

# E The Environment

JAL Group promotes "Sky Eco" today for a greener tomorrow.

## Environmental Guidelines

As an airline company in control of important social infrastructure, the JAL Group is fully aware of its responsibility to the global environment. We have therefore placed control of our environmental impact and protection of the environment as core themes in our business operations and will continue to implement "Sky Eco" in order to pass on this rich Earth to those of the next generation so they will always be able to see the beautiful Earth from the sky.

## Our Eco-First Commitment

In 2010, the JAL Group made an "Eco-First" commitment to renew its efforts for preserving the global environment and received certification as an "Eco-First Company" from the Ministry of the Environment of Japan.



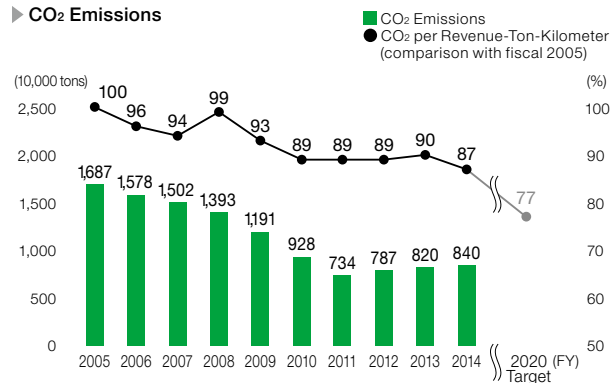
## JAL Group's CO<sub>2</sub> Emission Reduction Goal

We are working to reduce CO<sub>2</sub> emissions per revenue-ton-kilometer from JAL Group aircraft by 23% in fiscal 2020 as compared to the fiscal 2005 level.

## CO<sub>2</sub> Emissions by JAL Group Aircraft

In fiscal 2014, CO<sub>2</sub> emissions by JAL Group aircraft per unit transport volume (revenue-ton-kilometer) were reduced by 13.4% compared to the fiscal 2005 level. Total CO<sub>2</sub> emissions increased by 200,000 tons from the previous fiscal year as a result of expanded operations. CO<sub>2</sub> emissions per unit transport volume decreased by 3% from the previous year due to the increase in fuel-efficient Boeing 787-8 aircraft, improvements to flight operations efficiency, and regular engine washing for more efficient fuel consumption.

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



## Sky Eco Project

Pilots at JAL actively engage in environmental practices during flight operations as members of the Sky Eco Project. In addition to pilots, specialists from areas such as procurement, flight operation technology and CSR also participate to consider environmental activities related to flight operations primarily from the pilot's perspective, so they can be put into practice during flights. For example, while safety is a top priority, they also seek to reduce CO<sub>2</sub> emissions by devising procedures for taxiing an aircraft to the parking spot using only one of the twin engines. In addition, pilots are provided with feedback on the impact and execution rates, which deepens their understanding of the environment.



### Aviation Biofuels

Many countries are developing aviation biofuel toward significantly reducing CO<sub>2</sub> emissions. In January 2009, JAL became the first airline in Asia to conduct a test flight using nonfood biofuel on a Boeing 747-300. We continued to exchange information with related organizations in Japan and abroad, and participated in the founding of the Initiatives for Next Generation Aviation Fuels (INAF), which explores the potential for biofuel production in Japan. INAF was launched in May 2014 with "All-Japan" membership that comprises 46 organizations spanning companies, government and academia. As an active member, JAL serves as the secretariat of the subcommittee on producing aviation biofuel from municipal waste. We have seen promising results from several manufacturing processes (see diagram) using municipal waste, which offers a significant cost advantage in terms of procuring raw material.

