# Current water reuse practices and challenges in Japan

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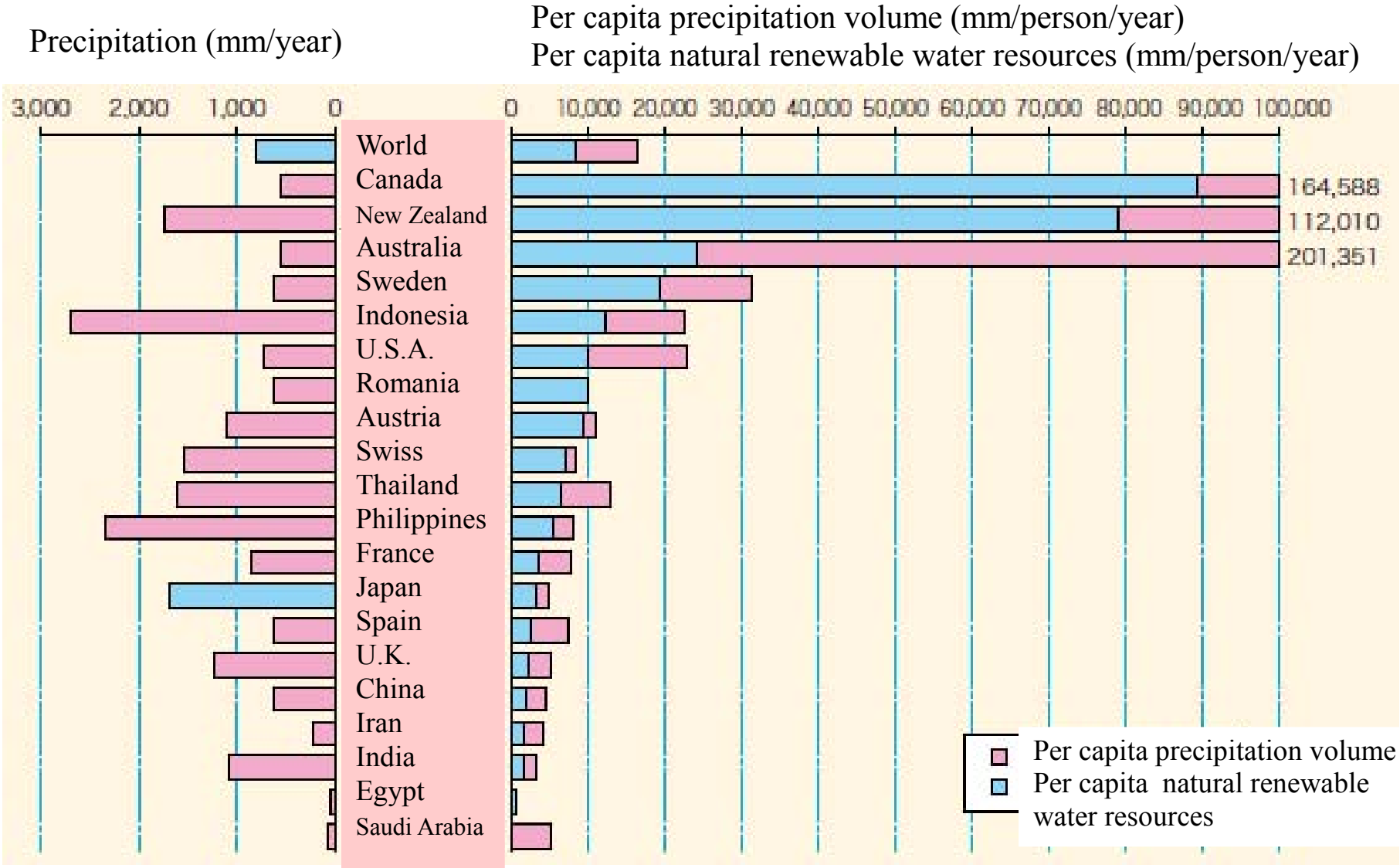
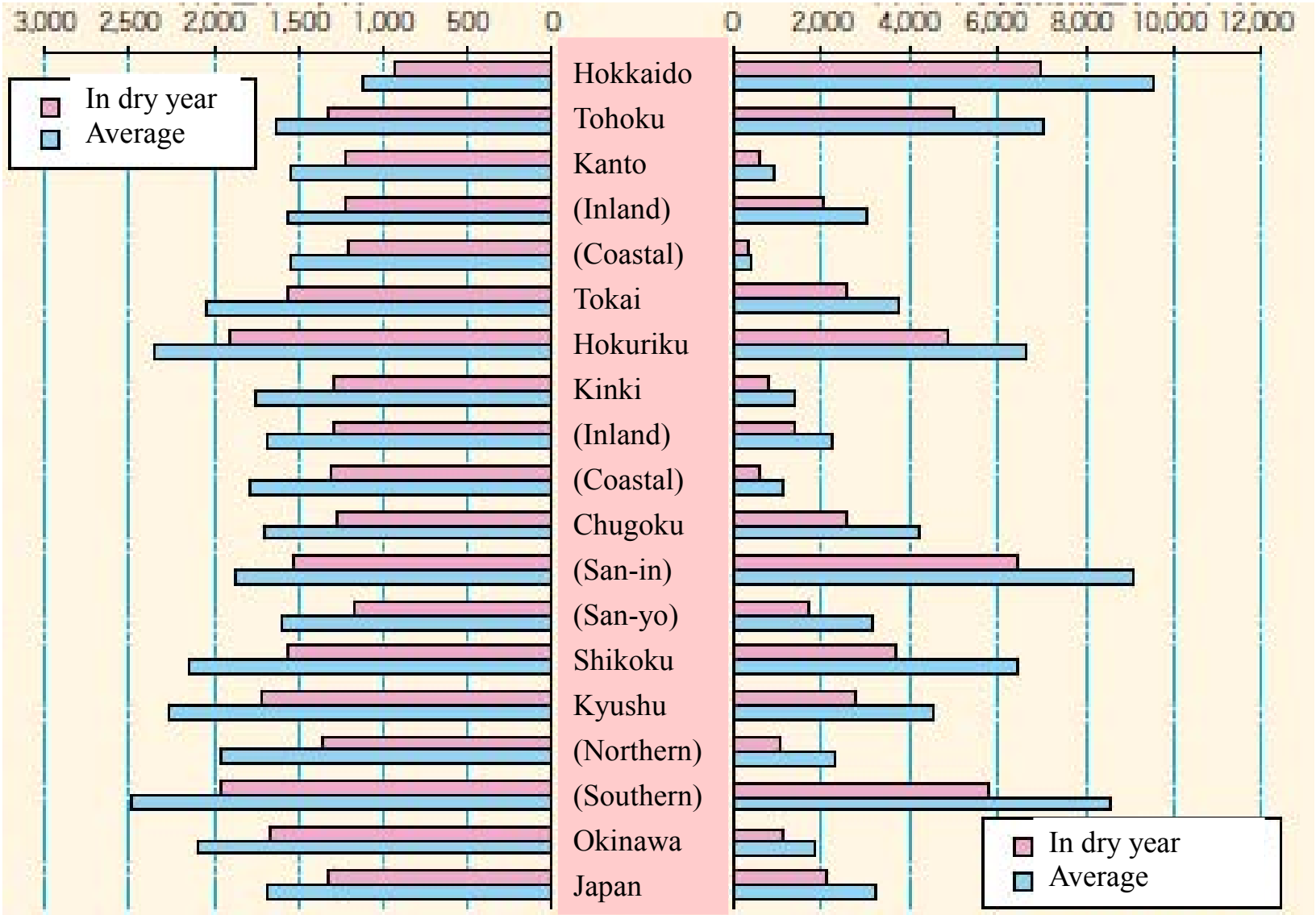
*Background*

