# Waste Reduction and Recycling Measures

To contribute to establishing a recycling-based society, Kyocera started its activities for industrial waste reduction with a basic policy in FY 1992. Kyocera has been working to reduce waste, including general waste since FY 2006, by focusing on minimizing the generation and discharge of all waste.

#### **Basic Policy for Waste Reduction**

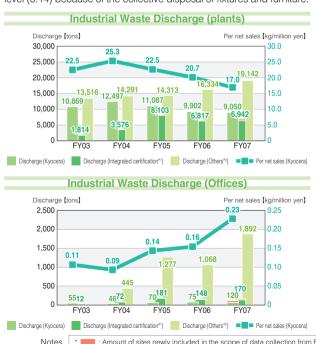
- 1. Minimize waste generated by business activities
- 2. Recycle waste once it is generated
- 3. Change non-recyclable waste into harmless materials

#### Fiscal 2007 Results

#### Reduce Industrial Waste Discharge

The plant activities comprising the majority of Kyocera's discharge resulted in a reduction of 24.3% per net sales (17.0) against the target of 12% reduction per net sales from the FY 2005 level (22.5). This was achieved by introducing internal treatment equipment for liquid wastes.

Office activities resulted in an increase of 58.8% per net sales (0.23) against the target of 12% reduction per net sales from the FY 2005 level (0.14) because of the collective disposal of fixtures and furniture.

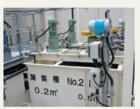


#### **Examples of Industrial Waste Reduction Measures**

Installed Nitric and Hydrofluoric Acid Treatment Equipment (Kagoshima Sendai Plant)

Waste liquids produced from the manufacturing process, including nitric and hydrofluoric acid, were previously sent to a waste disposal firm as industrial waste. Installing nitric and hydrofluoric acid treatment equipment resulted in an annual reduction of 216 tons of this waste.





Installed CVD Waste Liquid Treatment Equipment (Kagoshima Sendai Plant)

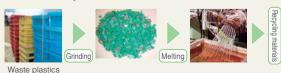
We previously used specialized vendors for treating waste liquids produced from CVD equipment, as this industrial waste is subject to strict regulations. Installing waste liquid treatment equipment resulted in an annual reduction of 196 tons of this waste.





#### Recycling Waste Plastics (Shiga Gamo and Yohkaichi Plants)

Waste plastics were previously sent as industrial waste to vendors that incinerated them and utilized the resulting heat, a process known as thermal recycling. Divided separation has made it possible to implement material recycling of some waste plastics as valuable resources. This allows us to reduce 78 tons of waste annually.



: Amount of sites newly included in the scope of data collection from FY 2007 I Integrated certification: Sites certified under the Kyocera Group Integrated Enviror

\*1 Integrated certification: Sites certified under the Kyocera Group Integrated Environmental Management System except KYOCERA Corporation (Ref. to Page 81) \*2 Others: Except KYOCERA Corporation and integrated certified sites

Site information

#### Reducing General Waste Discharge

Kyocera's general waste discharge was reduced by 42.8% per net sales (2.46) against the target of 12% reduction per net sales from the FY 2006 first half level (4.31). This was achieved by measures that include recycling wooden pallets into woodchips and measures taken to reduce sludge in sewage treatment tanks.

#### **General Waste Discharge**

Item		FY 2006 1 <sup>st</sup> Half Result (as reference)	FY 2007 Result	Increase/Decrease
Discharge	Plant	4.18	2.33	Decreased by 44.3%
per Net Sales (kg/million yen)	Office	0.13	0.14	Increased by 4.6%
	Kyocera total	4.31	2.46	Decreased by 42.8%

#### Reducing Waste Generation

Kyocera not only undertakes activities to reduce the discharge of industrial waste, general waste and valuables, but also promotes activities that reduce their generation.

Plant activities responsible for the majority of industrial and valuables waste resulted in a reduction of 5.7% per net sales (43.5) against the target of 6% reduction per net sales from the FY 2005 level (46.2).

Office activities resulted in an increase of 38.1% per net sales (0.29) against the office target of 6% reduction per net sales from the fiscal 2006 first half level (0.21).



