

インドネシア水インフラセミナー配付資料①



# Optimal Solutions for Promoting Sewerage Projects ~ Kitakyushu's Experience & Know-how ~



30 Jan 2014  
Water and Sewer Bureau, City of Kitakyushu



## Outline of Kitakyushu

### ◆ Kitakyushu's transformation as a Green City through its environmental rebirth

1960s

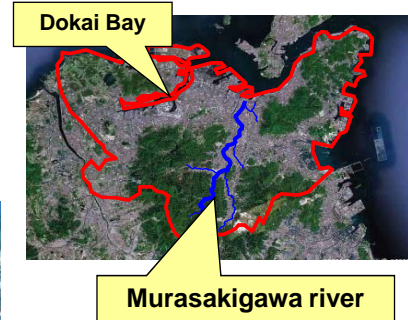
Present



Clear skies



Recovery from "Sea of Death"  
(Now home to 110 types of sea life)



#### Basic Data

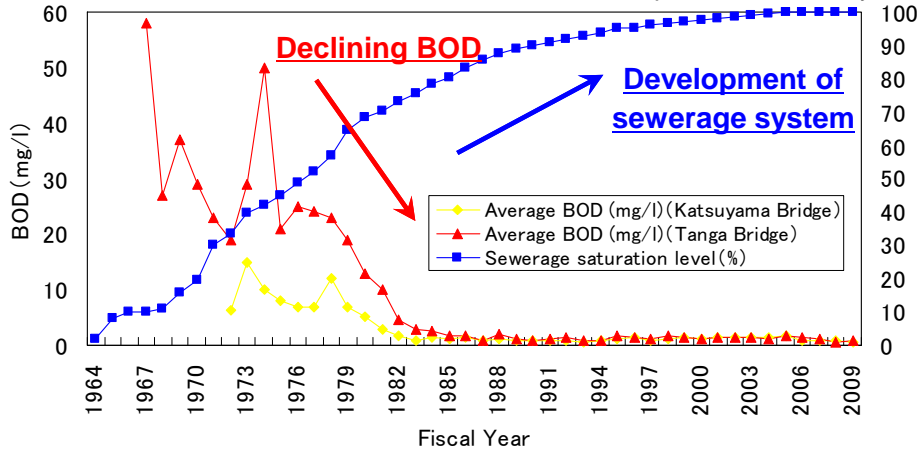
- Area: 488km<sup>2</sup>
- Population: 970,000
- Ave. Temperature: 16°C
- Ave. Rainfall: 1,600mm/year
- GDP: 3.5 trillion yen

# Improvements in Water Quality (Murasakigawa River)

◆ Dramatic environmental rebirth with more than 40 years of improvements to the sewerage system



People can swim today in Murasakigawa River



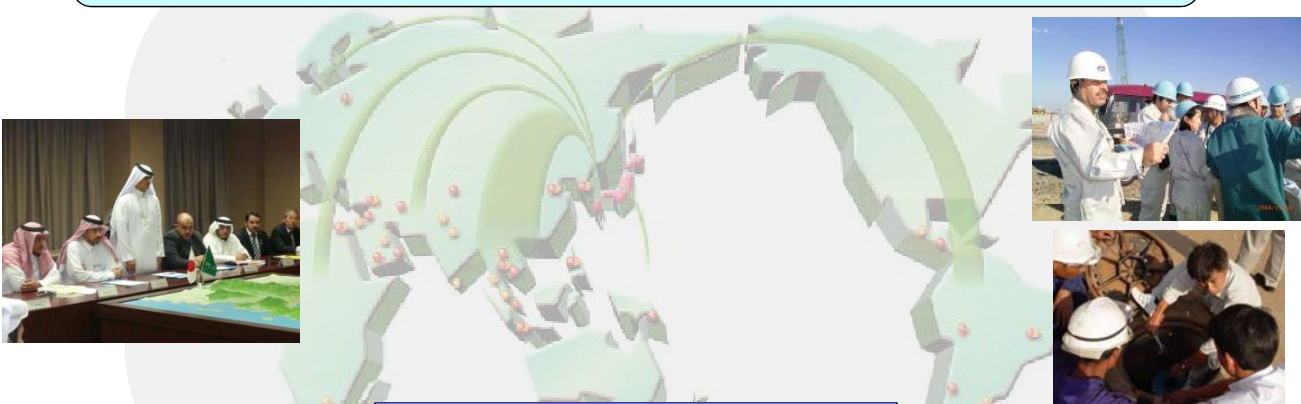
Ayu living in clear waters

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# International Environmental Cooperation (Water and Sewerage)

