Yokohama National University

Environmental Report 2009

Digest Version

横浜国立大学
YOKOHAMA National University

Basic Philosophy (University's Charter)

In the spirit that has been cultivated amidst Yokohama National University's history since its founding, the university declares that it will make every effort to build a strong footing in academic research and education in the world of the 21st Century by attaching importance to the concerns of the realities of society (Responding to the Need of Society), actively promoting new endeavors (Challenging and Daring), widely opening its door to the whole of society (Open and Outgoing), and promoting exchange with nations overseas (International). YNU has decided on the following matters as its long-term goals in order to realize this idea.

Responding to the Need of Society

This goal is to cultivate creative problem solving abilities with flexibility that respond to the changing of the times by assessing the true nature of various problems. YNU will contribute to society's welfare and development based on the results of education and research by focusing on scholarship that revolves around actual society.

Challenging & Daring

YNU will play a leading role in the intellectual development of mankind by producing cutting-edge research results through collaborating with domestic and international researchers. The university will work towards providing effective management, and develop a flexible organization that supports free thought and new approaches in contributing to education, research, and society.

Yokohama National University

YNU practices education and research that makes a contribution to solving the issues of civil society, regions, the business community, the nation, and various countries. YNU aims to support students and faculty members in their participation within society, and strives to be a university that is open to society in all aspects of education, research, and management.

Open & Outgoing

Along with fostering human resources that understand different cultures and have the communication ability to be active on the word stage, YNU promotes the acceptance and dispatching of international students and researchers and plans to expand exchange with various countries through education and research.

International

Yokohama National University, which makes it a principle to do the above, will develop a highly transparent organization and operating system, and university reform with even more character in the cycle of planning, practice and evaluation. Furthermore, **despite the university's urban location**, all the students and faculty members assembled at YNU enjoy **a campus overflowing with striking greenery**, and, while **maintaining this blessed environment**, they aspire to **practice a physically and mentally healthy university lifestyle**.

April 1, 2004

Yokohama National University

The Greenery of Tokiwadai Campus

Tokiwadai Campus is known for its abundant greenery. After integration and relocation in the 1970's, land development was limited to a minimum level, and a plan was put into practice in which as many trees were left as possible and new ones were planted. Seedlings were planted under the principle of "native forests by native trees," and along with the trees that existed before the relocation, have given shape to the forests of today.

Native Forests by Native Trees

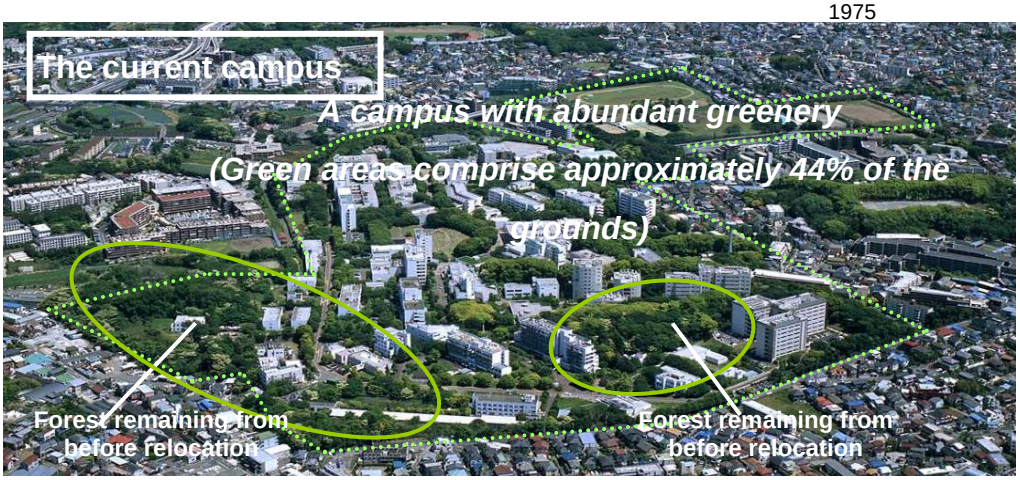
If one doesn't consider native vegetation when planting a beautiful forest, regular maintenance is necessary to make sure it doesn't waste away. Conversely, "true forests" that are a reincarnation of the trees that originally grew in an area only need to be cared for two to three years after planting, and will continue growing naturally afterwards.

