Recycling of treated water by Johkasou

Shaping a New Journey

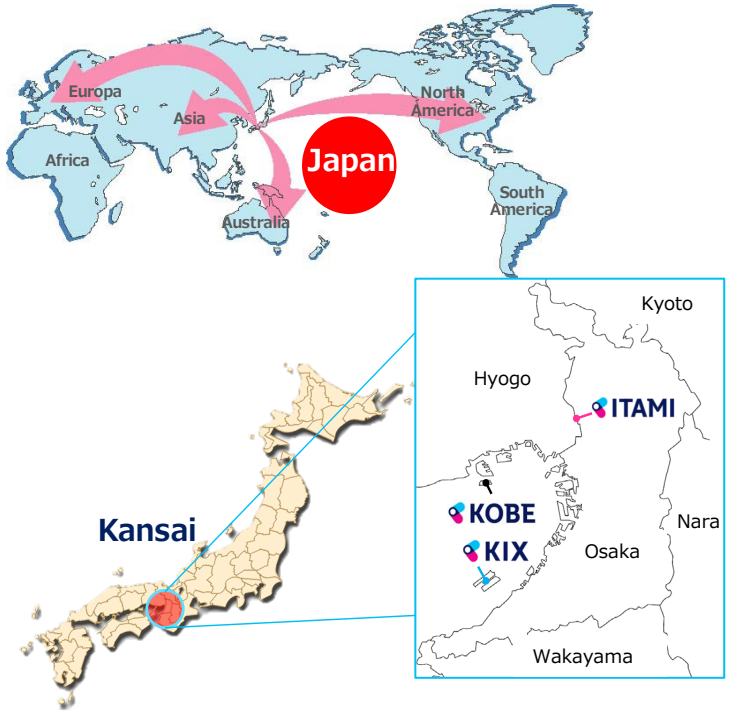
KANSAI AIRPORTS

Kansai Airports (KAP)

Operator	KANSAI AIRPORTS Concession period KIX and ITAMI : 44 years (April 2016 - March 2060) KOBE : 42 years (April 2018 - March 2060)
Owner	- New Kansai International Airport Company (NKIAC) - Kobe city Ownership of airport assets such as runways

Operating right

Consideration for operating right



＊KAP shareholders

ORIX 40%	ORIX
VINCI Airports 40%	VINCI AIRPORTS
Others 20%	30 companies

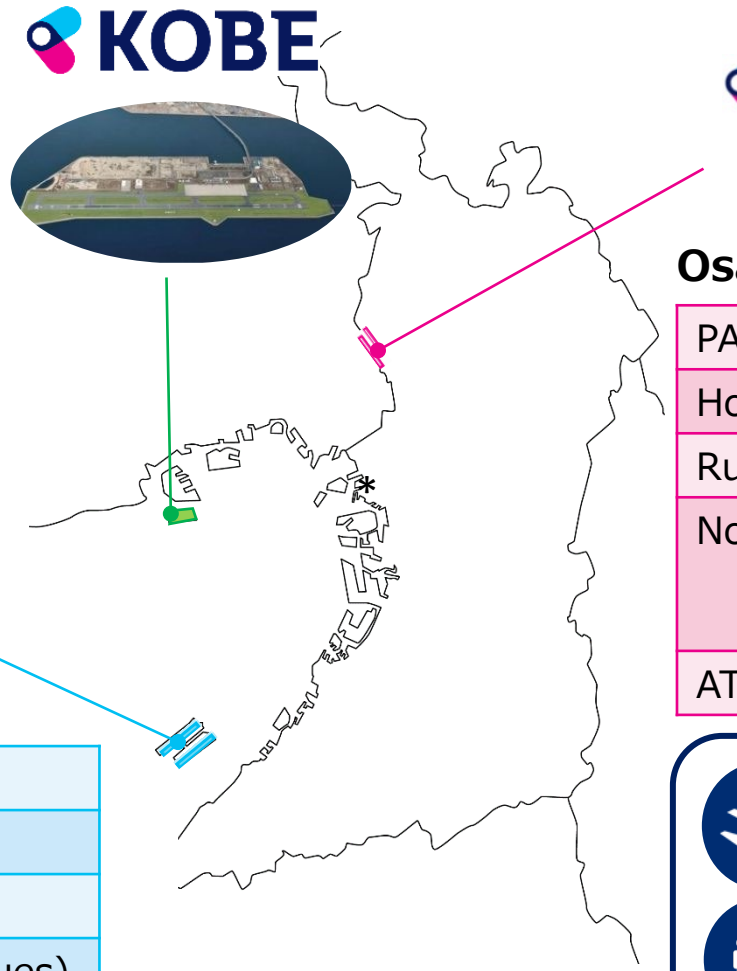
Overview of our airports

Kobe Airport (UKB)