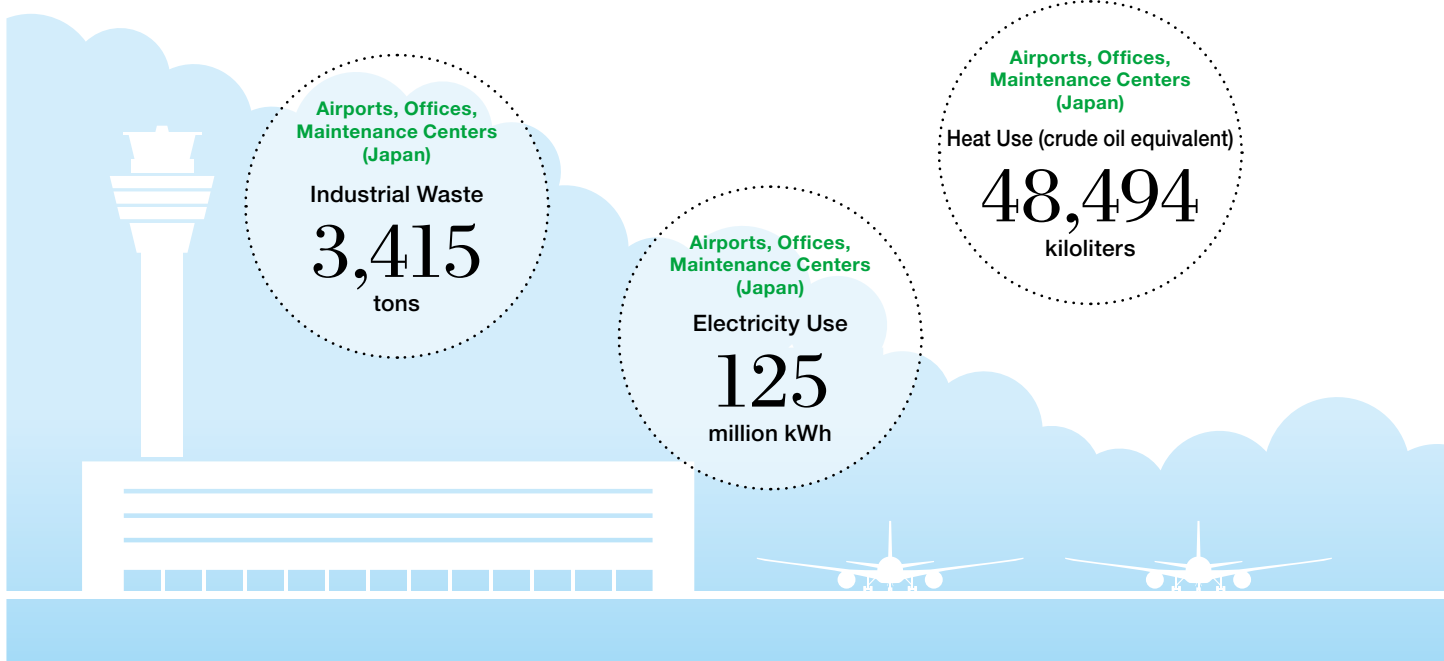
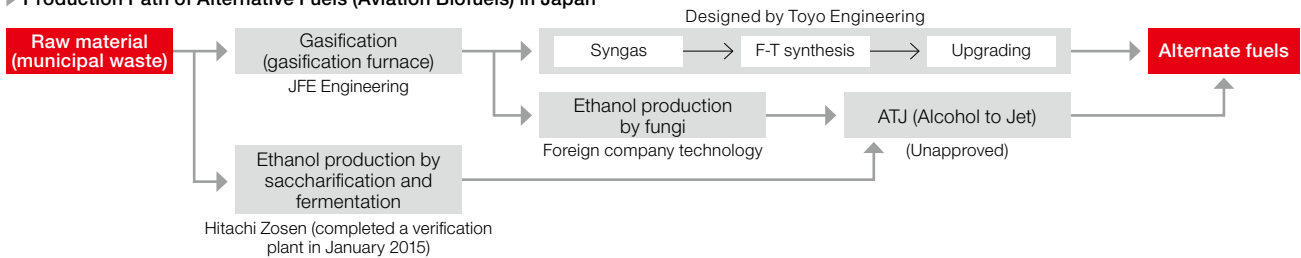
Looking ahead, we will participate proactively in an effort to realize domestic biofuel production by around 2020 with commercialization in the near future. Moreover, we hope to take a

major step forward in realizing a zero waste society, a common goal of many countries, through the recycling of resources that are otherwise discarded as waste into fuel.