The changing face of two 50 cm tall seedlings planted per square meter near the main gate

1975

1981

2007



The golf course before 1968

In 1979, after relocation

Campus greenery contributes to the environment of the campus and surrounding area

Carbon dioxide fixing | Temperature regulation | Disaster prevention | Rare habitat

1 . Student Environmental Activities

– "Live the Life" " Yokohama Eco Campus Project "

At YNU, students play a central role in carrying out a variety of environmental activities. This page introduces the activities of two of these groups, Live the Life and Yokohama Eco Campus Project.

● Implementing the "Yoko-Eco" Declarations NEW

With the **goal of creating environmental awareness in YNU students** through the Tokiwa Festival and the autumn 2008 school-wide cleaning, five "action plans" that can be easily implemented on campus are presented to students: 1) removing the caps and labels of plastic bottles before throwing them away, 2) not using plastic bags, 3) avoiding using the elevator, 4) making an effort to purchase products that are environmentally friendly, and 5) removing "re-repack" film from containers, then putting them in the recycling box. After **having students declare what they were actually going to do**, **the most popular option was "avoiding using the elevator."**

(Yokohama Eco Campus Project)

● Collecting and recycling abandoned bicycles left at school NEW

In March 2009, **over four hundred abandoned bicycles were collected at YNU**. These bicycles were given to businesses that are involved in the "environmentally friendly bicycles" project. After being repaired and inspected, **the recycled bicycles will be used as "environmentally friendly bicycles."**

(Live the Life Co-op Committee)

Carrying out activities

● Completion of Yoko-Eco News Volume 1 NEW

Yoko-Eco News Volume 1, a movie that showcases YNU's environmental activities to students, has been completed! Students planned the production of this movie, and were in charge of the entire process from shooting to editing. Yoko-Eco News Volume 1 introduces environmentally friendly co-op products such as original YNU tumblers, eco-friendly bags, and "re-repack" containers. It also features the college-wide cleaning that is one of YNU's representative environmental activities.

(Yokohama Eco Campus Project)

● Encouraging garbage separation at the school festival

At the school festival, a garbage station with a tent was set up to encourage **students and other visitors** to separate their garbage into seven categories: cans, bottles, plastic bottles, plastic bottle caps, plastic, burnable garbage, and disposable chopsticks. Collected disposable chopsticks were recycled into particle board, while caps were sent to the Ecocap Movement (details on page 25).

(Live the Life Co-op Committee)

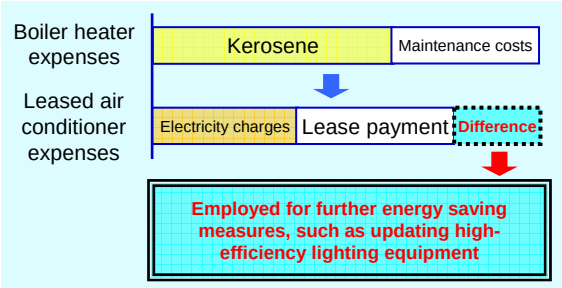
Garbage station

Collected disposable chopsticks

2. Conserving Energy Used for Air Conditioning

● Decreasing CO_2 emissions and costs by changing heating methods (Tokiwadai Campus) NEW

Tokiwadai Campus' **steam heating system via kerosene boiler was entirely abolished and changed to an electric heat pump (EHP).** By bringing in the latest EHP model, **campus-wide energy consumption can be decreased by 6% through crude oil conversion (preliminary value)**, and **campus-wide CO_2 output can be decreased by 11% (preliminary value).**



Kerosene boiler

Conserving energy used for air conditioning

Electric heat pump (EHP)

Eco Campus Construction Policy

Decided upon by Environmental Conservation Committee on August 4, 1999
Revised by the Campus Committee on July 27, 2006

(Purpose)

The purposes of this Policy are to create a new, environmentally-friendly space for education and research at Yokohama National University (hereinafter referred to as “YNU Eco Campus”); to work for environmentally conscious education and research, facilities and equipment that are in tune with the environment, and environmentally friendly management and operation; and to proactively promote the construction of the YNU Eco Campus which is in harmony with society and the regional environment.

(Fundamental Policies)

1. Environmentally conscious education and research

(1) Place concern on developing human resources that understand environmental issues and possess the necessary knowledge and power to take action.
(2) Implement experiments and research that is conscious of effects on the environment while providing substantial environmental education.
(3) Promote the development of educational materials for environmental education in cooperation with related organizations such as the Nature Conservation Society.
(4) Promote joint research in cooperation with related organizations as a research center in the field of the regional environment.
(5) Effectively use the natural environment of the campus as a living educational material.
(6) Promote the holding of seminars, lectures, and extension lectures related to the environmental field.
(7) Encourage students and faculty to deepen their understanding of environmental issues through releasing the Environmental Report, the provision of information, and volunteer activities.

