ITAMI Osaka International Airport

Osaka International Airport Environmental Report 2017

CONTENTS

1. Basic policies of the ITM Environmental Plan ····· 1

2. Environmental management structure ····· 4

3. Environmental initiatives ····· 5

- An airport that respects the local environment ····· 5
- An airport that respects the global environment ····· 14
- An airport that recycles resources ····· 19
- An airport that respects biodiversity ····· 23
- An airport that respects the local community ····· 25

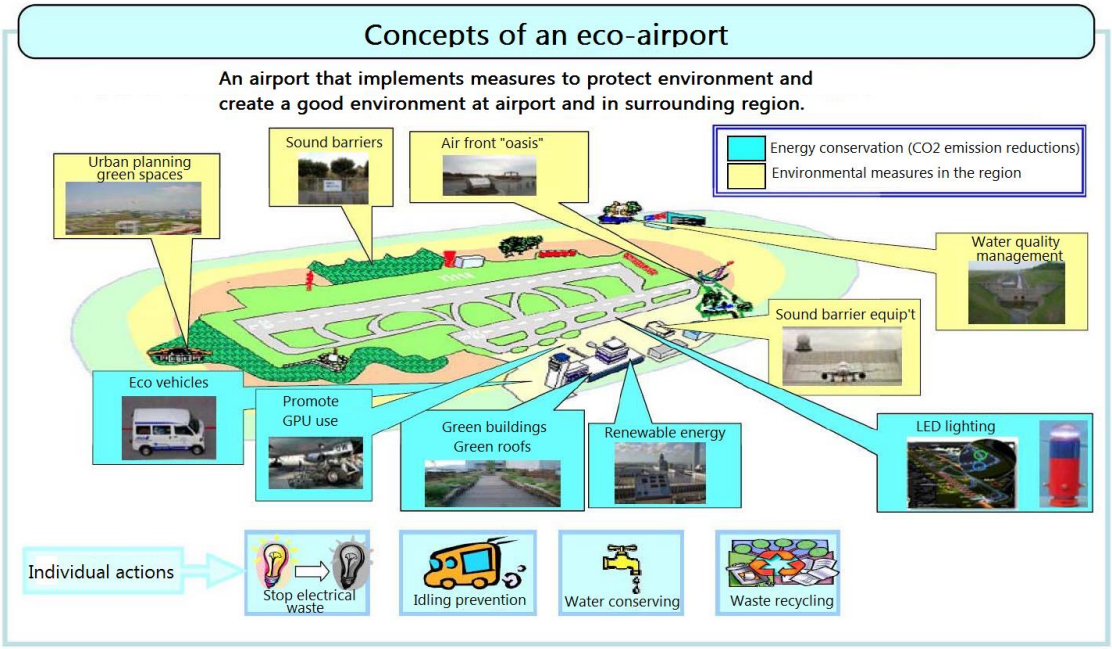
4. Outline of Osaka International Airport ····· 27

Appendices ····· 29

1. Basic policies of the ITM Environmental Plan

■Eco-Airport

An eco-airport can be defined as an airport that implements measures to protect the environment and create a good environment at the airport and in the surrounding region. In concrete terms, such measures can include conserving energy (reducing CO_2 emissions) and water, reducing waste, and taking other environmental measures in region of the airport.



■Outline of ITM Environmental Plan

Osaka International Airport established the ITM Eco-Airport Council based on the eco-friendly airport concept, with airport-related partners as its members. The Council produced the ITM Environmental Plan in March 2007 and revised it in March 2012. The Plan covers items such as the current status of each environmental parameter, environmental targets, and concrete measures, and aims include conserving water and energy (reducing CO_2 emissions), reducing waste at the airport, etc.

Outline of ITM Environmental Plan

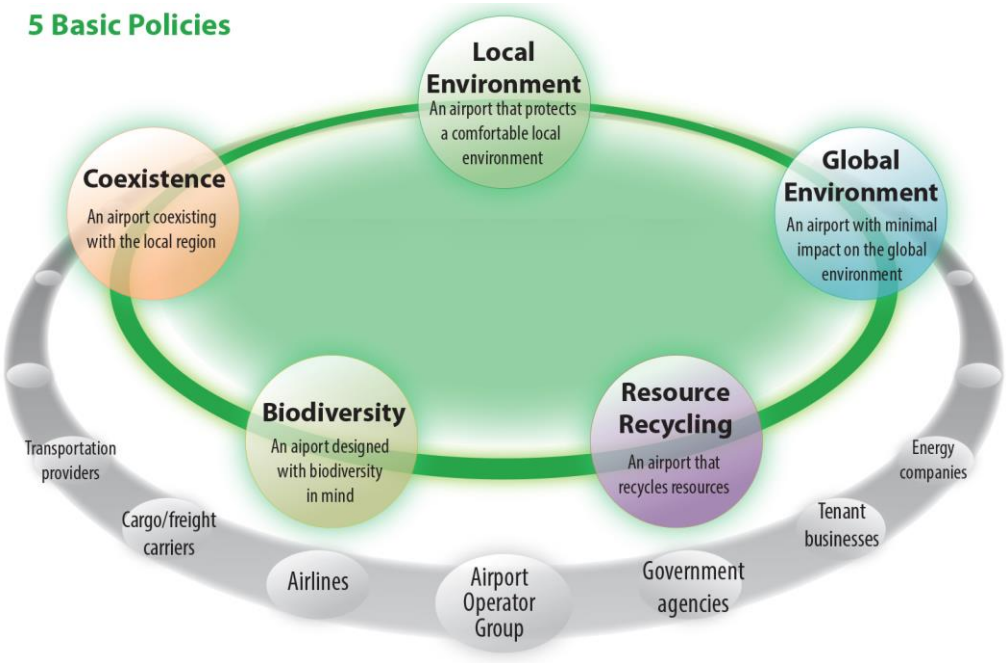
- Adopted: FY2006
- Target activities: All activities at the airport, including people, aircraft, vehicles, monorails, facility operations, etc.
- Area covered: ITM airport and region
- Environmental parameters: Air, energy, noise, water, soil, waste, natural environment, etc.
- Assessment and reporting: An Environmental Report is released yearly, covering Plan implementation status and assessments.

■ Measures by ITM in the surrounding region

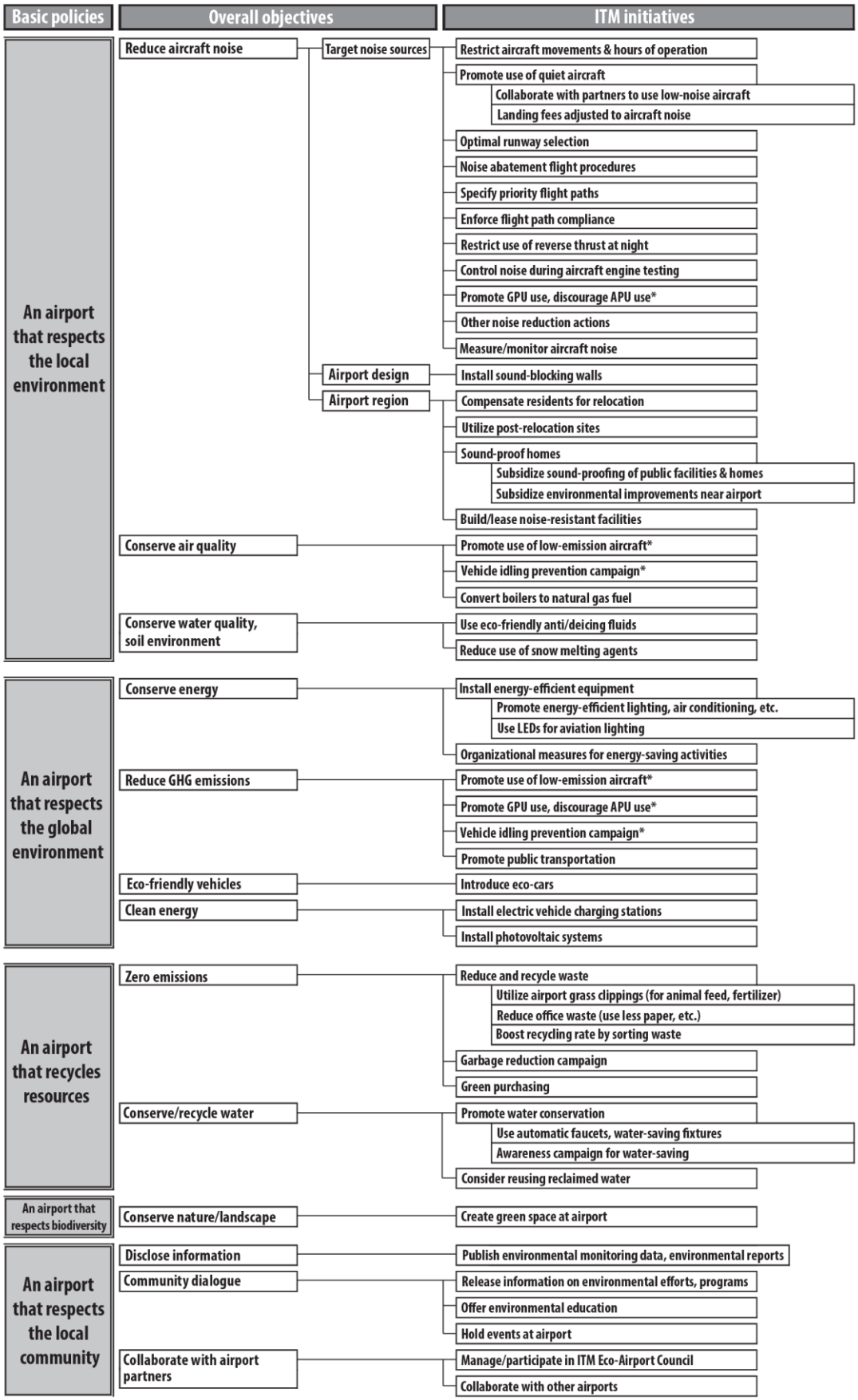
For years, ITM has been taking steps to reduce aircraft noise in the region around the airport and be "an airport that respects the local community," including identifying noise sources and reducing the impacts of noise. These measures include soundproofing upgrades for housing, projects to expand greenspace, monitoring and reporting of data on aircraft noise, and more.

■Evolution of ITM Environmental Plan

In July 2012, Kansai International Airport (KIX) and Osaka International Airport (ITM) were integrated, and a decision was also made to integrate their eco-airport policies. As part of efforts to make KIX an eco-airport, the airport developed its third Environmental Plan. It covers environmental measures that can be implemented sustainably as an "environmentally-advanced airport." The Environmental Plan includes measures and environmental targets built upon the five basic policies shown below.



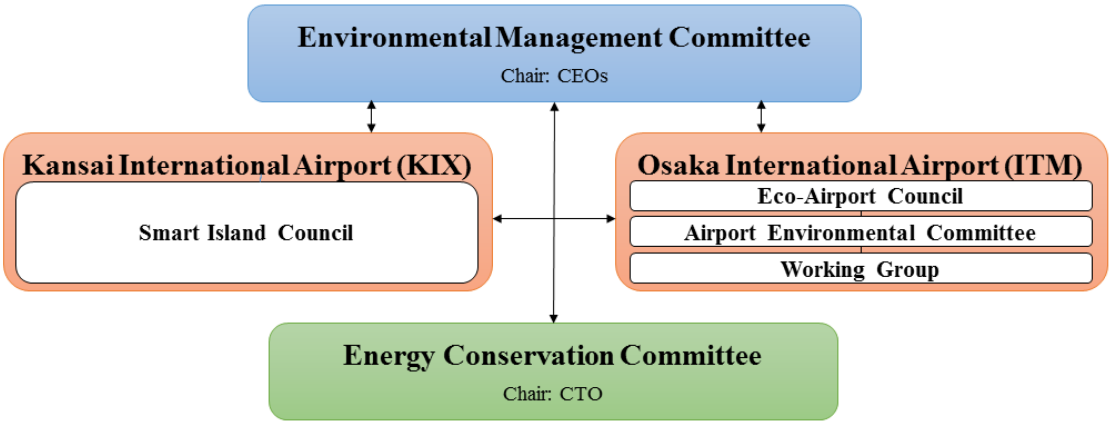
■ Relationship of five basic policies and specific initiatives



Note: Asterisk (*) indicates an initiative that applies to more than one objective.