# Water resources



Precipitation (mm/year)

Per capita natural renewable water resources (mm/person/year)

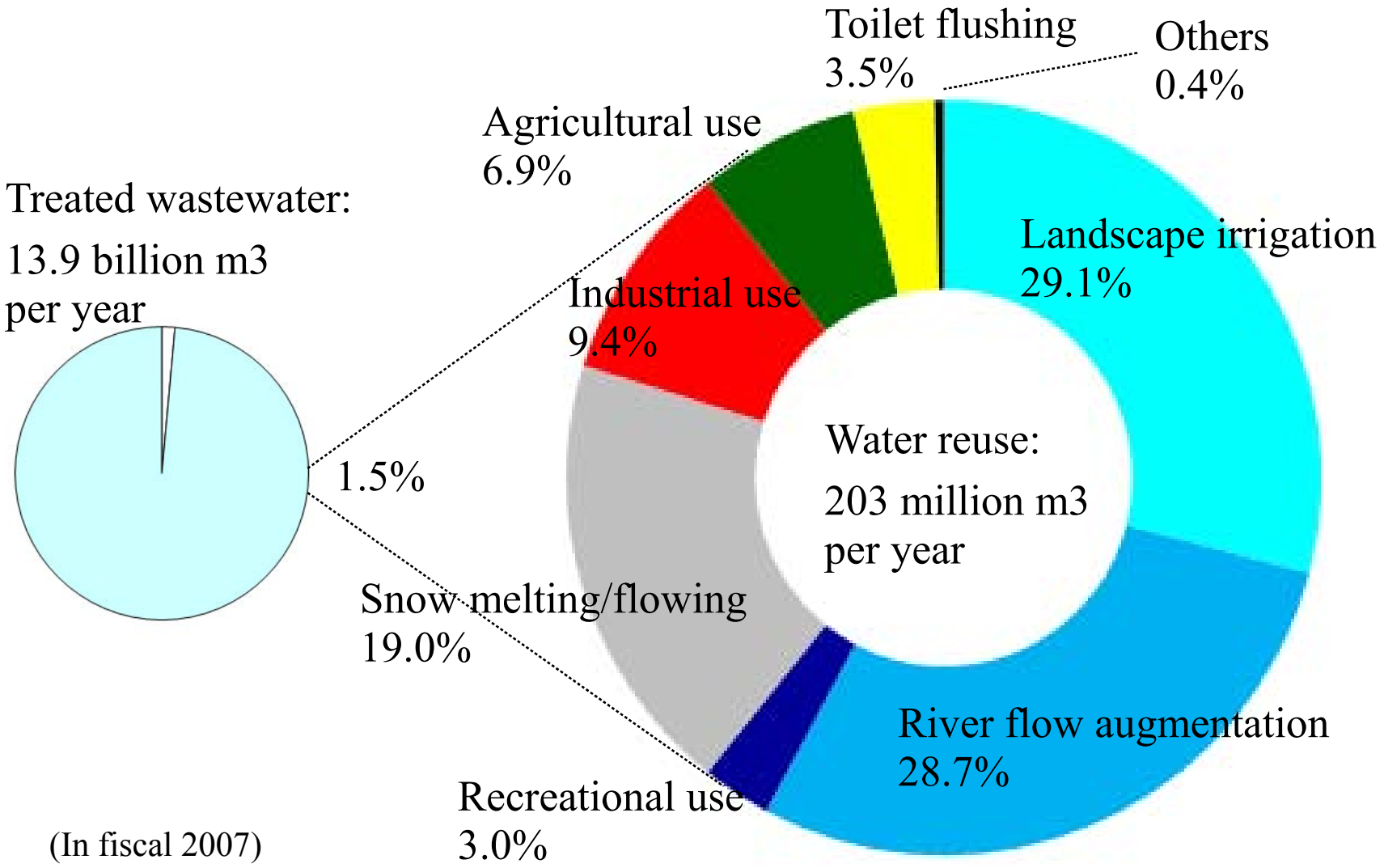


# Sewage works, as basis for water reuse

- Sewage work coverage: 73% (91 million capita), others by small centralized or decentralized systems
- Wastewater of 14 billion m3/year treated in 2,129 WWTPs
- Mainly secondary, 311 WWTPs adopts advanced treatment
- Maximize potential of water/sludge