PAX	3.3 million in FY2019
Hours	16 hours (7:00 to 23:00)
Runway	2,500 m
Notes	Offshore airport (8 km south of Sannomiya)
ATM	32,825 times in FY2019

Kansai International Airport (KIX)

PAX	28.8 million in FY2019
Hours	24 hours a day
Runway	3,500 m & 4,000 m
Notes	Offshore airport (almost no noise issues)
ATM	196,022 times in FY2019



Osaka International Airport (ITM)

PAX	15.8 million in FY2019
Hours	14 hours (7:00 to 21:00)
Runway	3,000 m & 1,828 m
Notes	Urban airport (11 km from central Osaka in a straight-line distance)
ATM	137,196 times in FY2019

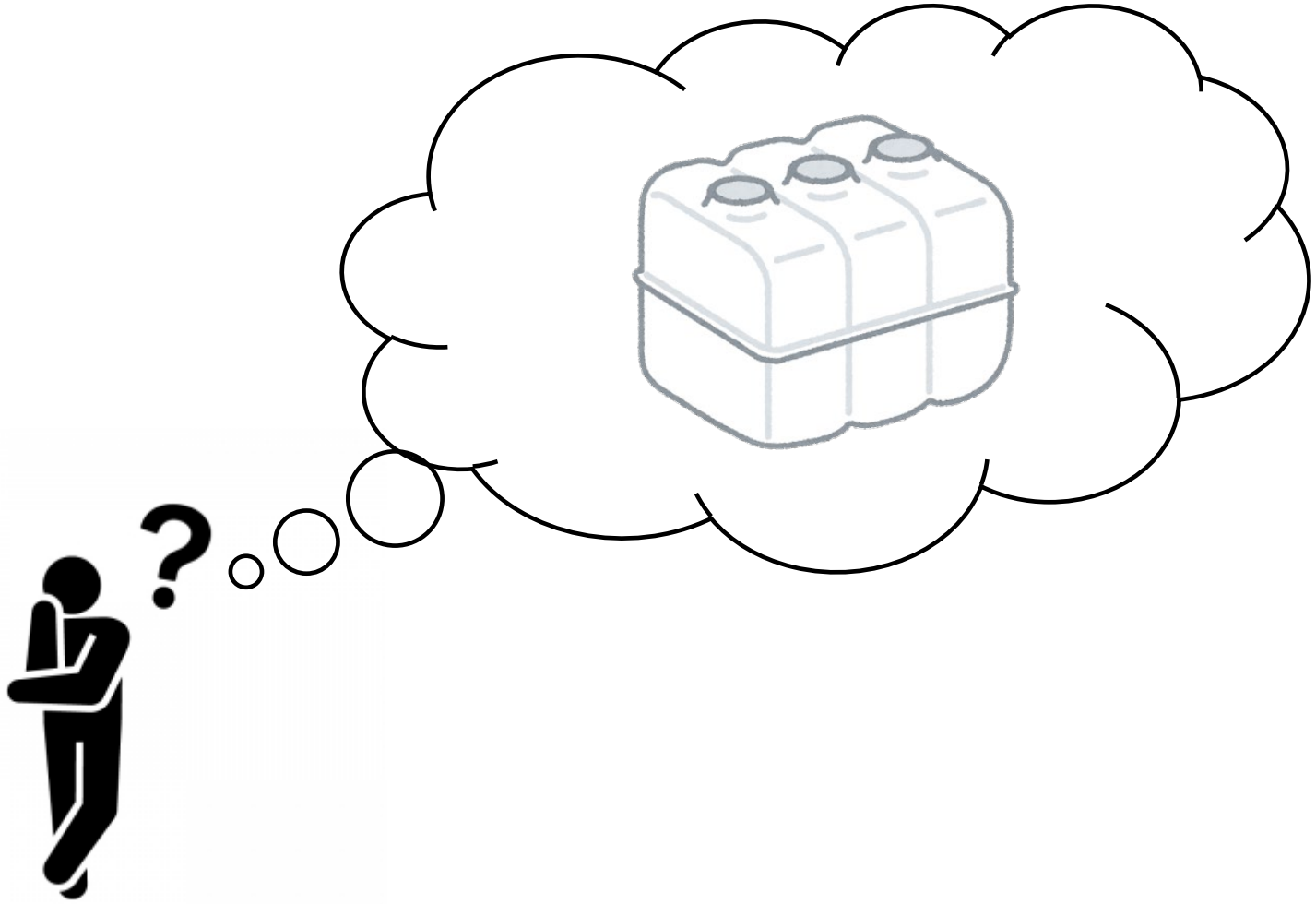
Annual ATMs
366,043

Annual PAX
47.8 million

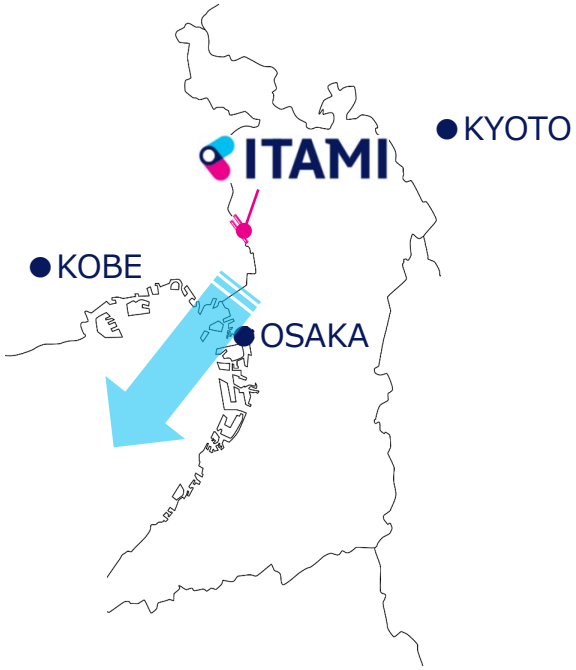
＊PAX: Number of passengers
＊ATM: Aircraft movements

We operate Japan’s largest (world’s largest?) Johkasou