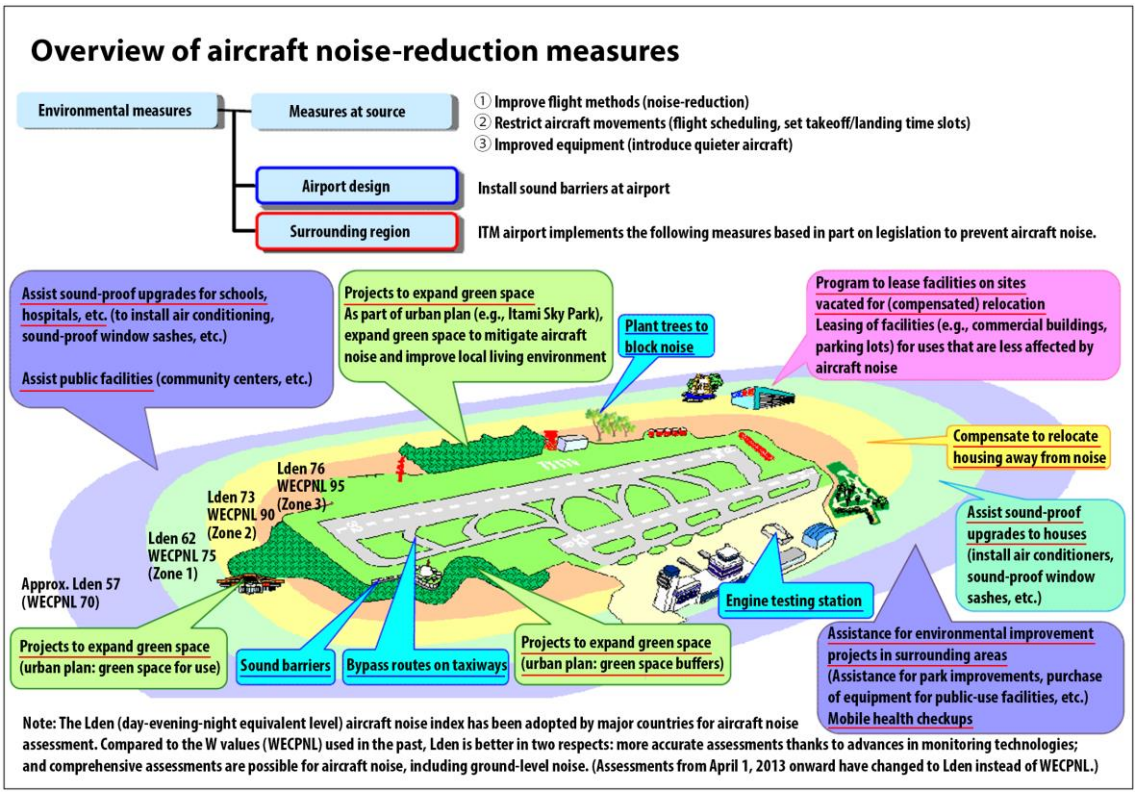
2. Environmental management structure

To implement the Eco-Airport Plan, the Osaka International Airport Eco-Airport Council was created, with the Osaka Civil Aviation Bureau (Ministry of Land, Infrastructure, Transport and Tourism), airline companies, and other airport businesses. Its function is to establish environmental targets and promote environmental activities in a unified way. The environmental management is structured as shown below.



3. Environmental initiatives (1) An airport that respects the local environment

Reducing aircraft noise

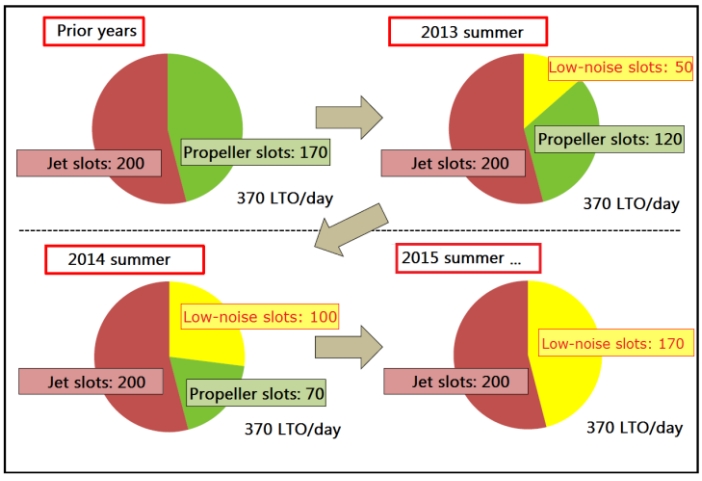


ITM implements various measures to reduce aircraft noise, including restricting the number of aircraft movements and hours of operation time, as well as encouraging the use of quieter aircraft, establishing flight routines that mitigate noise impacts, and constantly monitoring aircraft noise.

■ Measures at noise sources

(Restricting flight movements and hours of operation)

ITM restricts aircraft movements (landing-takeoff cycles) to 370 per day, in consideration of noise and other aircraft impacts on the airport region, and starting in the 2015 summer schedule, the shift was made toward quieter propeller aircraft, with 200 slots for jets versus 170 for low-noise aircraft, increasing convenience. We are appealing to airline companies to introduce low-noise aircraft to make use of these slots. Airport operation is 14 hours per day, from 7 a.m. to 9 p.m., and we strive to keep operations within those hours, in cooperation with airline companies.



Encouraging the use of quieter aircraft

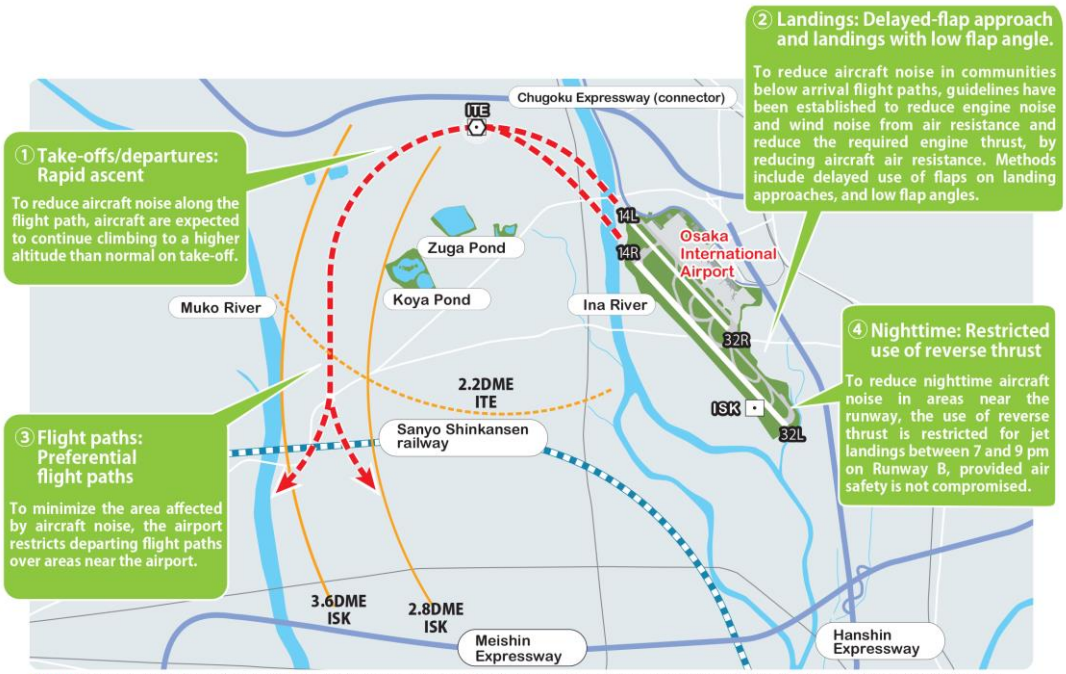
Osaka International Airport promotes the introduction of low-noise aircraft through a unique landing fee system, with discounts for low-noise aircraft and surcharges for high-noise aircraft, based on actual noise levels measured around the airport.

Optimizing runway use

It is normally preferred to have aircraft take off and land into the wind, but to reduce the impacts of aircraft noise on the ground, operations at ITM are normally conducted on Runway 32 as shown below as long conditions are safe (see image for flight direction).

Noise abatement flight procedures

As shown in the graphic below, we also make an effort to mitigate the impacts of aircraft noise by adopting noise abatement flight procedures.

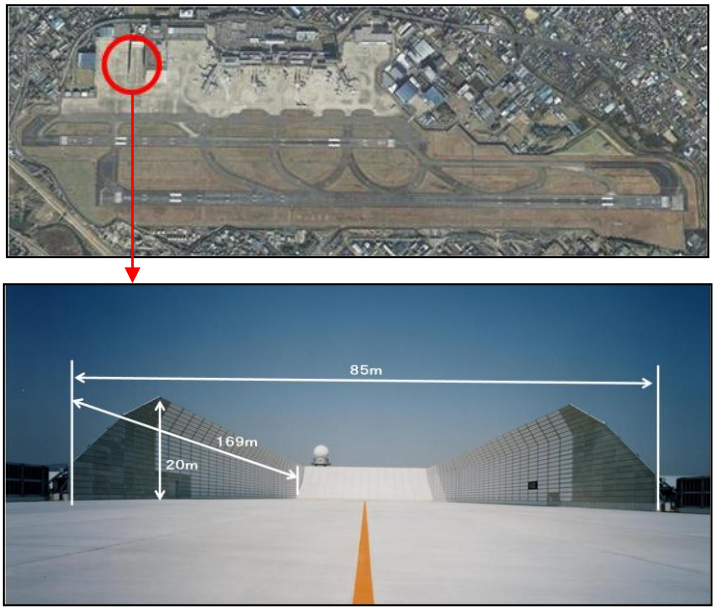


Note: The arrows in the above map illustrate the concept of flight path and are not intended to indicate actual flight routes.

Noise reduction at the airport

○ Noise reduction measures during aircraft engine testing

To reduce the impacts of noise emitted during aircraft engine testing, a large sound-blocking wall was installed at the engine testing site, and rules are in place for the location (within sound-blocking facilities), timing, and methods of testing.



■ Aircraft engine testing site

The noise blocking effect reduces the noise level of a B747-400 (take-off power) to below 65 dB in the vicinity of the airport.

○ **Promoting use of GPUs and limiting use of APUs**

In order to reduce noise impacts from auxiliary power units (APUs) while aircraft are parked, we are promoting the use of ground power units (GPUs).

■ GPU usage status

GPUs supply electricity and air conditioning. (Photo: GPU in use at ITM. Electricity is provided as soon as aircraft arrives.)

E.g., in the case of a Boeing 777, an APU at a distance of 20 meters has noise level of 92 dBA, while a GPU is not audible even at a distance of one meter.

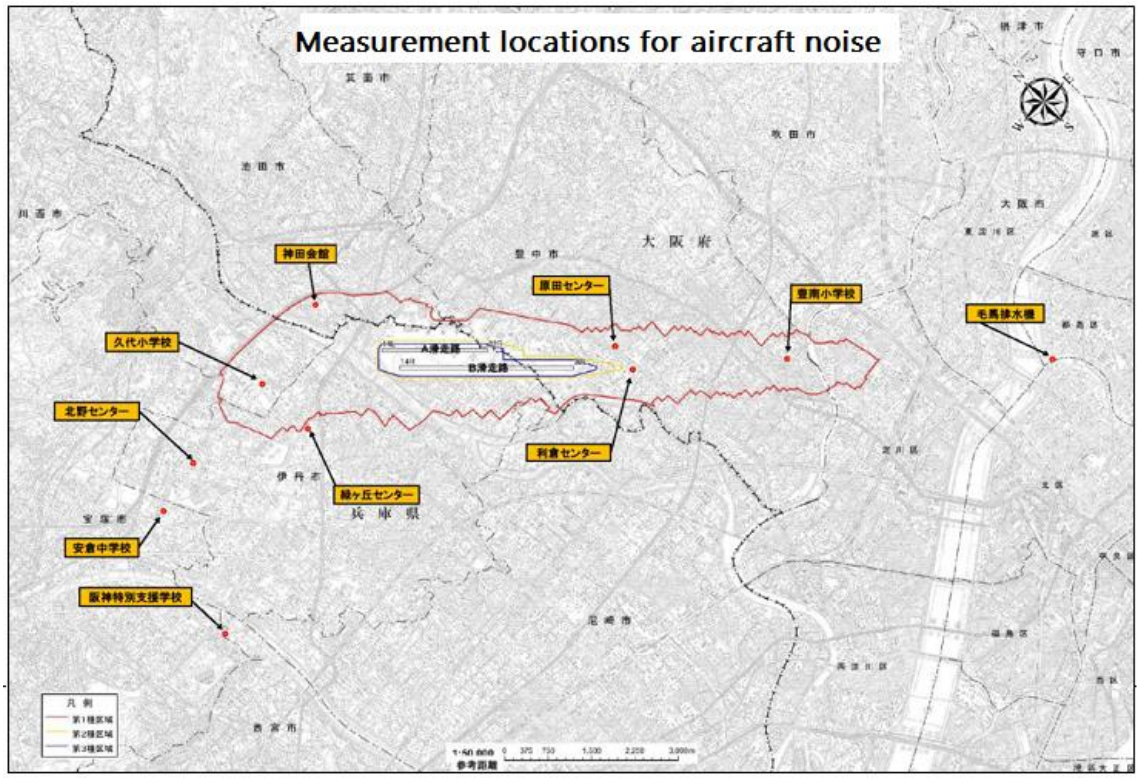
Source: AGP Corp.

