

Kansai International Airport  
Environmental Management Project



January 2012

Kansai International Airport Co., Ltd.

## **Kansai International Airport Environmental Management Project**

### **Background**

In September 1994, Kansai International Airport opened 5 kilometers offshore in Osaka Bay, bringing to reality the concept of a pollution-free airport, existing and prospering together with the community.

In view of the noise and other environmental pollution problems brought about by inland airports in the past, the airport was built on an offshore artificial island to minimize the negative impact of its operations.

In light of this laudable beginning, the Kansai International Airport Environmental Management Project was launched with the objective of driving forward with environmental initiatives and firmly establishing Kansai's reputation as an eco-airport.

During the first phase of this project from 2001 to 2007, otherwise known as the Eco Island Plan, as many as 30 items were set as targets for reducing the environmental impact on the atmosphere and water, etc., which were pursued and achieved.

The project entered its second phase with the expansion of the airport's capacity in conjunction with the opening of the second runway in August 2007. The project is currently pressing ahead under its new name, Eco Island Promotion Plan. KIAC has expanded its initiatives, and is pushing ahead with its environmental measures and eco activities with added enthusiasm while turning its gaze towards a more global environment perspective.

The first syllable of the word “island”, “i” (pronounced “ai”) means “love” in Japanese. The staff on the island are working concertedly to create a land of "love", an island brimming with love for the planet.

Sep 1994	Kansai International Airport opened.
Jun 2001	Phase 1 of Kansai International Airport Environmental Management Project, Eco Island Plan initiated. Plan finishes in fiscal 2007.
Aug 2007	Second runway commissioned.
Apr 2008	Phase 2 of Kansai International Airport Environmental Management Project, Eco Island Promotion Plan launched. Plan finishes in fiscal 2012.
As of Jan 2012	New plan under preparation.

(Table 1. Time Line of Kansai International Airport Environmental Management Project)

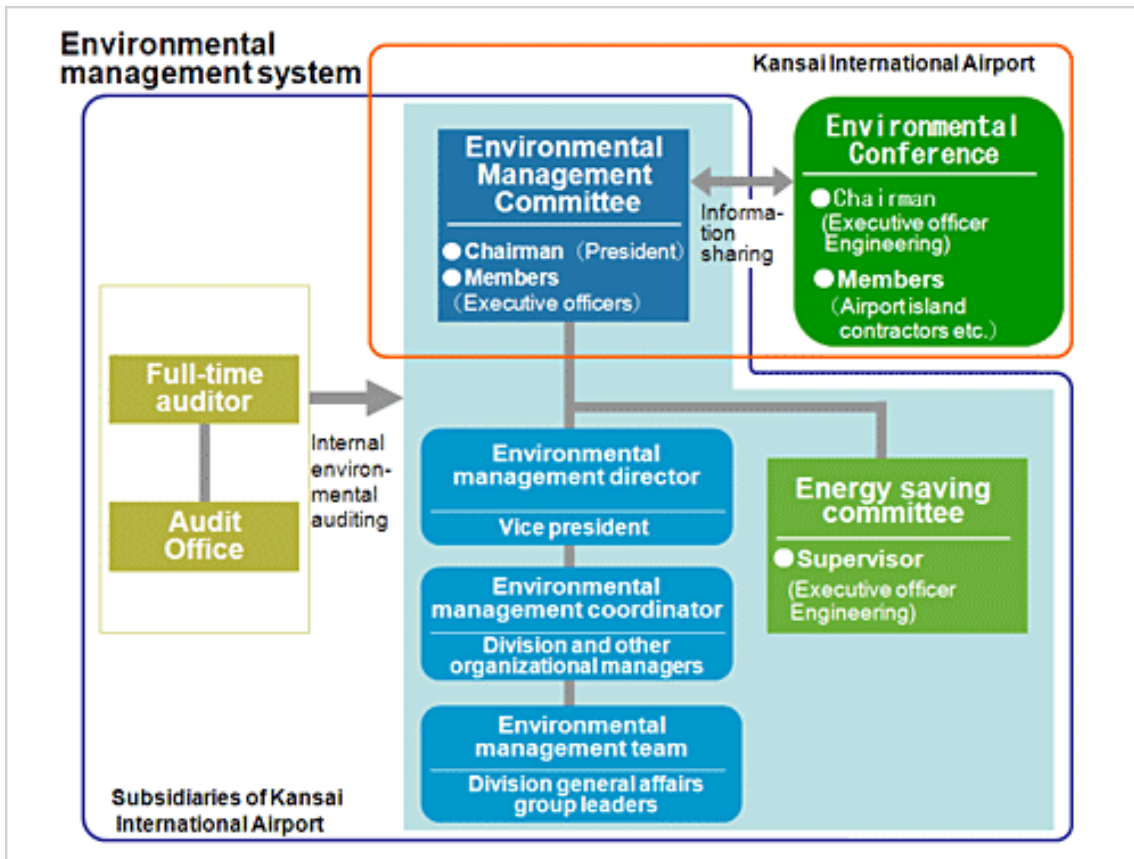
## Project Outline

The outline of the project is as shown in the table below.

Besides Kansai International Airport Co., Ltd. (KIAC), the operator of the airport, approximately 15,000 airport employees work hand-in-hand to propel our environment measures and eco activities throughout the airport island.

- Name: Eco Island Promotion Plan  
(Phase 2 Kansai International Airport Environmental Management Project)
- Period: 5 years from fiscals 2008 to 2012
- Applicable Area:
  - All areas of Kansai International Airport Island. Includes activities of airport users, companies and organizations that work in the airport.
  - Companies and organizations on the airport island also work together on initiatives even outside the area of control of the airport operator, KIAC.
- Targets:
  - The results of initiatives under the plan can be easily monitored and are assessed numerically wherever possible.
  - The progress of initiatives and achievement of targets are checked annually, and the results are widely publicized via websites and CSR reports, and reviewed as necessary in line with social conditions.
- Promotion Framework:
  - As shown in Diagram 1: Environmental Management System.
  - Measures under the project are promoted, managed and improved by the Environmental Management Committee headed by the President & CEO of KIAC.
  - The subordinate Environment Management Promoters' Board comprising department heads and Environment Management Promotion Member's Board comprising manager-class staff have been established to drive forward specific initiatives at each level.
  - The Energy Conservation Committee carries out measures to save energy in the airport facilities and thus reduce CO<sub>2</sub> emissions.
  - 43 companies and organizations on the airport island work together via the Eco Island Promotion Council to implement initiatives throughout the airport.