### Cabin Waste Recycling

Since 2007, JAL has been endeavoring to recycle waste generated inside aircrafts. Specifically, we have been recycling beverage cans, newspapers, in-flight magazines and plastic bottles at each airport using standardized procedures. As for food waste, such as leftover meals on international flights, we incinerate all of it due to quarantine and other restrictions. Disposal methods differ from country to country, and we are actively working with the International Air Transport Association (IATA) to formulate common international rules to increase the volume of recycled waste. While this is a difficult task involving revisions in the regulations and systems of different countries, we will continue to collaborate with the IATA and airport companies in activities for steadily raising the ratio of recycled waste.

#### ► Production Path of Alternative Fuels (Aviation Biofuels) in Japan



### CONTRAIL Atmospheric Greenhouse Gases Observation Project by Passenger Aircraft

The JAL Group has been participating in the “CONTRAIL Atmospheric Greenhouse Gases Observation Project by Passenger Aircraft” as an environmental effort that can only be implemented by airline companies. This joint project with Japan’s National Institute for Environmental Studies, the Meteorological Research Institute, JAMCO Corporation and the JAL Foundation has been advancing through ongoing system enhancements since 1993. Eight Boeing 777-200ER aircraft in our fleet, two of which bear the CONTRAIL project logo, and one Boeing 777-300ER aircraft incorporated in 2014 have been modified to allow for the installation of air sampling equipment (ASE and CME) for atmospheric observations. The project has been widely recognized for the global scale of its environmental activity, and received the “Environment Minister’s Award” and “Environmental Excellence Award” under the 40th Environmental Awards, sponsored by the Hitachi Environment Foundation, and the “19th Asian Environmental Awards,” sponsored by the Mainichi Newspapers Co., Ltd. and other organizations in fiscal 2013, as well as the “Special Award” under the 24th Global Environment Awards sponsored by the Fuji Sankei Communications Group in fiscal 2014.



#### VOICE



#### Working on a Joint Government-Industry Project with Environmentally Conscious JAL Staff

**Dr. Toshinobu Machida**  
 Head of the Office of Atmospheric and Oceanic Monitoring, Center for Global Environmental Research, National Institute for Environmental Studies

Is global warming progressing? Is CO<sub>2</sub> really increasing in the atmosphere? These are questions I am often asked. While a dazzling display of simulated data on the atmosphere may be useful, there is nothing more convincing than the results of actual observation. Today, a large amount of observed data on atmospheric CO<sub>2</sub> is being collected during JAL flights. The CONTRAIL Project began in 2005, with two types of equipment for observing greenhouse gases installed in aircraft operated by JAL. Since then, these atmospheric observations have continued at a global scale. This pioneering project has been hailed as an excellent example of government-industry collaboration.

It has been made possible through the cooperation of many staff in several JAL departments, who are deeply aware of the environment and have a can-do attitude. While I conduct research every day, they always make me feel that this is a Japanese company with world-class capabilities in fields other than manufacturing.

#### Airports, Offices, Maintenance Centers (Japan)

Water Use  
**445**  
 thousand m<sup>3</sup>



#### Aircraft in Flight (Japan, International)

CO<sub>2</sub> Emissions  
**8.4**  
 million tons



### Action Plan

We have placed the control of our environmental impact and the protection of the environment as core themes in our business operations, and create action plans for these areas. Our philosophy and dedication toward them are set out in the “Action Plan.”