○ **Other measures to reduce noise**

Besides aircraft being a noise source, noise is also emitted from ground support equipment (GSE) vehicles. We are working to reduce noise levels at the airport by introducing low-noise equipment such as electric vehicles and electric-powered forklifts.

Measurement and monitoring of aircraft noise

To monitor aircraft noise, ITM conducts continuous monitoring of noise levels at 10 locations in the airport region, and releases the results publicly.



■ Improving airport design

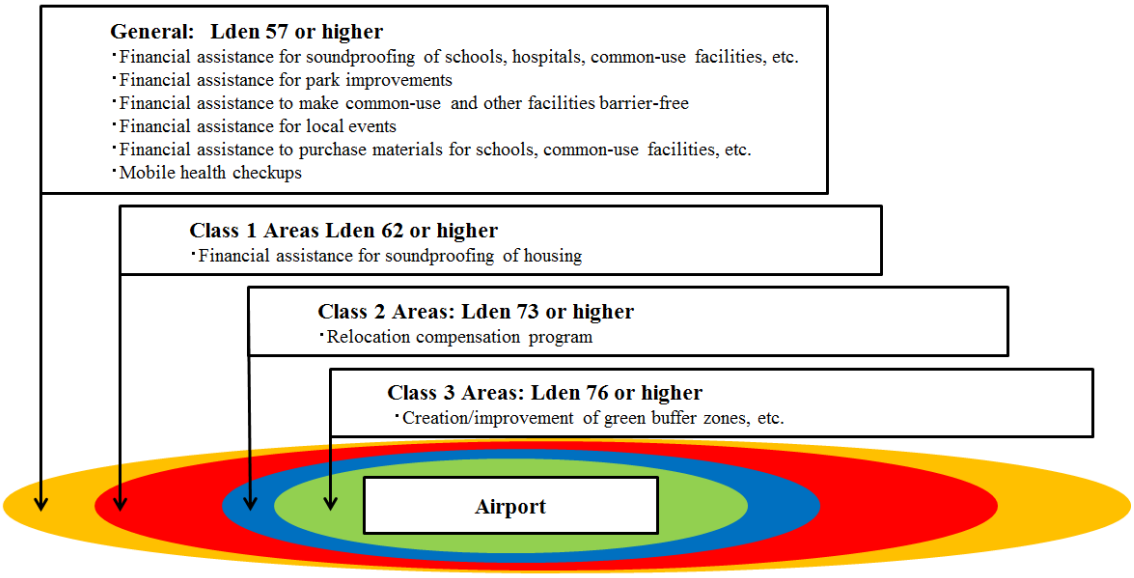
We have installed noise barrier walls and built noise barrier berms around the airport to mitigate noise impacts from aircraft on the runway, etc.

Noise barrier wall

Noise barrier berm

■ Measures in the region of the airport

Kansai Airports implements the following measures around the airport to reduce the noise in the region of Osaka International Airport and improve the living environment. Relocation compensation is applied to areas significantly affected by aircraft noise (Class 2 and 3 areas), and land obtained through this means is used to build parks and green space, in an effort to mitigate noise impacts. In Class 1 areas and their vicinity, upgrades are provided to make housing more sound proof.



Lden (day-evening-night equivalent level):
This is a method for assessment of aircraft noise that has been adopted by major countries, and is seen as an improvement on the previously-used W values (WECPNL), as it enables more accurate assessments thanks to improved measurement techniques, and it enables comprehensive assessments of aircraft noise including include ground-level noise.

Relocation compensation programs

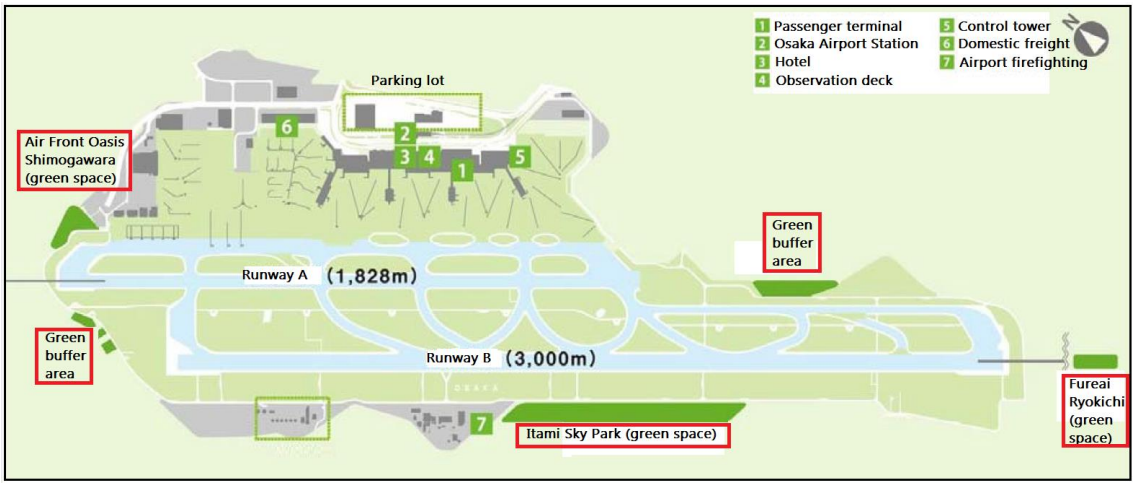
For buildings and land located in a zone when it is designated a Class 2 area, the airport has a program to provide compensation for buildings and purchase the land based on an owner's request to relocate outside the Class 2 area.

Utilization of land acquired by compensated relocation program

To prevent new negative impacts of aircraft noise in Class 3 zones around the airport and improve the living environment in the area, we create green spaces as buffer zones (see photos below) between the airport and surrounding areas, through landscaping and planting of vegetation in areas obtained through our relocation compensation program.

With the progress of the relocation compensation program in Class 2 and 3 zones, there has been an increase in vacant sites (after residents have relocated) in the area. Responding to community concerns about losing local cohesiveness, the airport has been working to develop green space in a planned and integrated way, by having Class 2 and 3 zones and surrounding areas designated as green space, as defined under the nation's City Planning Act. Examples include the Itami Sora Park on the Hyogo Prefecture side and Fureai Ryokichi (public green space) on the Osaka Prefecture side of the airport.

Also, with the aims of letting local residents become familiar with the airport through greenery and positive experiences as well as contributing to disaster prevention in the region, the Air Front Oasis Shimogawara was designed to improve the living environment for local residents and also have disaster prevention features included in the green space, and adjacent to this, Itami City developed the Shimogawara Green Area (photos on next page).



Green buffer zones

Green buffer zones created on sites after residents have relocated out of Class 3 areas near airport

Itami Sky Park

This green space opened in 2008 as a place of relaxation for the local community and is also designed to serve as a refuge area in time of disaster.

Fureai Ryokuchi (Friendship Green Square) in Toyonaka City

This is green space for use by the local community, designed with public input, with sports and recreational facilities. It includes biotopes (see page 23), a multi-purpose square, tennis courts, heated swimming pool, grass areas, a playing field, and more.

Air Front Oasis Shimogawara and Shimogawara Green Area

Air Front Oasis Shimogawara is well-located with a view of Osaka International Airport. Its main feature is an observation deck with a commanding view of the daily activities at the airport, but it also includes a monument to the wind and other items with an aeronautical motif. Together with the Shimogawara Green Area provided by Itami City, it is a place for locals to relax and enjoy the play and athletic equipment, and rest area.

Air Front Oasis

Shimogawara Green Area

We lease these areas to local governments at no charge for various uses including children's play and water tanks for fire fighting.

Sound-proofing upgrade program in airport region

Below are examples of sound-proofing upgrades and other programs offered in the airport region.

Category		Outline
Soundproofing of public facilities	Soundproofing of schools, etc.	If the aircraft noise exceeds intensity and frequency limits specified by legislation* related to aircraft noise prevention, a subsidy is provided to surrounding local governments and other bodies for work (soundproofing, installation of upgraded air conditioning) to prevent or reduce aircraft noise in facilities including schools, child care centers, and hospitals, etc.
	Improvement of shared or common-use facilities	Based on legislation,* a subsidy is provided to municipal governments where noise reaches Lden 57 (or W70), for improvements of shared or common-use facilities used by local residents for learning and other purposes. Eligible work includes new construction, renovation, installation of upgraded air conditioning, etc.
Soundproofing of housing	Soundproofing of housing	Based on legislation,* a subsidy is provided for work to prevent or mitigate aircraft noise (soundproofing, installation of upgraded air conditioning) on housing that was located in Class 1 zones when the national government made the designation.

* Act on Prevention of Damage caused by Aircraft Noise in Areas around Public Airports (Act No. 110 of 1967)

Other programs

Category		Outline
Other	Mobile health checkups	To promote the good health of residents living near the airport, mobile health checkups are offered, particularly for people who live in areas with greater amounts of aircraft noise.
	Environmental improvements in surrounding areas	In order to improve the living environment around the airport, this program offers subsidies for efforts of the surrounding local governments, to improve noise-measuring equipment, parks, and local facilities, improve convenience, revitalize the area, and other activities.

Modifying and leasing sites acquired by compensated relocation program

In addition to the programs described above, based on the Osaka International Airport Regional Improvement Plan established by the governors of Osaka and Hyogo prefectures, in order to effectively utilize sites after residents have relocated elsewhere in compensated relocation programs, we modify and lease the sites as commercial facilities or parking lots, etc., as their uses are less likely to be affected by aircraft noise. In doing this we also consider the living environment around the airport.

Conserving air quality

■ Converting building boilers to gas

In November 2011, we converted boilers in the terminal building from heating oil A to gas. This contributes to air quality conservation by reducing emissions of hazardous substances generated from burning heavy oil.

● Gas-fired hot water boiler

Boilers are being converted from heavy heating oil (containing sulfur, other pollutants), reducing air pollution.

Conserving water quality

■ Conversion to eco-friendly snow-melting agents

In the past, ITM used urea-based snow-melting agents, but large runoff of this agent could lead to eutrophication of water bodies. We have therefore switched to acetate-based snow melting agents, which are expected to have lower impacts on water quality.

■ Reducing consumption of anti-icing and deicing fluid

The consumption of anti-icing and deicing fluid depends largely on weather conditions and fluctuates from year to year. Some operators have upgraded to better spraying equipment, boosting the efficiency of spraying operations.

(2) An airport that respects the global environment

Osaka International Airport promotes energy conservation measures through the Energy Conservation Committee. In internal operations we are putting efforts into green purchasing, energy conservation, and going paperless. In December 2016, our efforts to reduce CO_2 emissions were recognized by the Airports Council International (ACI) when we received Airport Carbon Accreditation (ACA) Level 2. We will continue our efforts in collaboration with airport businesses to reduce CO_2 emissions.

* Airport Carbon Accreditation is an international evaluation and accreditation program to manage and reduce CO_2 emissions from airports. It is the only environmental accreditation program designed specifically for airports. ACA has four levels for carbon management: Mapping (Level 1), Reduction (Level 2), Optimisation (Level 3), and Neutrality (Level 3+).

Promoting energy conservation

■ Introducing energy-saving equipment

ITM encourages all businesses and contractors aim for high energy efficiency, including the use of energy-saving types of lighting and air conditioning equipment.

● Escalators with motion sensors (passenger terminal, monorail station, and connecting bridge)

We have installed motion sensors to reduce electrical consumption at times and locations with fewer users.