2. Facilities and equipment that are in tune with the environment

(1) Effective use of existing facilities and equipment while working to reduce their burden on the environment.
(2) Introduce facilities and equipment that make use of natural resources (the sun, rainwater, etc.).
(3) Promote the construction of a culturally rich, healthy outdoor environment.
(4) Thorough prohibition of the use of materials that have harmful effects on the environment or health, and employment of natural and recycled materials.
(5) Promote state/local government environmental conservation measures.

3. Environmentally friendly management and operation

(1) Promote conservation of resources and energy, and the appropriate processing/recycling of waste matter.
(2) Widely inform local residents of the YNU Eco Campus Construction Policy and its initiatives through opening the campus, advertisements, etc.
(3) Inspire awareness of environmental issues and spread manners to students and faculty.
(4) Work to maintain the educational and research environment and keep it in a constantly favorable condition.
(5) As a regional disaster prevention center, work to maintain and improve related functions, and ensure human security.
(6) Promote state/local government environmental conservation measures.
(7) Aim for initiatives towards environmental conservation that conforms to standards such as International Organization for Standardization (ISO) standards.

(Plan of Action)

Determine a Plan of Action each year to guarantee efficient initiatives in line with the Fundamental Policies.

(Evaluation)

(1) Evaluate and examine the implementation and results of the determined Plan of Action in accordance with the Fundamental Policies each year, publish the Environmental Report, and announce the results in an appropriate manner.
(2) Revise the Fundamental Policies and Plan of Action as necessary based on the evaluation results in the Environmental Report, and reflect this in the initiatives of the following year.

(Other)

The necessary matters related to the initiatives of this Policy and their implementation shall be carried out by the Campus Committee.

Initiatives in 2008 Based on the Eco Campus Construction Policy

Initiatives in 2008 based on the Yokohama National University Eco Campus Construction Policy are outlined below.

Eco Campus Construction Policy		Principal Initiatives
Environmentally conscious education and research	(1) Place concern on developing human resources that understand environmental issues and possess the necessary knowledge and power to take action.	・Creation of a handbook explaining the nature at YNU Tokiwadai Campus
		・The "Yoko-Eco Declarations," for choosing individual environmentally friendly activities
		・Showing the "Yoko-Eco News" movie
		・Environmental education and research
		・Environment-related communication with the local area
		・Distributing guidelines for the disposal of concentrated waste liquid, and holding informational seminars about handling experimental waste liquid
		・Holding informational seminars about the chemical management system
	(2) Implement experiments and research that is conscious of effects on the environment while providing substantial environmental education.	・Thorough separation of drainage for sewage and experiments
		・Appropriate storage and disposal of radioisotope (RI) waste, and appropriate disposal of genetic engineering waste
		・Promoting the procurement of eco-friendly goods
		・Appropriate management of PCB
	(3) Promote the development of educational materials for environmental education in cooperation with related organizations such as the Nature Conservation Society.	・Education related to the environment
	(4) Promote joint research in cooperation with related organizations as a research center in the field of the regional environment.	・The Global COE Program
		・Initiatives for ESD
		・Holding the YES Symposium
	(5) Effectively use the natural environment of the campus as a living educational material.	・Research related to the environment
		・Holding science fairs
	(6) Promote the holding of seminars, lectures, and extension lectures related to the environmental field.	・Faculty activities to contribute to society
	(7) Encourage students and faculty to deepen their understanding of environmental issues through releasing the Environmental Report, the provision of information, and volunteer activities.	・Releasing the 2009 Environmental Report
		・Environmental activities by students
		・Announcements related to environmental accounting, material balance, total energy use, water resources, and waste matter output
Facilities and equipment that are in tune with the environment	(1) Effective use of existing facilities and equipment while working to reduce their burden on the environment.	—
	(2) Introduce facilities and equipment that make use of natural resources (the sun, rainwater, etc.).	・Conserving energy used for air conditioning
		・Environmentally friendly construction
		・Using solar power at affiliated schools
		・Recycling and reusing water used in experiments
	(3) Promote the construction of a culturally rich, healthy outdoor environment.	・Preserving Tokiwadai Campus' abundant greenery
		・Rare creatures at Tokiwadai Campus
		・Collecting and recycling abandoned bicycles left at school
		・Collecting plastic bottle caps at affiliated schools, student co-ops, etc.
		・Collecting unneeded motorcycles
		・Thorough separation of waste
		・Promoting collection of recyclable items
	(4) Thorough prohibition of the use of materials that have harmful effects on the environment or health, and employment of natural and recycled materials.	・Using "re-repack" containers
		・Using disposable chopsticks that protect the forests
		・Promoting the procurement of eco-friendly goods
	(5) Promote state/local government environmental conservation measures.	・Decreasing greenhouse gas emissions
Environmentally friendly management and operation	(1) Promote conservation of resources and energy, and the appropriate processing/recycling of waste matter.	・Conserving energy used for air conditioning
		・The energy saving campaign
		・Environmentally friendly construction
		・Promoting the procurement of eco-friendly goods
		・Employing the "MOTTAINAI" recycling bulletin board
		・Appropriate management and disposal of toxic substances
	(2) Widely inform local residents of the YNU Eco Campus Construction Policy and its initiatives through opening the campus, advertisements, etc.	・Releasing the 2008 Environmental Report
	(3) Inspire awareness of environmental issues and spread manners to students and faculty.	—
	(4) Work to maintain the educational and research environment to keep it in a constantly favorable condition.	・Encouraging visitors to the school festival to separate garbage into seven categories
		・School-wide cleaning
	(5) As a regional disaster prevention center, work to maintain and improve related functions, and ensure human security.	・Disaster and fire drills
		・Emergency earthquake reports
	(6) Promote state/local government environmental conservation measures.	・Employing the Domestic Carbon Credit System
		・Acquiring CASBEE Yokohama certification at the Oka International Residence (temporary name)
	(7) Aim for initiatives towards environmental conservation that conforms to standards such as International Organization for Standardization (ISO) standards.	—