#### Action Plan 1 We actively conduct initiatives to prevent global warming.

Commitment	Status
We are working to reduce CO <sub>2</sub> emissions per revenue-ton-kilometer from JAL Group aircraft by 23% in fiscal 2020 as compared to the fiscal 2005 level.	<ul style="list-style-type: none"> <li>We increased the number of 787-8 aircraft with reduced fuel consumption, and because they logged a significantly higher proportion of operational time, CO<sub>2</sub> emissions per revenue-ton-kilometer for fiscal 2014 improved by 3% year-on-year and declined by 13.4% from the fiscal 2005 level.</li> <li>We achieved our target of 1.5% average annual improvement (average figure for fiscal 2005 to fiscal 2014).</li> </ul>
We are upgrading our fleet to lower fuel consumption and low noise aircraft (e.g., Boeing 787, 737-800 and Embraer 170).	<ul style="list-style-type: none"> <li>We introduced five 787-8 aircraft with reduced fuel consumption and retired five aircraft (777-200, 767-300 and 737-400).</li> </ul>
We are conducting “Eco Flights.”	<ul style="list-style-type: none"> <li>We achieved annual reductions in CO<sub>2</sub> emissions of approximately 42,000 tons, mainly through five “Eco Flight” activities in our daily operations: engine out taxi, idle reverse, reduced flap, delayed flap and delayed gear.</li> </ul>
We are endeavoring to reduce weight.	<ul style="list-style-type: none"> <li>We introduced 1,080 of the world’s most advanced cargo containers, which are approximately 40% lighter than conventional units. We achieved annual reductions in CO<sub>2</sub> emissions of approximately 7,000 tons.</li> </ul>
We are cutting CO <sub>2</sub> emissions by washing engines and pursuing other CO <sub>2</sub> reduction methods.	<ul style="list-style-type: none"> <li>We implemented engine water washing at intervals of between 190 days and 300 days for the 777, 767 and 737-800 aircraft. We installed new Eco Power equipment to enhance washing efficiency. Result: Annual CO<sub>2</sub> emissions were reduced by approximately 25,000 tons.</li> <li>Reduction in auxiliary power unit (APU) usage time for the 777 and 737-800 aircraft was little changed from the previous year as a result of our maximum effort.</li> </ul>
We work together with the associated ministries and aviation authorities such as air traffic control in various countries to introduce leading methods for fuel efficient aviation and will actively continue to do so in the future.	<ul style="list-style-type: none"> <li>Our Haneda-San Francisco route obtained certification for adopting operation methods that reduce environmental impact.</li> <li>We have been implementing CDO (continuous descent operations) at San Francisco International Airport, Kansai International Airport and Naha Airport.</li> <li>We have been operating UPR (user preferred route) on flights to Hawaii, Australia, the West Coast of North America (Los Angeles, San Francisco and Vancouver) and Palau.</li> <li>We extended the efficient selection of alternative airports (alternatives for Boston, Sydney and Haneda).</li> <li>Estimated annual reduction in CO<sub>2</sub> emissions as a result of the above efforts was around 6,000 tons.</li> </ul>
We are collaborating in the research and development of aviation biofuel made from inedible plants.	<ul style="list-style-type: none"> <li>As part of an all-Japan team of industry, government and academia, we are promoting a project to produce aviation biofuel from municipal waste, which we aim to realize by around 2020 (the year of the Tokyo Olympics and Paralympics). The project will also contribute to the creation of a recycling-based society (see page 40).</li> </ul>
We promote energy-saving activities in our ground facilities (offices, factories, etc.).	<ul style="list-style-type: none"> <li>We continued to adopt LED lighting in maintenance facilities (hangars and docks), conduct various energy-saving activities and upgrade to electricity-saving lighting in our offices.</li> </ul>

#### Action Plan 2 We actively promote social and environmental activities and environmental awareness activities.

Commitment	Status
By continuing to conduct environmental and social activities, we are able to contribute to long-term conservation of the environment, and we strive to improve the environmental awareness of children who will lead the next generation, as well as all of society and our own employees.	<ul style="list-style-type: none"> <li>We implemented our Sky Eco Project, in which our pilots have taken the initiative (see page 39).</li> <li>In fiscal 2014, we held 28 Sky Eco classes, in which our captains offered environmental awareness education for children.</li> <li>We contributed to reducing CO<sub>2</sub> emissions with cooperation from passengers by implementing the “Shades Closed Exercise” and improving on-time performance.</li> </ul>
We will continue to participate in the atmospheric observation project and the forest fire reporting project using our aircraft.	<ul style="list-style-type: none"> <li>The “CONTRAIL Atmospheric Greenhouse Gases Observation Project by Passenger Aircraft” received the Special Award under the 24th Global Environment Awards sponsored by the Fuji Sankei Communications Group (see page 41).</li> <li>We have been participating in the “Siberian Forest Fire Reporting Project.” Since 2003, pilots have been reporting any fires detected during summer flights over Siberia to a research team led by Hokkaido University in a cooperative research effort on early fire detection by satellites (306 fires were reported in fiscal 2014).</li> </ul>

**Action Plan 3** We work toward the realization of a recycling-based society and for the preservation of the environment.