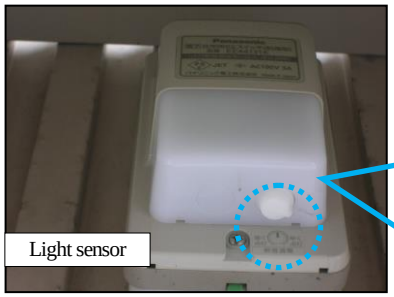
Passenger terminal

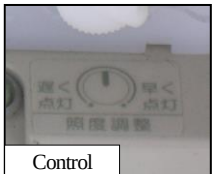
Monorail station

● Lighting control based on light sensors (passenger terminal)

• Electricity consumption is reduced by outdoor sensors that automatically turn interior lights on when it is dark outside and off when it is bright outside.

Mercury lights in building


Light sensor


Control

• Control can be set to turn on in lighting conditions between 5 and 300 Lx.

● Bicycle trailers (ANA)

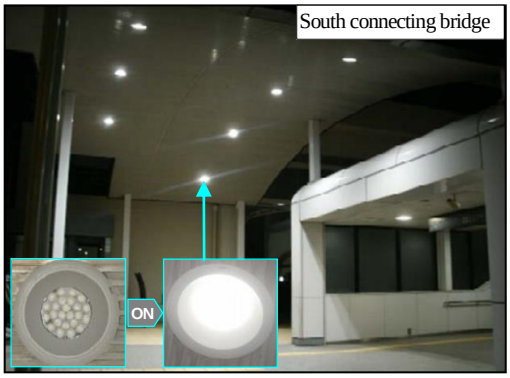
• Eco-friendly hauling: Electric-powered bicycles are used to pull trailers.

● Heat-reflecting film on windows (passenger terminal)

• Heat-reflecting film on windows reflects sunlight and keeps temperatures down inside the terminal.

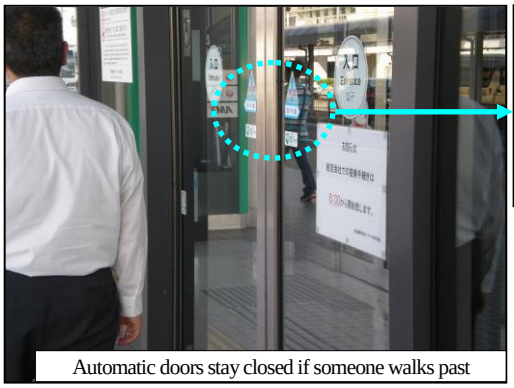
● LED lighting (south connecting bridge, north taxi stand)

• LEDs have a long service life, are efficient light sources, and use little electricity, reducing power consumption.



● Eco-friendly automatic door system (passenger terminal)

• Conventional automatic doors tend to slide open unnecessarily if a person simply walks past the door. We have installed sensors that determine whether a person will walk past or through the door. This reduces unneeded door opening, saving power consumption and reducing the load on interior air conditioning. Installed in all north-facing vestibules in the North Terminal.



■ Promoting the use of low-emission aircraft

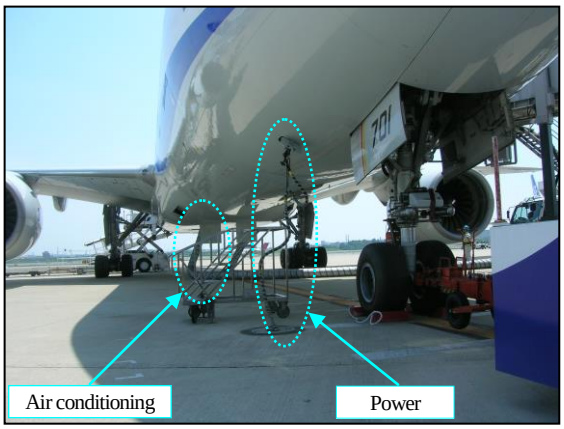
Thanks to their high-performance engines and lower weight due to the use of composite materials, the latest Boeing 787 aircraft are approximately 20% more fuel-efficient than other aircraft of similar size, resulting in approximately 20% reduced greenhouse gas emissions. For other aircraft as well, airline companies are making an effort to use low-emission engines when acquiring new equipment.

■ Promoting GPU use, discouraging APU use

Carbon dioxide emissions can be significantly reduced if power and other services are provided to parked aircraft by ground power unit (GPU) instead of an onboard auxiliary power unit (APU). GPU utilization at ITM is on the rise. GPU hours utilized were about 4% higher in fiscal 2016 compared to 2011 when data was first collected. Notably, CO_2 emissions reduced through the use of GPUs amounted to 16,000 tons in fiscal 2016.

● Use of GPUs

GPUs provide electrical power and air conditioning to parked aircraft (as depicted in photo below, taken at ITM).



As example of the significant benefits, a Boeing 777 emits 1,166 kg/hr of CO_2 when using an APU, but only 50.8 kg/hr with a GPU, resulting in a large reduction in emissions.
Source: AGP Group
(http://www.agpgroup.co.jp/agp/airport.html)

■ Vehicle idling prevention campaign

We are also helping to reduce CO_2 emissions by reducing vehicle fuel consumption, through awareness campaigns to promote eco-friendly driving habits, including encouraging drivers not to idle their vehicle engines while stopped. .

■ Promoting the use of public transportation

To promote the use of public transportation by our airport users, we offer connecting passengers free limousine bus services between ITM and KIX airports, and work with public transportation companies to ensure good long-distance bus services.

Promoting the use of eco-vehicles

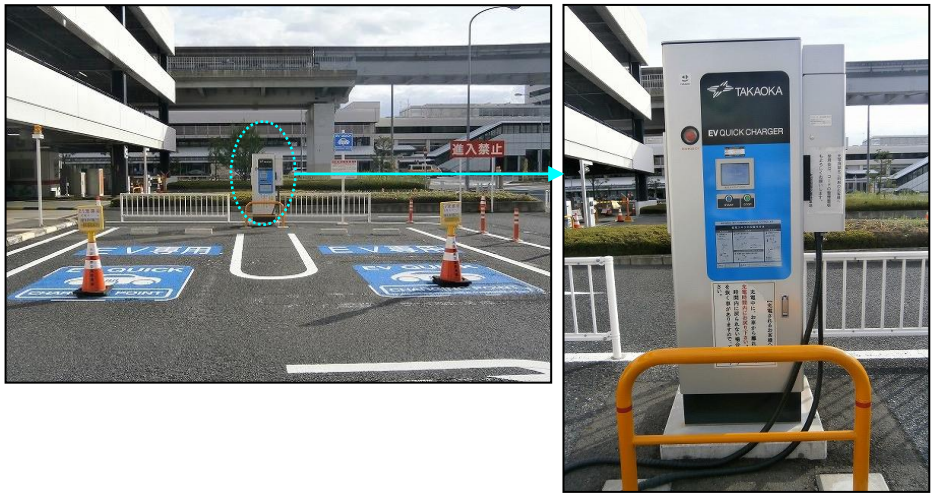
■ Introducing eco-vehicles for operations

Airports typically use many vehicles as ground support equipment (GSE) for aircraft operations, and transporters (passenger vehicles) to move people around, so the use of “eco-cars” or eco-friendly vehicles can help to reduce their CO_2 emissions.

The adoption rate of eco-vehicles at ITM currently stands at 23.1% and it is gradually increasing. Meanwhile, to promote the general use of electric vehicles, drivers need to have access to charging equipment, so ITM has been installing charging stations in airport parking areas.

● Charging station for electric vehicles

Quick charging stations have been installed in ITM parking lots.



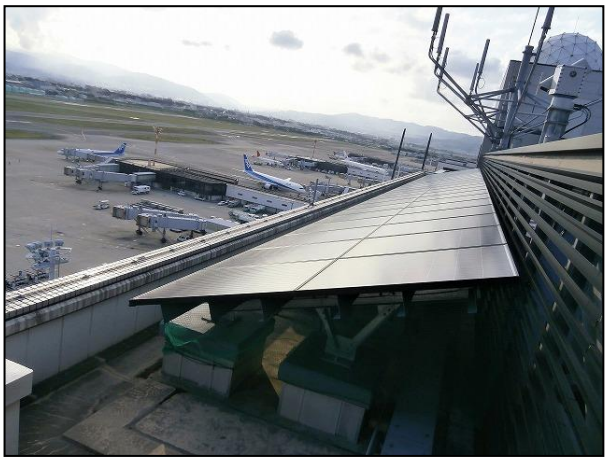
Promoting the use of clean energy

■ Installing photovoltaic systems

ITM has installed photovoltaic systems (solar power generation) to promote the use of clean energy.

●Photovoltaic panels

Solar panels installed on roof of ITM administrative building



(3) An airport that recycles resources

Zero emissions

■Reducing and recycling waste as a resource

At ITM we are working to boost recycling rates and limit the amount of waste generated, by measures such as proper waste separation, making use of grass clippings from runways (as animal feed and compost, as shown on next page), re-using office materials, and recovering resources from waste, etc.

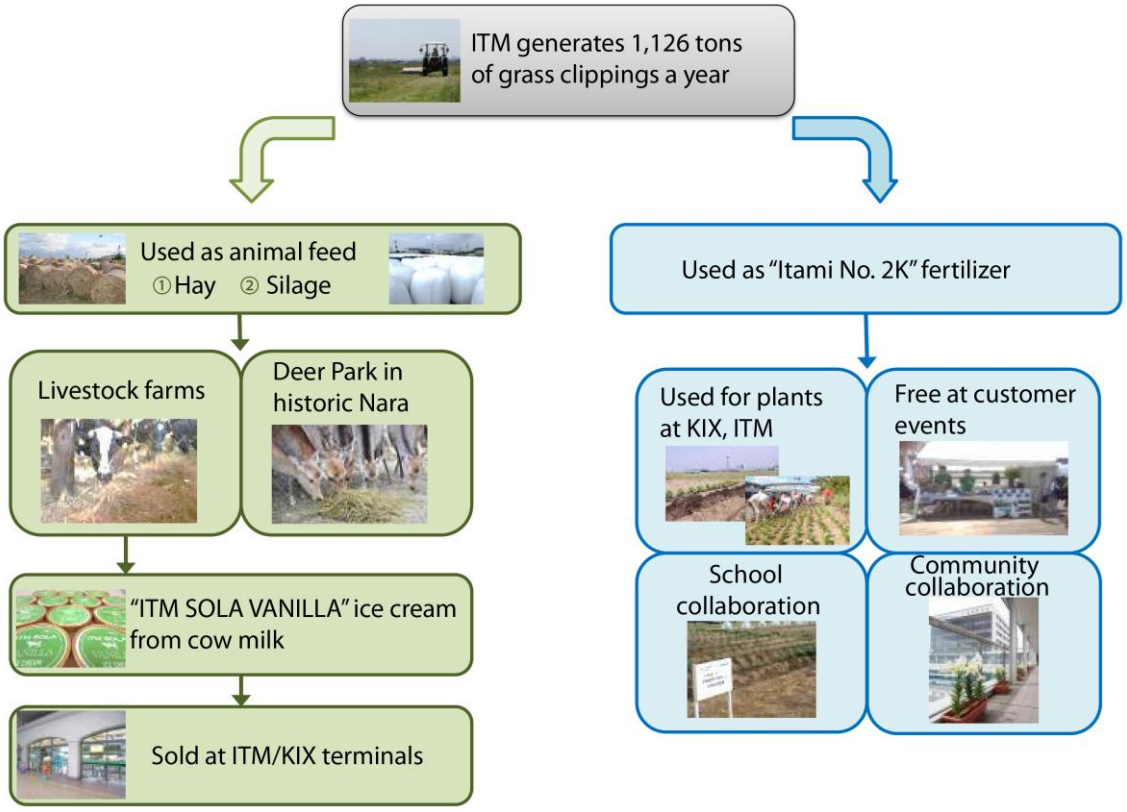
● Waste is collected in separate bins for recycling, and different materials are handled separately

Separation of waste is an important step in recycling.

● Preparation before resource recovery (examples of deconstructing, breakdown and sorting)

Initiatives as an eco-friendly, resource-recycling airport

- Osaka International Airport produces about 1,126 tons of grass clippings annually from maintenance along the runways.
  - →Clippings are composted and processed into organic fertilizer for reuse at ITM and local elementary schools, etc.
  - →Clippings are also fermented to produce silage and reused as feed provided at no cost to livestock farms and the Foundation for the Protection of Deer in Nara Park, etc.
- The fertilizer from grass clippings has been registered by the Ministry of Agriculture, Forestry and Fisheries as Itami Airport 1, 2, and 2K brands (October 25, 2015). This is first case of any Japanese airport to achieve such recognition.