Environmental Education and Research

* Excerpted from the original by the Planning Division, Facilities Department

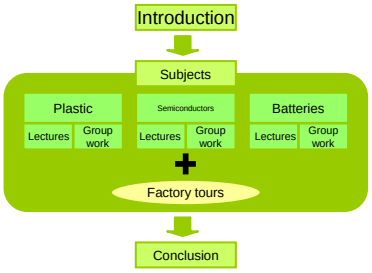
● Education regarding the environment

Development of an environmental education program on the subject of mobile phones

Shinya Matsumoto, Associate Professor, Faculty of Education and Human Sciences

An **environmental education program on the subject of mobile phones, a very familiar item in our daily lives, is being developed and put into practice** at the Matsumoto Laboratory. Although we don't realize it, we have direct and indirect effects on the environment every day. At the Matsumoto Library, an environmental education program was developed with the goals of **1) recognizing how our daily lives are connected with the environment from the standpoint of material consumption, and 2) acquiring fundamental knowledge of related industries and scientific technology**.

As a part of this subject, study meetings are held related to technical themes such as plastic, semiconductors, batteries, and displays, and knowledge shared there is used to create educational materials.



Overall image of the program

The program that has been developed was put into practice at three high schools in Tokyo and Kanagawa Prefecture, for a total of six times. In the future, feedback will be provided to the program about selected themes from questionnaire surveys, and the program will be implemented again. In this way, we hope to promote the spread of the program.

● Research regarding the environment

Research regarding making use of energy conservation in "Green Buildings"

Satoshi Yoshida, Associate Professor, Graduate School of Environment and Information Sciences; Kazuo Fukai, Associate Professor, Akihiro Tamura, Professor, Kazuoki Ohara, Professor, and Yasuhiro Fujioka, Lecturer, Faculty of Engineering; Hitoshi Fukao, Visiting Professor, Visiting Chair (Green building engineering); Ineko Tanaka, Special-Appointment Teaching Staff (Assistant Teacher) Interdisciplinary Research Center

Measuring air conditioning system burden

The number of "green buildings" with energy-saving technology has continued increasing in recent years. In buildings with various types of equipment other than energy-saving technology, the various functions may not coincide with the user's lifestyle, which may lead to even greater use of energy. For this reason, constructing an operational system that guides the user to make use of the green building's efficient functions is an urgent issue.