Commitment	Status
We are aiming for a final disposal rate of less than 2% for industrial waste from domestic worksites.	<ul style="list-style-type: none"> <li>Total waste volume in fiscal 2014 was reduced by 9% from fiscal 2013. The final disposal rate was 1.2%, achieving our target of less than 2%.</li> </ul>
We work to reduce water usage.	<ul style="list-style-type: none"> <li>We reduced water usage by 2% year-on-year by reusing wastewater and implementing water-saving measures.</li> </ul>
We work to reduce the amount of emissions of chemicals (governed by the PRTR Act).	<ul style="list-style-type: none"> <li>Total volume of PRTR substances handled in fiscal 2014 (462 chemicals) decreased 11% year-on-year to 59 tons (following last year's increase, the volume of trichloroethylene decreased as a result of improvements in recovery equipment).</li> </ul>
We work to recycle uniforms and items used in aircraft cabins such as in-flight magazines, newspapers, aluminum cans, plastic bottles and cargo packing materials.	<ul style="list-style-type: none"> <li>We continuously recycled beverage cans, newspapers, in-flight magazines and plastic bottles in accordance with our rules. We are promoting comprehensive efforts to dispose of in-flight waste in collaboration with the IATA and airport companies (see page 40).</li> <li>Total amount of recycled waste in fiscal 2014 was 2,400 tons.</li> </ul>

**Action Plan 4** We work to conserve the environment around airports.

Commitment	Status
We introduce low-noise aircraft and noise abatement operational procedures, and respond to other airport noise issues.	<ul style="list-style-type: none"> <li>We actively practice "Reduction of Noise at Source" and "Noise Abatement Operational Procedures" as responsibilities of airlines under the "Balanced Approach" recommended by the ICAO. All JAL aircraft are compliant with ICAO Chapter 4, the most stringent standard for noise.</li> <li>We practice noise abatement procedures at takeoff and operate under more stringent rules when taking off from Haneda Airport and Itami Airport.</li> <li>As for noise abatement procedures upon landing, we practice reduced flap, delayed flap and idle reverse. At San Francisco International Airport and Kansai International Airport, we conduct CDO (continuous descent operations) to significantly reduce both noise and CO<sub>2</sub> emissions.</li> </ul>
We work to reduce NOx emissions from aircraft, automobiles, etc.  (NOx, HC, CO and other aircraft engine emissions are strictly regulated by the ICAO. Similar restrictions have been established under Japan's Civil Aeronautics Act. NOx emission restrictions are particularly stringent.)	<ul style="list-style-type: none"> <li>All JAL aircraft engines are compatible with all regulation values and the ICAO's CAEP6 and CAEP8 NOx standards (the applicable standard differs depending on when a plane's Certificate of Airworthiness was issued).</li> </ul>

**Action Plan 5** We give due consideration to biodiversity.

Commitment	Status
We convey to customers and society at large the importance of biodiversity and follow the "JAL Group Policy on Biodiversity" in our business operations.	<ul style="list-style-type: none"> <li>We formulated and adhere to the "Biodiversity Policy of the JAL Group" in recognition of the fact that the JAL Group's air transport business may indirectly impact biodiversity.</li> </ul>
We take part in the "United Nations Decade of Biodiversity" initiative. In addition, we promote activities that convey the importance of protecting the natural beauty of Japan, including cranes, etc.	<ul style="list-style-type: none"> <li>We painted the "United Nations Decade of Biodiversity" logo on our aircraft, contributed to the JAL Endemic Rabbit's Forest and served certified coffee on our flights in consideration of biodiversity.</li> </ul>