Japan’s largest Johkasou?



History of Kansai International Airport (KIX)



1960s – 1980s Problems at Itami Airport

- Annoying facility (noise pollution)
- Deficient capacity due to restricted air traffic

1962 Wiseman Report

(Japan-UN joint survey)

A new airport to ease the increasing burden borne by Itami Airport should be planned in the Hanshin Metropolitan Area.

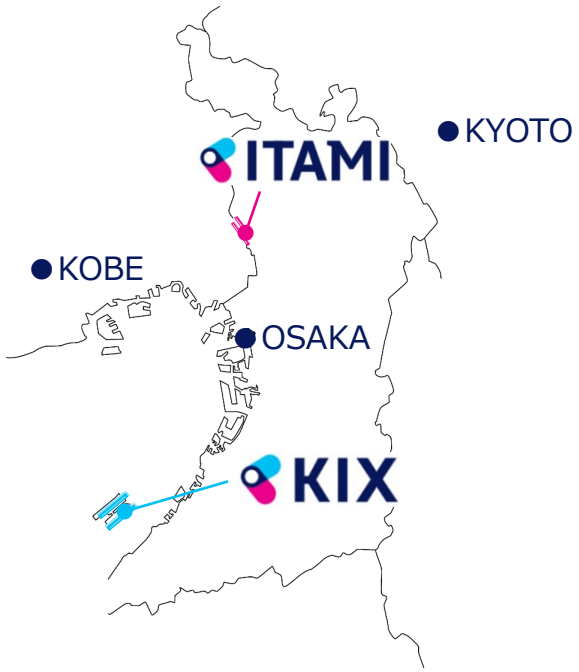
1969 Itami Airport noise pollution lawsuit

Pollution lawsuit by which neighboring residents called for flight suspension from 9 pm onwards as well as damage compensation. Settled in 1981.

1982 Condemnation by the US

Continental Airlines could not fly into Itami Airport, condemning the delayed development of airports in Japan as a non-tariff barrier.