■ Promoting water conservation

Businesses at ITM airport are promoting water conservation through various means, including the use of automatic faucets in sinks for handwashing, and noise generators in women's toilets that reduce the need to flush. Additional approaches include adjusting water pressure and flow rates of toilets and hand washing faucets, using displays and notices, and applying stickers as reminders for users to conserve water.

■ Using rainwater

Some businesses at ITM are reducing clean water consumption by collecting rainwater for uses such as sprinkling and watering (surfaces, plants, etc.).

● Rainwater storage tanks

Rainwater falling on airport facilities is captured, stored, and then pumped out for other uses. This helps to reduce the consumption of clean water.

Other initiatives

■ Donating retired equipment for other uses, grant assistance

Kansai Airports donates retired airport fire trucks from Osaka International Airport for use in developing countries.

8000-liter pumper truck (retired from service Jan 2016)

(4) An airport that respects biodiversity

Creating natural environments

■Parks and green spaces near the airport

Around the airport there are parks and other areas that have been developed on vacant sites after residents have relocated away under the relocation compensation program. One example is the Fureai Ryokuchi (Friendship Green Square), with its open area and biotope providing space for visitors to have contact with nature.

● Biotopes in the Fureai Ryokuchi

- These urban biotopes include water features to attract dragonflies and other living things.
- The flowing water, ponds, rocky banks, and aquatic plants support a diversity of habitats.

■Creating green space at the airport

Osaka International Airport has planted green areas and a “Flower Campus" on the roof of the passenger terminal building. The planting of flower beds instead of grass helps reduce the need to cut grass and also improves the scenery.

● Greenery at the airport (passenger terminal building)

- Green roof on terminal building (upper left) helps regulate temperature inside the building.
- Greenery on roof deck (upper right) creates relaxation space and pleasant scenery.
- Green walls (left) can be found in many locations.

● Greening around buildings: “Flower Campus”

• Designs are developed by students of Osaka Prefectural Engei High School (specializing in horticulture), and teachers, students and airport staff cooperate to manage the greenery. This activity was done once in fiscal 2016.

● Greening the airport (around buildings): “Butterfly Garden”

• The school also helped to develop the “Butterfly Garden” as one type of “biotope.” It features plants that attract butterflies and other insects. To celebrate the garden, the “ITM Airport Academy: Seminar on Insects” was held once in fiscal 2016.

● Greening inside the airport terminal buildings

• We also install greenery in many places inside the terminal buildings, creating comforting spaces.

● Greening on the airport grounds

• We also have green rooftops of ITM administrative buildings to promote greenery and reduce CO_2 emissions.

(5) An airport that respects the local community

Information disclosure

■Publishing environmental monitoring data and environmental reports

Osaka International Airport publishes environmental monitoring data and environmental reports.

- Environmental monitoring data (aircraft noise measurements, in Japanese):
  http://www.kansai-airports.co.jp/efforts/environment/itm/monitoring/
- Environmental reports:
  http://www.kansai-airports.co.jp/en/efforts/environment/itm/ecoairport/index.html

Dialogue with the community

Osaka International Airport aims to have good communication with local communities through information sharing and mutual interactions. Below are some examples:

■Exchanging views with local governments

Kansai Airports works to provide suitable forums for dialogue with local communities, and holds regular meetings with the "Council of Local Cities Near the Osaka International Airport" (consisting of ten cities) to promote measures to address aircraft noise and safety, and discuss urban planning issues in the airport area.

■ Releasing information on environmental efforts and programs

Kansai Airports actively uses every opportunity and medium to introduce to others its efforts to conserve the environment, including environmental initiatives around the airport, soundproofing upgrades, and more. Details are available from the website indicated below. (Nearby local governments also release information through their own websites and other means.)

http://www.kansai-airports.co.jp/efforts/environment/itm/taisaku/ (in Japanese)

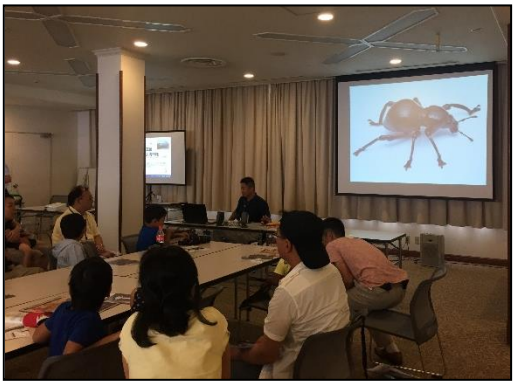
■ Providing opportunities to learn about the environment

Kansai Airports regularly offers opportunities to learn about the environment, including classes on insects and other topics. Also, biotopes and green areas around Osaka International Airport offer great opportunities to learn about the environment. (For more information about nearby green spaces, please contact the local governments managing them.)

■**Events at the airport**

Osaka International Airport holds a variety of events at the airport, as shown below.

- Osaka International Airport: Kuuraku Festa
- 17th La Sora Sketching Competition for primary school children
- ITM Airport Academy: Classes on the airport, insects, and airport lighting
- Other: ITM Airport Walks, concerts (live jazz, etc.), photo exhibitions, etc.



Cooperating with airport-related businesses

Osaka International Airport cooperates with airport-related businesses to promote environmental conservation, learning and education. The airport also exchanges information with other Japanese airports regarding efforts to conserve the environment.

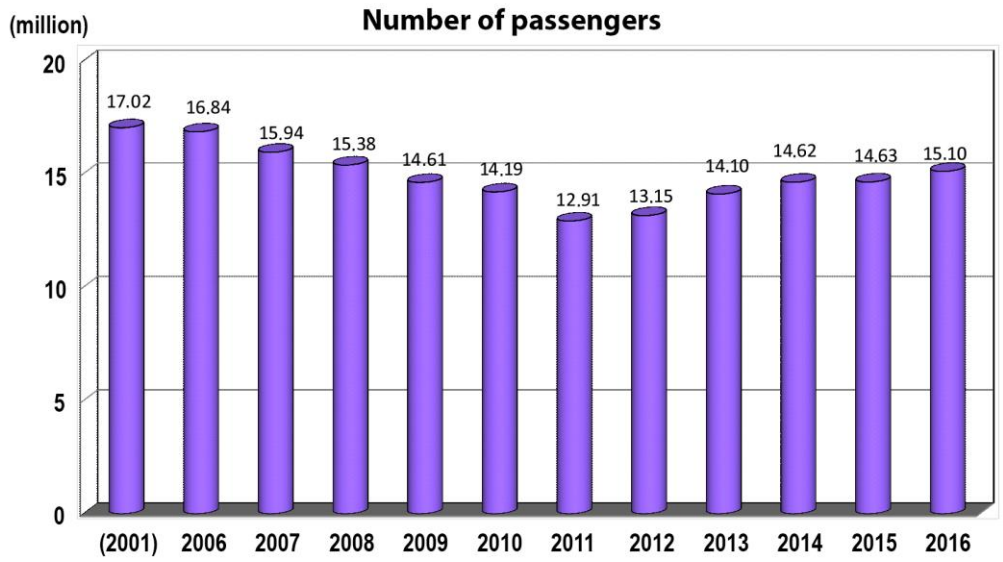
4. Outline of Osaka International Airport

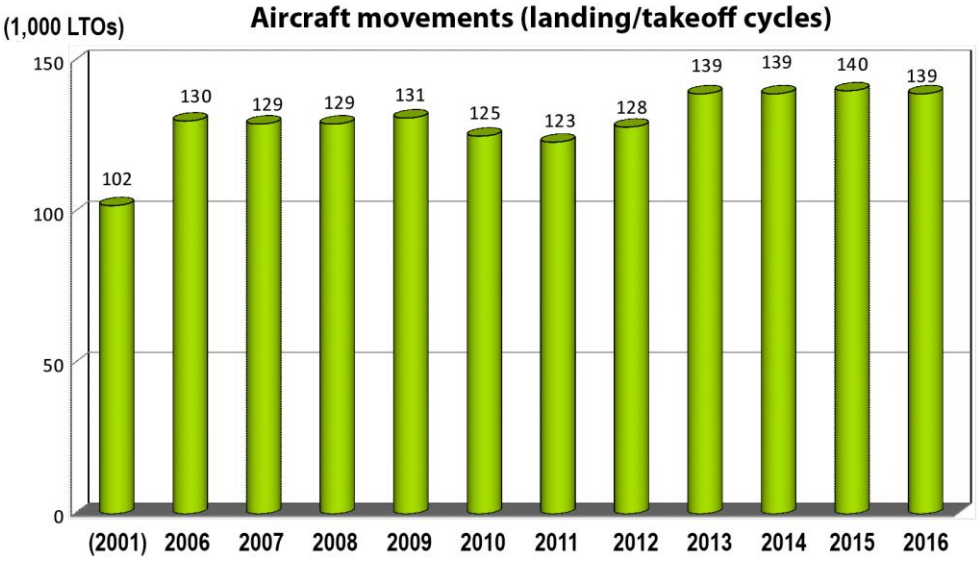
Opened	March 17 , 1958
Location	Itami City , Hyogo / Toyonaka City , Osaka / Ikeda City , Osaka
Scale	Area: Approx. 311 ha Runway A: 1,828 m long by 45 m wide Runway B: 3,000 m long by 60 m wide

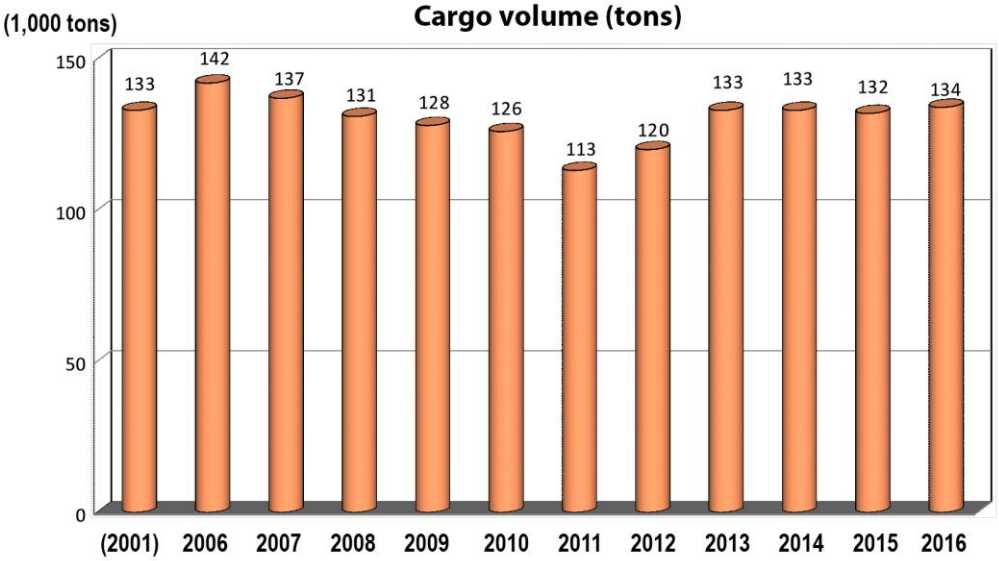
Osaka International Airport from the air

Chronology of Osaka International Airport

Year	Month	Event
1958	3	Complete return of airport from U.S. forces to Japan. Renamed “Osaka Airport” by the Ministry of Transport (runway was 1,828 m long)
1959	7	Designated a class 1 airport under Civil Airport Development Law, renamed “Osaka International Airport”
1960	4	International flights begin
1964	6	Passenger jet service begins
1969	1	Construction of terminal building completed
1970	2	Additional runway (3,000 m) opens and airport takes its present form
1994	9	International flights shift to newly opened Kansai International Airport
1997	4	Osaka Monorail starts operation
1999	7	Former international terminal building is renovated and opens as South Terminal
2012	4	New Kansai International Airport Company established
	7	Management of Osaka International Airport and Kansai International Airport is integrated
2015	12	Kansai Airports is established
2016	4	Kansai Airports starts operations


Number of passengers
(million)
20
15
10
5
0
17.02
16.84
15.94
15.38
14.61
14.19
12.91
13.15
14.10
14.62
14.63
15.10
(2001)
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016


Aircraft movements (landing/takeoff cycles)
(1,000 LTOs)
150
100
50
0
102
130
129
129
131
125
123
128
139
139
140
139
(2001)
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016


Cargo volume (tons)
(1,000 tons)
150
100
50
0
133
142
137
131
128
126
113
120
133
133
132
134
(2001)
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016

Appendices

Major targets and status of achievement

For each environmental parameter, this page summarizes major targets and the status of achievement at Osaka International Airport.