◆ Transfer of technology, experience and know-how acquired through the process of the city's environmental rebirth

- ◆ Experts dispatched: **159 experts to 13 countries** (FY 1990-2012)
- ◆ Visiting trainees: **~3,700 trainees from 100+ countries**



**Phnom Penh Miracle**  
(1996 ⇒ 2006)

Water supply diffusion rate: **25% ⇒ 90%**

Water supply time: **10h ⇒ 24h**

% of non-revenue water: **72% ⇒ 8%**

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## Exchange between Indonesia and Kitakyushu (Sewerage)



Formal mayors visit/Local training



Signing of MoU on eco-partner cities with Surabaya



Presentation at seminar (Jakarta)



Recommendations for sewerage system improvement plan (Surabaya)

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## International Recognition

- 1990 Received the **Global 500 Award** from **UNEP** (1<sup>st</sup> local government in Japan)
- 1992 Received **Local Governmental Honours** at the **Rio Summit** (only city in Japan)



◆ Selected as **OECD Green Growth Model City** (June 2011)



### Selected cities:

- Paris, France
- Chicago, USA
- Stockholm, Sweden
- **Kitakyushu, Japan**  
(Only city in Asia)

### OECD assessment

It is meaningful that Kitakyushu's policies can be launched at the global level.

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# Sewerage System in Kitakyushu

## 【History】

- Feb 1963 Kitakyushu formed ⇒ Sewerage system launched
- July 1963 Kogasaki STP started operations
- **Mar. 1976** 50% of population receiving sewerage services
- Mar. 2005 4,000 km of sewers constructed
- **Mar. 2006** 99.8% of population receiving sewerage services (effectively complete)

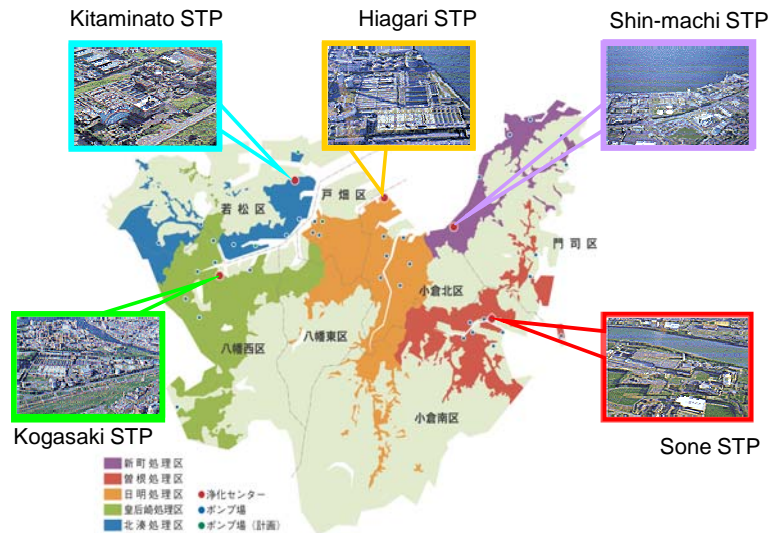
Invested  
40 years & JPY 600 billion  
(JPY 91 billion spent by the  
time coverage reached 50%)

※ Flood control achievement rate 70.3% (Mar. 2013)

## 【Sewerage Facilities】

- STP: 5  
(Capacity: 621,000 m<sup>3</sup>/day)
- Pumping stations: 34
- Pipe length: 4,428 km
 

Sewage	3,233 km
Storm water	343 km
Combined	852 km



## 【Service Area】

- 16,275 ha  
(Combined area: 3,422 ha)