History of Kansai International Airport (KIX)



Difficulty in selecting a relocation site
- Annoying facility (opposition by residents against welcoming an airport)
- Concerns over municipalities-borne burden associated with infrastructure development

1974 Government selected the best candidate site
1981 Presented airport data for local consent

(Presented Airport Development Plan to locals)

- **Airport development plan**
- **Environment impact assessment plan**
- Philosophy for local preparation

1982 Local consent obtained
1987 Construction started

1994 Airport opened

Wastewater/waste generated in the airport island should be treated in the airport

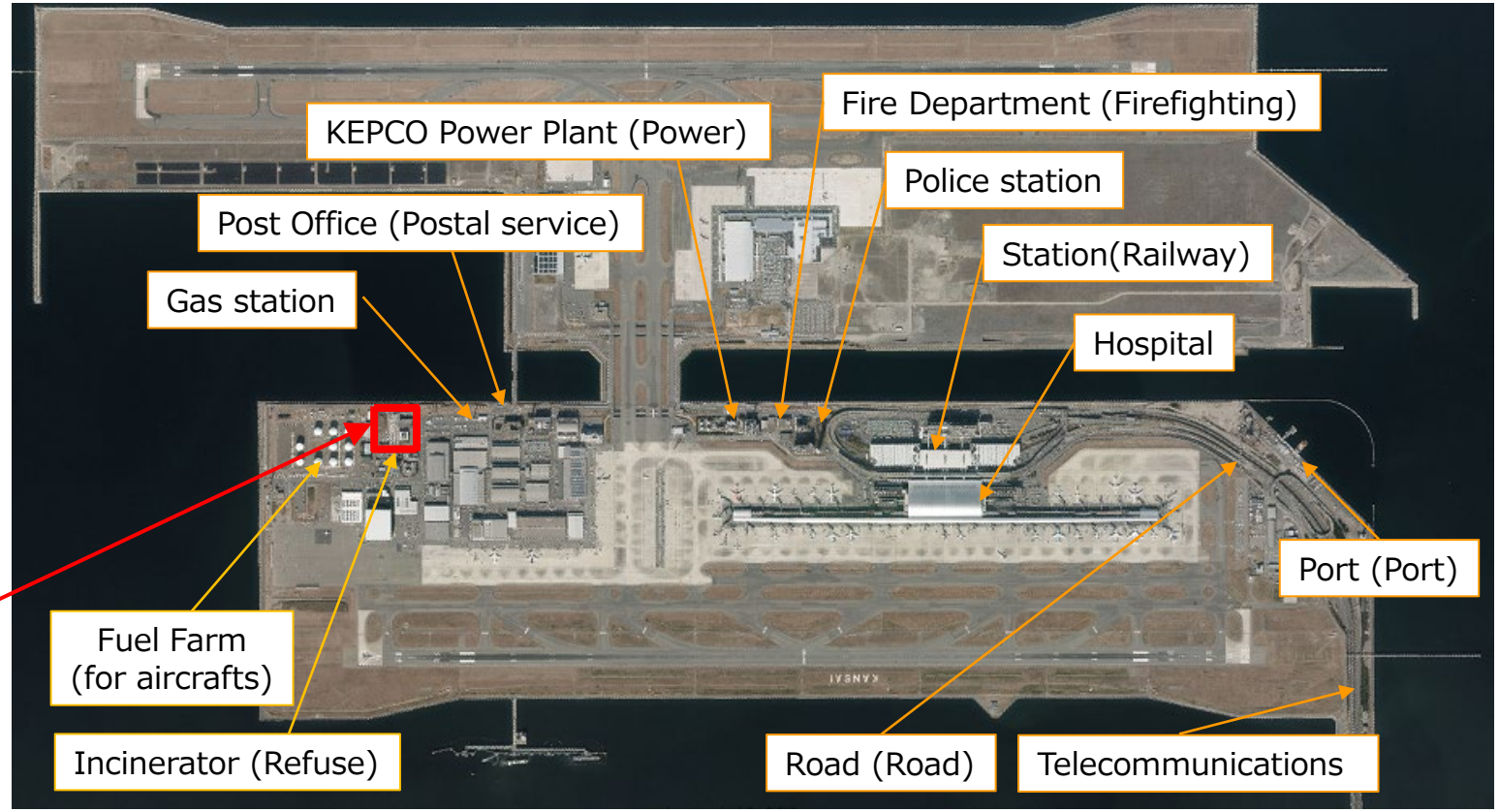
- **Construct and operate a water treatment units**
- Construct and operate incinerators…

Lower the amount of load (T-N, T-P, etc.) caused by the treated water discharged into Osaka Bay (enclosed water area)