Parameter	Target	Status	Details	Progress	Evaluation
Air and energy	■ Reduce CO_2 emission as much as possible	B	1. Promote the use of low-emission aircraft engines	4	☺
			2. Expand GPU usage as much as operations permit	4	
			3. Promote the use of eco-vehicles for ground support equipment (GSE), considering technological development	3	
			4. Promote the adoption and efficient use of energy-efficient lighting and air conditioning	4	
			5. Use thorough organizational approach to energy-saving behavior	5	
			6. Convert building boilers to gas fuel	5	
			7. Organizationally promote idling prevention campaigns	4	
Noise and vibration	■ Reduce noise and vibration by using low-noise equipment/ vehicles and ground power units (GPUs)	A	1. Promote the introduction of low-noise aircraft	4	☺
			2. Promote the use of GPUs	4	
			3. Convert to low-noise vehicles for GSE-related functions	4	
Water	■ Reduce clean water use continuously by 2% annually from FY2006 ■ Consider using reclaimed water by installing advanced treatment facilities at the time of new construction, additions or upgrades to buildings.	B	1. Promote water-conservation by installing automatic faucets for handwashing, water-conserving equipment and parts	4	☺
		B	2. Raise water conservation awareness of airport users and others through awareness campaigns	4	
			3. Continue investigating the use of clean water as part of total clean water consumption at the airport	3	
Soil	■ 100% ratio of use of acetic acid, formic acid-based snow-melting agent ■ Use less anti-icing/deicing fluid	A	1. Shift from urea type to acetic acid, formic acid-based snow-melting agent, which is more eco-friendly	5	☺
		B	2. Consider measuring water quality when there is an increase in use or change in type of chemicals used	4	
Waste	■ As target for waste reduction, do not generate more general waste than in FY2001 ■ Exceed 30% as the recycling rate for general waste ■ Exceed 32% as the recycling rate for industrial waste	A	1. Raise environmental awareness through campaigns and promote environmental literacy	4	☺
			2. Regularly and continuously investigate and analyze the amount of industrial waste generated	4	
		A	3. Encourage proactive reuse of used products	4	
		B	4. Reduce volume and improve recycling rates of industrial waste	3	
			5. Promote green purchasing	3	
Nature	■ Maintain the existing area of green space on the airport grounds and promote more greening and conservation to the extent possible	A	1. Continuously care for and maintain greenery at the airport	4	☺
Other	■ Steadily increase the utilization ratio rate of public transportation	B	1. Promote public awareness activities targeting travelers and travel agencies, based on cooperation and collaboration	3	😐
			2. Encourage drivers to use public transportation instead of private cars	3	

Progress toward targets / Progress of initiatives	A	B	C
Average ≥ 3.5	☺	☺	😐
Average 2.5 < 3.5	☺	😐	☹
Average < 2.5	😐	☹	☹

Progress toward targets

A: Steadily progressing toward target
B: Little change from reference year
C: Worse than the reference year
Note: Reference year FY2006 for clean water use & soil. Others: FY2001.

Progress of initiatives

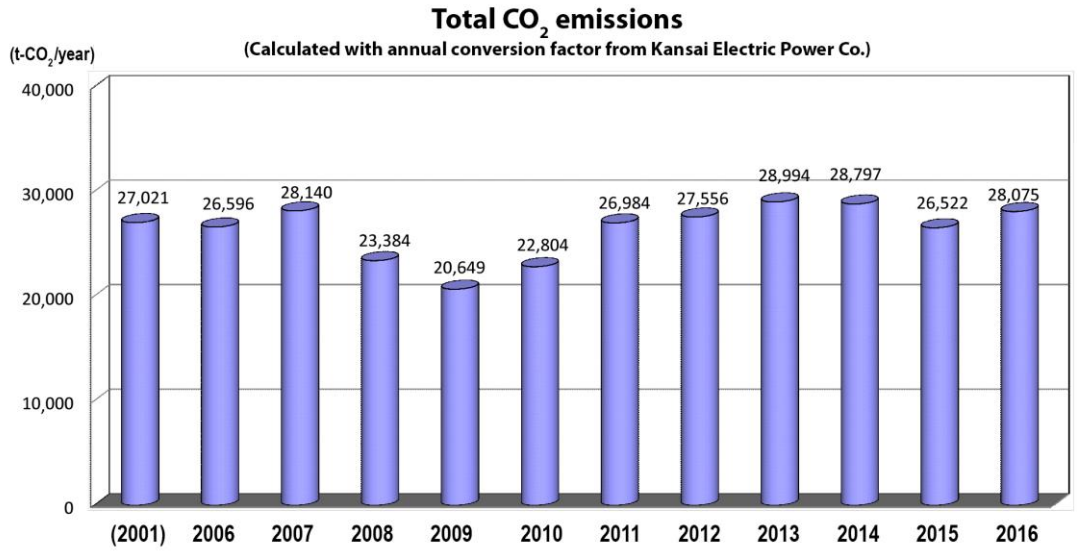
5: Achieved, or expected to be achieved earlier than planned
4: Progressing steadily
3. Progressing but with delays
2: Moving away from target
1: Far from achieving target

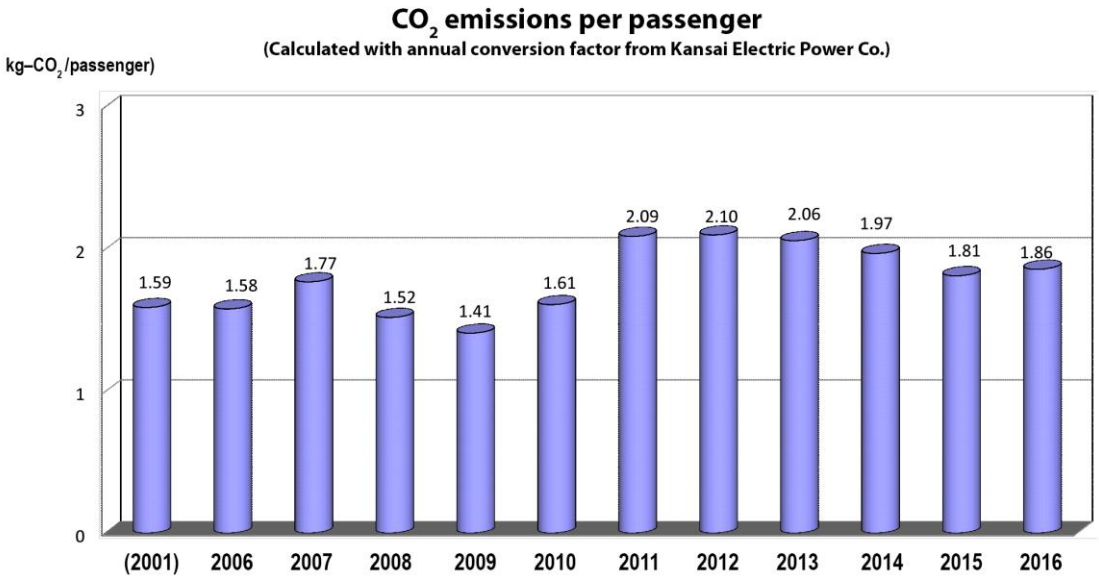
■ **CO_2 emissions (air parameter)**

Annual carbon dioxide emissions were on a declining trend until fiscal 2009 from the reference year (fiscal 2001). They then have tended to increase, reaching 28,075 t-CO_2 in fiscal 2016 (at approximately the same level as the reference year).

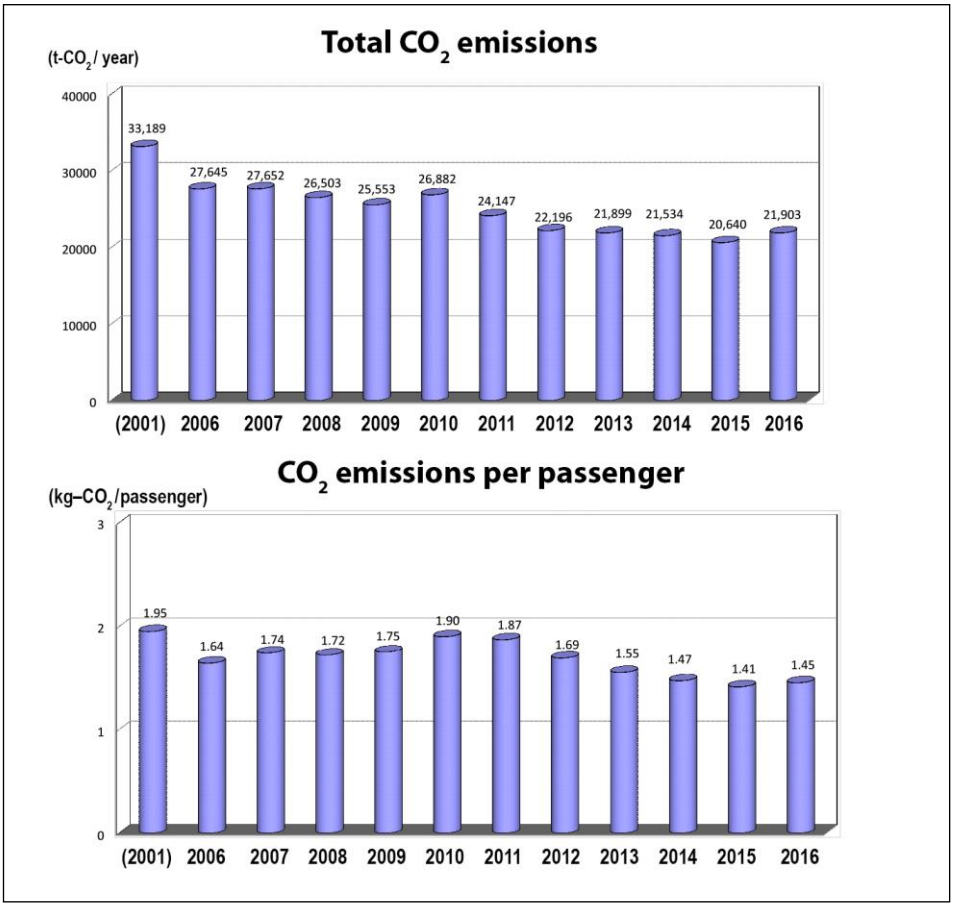
Emissions per passenger jumped in fiscal 2011, but thereafter have been level or decreasing slightly. The jump was due to a major increase in the CO_2 emission factor for electricity (due to nuclear power plants being halted) and a reduction in passenger traffic, and these are likely a result of the Tohoku earthquake and tsunami in March 2011.

Airports typically consume a large amount of electricity, so CO_2 emissions are significantly affected by changes in CO_2 emission factors (used to calculate emissions). For comparison, the graphs on the next page show how emissions would have been calculated if the CO_2 emission factor for electricity had remained the same as when the ITM Environmental Plan was adopted. The graphs show total that CO_2 emissions would be on a declining trend since the reference year, reaching 21,903 t- CO_2 in fiscal 2016 (a 34% reduction from the reference year).





