministry of the Environment, Nov. 2007)
- Survey locations ● Rokkodai area:  
Rokkodai 1 campus (main departments: Faculty of Law, Faculty of Economics, School of Business Administration, Graduate School of Law, Graduate School of Economics, Graduate School of Business Administration, Graduate School of International Cooperation Studies)  
  
Rokkodai 2 campus (main departments: Administrative offices, Faculty of Letters, Faculty of Science, Faculty of Agriculture, Faculty of Engineering, Graduate School of Humanities, Graduate School of Science, Graduate School of Engineering, Graduate School of Agricultural Science)  
  
Tsurukabuto 1 campus (main departments: Faculty of Intercultural Studies, Graduate School of Intercultural Studies)  
  
Tsurukabuto 2 campus (main departments: Faculty of Human Development, Graduate School of Human Development and Environment)  
  
Kusunoki area (main departments: School of Medicine, Graduate School of Medicine, university hospital)  
Fukae area (main departments: Faculty of Maritime Sciences, Graduate School of Maritime Sciences)  
Myodani area (main departments: School of Medicine Faculty of Health Sciences, Graduate School of Health Sciences)
- Fiscal year of operations ● Fiscal 2008 (April, 2008 to March, 2009)
- Date of issue ● September 30, 2009
- Planned date of next issue ● September 30, 2010
- Department in charge of publication ● Environmental Reporting Work Group (chairperson: Prof. KOKUBU, Katsuhiko, Graduate School of Business Administration)
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TEL : 078-803-5173  
E-mail : shis-soumu@office.kobe-u.ac.jp
- URL ● <http://www.kobe-u.ac.jp/report/environmental/2009/>
- Cover ● Main building of the Faculty of Engineering (Rokkodai 2 campus)

Solar cell modules installed on the curtain-wall roof



Specifications of photovoltaic power generation

- Solar cell modules  
see-through amorphous silicon,  
light transmittance 9%
- Capacity  
3.99KW (38W×105)
- Power conditioner  
4KW
- Deemed low-voltage distribution