(Table 2. Outline of the Eco Island Promotion Plan)



(Diagram 1. Environmental Management System)

### Initiatives

We have set down and are working on as many as 44 environmental targets under the Eco Island Promotion Plan. These can be divided into 5 types of activities.

1. Activities to create an airport that protects the pleasant regional environment (14 targets)
2. Activities to create an airport with a low impact on the global environment (13 targets)
3. Activities to create a recycling airport (6 targets)
4. Activities to create an airport that values nature and supports personal interaction (3 targets)
5. Activities to create an airport that exists in harmony with local residents and users (8 targets)

Total: 44 targets

(Table 3. Eco Island Promotion Plan Categories)

Where possible, numerical targets have been prescribed for each of the items above to be attained during the plan period (2008-2012). Achievement results are checked, summarized and widely disclosed every year.

The main activities under each category are as shown in the table below.

	Category	Initiative	Activity	Numerical Target	Present (FY2010 Figures)
1.	Airport that protects a pleasant regional environment	Aircraft noise	Attainment of environmental standards Noise reduction	Environmental standards attainment 100%	Maintained at 100%
		Radio interference	Mitigation of radio interference due to aircraft	Improvement measure implementation 100%	Maintained at 100%
		Air quality	Exhaust emission control at clean center	Maximum NOx concentration: 70ppm (Legal standard: 180ppm)	37ppm
		Water quality	Reduction of impact on the sea from effluent	COD effluent quality Maximum: 12mg/l	7.3ppm
2.	Airport with a low impact on the global environment	Energy-saving measures	Development of energy-saving technology	5% reduction in usage (Compared to FY2006)	Efficient operation of terminal A/C
			Promotion of new energy use	—	Use of hydrogen energy
		Reduction of greenhouse gas emissions	Promotion of GPU use	GPU usage 75% or more	81.8%
			Reduction of emissions from airport facilities	10% reduction in emissions (Compared to FY2006)	10.8% reduction
3.	Recycling airport	Efficient use of resources	Reduction of general waste	Recycle rate 10% or more	10.2%
			Environment-friendly commodity purchases	—	Green purchasing implemented
		Water recycling	Advanced processing and reuse of wastewater	5% reduction in potable water use (Compared to FY2006)	Reused as flushing water in all toilets
			Promotion of water-saving measures		9.4% reduction
4.	Airport that values nature	Natural environment	Preservation and monitoring of seaweed bed on gently-sloped stone seawall	—	Development of seaweed beds, etc.
			Airport island greening	—	Implemented proactively
5.	Airport that exists in harmony with local community	Information dissemination	Enhancement of noise complaint handling framework	—	24-hour, year-round framework established
			Release of environmental monitoring data	—	Implemented at Environment Center
		Communication with the local community	Provision of venue for learning about the environment	—	Science classes, etc.
			Improved social contribution activities	—	Visiting workshops, etc.

(Table 4 Main Activities, Targets and Progress of the Eco Island Promotion Plan)

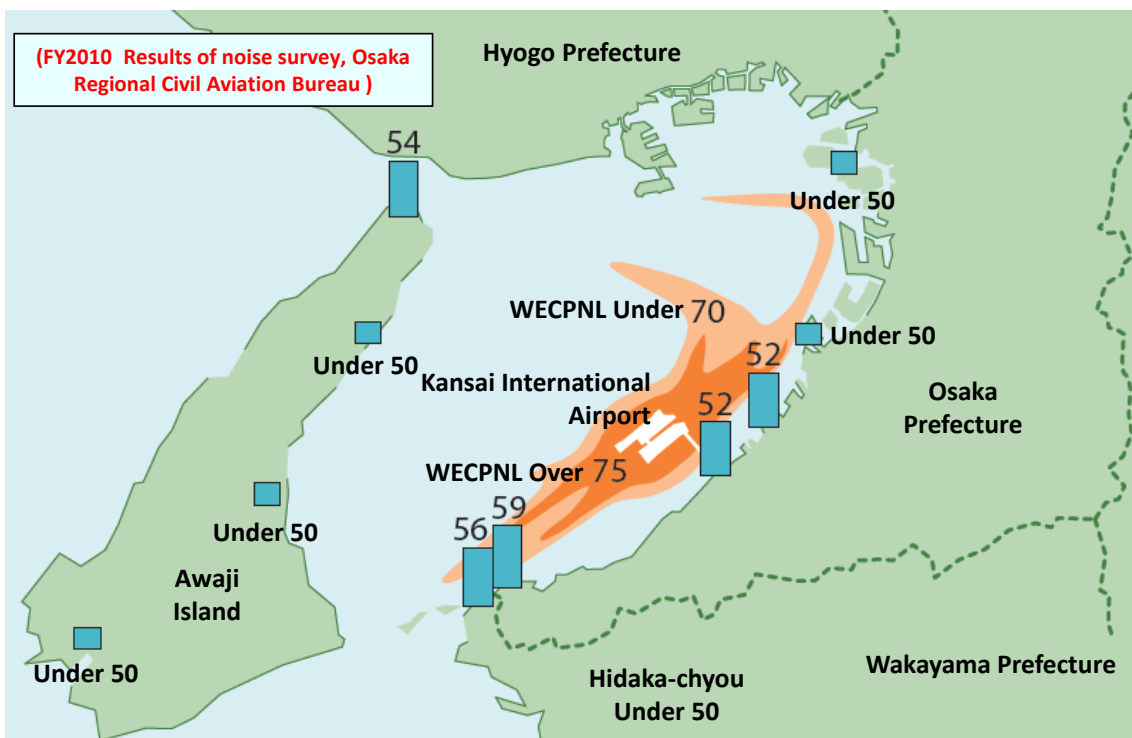
Specific examples of the activities undertaken in each category are described below.