- Advanced treatment
- **Re-use of treated water on the island…**

KIX Johkasou

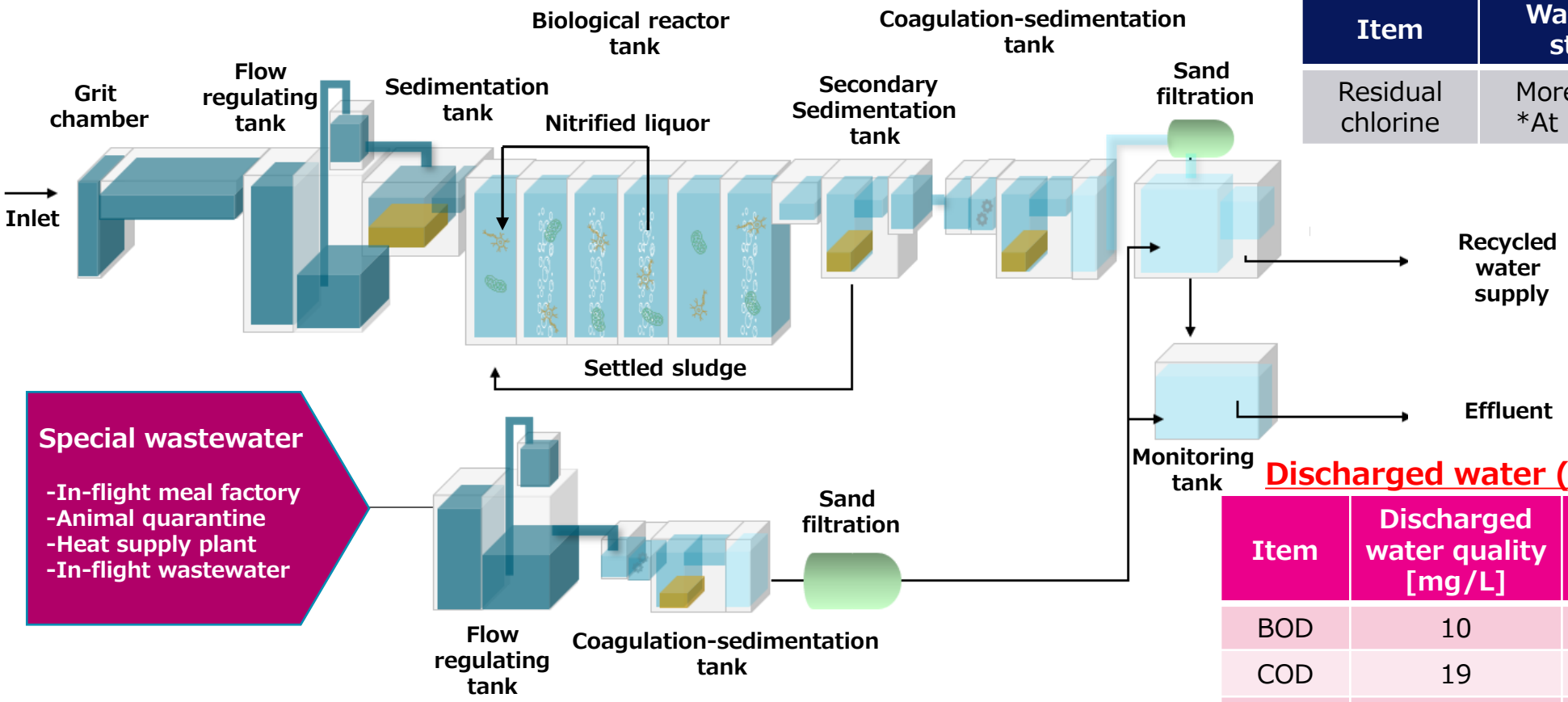
KIX Johkasou	
Type	Domestic wastewater treatment unit
Method	Recycled nitrification/denitrification process
Design Capacity	38,500 PE
Inflow	10,050m^3/day



KIX Johkasou

Influent water

Item	Influent water quality [mg/L]
BOD	210
COD	140
SS	150
T-N	70
T-P	7.7



Recycled water (into building)