#### **Waste Generation (Offices)**

Item		FY 2006 1 <sup>st</sup> Half Result (as reference)	FY 2007 Result	Increase/Decrease
Generation per net sales (kg/million yen)	Office	0.21	0.29	Increased by 38.1%

<sup>\*</sup> Total of industrial waste and valuables is shown

#### Promoting Zero Emissions

Kyocera defines zero emissions as "an amount of waste landfilled at final landfill sites (including residue discharged from intermediate waste processing companies) that is no more than 1% of the total waste amount, excluding waste that must be disposed of by local governments through a specified method." We have achieved zero emissions in all of group companies certified by the Kyocera Group Integrated Environmental Management System. We intend to continuously expand these activities.

#### Proper Waste Disposal

In accordance with waste disposal regulations established in 1994, Kyocera holds consignment contracts with companies for waste

disposal after it conducts thorough investigations, including financial stability and on-site surveys.

Kyocera conducts field surveys of its disposal companies twice per year to ensure that waste is being treated appropriately. In FY 2007, we conducted field surveys and exchanged information with 53 companies.



#### **Examples of General Waste Discharge Reduction Activities**

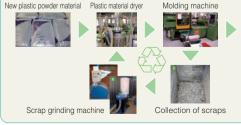
Recycling of Used Wooden Pallets (Shiga Gamo and Yohkaichi Plants)

Used wooden pallets from manufacturing plants are made into chips and used in green areas, resulting in annual recycling of 206 tons. With cooperation from Higashiomi City, Shiga Prefecture, they are also used in parks and along city sidewalks.



## Internal Recycling of Waste Plastics (AVX Czech Republic. s.r.o) (Czech)

Plastic debris generated from processes is collected and ground into powder. This results in 8.4 tons of plastic material being recycled annually. Product



Notes

\* Immunity of sites newly included in the scope of data collection from FY 2007
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## Air Pollution and Water **Pollution Prevention Activities**

Kyocera has been involved in activities to reduce pollutants because the discharge of pollutants into water, the atmosphere and soil causes a large impact on the natural environment and ecosystem. Kyocera manages pollutants very strictly, setting tighter limits than legal controls require through its company-wide Kyocera Environmental Management Standard, established in FY 1993.

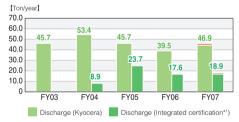
#### FY 2007 Results

#### Air Pollution Prevention Activities

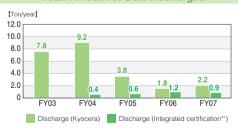
Under the Kyocera Group Integrated Environmental Management System, Kyocera established the Kyocera Environmental Management Standard with emission concentrations of SOx and NOx more tightly controlled than legal requirements specify, to prevent air pollution and global warming. Each plant/office establishes its own Self-Management Standard, through which we work to reduce environmental impact. In FY 2007, Kyocera faced an increase in NOx due to the addition of

a large gas furnace, but reduced SOx by changing fuel, as compared with FY 2005.





#### **Total Amount of SOx Discharged**



#### Measures for Water Pollution Prevention

Kyocera controls the total amount of "substances that impact human health" in discharged water, as specified by the Water Pollution Control Law. Since FY 2006, we have taken measures

to control the discharge amount of the following four substances: mercury, cadmium, lead and hexavalent chromium. In FY 2007, we reduced discharge of these four substances by 70.2% against the target of an average reduction of 50% of the FY 2005 result, due to efforts to improve wastewater treatment efficiency. In FY 2008, we will introduce a closed system to treat wastewater containing these substances.

Under the Kyocera Group Integrated Environmental Management System, Kyocera is also taking action to reduce environmental impact on rivers through tight control of wastewater discharge.

In FY 2007, the BOD discharge amount increased along with an increase in total wastewater volume due to expanded production, as compared with FY 2005.

#### **Total Amount of BOD Discharged**



#### **Example of Water Quality Improvement Activities**

Modification of Wastewater Treatment Facility (Kagoshima Hayato Plant)

To further improve wastewater quality and increase processing capacity, we reviewed the inflow system of each wastewater treatment facility and upgraded to the most appropriate treatment system. We also modified the reaction chambers and flocculation tanks of each wastewater

treatment facility to increase processing capacity.



Installation of Cyanogen Wastewater Closed Treatment Facility (Shanghai KYOCERA Elect onics Co., Ltd.)

Kyocera group companies located overseas are also working aggressively to reduce environmental impact and risk.