### 1. Activities to Create an Airport that Protects the Pleasant Regional Environment

Our activities to create an airport that protects the pleasant regional environment perfectly matches Kansai International Airport's concept of a pollution-free airport that exists and prospers together with the community. Since this is a prerequisite for our existence, 100% compliance to environmental standards is mandated and we have continually achieved this goal.

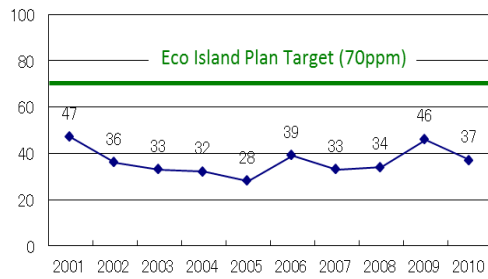
In regards noise, which is a difficult target item to attain at inland airports, we have achieved levels that are far lower than standard values, clearly illustrating the merits of an offshore airport.

With respect to air and water quality too, we have set down our own standards that are more stringent than those required by law, and have developed water treatment and waste incineration facilities specially designed for airports so that we can meet these requirements and continue to maintain the highest level of treatment standards in Japan.



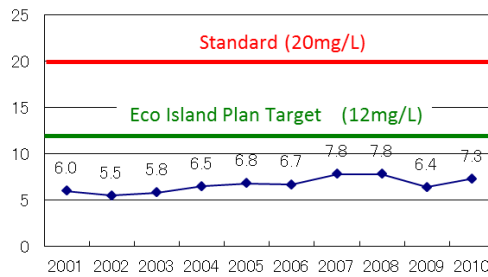
(Diagram 2. Noise Measurements)

● Exhaust Emission Measurements (NOx)



Clean Center

● COD Effluent Quality

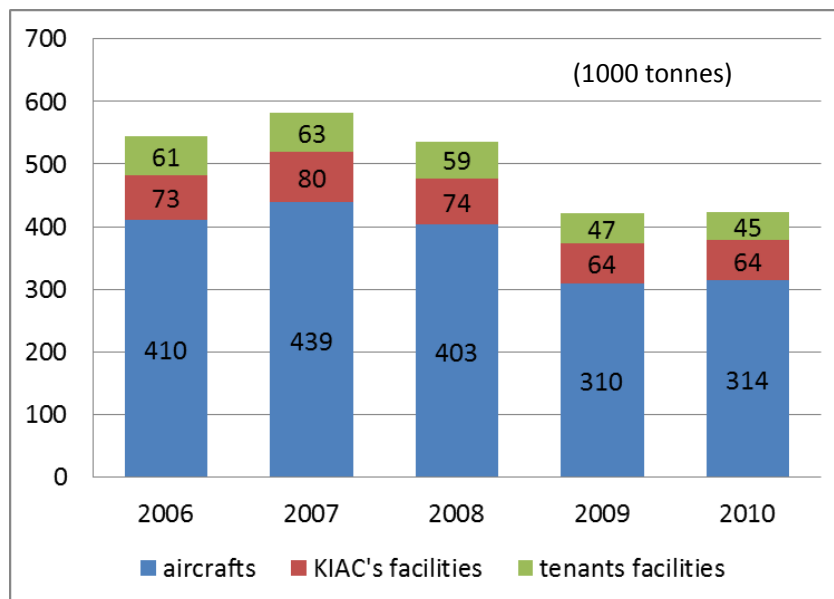


Sewage Treatment Center

(Diagram 3. Processing at the Waste Incineration and Water Treatment Facilities)

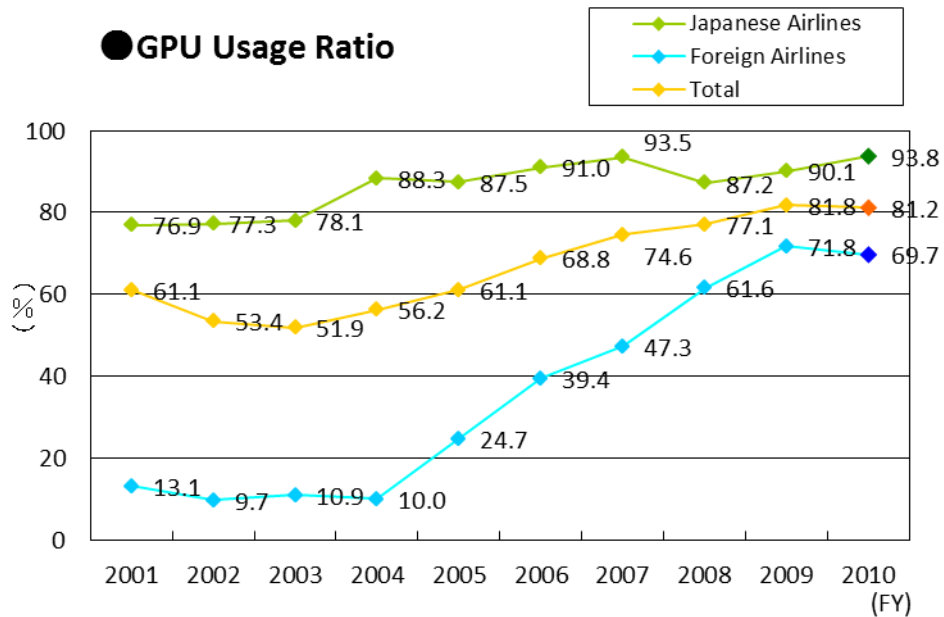
2. Activities to Create an Airport with a Low Impact on the Global Environment

Our activities to create an airport with a low impact on the global environment focus especially on energy conservation and the reduction of greenhouse gas emissions and these have continued to produce positive results.



(Diagram 4. CO<sub>2</sub> Emissions at Kansai International Airport Overall)

In particular, the significant drop in emissions from aircraft, a major source of emissions, is attributed to the trend towards the use of smaller aircraft as well as our pioneering initiative at Kansai to limit the use of APUs to 15 minutes and promote the use of GPUs instead.