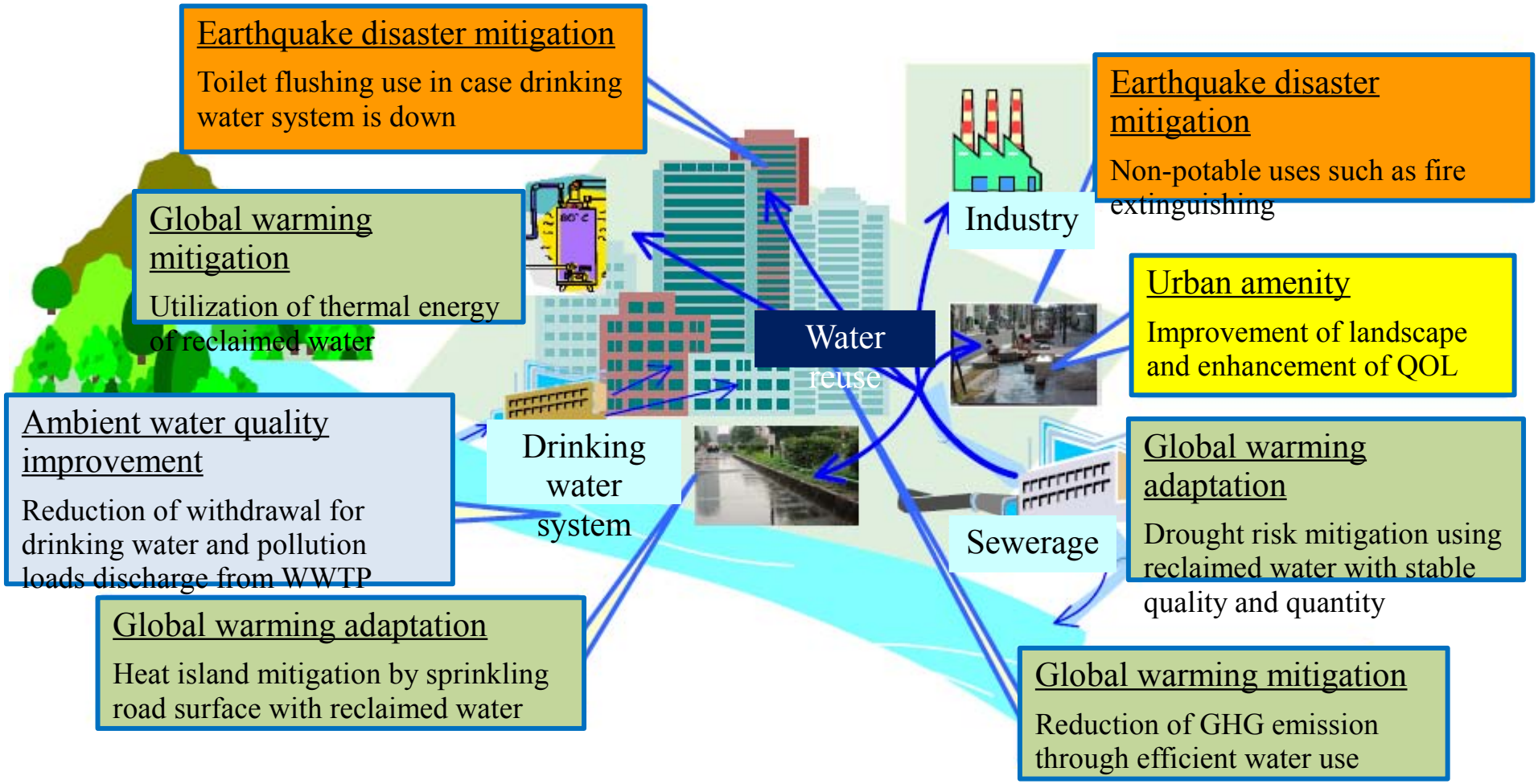
*Applications and select cases*

# Applications



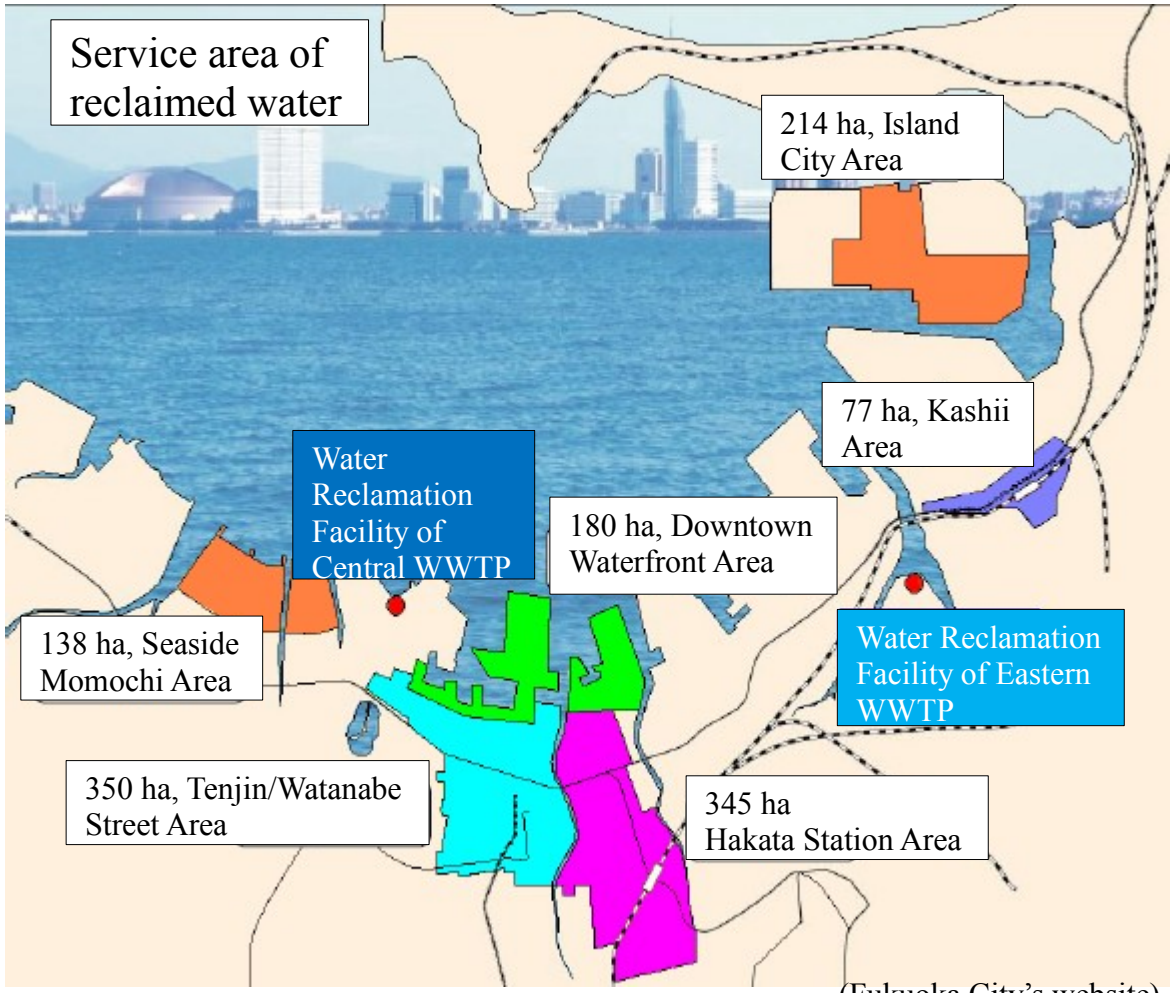

(In fiscal 2007)

# Social significance



# Case 1: Fukuoka City

- Large scale dual system for toilet flushing


(Fukuoka City's website)

*Central WWTP*

Capacity: 7,200 m3/year

Service area: 1,013 ha

Advanced treatment: Chemical precipitation, Ozonation, Sand filtration, Chlorination, Fibre filtration

*Eastern WWTP*

Capacity: 1,600 m3/year

Service area: 291 ha

Advanced treatment: Chemical precipitation, Ozonation, Biological filtration, Chlorination

# Case 2: Tokyo

- Large scale dual system for toilet flushing



3 WWTPs provides reclaimed water to 7 areas.

9,000 m3/day (FY 2009)

13,000 m3/day (FY 2013)

凡例

- WWTP
- Service area of reclaimed water
- Reclaimed water conveyance pipe
- (under construction)
- Reclaimed water conduit for river flow augmentation

- River flow augmentation

Stream revitalization by reclaimed water of Ochiai WWTP

19,900 m3/day + 30,200 m3/day + 36,300 m3/day (at maximum)

- Train cleaning

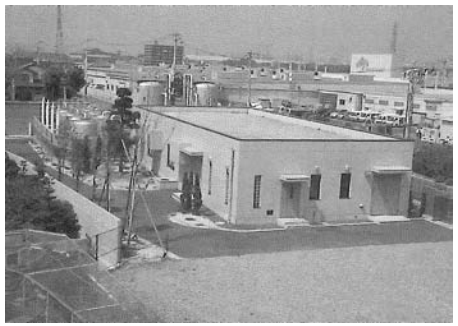
- Road sprinkling

# Case 3: Tadotsu Town


Regional WWTP

10,000 m3/day of Reclaimed water
Pump up (3km)