Item	Water quality standards
Residual chlorine	More than 0.2% *At building end

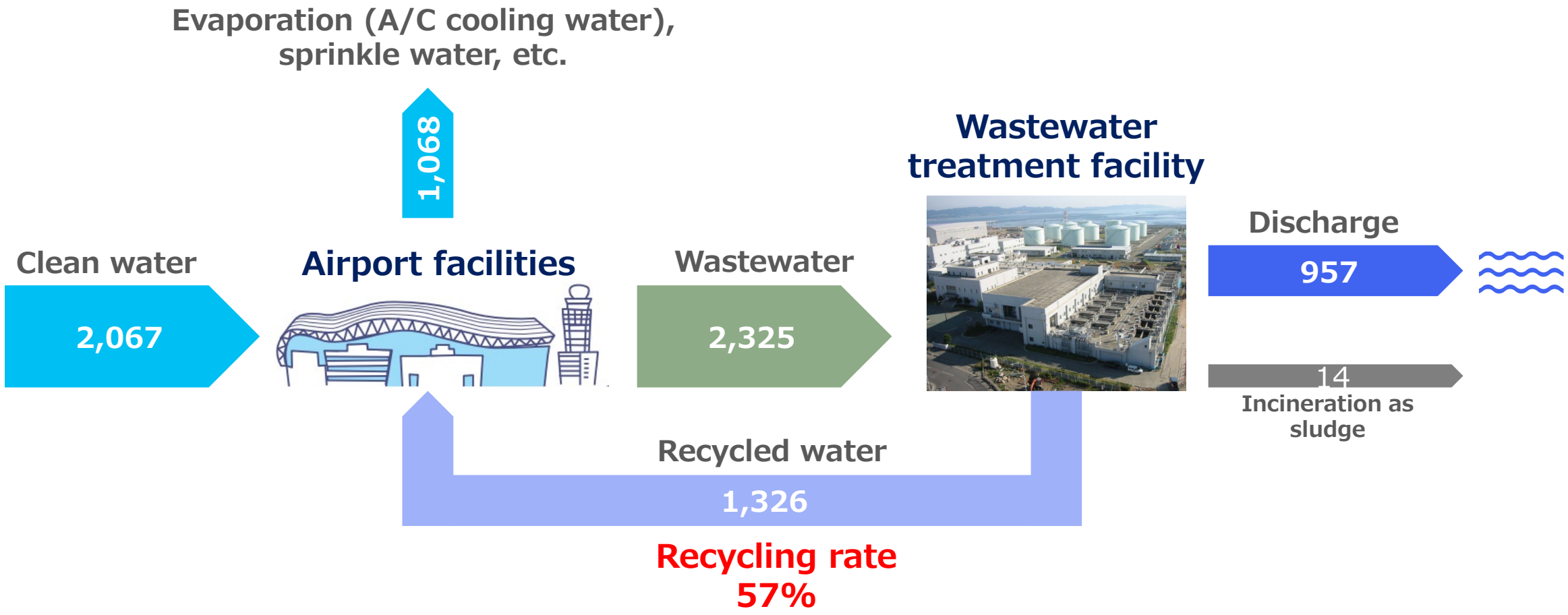
Discharged water (into ocean)

Item	Discharged water quality [mg/L]	Voluntary standards [mg/L]
BOD	10	4.9
COD	19	10
SS	15	3
T-N	15	13.1
T-P	1	0.39

*The law restricts the total volume of N and P to be discharged into the ocean because the discharge destination is the enclosed water area.

KIX Johkasou

Water balance for FY2019 [m³/day]