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# Kitakyushu's Know-how

- ① **Flooding measures**  
⇒ Reduce flooding damage in cooperation with residents
- ② **Efficient facility improvements**  
⇒ Stepwise approach to adoption of interceptors
- ③ **Project management**  
⇒ Development of project management scheme  
(Implementation system, sewerage regulations, business management plan)
- ④ **Public awareness**  
⇒ PR activities, environmental education
- ⑤ **Development of human resources**  
⇒ Training based on practical experience

※ Potential for application in Indonesia

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# ① Flooding Measures

## <Basic Idea>

① Disaster prevention: Steady construction and improvement of infrastructure

Gov't

② Disaster reduction: Implementation of measures to mitigate damage

Gov't + Residents

## <Infrastructure improvement>



Pipeline

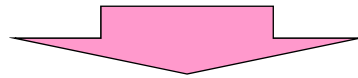


Pumping station



## <Soft Measures>

Gov't Active information sharing  
 ⇕ cooperation  
 Residents Voluntary activities



Minimize flooding damage

**※Cooperation with residents is critical**

# Cooperation with Residents

- Distribution of hazard map (Dangerous areas, evacuation sites, etc.)
  - Information released on web (Rainfall, live cameras, river levels, etc.)
  - Setting sandbags and water stop gates
  - Quick evacuation
- } Government
- } Residents

## <Good Practice in Kitakyushu>



Information sharing (hazard map, web)



Residents' activities (setting water stop gates, sand bags)



## ② Effective Facility Improvements

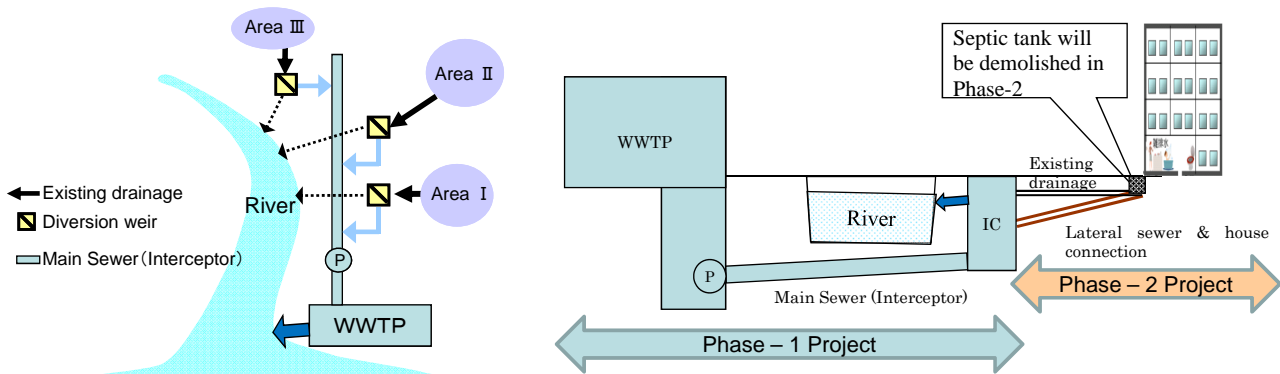
### ◆ Stepwise approach to adoption of interceptors

Phase-1: Main Sewer (Interceptor), Pumping Station & WWTP

Phase-2: Lateral Sewer & House Connection

Future : Upgrading sewerage service

Separate sewer system & sewer rehabilitation



\* Particularly effective for DKI Jakarta as it undergoes urbanization

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## Impacts of Sewage Interceptor Systems

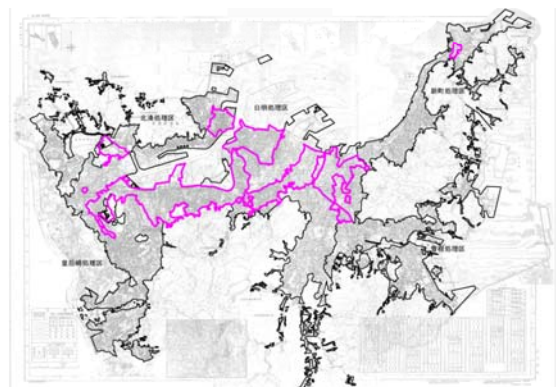
- ◆ Cost control
- ◆ Appearance of early effects of development
- ◆ Excellent workability

[Kitakyushu's Solutions]

Develop improvement plans

Practical use of existing drainage

- Connect to main sewer
- Improve existing drainage
- Maintenance



▭ : combined sewerage system area

※Kitakyushu's achievements: 3,422ha

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### ③ Project Management

#### ◆ Establish implementation system

- Organizational development according to task  
(Planning, design, supervision, O&M, management, PR)

#### ◆ Enact sewerage ordinance

- Detailed regulations based on law  
(Structural standards, wastewater standards, operating procedures, etc.)