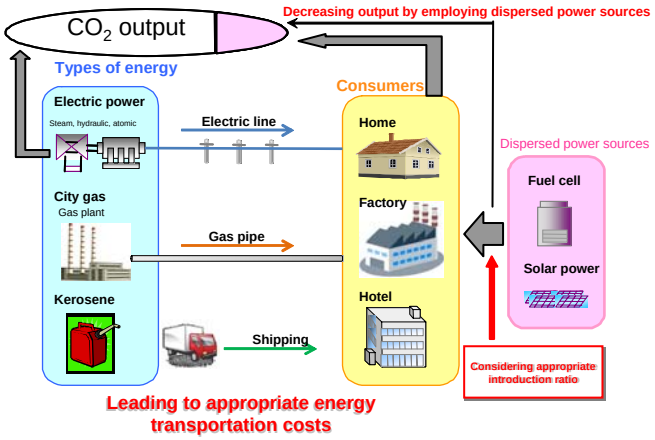
This research is **focused on the Department of Architecture and Building Science**, which was renovated as a green building after being repaired for earthquake resistance. **It aims to examine the behavior of users that allows them to make the maximum use of architectural functions, as well as the construction of a visualization system that leads users to this behavior.** In the first year, measurement and characteristic analysis were simultaneously carried out regarding the amount of energy consumed for building use, such as air conditioning and lighting. In particular, a survey was carried out at the same time to investigate the possibility of decreasing the amount of energy used for air conditioning and improving environmental efficiency. Reflecting these results in architectural education is also one of the goals of the research, and it is also expected to be effective for **educating talented people who are able to contribute to sustainability and building the green buildings of the 21st century**.

Environmentally friendly energy transportation

Tsutomu Oyama, Professor, Faculty of Engineering

A pressing issue in the field of energy is switching from traditional large scale electrical power sources to dispersed power sources. With this in mind, research was carried out regarding environmentally friendly energy transport.

We paid attention to the process by which resources are imported into Japan and then sent to consumers. We examined CO_2 emissions at large scale power plants, CO_2 emissions from dispersed power sources at the consumer end, and CO_2 from fossil fuels used as a heat source by consumers, and considered how CO_2 emissions can be decreased overall. We also **analyzed how much of a decrease in CO_2 could be seen from introducing dispersed power sources such as solar power and fuel cells to consumers**. In this way, **we hope to contribute to switching from traditional energy systems to those that are more friendly to the environment.**



Energy system

Contributions to Society by Faculty Members

● Initiatives as part of the "Global Eco-Risk Management from Asian Viewpoints" YNU Global COE Program

This Global COE Program is based on YNU's ample experience including the 21st Century COE Program and is carried out in cooperation with the National Institute for Environmental Studies (NIES). It is an initiative to contribute to the appropriate management of eco-risk in locations such as developing countries in Asia, which are home to remarkable ecosystem destruction and ecosystem services deterioration resulting from population increase and economic development.

On December 12, 2008, the program held the "Inconvenient Truth in Environmental Issues" seminar at United Nations University (jointly hosted by NIES and the United Nations University Institute of Advanced Studies). Approximately two hundred researches and citizens attended the seminar, which included lectures and debates.

On the following day, the Nihon Seimei Zaidan and the program jointly hosted a workshop at Pacifico Yokohama in Minato Mirai 21, Yokohama. This workshop, called "The Possibility of a Spatial Information Platform for Creating Sustainable Watershed Areas Through Cooperation: Focusing on Large Scale Watersheds in Kanagawa," was attended by approximately 190 people.

In addition, the program held thirteen extension lectures in 2008.

Symposium

● Initiatives for Education for Sustainable Development (ESD) NEW

United Nations University certifies areas working towards ESD as "Regional Centres of Expertise" (RCE), and Yokohama was designated as a RCE in 2006. RCE Yokohama has established conferences made up of city universities, NGOs, and international organizations, to carry out a variety of activities to spread the concept of ESD.

YNU plays a central role in working for RCE international cooperation and is cooperatively carrying out initiatives for ESD with **Penang (Malaysia) and Cebu (the Philippines).** In addition, the Tokyo International Conference on African Development (TICAD) provided the opportunity to begin exchange with Nairobi (Kenya).

●2008 YNU Graduate School of Environment and Information Sciences Axis Project Symposium NEW

"Anti-Global Warming Lifestyles from the Environment Model City of Yokohama"
Yokohama becomes a place of learning through the Yokohama Eco School (YES)

This symposium was held jointly with the City of Yokohama in March 2009 with the goal of sharing the research results of the Graduate School of Environment and Information Sciences Axis Project. Over two hundred people, mostly citizens, attended. The symposium **introduced the latest information regarding global warming counter measures and the development of environmental technology by YNU and Japan**. Panel discussions were also held made up of panelists from YNU, Yokohama City, industries, and citizen groups.