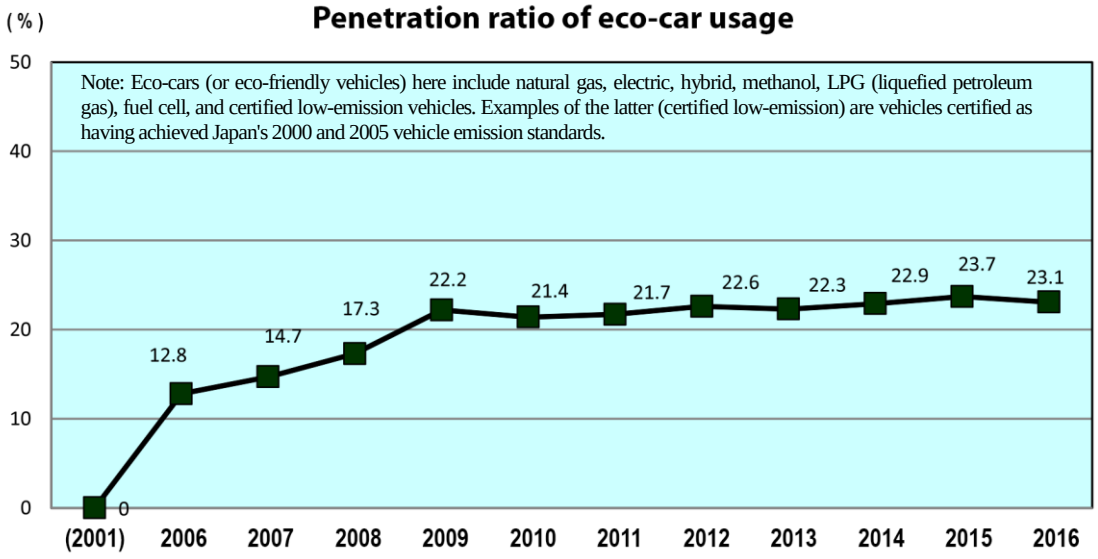
For comparison: Emissions as calculated using CO_2 emission factor from year of adoption of ITM Environmental Plan



Note: CO_2 emission factors for the year the ITM Environmental Plan was adopted are from a report by the Panel Committee on GHG Emission Calculation Methods (Ministry of the Environment, Japan, 2010).

■ Eco-friendly vehicle use (air parameter)

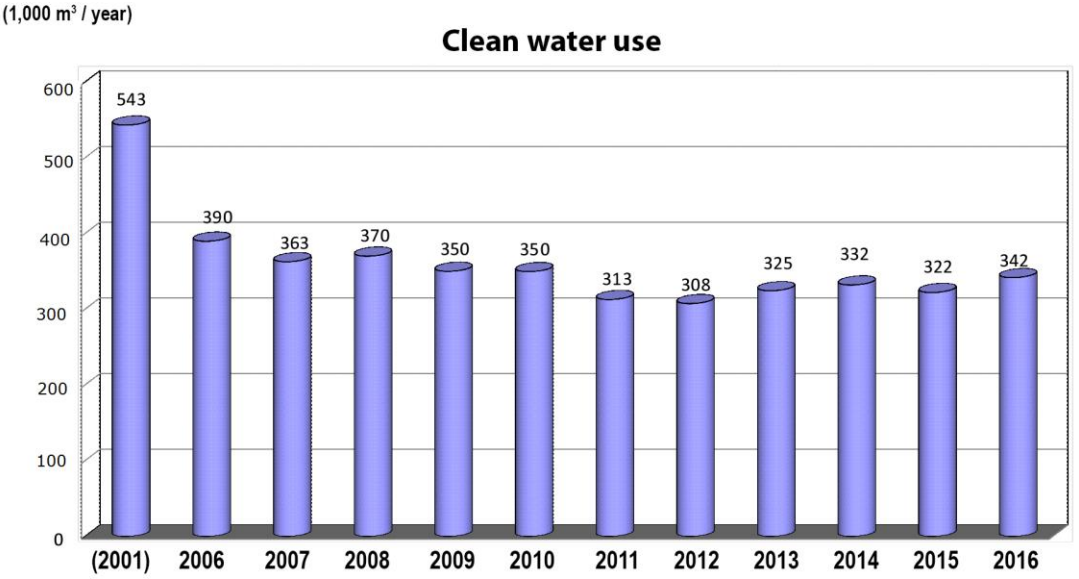
The penetration ratio of eco-friendly vehicles was increasing steadily from the reference year (fiscal 2001) to fiscal 2009, but has been generally steady since then.



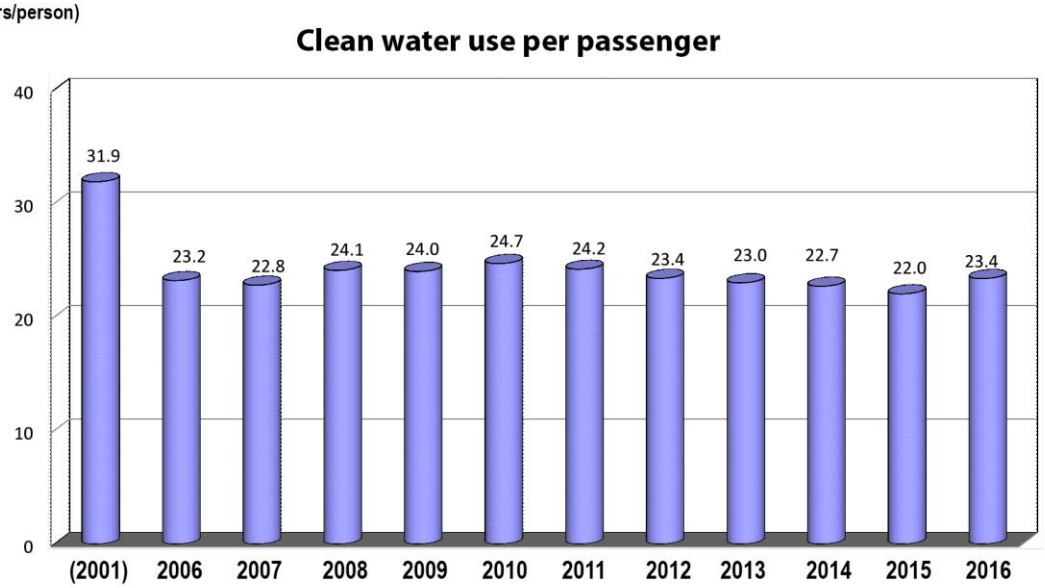
■ Clean water use (water parameter)

The amount of clean water used in fiscal 2016 was about 88% below 2006 consumption, and about 63% below 2001 (signifying a net average annual reduction of 1.2% since FY2006). Clean water consumption per passenger in fiscal 2016 was about 73% below the level in 2001.

(1,000 m³ / year)



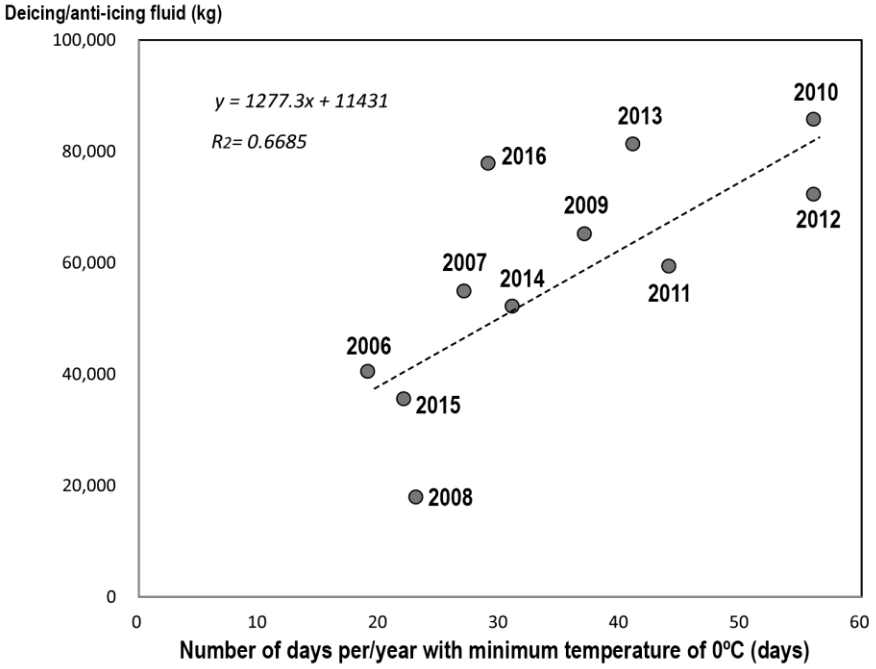
(Liters/person)



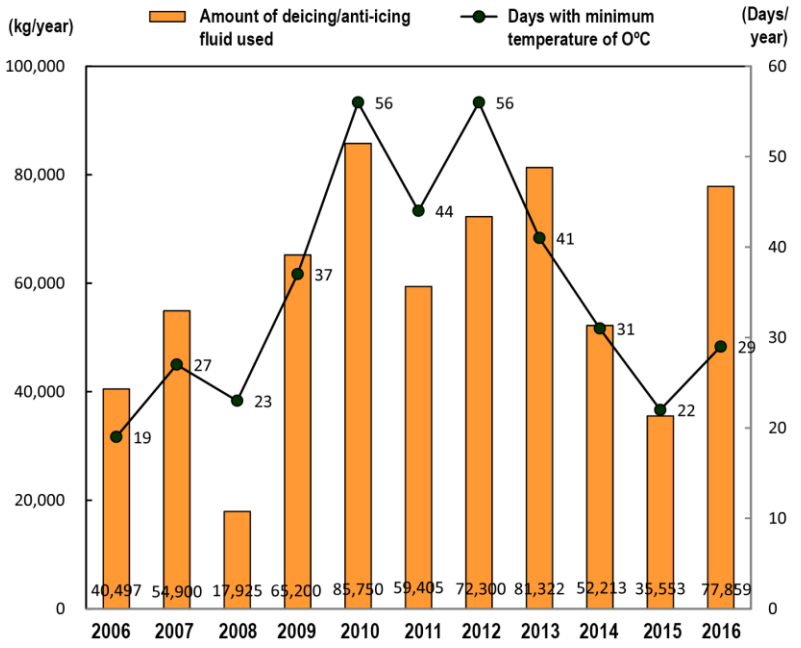
■The use of snow-melting agent and deicing/anti-icing fluid (soil parameter)

No snow-melting agent was used from fiscal 2006 fiscal 2011. It was used from fiscal 2012 onward, but only acetic acid-based or formic acid-based snow-melting agents were used that have low impacts on water quality. As for anti-icing/deicing fluid, general assessments are difficult as consumption is affected by weather (minimum temperatures at the Toyonaka weather station as used as the reference point), but also by factors such as patterns of continuous low temperatures and hours of operation. The interpretation here is that there have been no particular variations in the use of anti-icing/deicing fluid.

Correlation between minimum temperature and use of deicing/anti-icing fluid

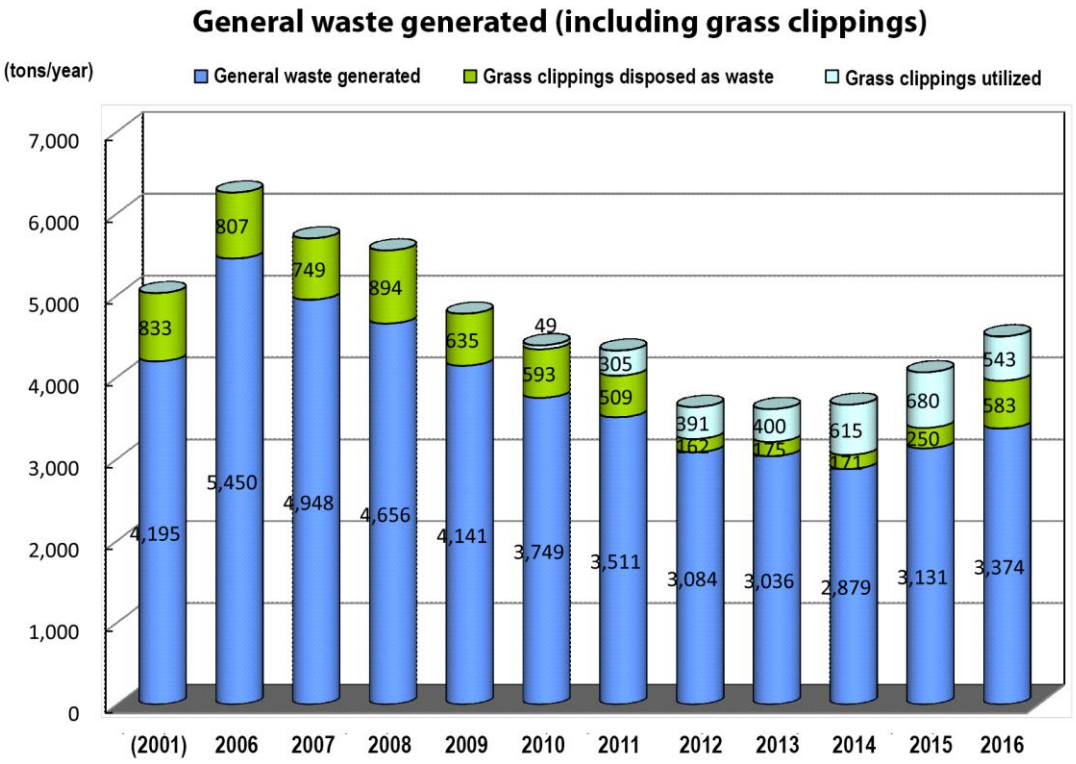


Trends in minimum temperature and use of deicing/anti-icing fluid



■Waste generation (waste parameter)