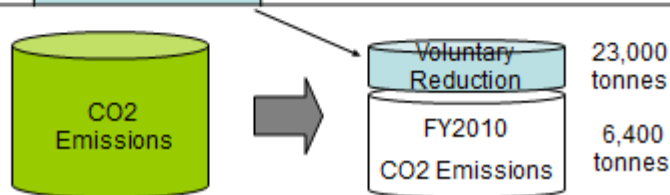
(Diagram 5. Changes in GPU Usage)

Energy conservation and the reduction of greenhouse gas emissions through facility improvements are areas in which the efforts of the airport operator become most evident. We have made continual efforts in this regard ever since the airport was first opened and as shown in the diagram below, we have managed to curb CO<sub>2</sub> emissions by 23,000 tonnes annually (equivalent to 26% of emissions at the opening of the airport).



### Voluntary Reduction of CO2 Emissions (FY1994 to 2010)

Fiscal Year	Annual Reduction	Efforts Example
94-04 (10 yrs)	12,622t	
2005	2,375t	A/C in gate lounges (Minister's prize) 1434t
2006	856t	Replacement of A/C fan belt 64t
2007	2,190t	Replacement of lights 49t
2008	1,742t	Machinery rooms A/C 372t, A/C pump inverter 158t
2009	2,044t	Installation of steam piping covers 293t
2010	861t	Replacement from fluorescent lightings to LED 51t
<b>Total</b>	<b>22,691t</b>	



(Diagram 6. Reduction of CO<sub>2</sub> Emissions through Constant Airport Facility Improvements)

Of the many facility improvements, KIAC designed, developed and installed its own system for automatically regulating the operation of the air conditioning units in the spacious gate lounges according to flight schedules by using our passenger information system to achieve greater efficiency in the operation of air conditioning in the passenger terminal. As shown below, the results were extremely significant.

- Annual reduction of 2,600,000 kWh in power consumption (equivalent to 1000 kl of crude oil).
- Approximately 34% reduction in air conditioning system energy consumption.
- Investment costs (approximately ¥50 million) recovered within a year.

On-the-spot inspection after installation and customer feedback indicated that there was no drop in service levels and the initiative received recognition from other sectors of society, receiving the Minister's Prize from the Ministry of Economy, Trade and Industry.

Further details on this system will be explained later in the section, Efficient Operation of Air Conditioning in the Passenger Terminal Utilizing an Information System.

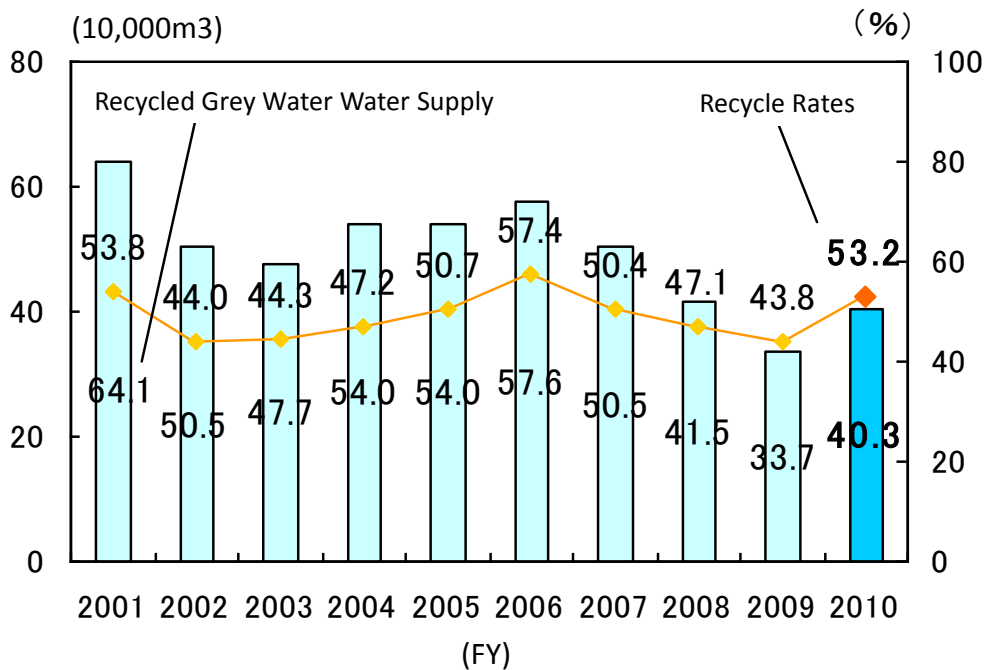
### 3. Activities to Create a Recycling Airport

The use of "grey water" is a noteworthy initiative in our activities to create a recycling airport.

Water treated at Kansai International Airport satisfies standards of the Eco Island Promotion Plan set at more stringent levels than the environment standards of Osaka Bay, which prescribe the most stringent effluent standards in Japan. This water is purified to levels that measure up favorably to the quality of water in rivers and oceans.

Therefore, the water can be reused for flushing the toilets, washing vehicles and sprinkling on roads and plants—basically for every use except human consumption which is prohibited under sanitary regulations. This means no less than 53.2% of potable water, or 403,000 tonnes, is recycled.

This contributes greatly not only to reducing the use of potable water, which is a valuable resource, but also to curbing the impact of effluent on the Osaka Bay area.