Advanced Treatment Centre



Agricultural use — 2,000 m3/day

River flow augmentation — 5,500 m3/day

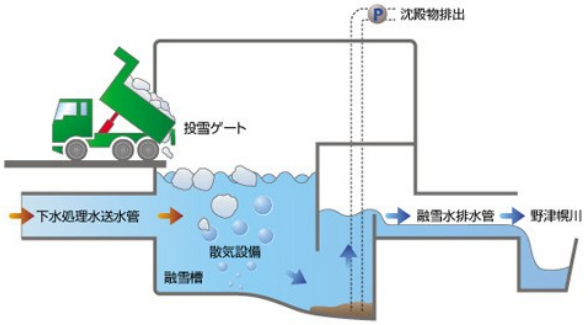
Recreational use — 2,445 m3/day

- In-line coagulation-filtration
- Activated carbon

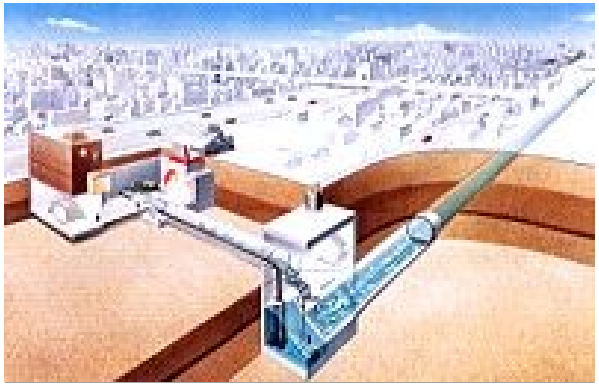
Recreational use — 55 m3/day

- In-line coagulation-filtration
- Ozonation
- Activated carbon

# Case 4: Sapporo City


(Sapporo City's website)



(Sapporo City's website)

(Sapporo City's website)

Use <u>wastewater regulating tanks</u> for snow melting in snow season

2 tanks with snow melting capacity of 10,000 m3/day, 6,000 m3/day

Use <u>storage sewers (CSO abatement)</u> for snow melting in snow season

2 sewers with snow melting capacity of 2,200 m3/day, 4,000 m3/day

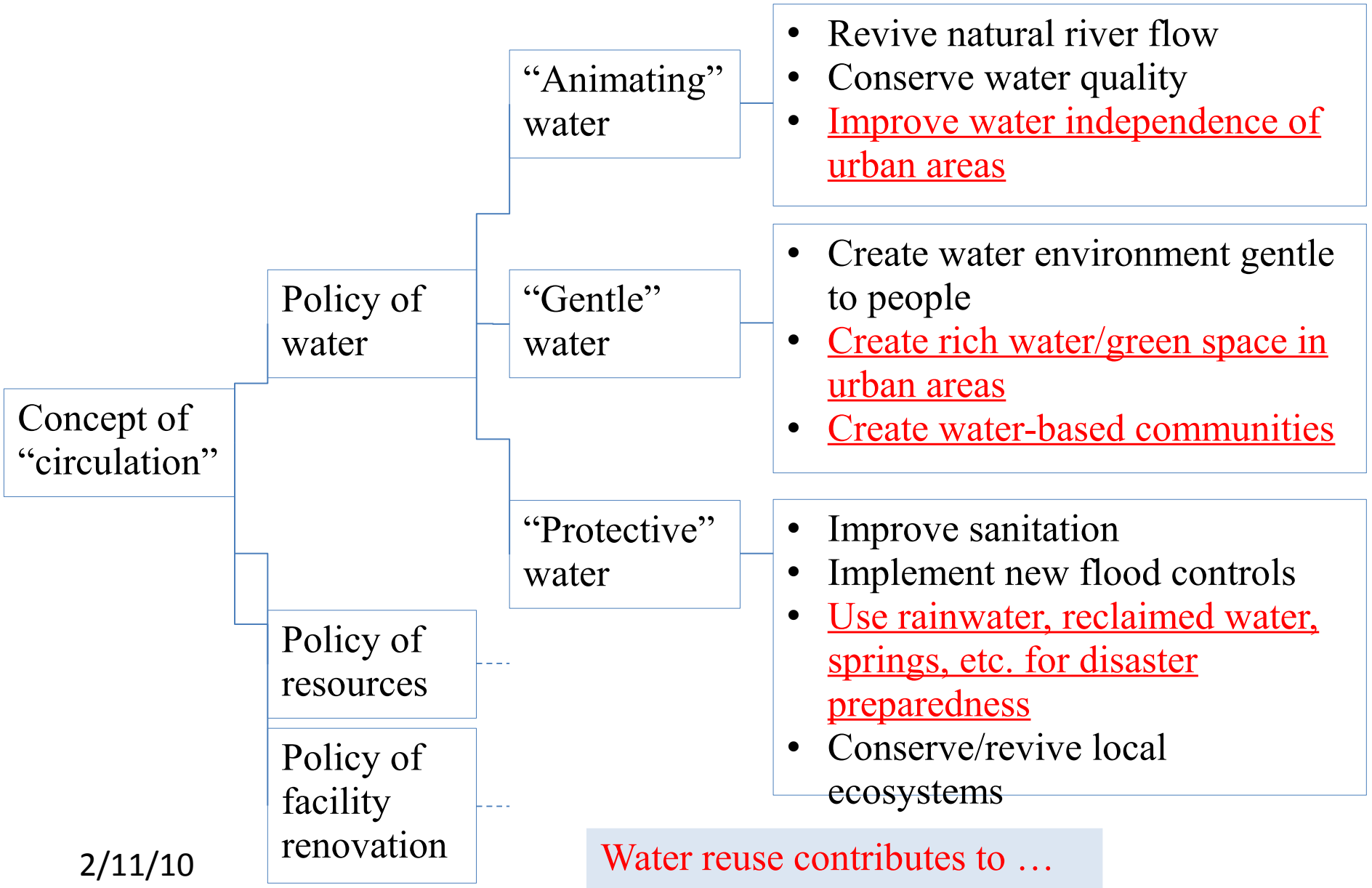
<u>Snow flowing gutters</u> along trunk roads