Shanghai KYOCERA Electronics Co., Ltd. in China treats cyanogen wastewater in its newly installed plating process line with ion-exchange resin and reverse osmosis membrane equipment for water recycling during production processes.



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Site information

## **Chemical Substances Management**

Some chemical substances cause environmental pollution and affect human health and the ecosystem as a result of long-term accumulation. To manage these substances, we have established a chemical substances control system to minimize the amount of toxic chemical substances released into air, water and waste.

#### FY 2007 Results

### Reduction of Class 1 Designated Chemical Substances Specified by PRTR Law

Under the Kyocera Group Integrated Environmental Management System, Kyocera manages, and has specified reduction goals for, 18 chemical substances that account for more than 90% of the Class 1 designated chemical substances specified by the PRTR Law and used by Kyocera.

By substituting alternative substances and implementing process improvements, Kyocera has reduced the amounts of these substances used by 31.5% per net sales (1,733.6), reduced the amounts released by 24.7% per net sales (144.8), and reduced the amount transferred by 11.7% per net sales (132.1) against its reduction targets.

Item	FY 2005 Reference	Reduction Target	FY 2007 Result	Increase/ Decrease
Used amount per net sales (g/million yen)	2,529.3	12%	1,733.6	31.5% reduction
Released amount per net sales (g/million yen)	192.4	27%	144.8	24.7% reduction
Transferred amount per net sales (g/million yen)	149.7	13%	132.1	11.7% reduction

#### Supporting the PRTR Law

The handled, released and transferred amounts of chemical substances subject to the PRTR Law, as reported in the Kyocera Group Integrated Management System in FY 2007, were reduced as shown in the table below, through substituting alternative substances and other measures.

Item	FY 2005 Result	FY 2007 Result	Increase/Decrease
Handled amount (Ton)	6,203.4	5,434.4	△769.0
Released amount (Ton)	198.5	162.6	△35.9
Transferred amount (Ton)	257.8	216.9	△40.9

#### Management and Disposal of PCB Waste

PCB (polychlorinated biphenyl) waste is strictly controlled and managed at specified locations with control sheets prepared in accordance with

the relevant law through the Kyocera Group Integrated Environmental Management System. Kyocera was an early registrant for disposal of these wastes with the Japan Environmental Safety Corporation.



PCB storage box (Shiga Gamo Plant)

#### Reducting Volatile Organic Compound (VOC) Emissions into the Air

Emissions of volatile organic compounds (VOC) are now strictly controlled by a law enacted in 2004. The Central Environment Council of the Ministry of the Environment also established a policy to reduce VOC emissions into the air by 30% (compared with 2000) in 2010.

Considering these circumstances, Kyocera has targeted reduction of the four substances (toluene, IPA, acetone and methanol) that comprise more than 90% of VOC used by Kyocera, by 30% in FY 2008 and 50% in FY 2016 (compared with the first half of FY 2006) based on the Kyocera Group Integrated Environmental Management System.

In FY 2007, Kyocera achieved a reduction of 11.1% (emission of 566.3 tons) against the FY 2006 emission reduction target of 18% (emission of 636.7 tons) as a result of improved solvent collection equipment and other measures.

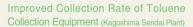
Item	FY 2006 Reference*	Reduction target	FY 2007 Result	Increase/ Decrease
Emission amount (Ton)	636.7	18%	566.3	11.1% reduction

<sup>\*</sup> FY2006 reference is a value created by doubling the amount of emissions from the first half of FY 2006.

#### Example of Reduced VOC Emissions into the Air

Introduction of Acetone Solvent Collection Equipment (Kagoshima Kokubu Plant)

Introduction of acetone solvent collection equipment resulted in an annual reduction of about 19 tons of VOC emission into the air



In FY 2007, collection equipment improvements reduced emissions of toluene into the air and resulted in a 12% increase in collection rate as compared with FY 2006.



#### Preventing Dioxin Generation

Kyocera enacted a plan to abolish all small incinerators in April 1999 to prevent the generation of dioxins, resulting in all of its small incinerators being abolished by December 2000.

Curently, there are three "complex intermediate waste processing facilities" that perform the integral functions of incinerating waste, then drying the sludge and waste liquid by using the heat from incineration. These facilities meet Kyocera Environmental Management Standards that are more strict than the tightest discharge standard of the Law Concerning Special Measures against Dioxins (1/10 of the legal control).