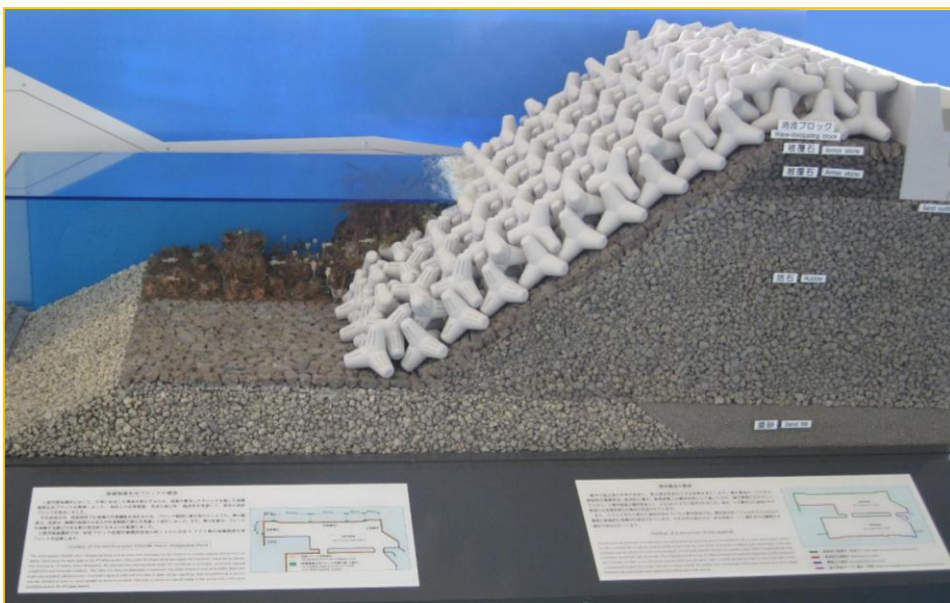


(Diagram 7. Recycled Grey Water Supply and Water Recycle Rates)

#### 4. Activities to Create an Airport that Values Nature and Supports Personal Interaction

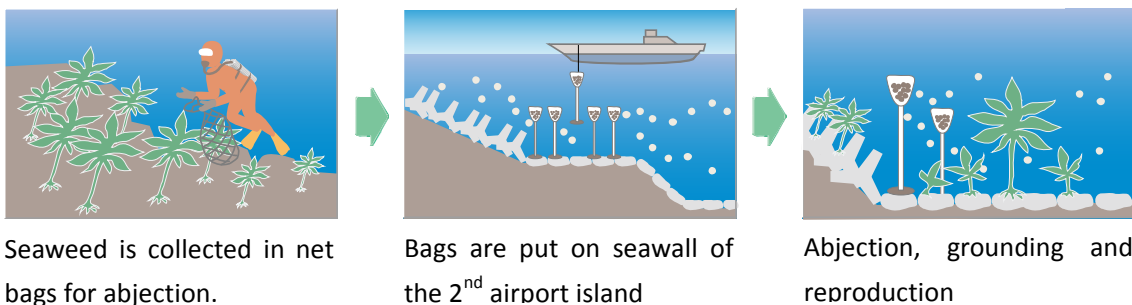
In regards to our activities to create an airport that values nature and supports personal interaction, Kansai Airport was built 5 kilometers offshore on an artificial island with a view to developing a pollution-free airport. In conjunction with this, various methods have been employed to ensure that fishery resources are preserved so as not only to avoid harming the natural environment but also to create a more bountiful one.

As a prime example of this, we have installed a gently sloped stone seawall around the airport which is widely exposed to sunlight to induce the growth of seaweed.



(Diagram 8. Model of the Gently sloped Stone Seawall and Concrete Blocks with Seaweed Attached)

Furthermore, we have laid concrete blocks on top of the seawall so that seaweed can easily attach itself to these and introduced spore bags to encourage seaweed beds to form quickly.



(Diagram 9. Seeding Using Spore Bags)

Thanks to these efforts, a rich seaweed bed has formed over a broad area. At present, 107 types of seaweed including sea trumpets and wakame, and approximately 200 types of fishery industry resources such as fish, crabs, shrimps, abalone and sea cucumbers, comparable to those found in natural rock reefs, have been observed. In addition to serving as an important feeding and spawning ground, the hatchlings from this site have migrated all around Osaka Bay.

From our continuous observations, we have found that this seaweed bed now covers an area spanning approximately 55 ha around the airport alone which is equivalent to about 10% of the seaweed area in the entire Osaka Bay, clearly demonstrating the fact that the presence of the airport has not resulted in a loss of fishery resources, but has rather contributed to the overall environment of the bay.

Actual conditions of the seaweed bed are introduced later in the section, Seaweed Bed around Kansai International Airport.

## **5. Activities to Create an Airport that Exists in Harmony with Local Residents and Users**

Turning our focus now to our activities to create an airport that exists in harmony with local residents and users, we have a community relations desk for dealing with noise complaints and other issues 24 hours a day, all year round, and we also release our environmental monitoring results extensively through our website and CSR reports.

Moreover, we make efforts to actively disclose environment-related information. Noise and other monitoring data and results of our various eco activities are exhibited at the Environment Center in the Observation Hall at Kansai International Airport along with displays to allow visitors to listen to the actual noise and gain a hands-on learning experience.

As a way of forging closer ties with the community, we have also opened up the airport as a venue for learning about the environment. Science Class at Kansai Airport was convened to inform children about the environment and science-related features of the airport such as items relating to global warming and the use of clean energy, and we also invited local primary school children to participate in greening trials on the roof of the terminal as a countermeasure for the heat-island effect, as well as recycling courses and the sweet potato harvest festival.

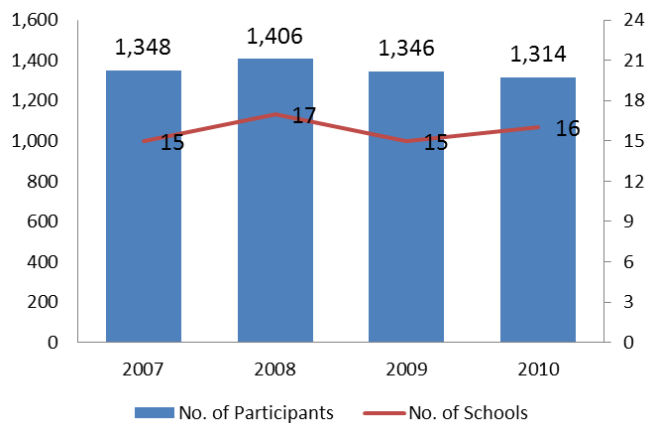
(Diagram 10. Science Class)





(Diagram 11. Eco Sweet Potato Harvest Festival on the Roof of the Passenger Terminal (newspaper article))

To further enhance our social contribution, since 2002 we have dispatched staff to local schools and universities to hold Visiting Workshops introducing the environmental activities and various other initiatives at Kansai Airport. The workshops are attended by over 1,000 students each year and more than 10,000 students have taken part so far.