Use of recycled water

Treatment center

>1%

<99%

Toilet flush water

Water for construction

Fire hydrant

Plant watering

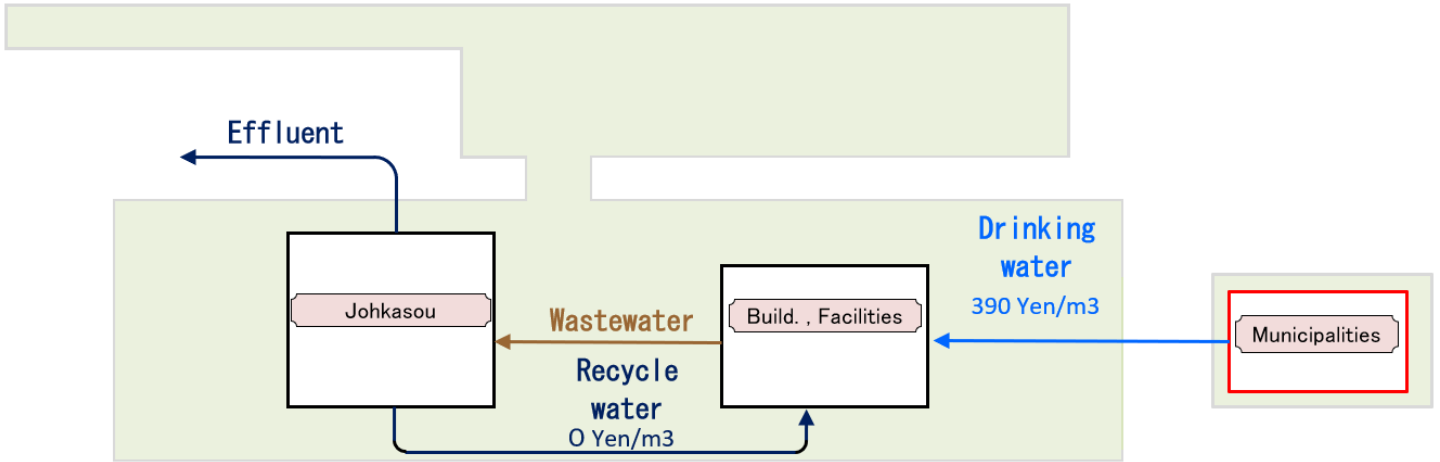
Water for fire drills

Pros and cons of using recycled water

☞Pros

1)Cut on water bill

Clean water	Recycled water
Purchase from the municipality on the opposite shore	Use treated water (effluent)
390 JPY/m^3	0 JPY/m^3



***If recycled water of 1,000m^3/day is used, water bill will be cut by 390,000 JPY/day**

2)Reduced environmental footprints

The total volume of N and P to be discharged into the waters can be reduced by recycling the treated water rather than discharging it.

***If the recycled water of 1,000m^3/day is used, rather than being discharged,**
(1) T-N : 1,000[m^3/d]×13.1[mg/l] = 13.1[kg/d]
(2) T-P : 1,000[m^3/d]×0.39[mg/l] = 0.39[kg/d]

Pros and cons of using recycled water

☞Cons

Large initial investment cost

: Recycled water piping
- ✓ Φ400×Approx. 12km pipe laid (at opening)
- ✓ 30kW×3 pump units installed (in the treatment center)

: Passenger terminal building (PTB) (example)
- ✓ Water receiving tank dedicated to recycled water is required
- ✓ Piping to each toilet needs to be installed

Recycled water piping in red box (developed in 1994) : Approx. 600M JPY

Recycled water piping in PTB (developed in 1994) : Approx. 500M JPY
->Including the piping for other buildings Approx. 1B JPY (assumed)

(Investment at airport opening) Approx. 1.6B JPY

☞If recycled water of 1,000m3/day was used to replace clean water, the payment of the water bill: 390,000 JPY/day would not be required; hence, the investment could be recovered in **approx. 12 years**.
(In disregard of the maintenance and operation costs, taxes and public dues, interests, etc.)