#### ◆ Optimize business management

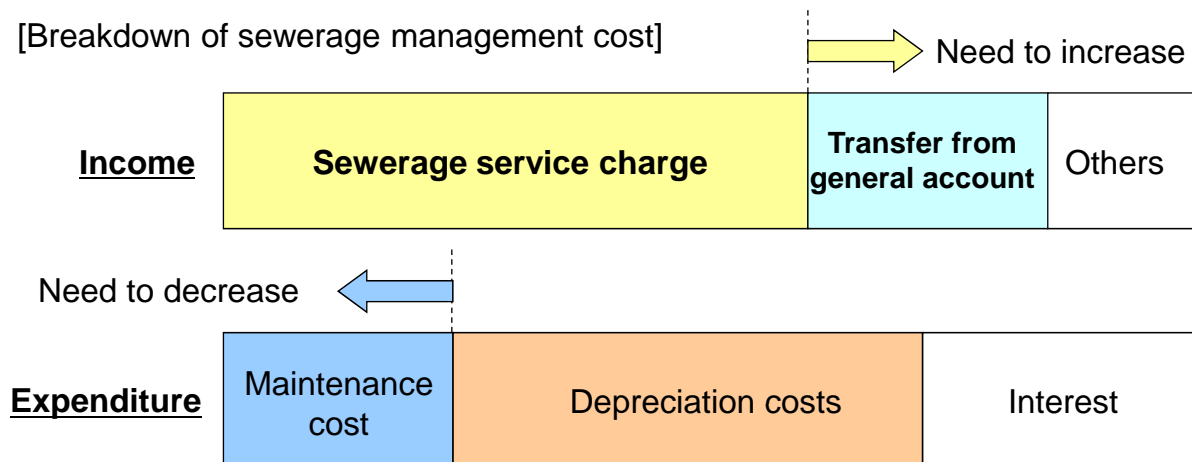
- Formulation of management plan
- Setting/collection of appropriate sewage service charge
- Reduction of costs

※Kitakyushu's track record: 50 years of stable management

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### Sound Business Management Practices

[Breakdown of sewerage management cost]



#### ◆ Sound management practices to facilitate the promotion of sewerage projects

##### ● Income increase

- Proper levies and reliable collection of sewerage service charge

##### ● Cost reduction

- Optimum facility planning
- Energy saving by devising the operation in the sewage treatment plant

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## ④ Public Awareness Techniques

- ◆ Creation of PR materials (pamphlets, web)
- ◆ Organize events
- ◆ Information sessions for residents

<Good practice in Kitakyushu>



Organization of events



PR pamphlet



Information sessions for residents



Environmental education for children

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## ⑤ Training in Kitakyushu

### ◆ Diverse training menu

<Features>

- Comprehensive coverage of sewage works
  - ⇒ Planning, design, O&M, business management, public awareness, etc.
- Curriculum developed according to needs
  - ⇒ Designed considering position/rank, knowledge level, training period, etc.
- Importance attached to practicality
  - ⇒ Transfer of Kitakyushu's know-how that can be immediately useful

<Lectures>



<Site Visits>



<Actual Practice>



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# Fundamental Training Menu in Kitakyushu

Category	Main theme	Target	Term (weeks)	Main purpose
Basic training	Outline	Beginner	2	Understand general framework of sewage works
Practical training	Maintenance	Practitioner	4	Improve O&M efficiency
	Design		4	Understand facility design techniques
	Business management		2	Optimize project management
Inspection training	Expand knowledge	Managers	2-3	Understand state of sewerage systems in Japan, apply to home country

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## Site Visits ①: Sewage Treatment Plants