● The Science Cafe

Three years after the project began, six sessions of The Science Cafe (#11 - #16) were held in 2008, featuring lecturers (mainly female researchers) on a wide variety of themes, including the humanities. Science Cafe #11 was led by Professor Kazue Fujiwara of the Graduate School of Environment and Information Sciences and discussed the theme **"Can 'green' save the future of the human race?"** Many people are interested in this program, which is attended by a diverse group of people including high school students and the elderly.

Exchanges of opinions spanning generations

Environmental Communication with the Community

* Excerpted from the original by the Planning Division, Facilities Department

● Local Interchange Course project: practical local activities by students

The Local Interchange Course is one of the minors available at YNU. As part of the “Practical Local Issues Studies” portion of the minor, a total of fifteen projects were held this year featuring practical local activities regarding various local issues. Two of these projects are described below.

■ Eco Project: Considering Water and Air From the Earth

Faculty in charge: Tadashi Takai, Part-time Lecturer, Faculty of Economics (Tokyo Institute for Municipal Research)

This project considers environmental issues from a “glocal” viewpoint through Kanagawa Prefecture’s policies. In the first term, students extensively studied **issues related to water, air pollution, and global warming** in Kanagawa Prefecture, focusing on Kanagawa’s unique headwater environment tax and carbon tax plan **through the subject of forests**.

In August, students carried out a head water survey in which they traveled more than 100km one-way in just one day, starting at Yamanaka Lake and Oshino Hakkai ponds, which are the sources of the Katsura and Sagami Rivers. There, they confirmed the process by which the amount of water is gradually increasing. On the way to Sagami Lake, they observed the river while viewing several of Tokyo Electric Power’s hydro electric plants. The participants were impressed by how the water slowly grew muddy as they descended the river, and were able to affirm with their own eyes the knowledge they had gained in the first term. (Kazuaki Sato, Second Year, Master Course, International Graduate School of Social Sciences)

Tawarano Waterfall (Tsuru City, Yamanashi Prefecture) on the Katsura River (upper stream of the Sagami River) – August 3, 2009

■ Sprouting Eco in Yokohama Project

Faculty in charge: Ineko Tanaka, Assistant Teacher, Interdisciplinary Research Center;
Akihiro Tamura, Professor, Faculty of Engineering

This project places global scale environmental issues, including global warming, as issues closely involved in the lives of Yokohama residents. It aims to resolve these issues in the realm of everyday life, and **carries out activities through environmental education to deepen citizens’ awareness of the environment and to encourage them to act. Students were involved from the planning stage in environmental events for citizens in 2008**, and introduced YNU's practical local activities while cooperating with students from other projects. They also created kits for workshops to encourage citizens to realize the necessity of conserving water and to put what they learned into practice, including the creation of a pamphlet that calculates daily C02 emissions produced during daily life.

Pamphlet for calculating daily CO_2 emissions produced through everyday life

Environmental Communication with Corporations

● Employing the Domestic Carbon Credit System NEW

Large scale repair work was carried out on two buildings at Tokiwadai Campus, replacing existing lighting with high efficiency lighting fixtures. This project earned the Certificate of Approval for Emissions Reductions from the Domestic Carbon Credit System.

1. Partners: Panasonic Electric Works Co., Ltd.
2. Project: Reducing CO_2 by large scale repairs to replace lighting fixtures in two buildings (carried out with two other businesses)
3. Activities: Replacing existing lighting with high efficiency lighting fixtures (Hf32W,etc.) – total 825 fixtures
4. Start date: February 27, 2009
5. CO2 emissions: Approximately 11t of CO_2/year (27,000kWh/year)

Natural Science Research Building II

Social Science Research Building III

Domestic Carbon Credit System
Certificate of Approval for Emissions Reductions

Energy Conservation Counter Measures

● Summer/Winter Energy Conservation Campaign NEW

Energy usage soars in summer. To promote energy conservation and to prevent global warming, the following energy conservation efforts have been designated as points of focus for the "YNU Summer (Winter) Energy Conservation Campaign."