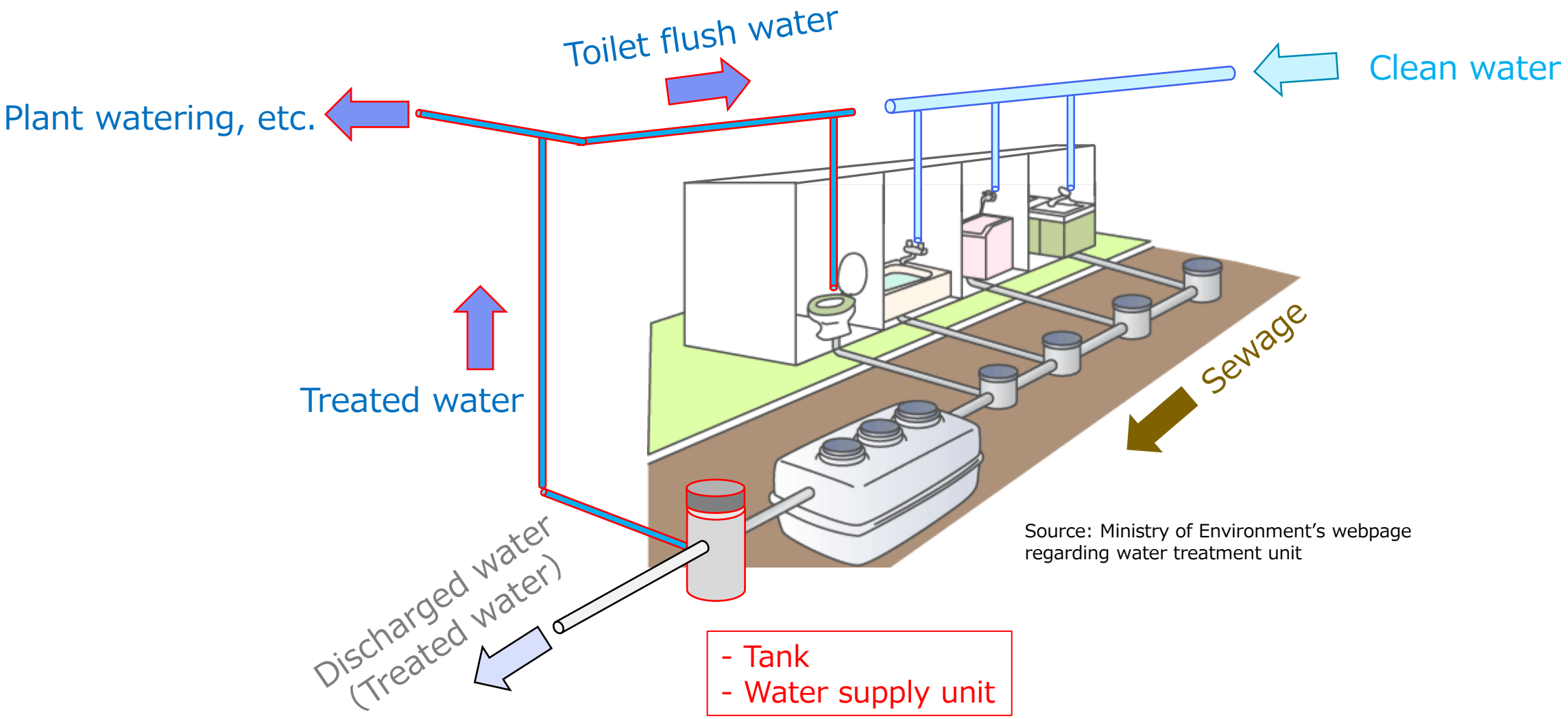
Pros and cons of using recycled water

☞Cons

Chromaticity

- ✓ Recycled water, affected by humic substances in sewage, somewhat turns yellow. Normal treatment cannot eliminate the substances.
- ☞ Solutions include membrane treatment and ozone treatment which we initially considered implementing. But, we decided against it due to their high cost.

Pros and cons of using recycled water



Source: Ministry of Environment's webpage regarding water treatment unit

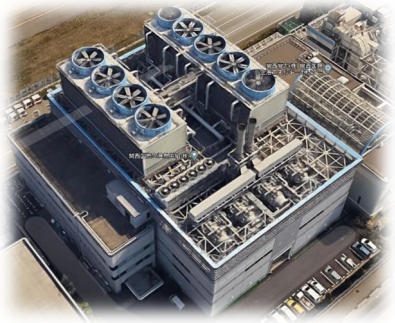
Future vision

Further increase the rate of recycled water use

Buildings

A/C

Heat supply plant



Evaporation

Cooling tower

Cooling water (Clean water)
*Use 150 km³ annually

Cooling water

Chiller

Cold water (6℃)

Returned water (13℃)

✓Use recycled water as cooling water
- Demand fluctuation
- Water quality
- Cost

Produce cold water for cooling buildings, and supply/return the water as an A/C refrigerant to/from buildings

KIX Kansai International Airport

Runways	Operating Hours	Aircraft Parking Stands	Size
2	24 hours	99	Phase 1 Island approximately 510 ha / Phase 2 Island approximately 545 ha

Environmental Facilities and Equipment

1 KIX Megasolar
A mega solar power plant capable of generating 11.6 MW of power.

2 Small-scale wind turbines
Three wind turbines are installed at the airport. The generated electricity is used to power streetlights.

3 Hydrogen stations
Two stations serve fuel-cell vehicles and industrial vehicles such as forklifts, etc.

4 EV charging stations
EV charging stations are available to encourage the use of eco-friendly vehicles.

5 Heat supply plant
The plant serves as a community heating and cooling system that centrally supplies cold water and steam.

6 Sewage Treatment Center
Wastewater from each facility is treated onsite and reused as reclaimed water.

7 Seaweed bed
The gently sloping rubble mound seawall surrounding the airport island fosters the growth of seaweed, providing a habitat for sea life.

8 Waste Disposal Center
General waste from the airport is sorted and either incinerated or recycled.

9 Environmental Center
Introduces environmental information and initiatives inside the Sky View Observation Hall.

10 KIX Sky Park
This roughly 4 hectares park features an expansive lawn and view of the sea.

11 Solar panels
The electricity generated by these panels is used in the Terminal 2 building.

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http://www.kansai-airports.co.jp/en/efforts/environment/reports/

Thank you for your attention.