## **Energy Conservation**

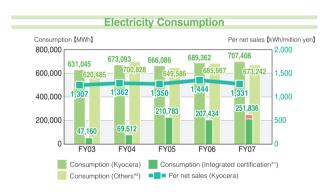
Increasing energy consumption has an impact on environmental issues such as global warming. It is now a common practice for corporations to utilize limited energy levels more effectively to complete the required industrial activities.

Kyocera began its energy conservation measures in FY 1993 with the goal of reducing energy consumption.

#### FY 2007 Result

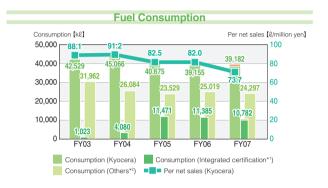
#### Reduced Electricity Consumption

Kyocera's electricity consumption was reduced by 1.4% per net sales (1,331) against the target of 4% reduction from the FY 2005 level (1,350). We enacted energy saving measures for production equipment as well as using inverter pumps and energy saving measures for single-crystal sapphire production equipment. However, we did not achieve the target due to the operation of a new production line.



#### Reduced Fuel Consumption

Kyocera's fuel consumption was substantially reduced by 10.7% per net sales (73.7) against the target of 4% per reduction from the FY 2005 level (82.5). Although consumption increased due to production increases, the conversion from absorption-type chillers operated by gas to highly-efficient turbo chillers operated by electricity resulted in a considerable reduction of fuel usage, thus achieving the target.



#### **Example of Energy Conservation**

Energy-saving Single-crystal Sapphire Production Equipment (Shiga Gamo Plant)

Kyocera produces single crystal sapphire, used for substrates and optical parts, through a manufacturing process called the EFG method. This method provides products with large diameters or specific shape requirements in an integrated production process that spans from "pulling-up" the raw material to machining.

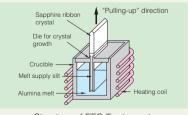
The energy consumption of the EFG equipment that pulls-up the raw material is a large part of this process. However, we significantly reduced electricity consumption by improving its heating efficiency.

#### **Benefits**

Annual electricity reduction	2,160,000kWh		
Annual CO <sub>2</sub> reduction	564 ton-CO <sub>2</sub>		



Single crystal sapphire



Structure of EFG Equipment

Notes

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Site information

## **Global Warming Prevention**

As we approach 2008, the first commitment period specified in the Kyoto Protocol, it is necessary to take strong measures in achieving the greenhouse gas reduction target. Kyocera is working to reduce greenhouse gas emissions through various global warming prevention measures such as energy conservation.

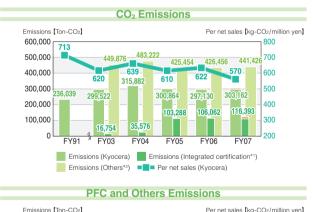
#### FY 2007 Result

#### Reducing Greenhouse Gas Emissions

Kyocera's greenhouse gas emissions were 305,353 ton-CO<sub>2</sub>, up 6% against the target of 3% reduction from the FY 1991 level (288,066 ton-CO<sub>2</sub>) due to increased energy consumption resulting from increased production.

The value per net sales was significantly reduced by 34.1% as compared with FY 1991 through various energy-saving activities conducted from FY 2006 through FY 2007, such as the introduction of turbo chillers.

In FY 2008, Kyocera intends to achieve its target through energysaving measures for production facilities and other methods.





#### **Emission of Greenhouse Gases** Per net sales [kg-CO2/million yen] Emissions [Ton-CO2] 600,000 500,000 462:960 800 427.160 400,000 700 628 300,000 288,066 600 200,000 500 100,000 400 300 Emissions (Kyocera) Emissions (Integrated certification\*1) Emissions (Others\*2) Per net sales (Kyocera)

#### **Example of Global Warming Prevention**

Introduction of High-efficiency Turbo Chillers (in four domestic sites)

In FY 2006, high-efficiency turbo chillers were installed at the Shiga Yohkaichi Plant, Kagoshima Sendai Plant, International Golf Resort KYOCERA, and KYOCERA KINSEKI Yamagata Corp. Installation of nine total units resulted in an annual  $CO_2$  reduction of 15.800 ton- $CO_2$ .