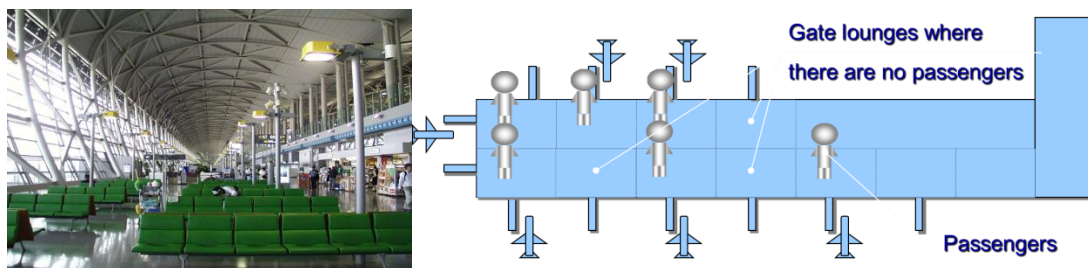


(Diagram 12. No. of Participants in the Visiting Workshops)

### Efficient Operation of the Air Conditioning in the Passenger Terminal Utilizing an Information System

The passenger terminal consumes by far the largest amount of energy at Kansai International Airport, used up primarily by the air conditioning system.

However, because the terminal is comprised of a huge continuous stretch of space with no partitions and is used by an endless stream of customers, in principle, all areas of the terminal must be kept in operation from the first flight of the day until the last flight. This uses up a great deal of energy.

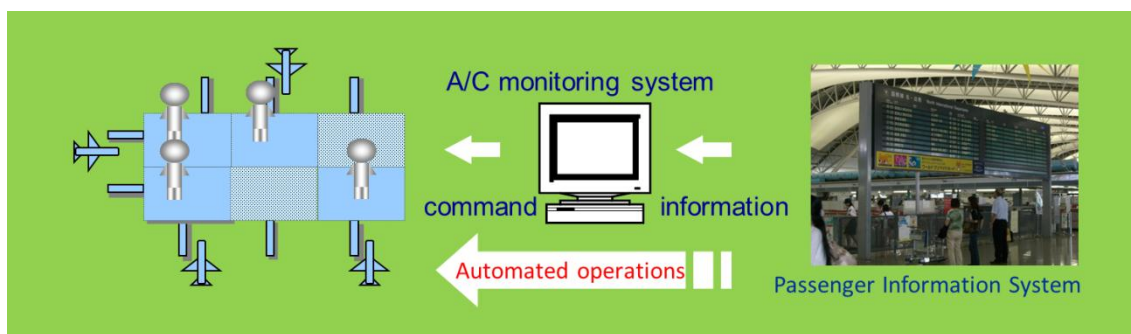


(Diagram 13. Air Conditioning System in the Gate Lounge in the Past)

Because the passengers are dispersed in each gate lounge, to save power, we need to check where the passengers are and switch off the air conditioning in gates where there are no passengers. Hiring staff to patrol and do this or operating the switches using a remote monitoring system would entail enormous running expenses.

After considering various methods for switching the air conditioning in the gate lounges on and off without relying on manpower, we noticed that the passenger information system (PIS) at the airport updated flight information in real-time and that passengers moved in response to this information.

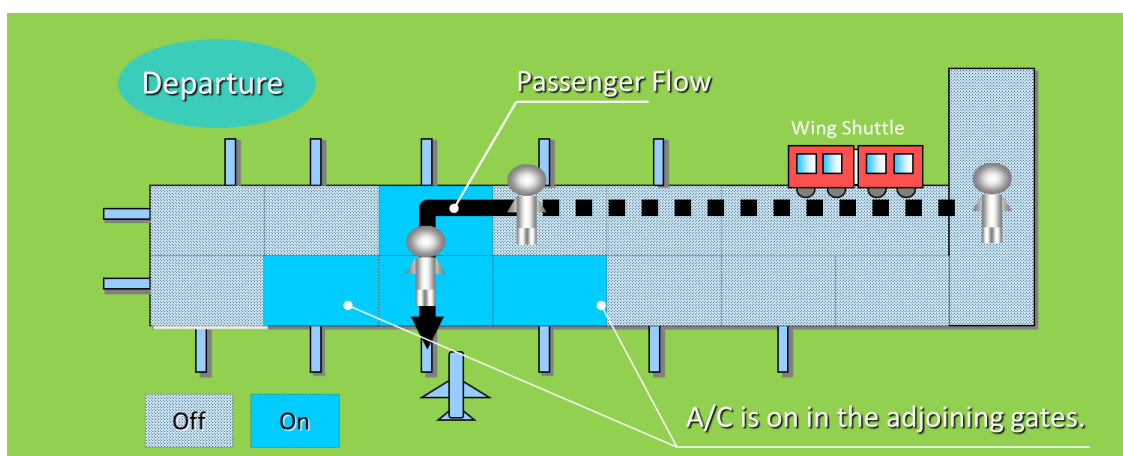
Therefore, we decided to develop a fully automated energy-saving air conditioning system by linking the on-off function of the air conditioning equipment at each gate with the PIS.



(Diagram 14. Automated Air Conditioning Operation Using PIS)

First of all, we conducted a survey on passenger flow routes and traveling times so as to narrow down the relevant range.