1. Always setting the air conditioner to 28℃ and the heater to 20℃
2. Unplugging electrical appliances when not in use
3. Turning off all lights during the lunch break
4. Avoiding using the elevator, and taking the stairs whenever possible

● Environmentally friendly construction

During large-scale repair work to four buildings (Natural Science Research Building II [Dept. of Architecture and Building Science], Natural Science Research Building IX [Basic Engineering Laboratory], Social Science Research Building III [Lecture Hall 1)] and Yokohama Elementary School in 2008, the following environmental friendly construction methods were employed.

- **Green walls**
- **Using energy-efficient lighting equipment**
- **Installing exterior installation in buildings**

Green walls

Environmental Activities at Affiliated Schools

● Solar power (at various affiliated schools)

Solar power is a type of power that is kind to the planet and doesn't produce carbon dioxide or other gases that cause global warming. Solar power generation facilities were installed in five affiliated schools in 1998.

The total amount of power generated in 2008 was 51,683kWh, with a yearly total of approximately 22 tons of carbon dioxide reduction. While using environmentally friendly energy, children and students at official schools are also proactively given and study environmental education.

●School-wide Eco Cap Movement (Yokohama Elementary School)

In the Eco Cap Movement, caps from plastic bottles are collected and sold to businesses, then the profits are used to purchase vaccinations that help save the lives of children all over the world. As part of the general curriculum, YNU also helps give back to society in a variety of other ways, such as collecting aluminum cans and using them to purchase wheelchairs and giving donations to animal rights groups.

Eco Caps

Environmental Activities at the YNU Co-op

● Collecting unneeded motorcycles NEW

The parking lots on campus are filled with many abandoned motorcycles. Just like bicycles, the Co-op removes abandoned motorcycles and collects motorcycles that are no longer needed. Signs have been posted in each parking lot, reminding people that abandoning motorcycles is prohibited and asking people to bring their unneeded motorcycles to the Co-op (photograph at right).

● Using "re-repack" recyclable containers for take-away meals

● Using disposable chopsticks that protect the forests

● Collecting plastic bottle caps, which are then used to purchase vaccinations

● Working to reduce the amount of plastic bags used

Environmental Accounting

YNU discloses environmental accounting information focused on financial data from FY2008 (April 1, 2008 – March 31, 2009). Based on the Ministry of the Environment's *Environmental Accounting Guidelines* (2005), this information includes environmental conservation costs and effects, as well as economic effects of environmental conservation counter measures (amount saved).

● Environmental conservation costs

In 2008, environmental conservation costs were as follows: investment expenditures were 150 million JPY, and expenses were approximately 200 million JPY. Among investment expenditures, preservation of living environment was approximately 47.0%, global warming countermeasures were approximately 39.1%, and preservation of air, water and soil/ground quality was approximately 10.7%. Among costs, preservation of living environment was approximately 32.4%, chemical substance counter measures were approximately 22.1%, and global warming counter measures were approximately 12.6%.

Investment expenditures are costs related to environmental conservation counter measures with long term effects. Other costs intended for environmental conservation are designated as expenses.

● Environmental conservation effects and amount saved

The effects of environmental conservation in 2008 were not entirely positive – increases were seen in the amount of kerosene, fuel oil, and gasoline consumed, as well as greenhouse gas emissions and inorganic waste fluid output (excepting recycled waste fluid) compared to the previous year. However, environmental conservation effects were brought about in regards to other items. Economical effects (amount of money saved) were approximately 48.70 million JPY (approximately 32.50 million JPY on the input side and approximately 16.20 million JPY on the output side).

Material Balance

Various types of energy are consumed and waste material/carbon dioxide is produced through educational, research, and other types of activities at YNU. The following tables show the environmental load through consumption and emissions at the four main campuses.

INPUT

Campus	Energy and other usage amounts						
	Electricity (Kwh)	City Gas (Nm^3)	Kerosene (L)	Fuel oil (L)	Gasoline (L)	Water (m^3)	Copy paper (t)
Tokiwadai	17,141,980	582,500	208,368	—	5,145	77,883	88.3
Kamakura	270,151	17,036	450	7,500	—	12,131	
Tateno	228,060	15,062	—	—	—	6,564	
Ooka	263,610	16,608	140	—	—	5,374	
Total	17,903,801	631,206	208,958	7,500	5,145	102,901	88.3

Usage amounts at Tokiwadai Well water: 17,597 m^3
Recycled waste water: 21,518 m^3

Education, research, and other activities at each campus

OUTPUT

		Output
Carbon dioxide emissions	($t\ CO_2$)	9,598
Total discharged water	(m^3)	113,322
Inorganic waste fluid	(L)	11,174
Organic waste fluid	(L)	17,160
General waste	(t)	165
Industrial waste	(t)	129