Kagoshima Sendai Plant



International Golf Resort KYOCERA

Notes

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Site information

Environmental Impact of Shipping [Promotion Modal Shift]

Environmental impact resulting from shipping products has many effects, such as global warming, air pollution, traffic iams and noise.

The Kyocera Group takes action to minimize environmental impact caused by the transportation of our products.

As an example of a modal shift, the transportation of semiconductor components produced at the Kagoshima Sendai Plant was changed from trucks to railway, resulting in a reduction of 5.4 ton-CO<sub>2</sub> in FY 2007.

#### Example of Reducing Environmental Impact of Shipping

Modal Shift Activities (Kagoshima Sendai Plant)

#### Shipping Overview

· Product: Semiconductor components Amount: 3.82 tons/per shipment

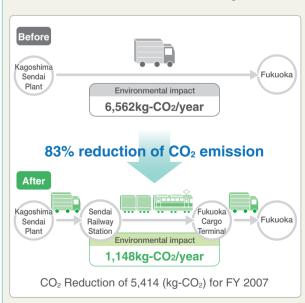
· Frequency: 2 to 3 shipments/month

#### CO<sub>2</sub> Emission per Transportation Ton-km\*

· Railway: 22 (g-CO<sub>2</sub>/ton-km) • Truck: 173 (g-CO<sub>2</sub>/ton-km)

\* Ministry of Economy, Trade and Industry, and Ministry of Land, Infrastructure and Transport

"Guidelines for CO2 Emission Calculation Method in Logistics Ver. 2.0"



#### Energy Conservation and Global Warming Prevention Plan for FY 2008

In FY 2008, a top priority will be lowering the amount of energy used by production equipment, through installing turbo chillers and various new kinds of manufacturing equipment.

Kyocera is not only extending its efforts to ensure energy conservation at plants but also in offices. We installed infrared sensors that control the lighting in the Kyocera Museum of Art and the Museum of Fine Ceramics in the Kyocera Headquarters building, as one example of energy conservation.

#### Introduction of Turbo Chillers

#### Kvocera

- · Kagoshima Kokubu Plant
- · Kagoshima Hayato Plant
- · R & D Center, Keihanna

Domestic Kyocera Group

- · KYOCERA SLC Technologies Corp., Kokubu Office
- · KYOCERA KINSEKI Yamagata Corp.
- · Hotel KYOCERA

#### Activities at Production Sites

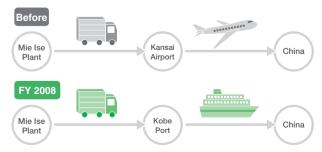
- Furnace optimization
- · Use of inverter pumps in production equipment
- · Increasing the number of material sets for equipment
- Upgrading to high-efficiency equipment
- · Implementing fuel conversion

#### Activities in Office Buildings

· Use of infrared sensors for lighting (Kyocera Headquarters, Kyocera Management Research Institute, Kagoshima Training Center)

#### Plan for Reducing Environmental Impact of Shipping in FY 2008

In FY 2008, we will implement a modal shift by changing the material supply transportation method for KYOCERA (Tianjin) Solar Energy Co., Ltd. from air transportation to transportation by ship.



We are working to enact this transportation modal shift to reduce environmental impact.

## **Resource Conservation**

To maximize the utilization of limited resources and contribute to global environmental protection, Kyocera promotes resource conservation based on specific reduction targets for vehicle fuel, water, travel expense, gases, paper and packing materials.

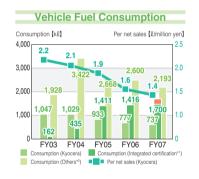
#### FY 2007 Results

#### Reducing Vehicle Fuel Consumption

Kyocera works to reduce vehicle fuel consumption to effectively utilize our remaining fossil fuels and prevent pollution caused by gas emissions. Specifically, low fuel consumption vehicles are used, the reasons for business trips are reviewed, public

transportation is utilized, and the company promotes "driving smart" to conserve energy.

As a result, we achieved a 26.7% reduction per net sales (1.4) against the target of 5% reduction from the FY 2005 level (1.9).



#### Reducing Water Consumption

Reducing water consumption greatly contributes to a reduced environmental impact because it protects water resources and allows reduction of wastewater. Accordingly, Kyocera works to reduce both city water and groundwater consumption.