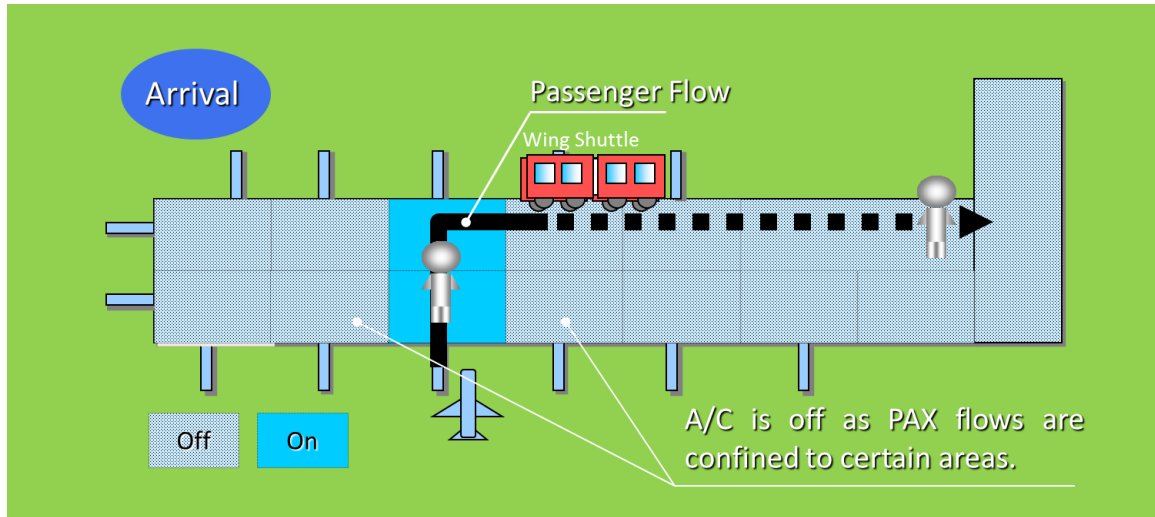
Departure passengers who used the wing shuttle etc. to get to their gates traveled as far as the neighboring gate but did not go any farther. Therefore, we found that we could set the operating range to extend as far as the adjoining gate.



(Diagram 15. Air Conditioning Operating Range on Departures)



On arrivals, on the other hand, because the passenger flows are confined to certain areas, there was no need to set the range over a wide area. We simply needed to operate the air conditioning along the passenger flows from the gates.

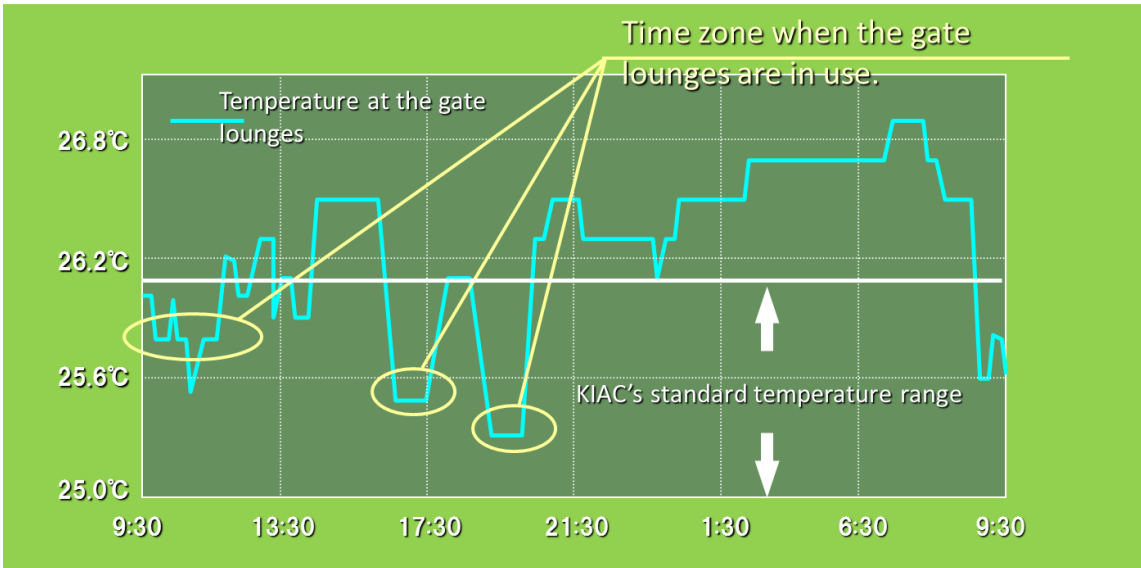


(Diagram 16. Air Conditioning Operating Range on Arrivals)

With respect to suitable air conditioning operating times, on departures, we set the system to come on 120 minutes before departure time to coincide with the start of check-in procedures and to switch off immediately after the passengers have left on their flights. On arrivals, because it takes approximately 30 minutes for the gate lounge to reach the designated temperature, the system was set to come on 30 minutes before arrival time and stay on for 30 minutes after arrival while the passengers pass through the gate lounge.

After repeated discussions and trials, we managed to develop a fully automated system for calculating the air conditioning range and times in each gate lounge and switching air conditioning on and off based on flight arrival and departure times provided by the PIS.

On running this system and checking the temperatures in the gate lounges, we were able to confirm that the temperatures were all within acceptable range while the passengers were in the facility and that passenger comfort was being maintained.



(Diagram 17. Gate Lounge Temperature Verification during System Operation)

This system was designed and vetted entirely in-house by KIAC staff. Through repeated checks, we succeeded in achieving a sizeable reduction in energy consumption without sacrificing customer comfort. The results of this initiative are as shown below:

● Gate lounge A/C operating time:	Shortened by approximately 6 hours/day
● Energy consumption of the A/C system:	Reduced by approximately 34%
● Total amount of energy conserved:	Approx. 1,000 kl/year (crude oil equivalent)
● Reduction in CO <sub>2</sub> :	Approx. 1,500 t/year
● Reduction in heating expenses:	Approx. ¥65 million/year

(Table 5. Summary of the Effects of Introducing Lounge Air Conditioning System Utilizing PIS)



## Seaweed Bed around Kansai International Airport

Kansai International Airport is striving not only to conserve but also to create natural environments.

The development of the gently sloped seawall, introduction of concrete blocks to encourage seaweed growth and the creation of a seaweed bed by way of seeding are examples of this.

Thanks to these efforts which have been continued for more than 15 years, a lush bed of seaweed and wide varieties of fish can now be found around the airport.