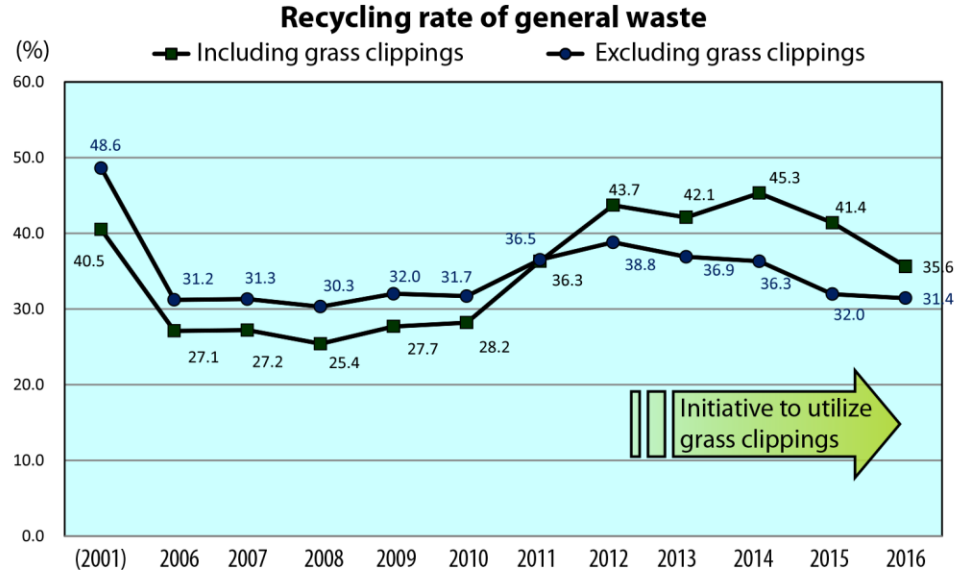
The amount of general waste (including grass clippings disposed as waste) increased temporarily but then declined steadily, and in fiscal 2016 was about 79% of the amount in the reference year (2001). General waste (excluding grass clippings) has been declining steadily year by year. The graph shows the beneficial impact of utilizing grass clippings effectively (to make animal feed and fertilizer) since fiscal 2010.

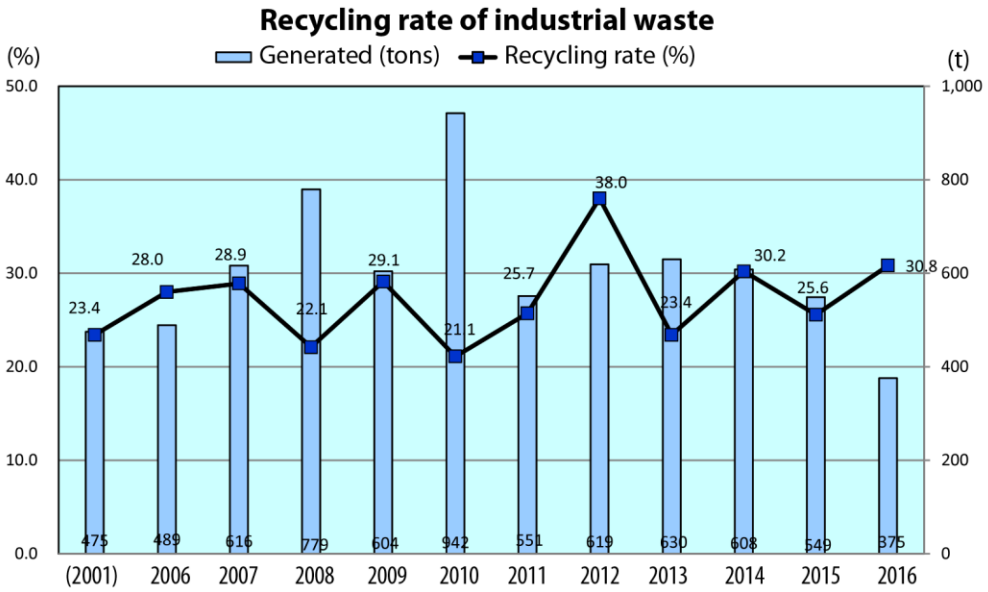


■Recycling rate of waste (waste parameter)

The recycling rate of general waste (excluding grass clippings) was slightly above 30% from fiscal 2006 to 2010, and over 35% from 2011 onward. The recycling rate of general waste including grass clippings dropped temporarily below 30%, then increased as grass clippings started to be utilized more from 2011, and has surpassed 40% since 2012. The recycling rate for industrial waste temporarily increased to 38% in 2012 but has generally fluctuated between 20% and 30%. Our environmental target for the industrial waste recycling rate is 32%, so more effort is needed in this area.

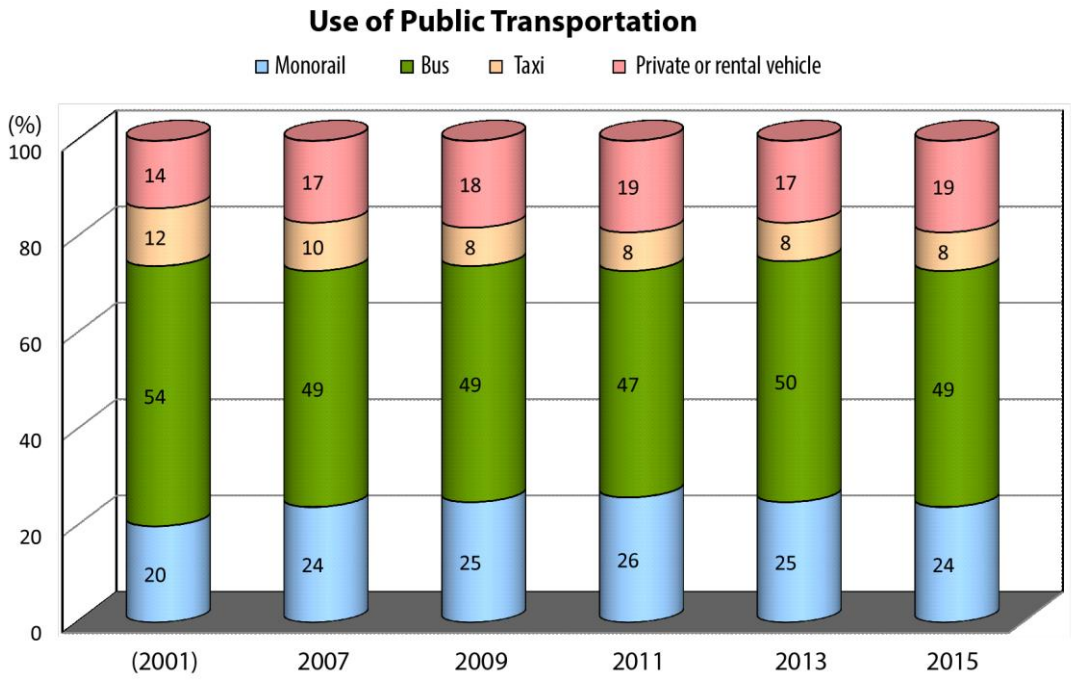
Note: Our quantity of industrial waste generated fluctuates significantly from year to year, and the amount by sub-category can vary considerably, changing the relative proportion of that category in a given year.





■Use of public transportation ("other" parameter)

Transportation access to Osaka International Airport is highly convenient, and the use of public transportation (monorail and bus in graph below) has been steady for many years, in the range of 70% to 80%.



■Water, energy, waste

					FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Energy use	Facilities	Electricity	From grid	kwh/yr	55,203,891	54,141,511	53,782,296	53,297,296	53,657,180	49,757,239	45,422,959	44,623,981	43,751,338	42,314,587	44,262,573
			Self-generated	kwh/yr	0	0	0	0	0	0	0	0	0	0	0
		Gas	City gas	m3/yr	1,329,443	1,254,497	1,074,364	899,702	1,070,047	1,161,421	1,051,597	1,045,743	992,832	890,282	1,131,477
			Propane gas	m3/yr	729	843	631	839	795	762	755	639	639	613	639
		Other	Kerosene	ℓ/yr	55,543	80,360	76,238	54,307	54,465	55,251	55,232	60,805	50,541	46,450	54,182
			Heavy oil A	ℓ/yr	638,700	652,200	492,700	294,000	364,000	89,000	68,000	62,000	55,000	22,822	24,213
			Light oil	ℓ/yr	0	0	0	484	920	1,047	1,128	1,303	1,578	5,357	2,297
	Vehicles		Gasoline	ℓ/yr	120,724	122,944	137,069	104,399	113,814	94,075	107,193	101,586	103,293	88,296	82,399
			Light oil	ℓ/yr	1,092,247	1,266,660	1,185,986	1,293,937	1,529,715	1,236,169	1,184,747	1,191,247	1,231,753	1,220,203	1,211,086
			Electricity	kwh/yr	0	0	0	0	0	0	0	0	0	0	139,409
Water use		Clean water	Tap water	m3/yr	390,020	362,890	370,326	350,229	349,870	312,973	307,657	324,640	332,194	322,275	341,931
			Well water	m3/yr	0	0	0	0	0	0	0	0	0	0	0
			Other	m3/yr	0	0	0	0	0	0	0	0	0	0	0
		Reclaimed water		m3/yr	0	0	0	0	0	0	0	0	0	0	0
		Wastewater treated		m3/yr	363,604	337,909	336,603	324,206	335,328	308,351	298,327	316,383	323,937	312,394	293,208
Waste emissions		General (excl grass clip)		t/yr	5,450	4,948	4,656	4,141	3,749	3,511	3,084	2,987	2,879	3,131	3,374
		Industrial		t/yr	489	616	779	604	942	551	619	528	608	549	375
		Construction		t/yr	25,797	29,789	4,968	60,783	3,528	2,846	810	288	240	494	7,603
		Grass clippings (disposed)		t/yr	807	749	894	581	381	509	152	224	171	250	583
		Controlled industrial		t/yr	35	67	155	28	14	21	11	7	15	18	14

■CO_2 conversion factors

	City gas	Propane	Kerosene	Heavy oil A	Gasoline	Light oil
Conversion factor	0.00223	0.0066	2.49	2.71	2.32	2.58
(Units)	t-CO_2/m^3	t-CO_2/m^3	t-CO_2/kℓ	t-CO_2/kℓ	t-CO_2/kℓ	t-CO_2/kℓ

Electricity to CO_2 conversion factors (kg-CO_2/kWh)	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
	0.338	0.366	0.299	0.265	0.281	0.414	0.475	0.516	0.523	0.496	0.493

■CO_2 emissions

	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
CO_2 emissions (t-CO_2/yr)	26,596	28,140	23,384	20,649	22,804	26,984	27,556	28,994	28,797	26,522	28,075
Number of passengers	16,842,868	15,937,494	15,382,431	14,606,951	14,193,277	12,909,665	13,147,345	14,101,239	14,620,934	14,626,431	15,100,395
CO_2 emissions per passenger (kg-CO_2/person)	1.58	1.77	1.52	1.41	1.61	2.09	2.10	2.06	1.97	1.81	1.86

■ Vehicles

				FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Number of vehicles	Eco-friendly vehicles	Electric	Units	11	11	10	9	9	11	11	11	11	9	9
		Hybrid	Units	1	1	2	1	1	0	1	1	3	2	1
		Natural gas	Units	0	0	0	0	0	0	0	0	0	0	0
		LP gas	Units	0	0	0	0	0	0	0	0	0	0	0
		Other	Units	63	73	88	100	114	107	113	113	114	113	116
	Other	Diesel	Units	396	387	373	300	372	79	85	82	74	67	69
		Gasoline	Units	105	95	94	75	73	341	339	349	357	330	345
		Other	Units	10	10	10	10	10	5	5	5	1	2	6
	Total		Units	586	577	577	495	579	543	554	561	560	523	420
	Ratio of eco-friendly vehicles		%	12.8	14.7	17.3	22.2	21.4	21.7	22.6	22.3	22.9	23.7	23.1

Note: Low-emission vehicles using gasoline or diesel

Queries:

Kansai Airports **Technical Department, Smart Island Group**

E-mail: kankyo@kansai-airports.co.jp

Published: January 2018