In 6 areas with gutters, 300,000 m3 of snow is disposed per snow season.

Advanced treatment: Sand filtration

*Institutions for promotion*

# [1] National vision




Water reuse contributes to …

# [2] Water quality criteria

| | Toilet flushing | Sprinkling in lawn/street, etc. | Landscape irrigation | Recreation |
|---|---|---|---|---|
| E.Coli | N.D./100ml | | 1,000CFU/100ml (provisional) | N.D./100ml |
| Turbidity | 2 or less (maintenace target value) | | | 2 or less |
| pH | 5.8-8.6 | | | |
| Appearance | Not unpleasant | | | |
| Colour | (Set according to users preference) | | 40 or less (set stricter according to users preference) | 10 or less (set according to users preference) |
| Odour | Not unpleasant (odour intensity set according to users preference) | | | |
| Residual chlorine | 0.1mg/l in free or 0.4mg/l in combined (maintenace target value) | | N.A. | 0.1mg/l in free or 0.4mg/l in combined (maintenace target value) |

# Important notes

*Hygienic safety*

- Requirements of water reclamation facilities
- Maintenance of residual chlorine in supply process
- Prevention of cross connection
- Prevention of accidental ingestion
- Emergency preparedness/response

*Appearance/comfortableness*

- Control of rusty water and colour/turbidity
- Control of water appearance in landscape irrigation/recreation facilities
- Control of midges in toilet flushing

*Control of facility malfunction*

- Control of corrosion/blockage in water reuse system

# [3] Local ordinances on buildings/developments

- Big buildings/developments to use reclaimed water or rainwater for toilet flushing, etc.

*Tokyo Prefecture*

Target: buildings with total floor space of 10,000m2 or more, and developments with area of 3,000m2 or more

Reclaimed water or rainwater for non-potable water use (incl. toilet flushing)

*Fukuoka City*

Target: buildings with total floor space of 5,000m2 (3,000m2 in reclaimed water provided area) or more

Reclaimed water or rainwater for toilet flushing

# [4] Subsidy for facility construction

- Specially subsidize sewerage projects taking new roles:

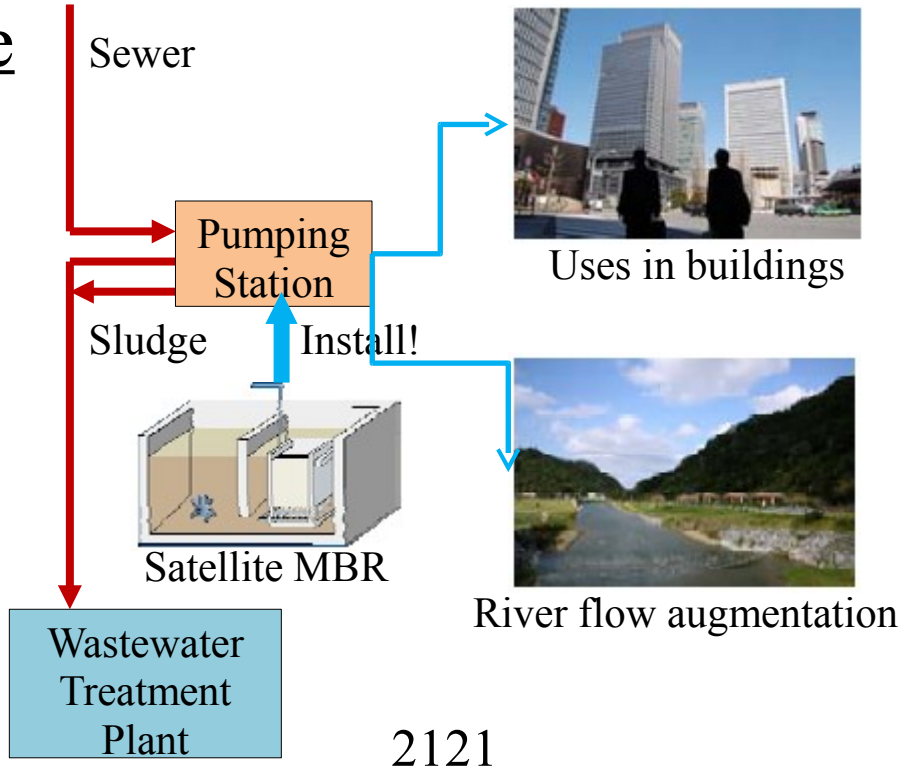
| Water environment creation | Recycle promotion (sludge/energy) | IT/new technologies propagation |
|---|---|---|

- Water reuse for sound water cycle systems

- Emergency provision of reclaimed water in drought
- Snow melting/flowing by reclaimed water
- Micro hydroelectric power generation by reclaimed water

# [5] Satellite MBR demonstration project

- Satellite system (sewer mining) is recommended in "National Vision", but practices are not common.
- MBR, space saving, is appropriate for satellite system.
- National project for Satellite MBR demonstration launched in fiscal 2009.
- Stability of reclaimed water quality, issues on maintenance, etc. surveyed in Nagoya City.



# [6] Experiment on reclaimed water export

- Import iron ore through tankers from Austria.
  Export reclaimed water through the same tanker, replacing seawater in ballast.
- Chiba/Kawasaki Cities, Japan  Western Australia
- Experiment on water quality degradation from Japan to Australia this autumn
- Export starts in fiscal 2012 earliest.
  Application: industrial use (iron ore cleaning, etc.)

*Future directions*

# I. Evaluation of water reuse in realizing sound water/material cycle systems and better cities

- Evaluate water reuse in realizing sound water/material cycle systems
- Evaluate water reuse in realizing better cities
- Promote water reuse for pollution loads reduction and global warming mitigation

# II. Info sharing and advocacy of water reuse

- Share info with other sectors to foster water reuse
  - Actively disclose info on reclaimed water
  - Share info on water availability with water providers

- Advocate social significance of water reuse
  - E.g., global warming mitigation

# III. Establishment of water quality standards and new technology evaluation methodology

- Establish water quality standards
  - For agricultural and industrial uses
  - Conduct study on hygienic safety

- Establish new technology evaluation methodology
  - E.g., membrane treatment technologies

# IV. Water reuse promotion through collaboration with private sectors, etc.

- Provide groundwork for private sectors participation
  - E.g., reclaimed water distribution network by public sectors

- Reduce cost through collaboration with other works
  - E.g., laying sewers and reclaimed water distribution pipes together

# V. Water reuse as energy

- Positively utilise thermal or potential energy of reclaimed water
  - E.g., reclaimed water distribution pipes or sewage system

*Thank you for your attention.*