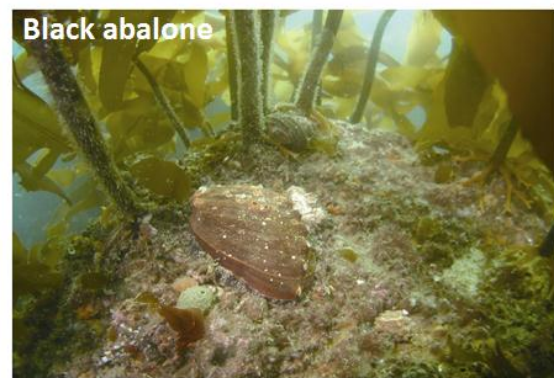
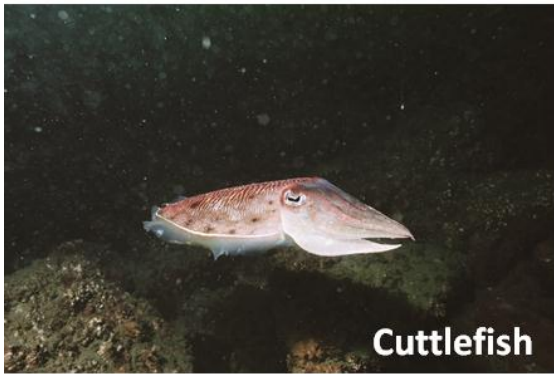
Aquatic animals such as scorpion fish that could not be seen in the past have settled in the area which now serves an important role as a spawning ground. The presence of the airport has thus enriched the local marine life.

The photos below show what the area now looks like.



Diagrams 18-21. Seaweed Bed)



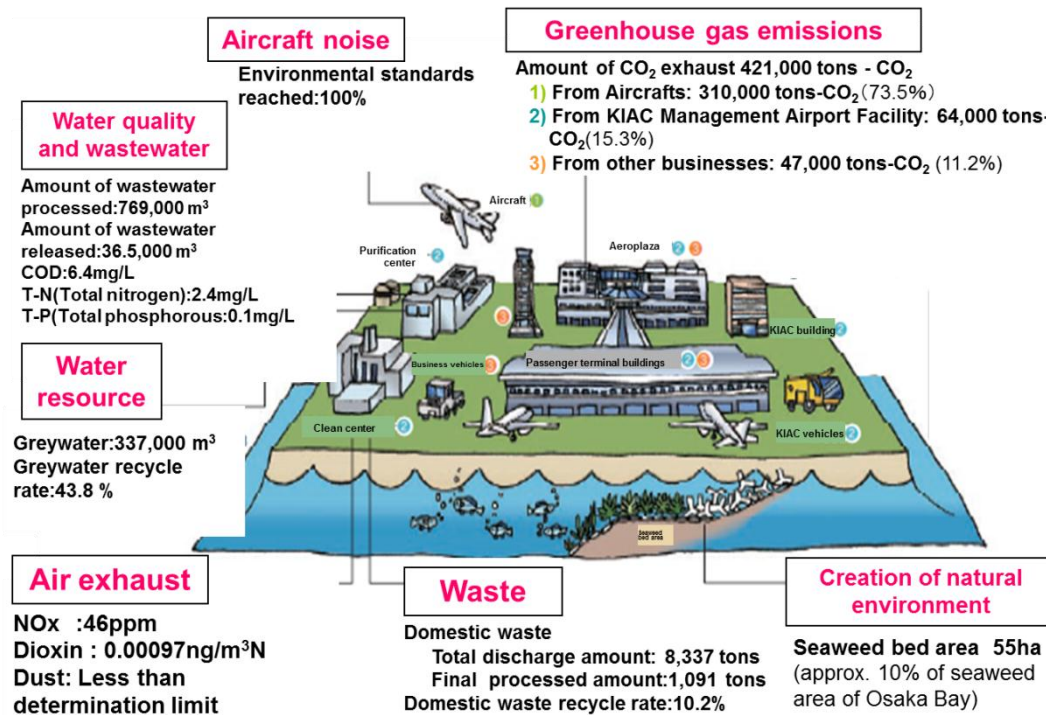


(Diagram 22-29. Marine Life around the Seaweed Bed)

In this way, the underwater foliage around Kansai Airport has attracted much fishery resources into Osaka Bay.

## Kansai Airport's Performance Data

The main environment specifications of the current airport island attained as a result of implementing the Kansai International Airport Environmental Management Project can be summarized as follows:



(Diagram 30. Eco Island Performance Data)

We are proud of our achievements in attaining excellent world-class results in all areas and in maintaining a strong awareness of environmental aspects. This artificial island in Osaka Bay truly exhibits features befitting an eco-island.

## **Conclusion**

The reason the man-made island on which Kansai International Airport is situated is able to attain and maintain high degree of environmental effectiveness as an eco-island is that various parties and initiatives involved are coordinated in an organized manner centered on the Eco Island Promotion Plan.

The preeminent aspect of this plan is that it does not simply set down initiatives for a dedicated department within the airport company but rather specifies a system for company-wide initiatives under the direct responsibility of its President & CEO. This is the first initiative of its kind at airport in Japan.

In addition, a promotion system on all hierarchical levels and a system for collaboration between all airport businesses have been established and considerable achievements have been made. We are convinced that this is a top-level initiative anywhere in the world.

2012 is a turning point for environmental efforts at Kansai in two ways.

Firstly, it is the final year of the Eco Island Promotion Plan and is, as such, expected to end in a culmination of previous efforts, and there is also the need to formulate plans for Phase 3 of the Environmental Management Project to make further advancement. Secondly, we have been assigned to take over the management of Itami Airport, an inland airport in Osaka, and will soon begin operating the airport.

Since Kansai International Airport was developed as an antithesis to landlocked airports, thus successfully creating an eco-island, setting out on the operation of Itami Airport which no doubt has numerous environmental issues will create a dilemma in our policies.

However, the fact that we have been entrusted with the management of this airport indicates that our eco-centered airport operations to date has been highly appraised and that the public is looking with keen interest at how we will handle this airport with its many problems. We intend to take a positive stance in implementing uncompromising and credible initiatives so that our environmental initiatives will eventually spread to airport operations in Japan and the rest of the world.

We hope that our eco-island aspirations will reach all corners of the world. This is a message from an eco-island to the globe.