This resulted in a 6.5% reduction per net sales (11.1) against the target of 10% reduction from the FY 2005 level (11.9). Reductions were achieved through recycling non-filtrated

water generated during pure water production at the Kagoshima Kokubu Plant and improving the supply of pure water according to production line conditions at the Kagoshima Hayato Plant.



In regard to office locations, however, consumption increased by 27.6% per net sales (0.39) against the target of 5% reduction from the FY 2005 level (0.31).

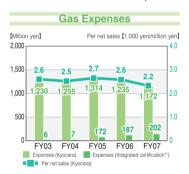


#### Reducing Gas Expenses

To reduce environmental impact, Kyocera works to reduce the amounts of nitrogen, hydrogen and argon gases consumed in Kyocera production processes.

These activities resulted in 17.2% reduction of amount per net

sales (2.2) against the target of 15% reduction from the FY 2005 level (2.7). This was achieved by substituting air for the nitrogen gas used in the liquid crystal manufacturing process and through other methods.



#### Reducing Travel Expenses

Reducing the number of business trips contributes to saving many resources such as the fuel used by public transportation, and resources used by accommodations.

In Kyocera, a video-conferencing system has been introduced sequentially into all plants and offices to reduce travel expenses, and has been expanding to include additional group companies since

FY 1992. Furthermore, a multi-media conference system is being introduced to enable participants from many places at once.

This resulted in a 7.8% reduction per net sales (9.1) against the reduction target of 4% from the FY 2005 level (9.8).



Notes

\* Industrial Example 1 - Amount of sites newly included in the scope of data collection from FY 2007

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#### Reducing Paper Consumption and Disposal

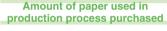
In addition to reducing office paper use, Kyocera has been working to reduce the amount of paper used in the manufacturing process and also reduce the amount of paper discharged. Digitizing documents, using both sides of paper in the office setting and the reuse of paper used in production processes have been promoted.

These activities resulted in a 17.8% reduction in weight per net sales for office paper (0.38) and 13.2% reduction in weight per net sales for paper used in production processes (0.80) against the target of 6% reduction from the FY 2004 level (office paper — 0.46, production paper — 0.92). For weight per net sales of paper discharged, the activities resulted in a 1.5% increase per net sales (2.73) against the reduction target of 6% (2.69).

#### Reducing Packing Materials

To reduce packing materials, Kyocera is working toward improving its packing methods and adopting reusable packing containers. There was a 0.5% reduction per net sales (4.25) against the target of 6% reduction from the FY 2005 level (4.27).











### **Measures for Office**

#### Green Purchasing

Kyocera uses the MRO\* internet purchasing system "@office" for purchasing office appliances in order to preferentially purchase products and services with low environmental impact. The green purchasing ratios are shown below.

\* MRO: Maintenance, Repair and Operations Generic name for goods purchased by companies other than production materials such as office appliances, consumables and office furniture.

#### **Green Purchasing Results**

Item	Purchasing ratio		
Itelli	FY 2005	FY 2006	FY 2007
Notebooks, stationery, office appliances	71%	74%	78%

#### Ecologically Sound Building

The construction concept for Kyocera's headquarters building, completed in 1998, was to be "environmentally friendly and coexist with the local community." The building itself is an "ecologically sound building" that incorporates various environmentally friendly features.



#### Features

- 1. Solar power generating system (Total output: 214 kW, Annual  $CO_2$  reduction: About 100 ton- $CO_2$ \*)
  - \* Calculated from FY 2007 result
- 2. Natural gas cogeneration system
- 3. Ice thermal storage system
- 4. Various environmentally friendly systems
  - 1) Peripheral ventilation system
  - 2) Individual air conditioning systems
  - 3) Inverters for air conditioner motors
  - 4) Air volume adjustment system at air conditioner duct
  - 5) Central air conditioning system
  - 6) Reduced wasteful lighting through subdivided system
  - 7) High-efficiency inverter lighting
  - 8) System to measure energy consumption levels for each floor
  - 9) High-efficiency, heat-reflective glass
  - 10) Automatic escalators
- 11) Utilize groundwater and rainwater

\* Image: Amount of sites newly included in the scope of data collection from FY 2007

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