### Energy savings & energy creation at STP

**Kitakyushu City Hiagari Sewage Treatment Plant**



**Biogas power generation**

Annual energy production:  
1,106 thousand kwh  
CO<sub>2</sub> reduction: 426 tons



**Sludge fuelization (future)**  
(use as substitution for coal fuel)

CO<sub>2</sub> reduction as the entire project  
11,200 tons




**Small hydroelectric generation**

Annual energy production:  
8 thousand kwh  
CO<sub>2</sub> reduction: 3 tons



**Solar energy generation**  
[1<sup>st</sup> -4<sup>th</sup> Series]

Annual energy production:  
252 thousand kwh  
CO<sub>2</sub> reduction: 97 tons



**Micro wind power generation**

Annual energy production :  
6 thousand kwh  
CO<sub>2</sub> reduction : 2 tons



**Use of LED light**

Annual energy reduction:  
147 thousand kwh  
CO<sub>2</sub> reduction: 56 tons



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# Site Visits ②: Environmental Facilities

## ◆ Reducing CO<sub>2</sub> emissions under “Future City” Kitakyushu Initiative

### Kitakyushu Eco-Town

Automobile recycling

Home appliance recycling

OA equipment recycling

Fluorescent lighting recycling

### Showcase of an Advanced Water Recycling System

Test Bed

PILOT PLANT AREA

MBR SEWAGE TREATMENT

MBR

WATER PLAZA KITAKYUSHU

UF+RO MEMBRANE

Seawater Desalination System

### Local Energy Management

Smart Buildings

Smart Factories

Large-scale Batteries

Power Generation through New Energy Sources

Next-generation SS

Smart Houses

Smart Community Center

Rent-a-Cycle Station

Data Center

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# Site Visits ③: Other Cities

## WES Hub

*Water and Environment Solution Hub*

**MLIT**  
Ministry of Land, Infrastructure, Transport and Tourism

Organizer of the Initiative

**JSC**  
Japan Sanitation Consortium  
To solve sanitation issues in the Asia-Pacific

Knowledge Hub of the APWF and Central Contact point

### AAA: Alliance Advanced Agency

Japan Sewage Works Agency

Kobe City

Kitakyushu City

Fukuoka City

Osaka City

Yokohama City

Saitama Prefecture

Tokyo Metropolitan

Kawasaki City



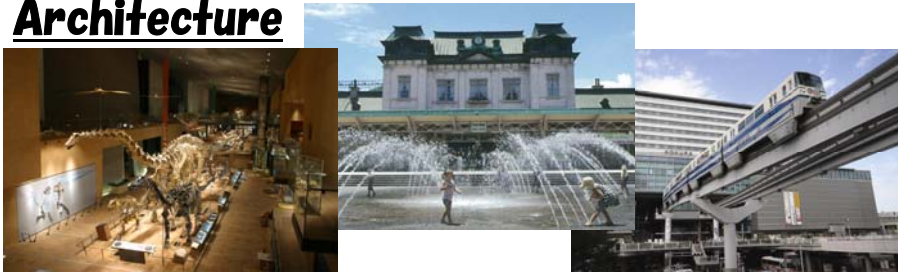
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# Welcome to Kitakyushu