		Output
Recycled plastic	(t)	118
Recycled cans/plastic bottles	(t)	36
Recycled paper	(t)	3
Recycled used paper	(t)	338

Recycled

Overall Energy Usage at Tokiwadai Campus

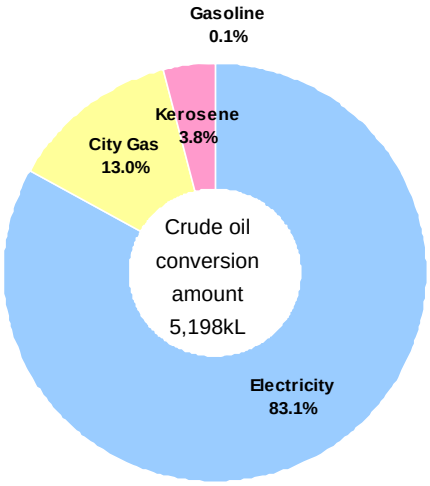
★ Crude oil conversion decreased approximately 4%, and the amount of kerosene used decreased approximately 55% compared to the previous year!

The usage amounts for various types of energy, crude oil conversion amount, and CO2 emissions from energy at Tokiwadai Campus are as follows. The energy distribution in 2008 is also explained in the chart to the right.

Crude oil conversion, which indicates the total amount of energy used, decreased approximately 4% compared to the previous year, showing that energy conservation was accomplished.

Electricity usage was average, compared to the energy conservation that took place in 2008. Gas increased 6% compared to the previous year, resulting from large scale repairs in 2007 in which air conditioning was updated from boiler-type to GHP-type. Kerosene use was greatly decreased, due to switching from kerosene boilers to leased energy efficient electric air conditioners in mid-2008.

CO_2 emissions from energy, because of the increase in the electrical conversion factor (from 0.339t CO_2 /1,000kWh in 2007 to 0.425t CO_2 /1,000kWh in 2008), increased 10% compared to the previous year.



2008 energy distribution

Energy type	2005	2006	2007	2008	Increase/decrease compared to previous year (%)
Electricity (kwh)	17,914,320	16,994,400	17,147,520	17,141,980	0.0
City gas*1 (Nm^3)	420,931	401,710	550,808	582,500	5.8
Kerosene*2 (L)	722,000	527,000	464,000	208,368	▲ 55.1
Gasoline*3 (L)	3,671	4,000	4,660	5,145	4.1
Crude oil conversion amount (kL)	5,691	5,252	5,404	5,198	▲ 3.8
$C0_2$ emissions from energy source (t- CO_2)	9,357	8,490	8,233	9,142	10.0

*1 Total from general use and air conditioning
*2 Used for heating
*3 Used for official vehicles

Greenhouse gas emissions at Tokiwadai Campus

In 2005, YNU created the "Plan on Global Warming Counter Measures" based on the City of Yokohama's "Regulations on the Preservation of the Living Environment in Yokohama City," and is carrying out measures to prevent global warming accordingly. YNU's target greenhouse gas emissions reduction is 1% per year compared to the base year.

Policy regarding the promotion of measures to prevent global warming

○ By taking the initiative to check greenhouse gas emissions in the various fields in which YNU carries out business activities, YNU works to decrease emissions, promote global warming counter measures, and contribute to the realization of a vital and sustainable society.

○ A school-wide organization will be established to promote, examine, and evaluate this project. In addition, global warming counter measures will be implemented in a long term and continual fashion.

★ In 2008, greenhouse gas emissions were **reduced by 6.9%** compared to the base year (2007)!

Target emissions reductions: 1% decrease compared to the base year; 3% decrease over the three years of the plan period

Plan Period II results　Base year: 2007

Year	Greenhouse gas emissions (t-CO_2 /year)	Increase/decrease compared to 2007 (%)
2007	8,233	—
2008	7.668	▲ 6.9

Plan Period I results　Base year: 2004

Year	Greenhouse gas emissions (t-CO_2 /year)	Increase/decrease compared to 2004 (%)
2004	9,348	—
2005	9,432	0.9
2006	8,572	▲ 8.3
2007	8,766	▲ 6.2

* Calculated according to the "Regulations on the Preservation of the Living Environment in Yokohama City." However, during Plan Period I, the factor of the base year was employed for the CO_2 emission conversion factor.

Yokohama National University

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