## Nature



## Architecture



## Food



## Festival



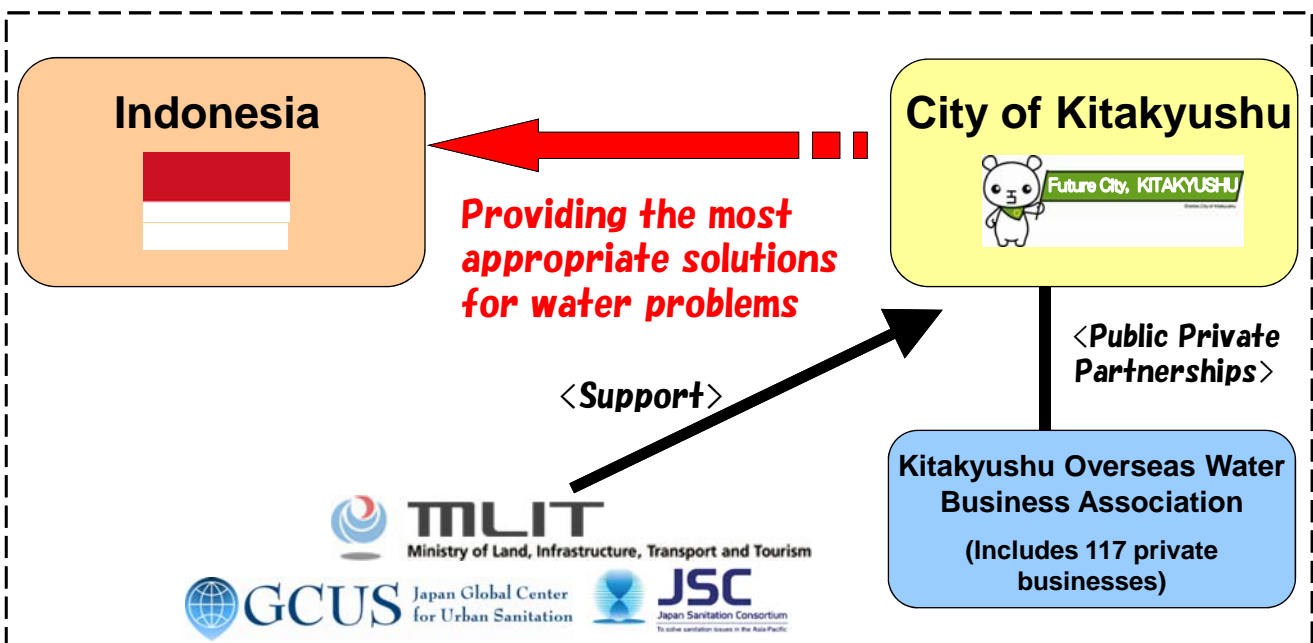
## JICA KYUSHU Training Center



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# Kitakyushu's Actions

Kitakyushu satisfies diverse needs related to water with the cooperation of private businesses and the support of the national government.



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**Thank you for your attention!**

Kitakyushu's  
experience and know-how on  
sewerage management can be  
applicable to Indonesia.



**Future City, KITAKYUSHU**

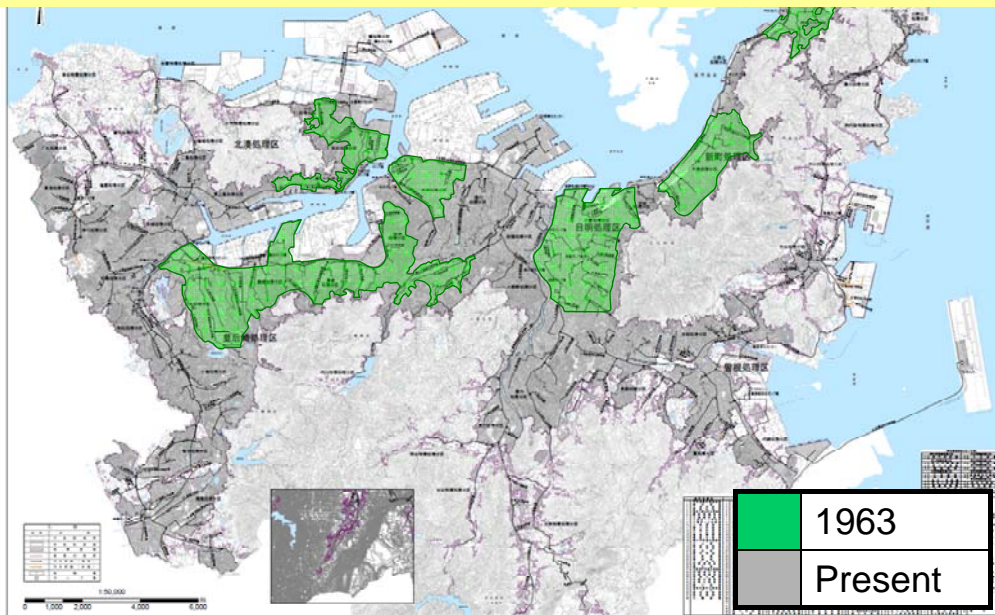
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<http://www.city.kitakyushu.lg.jp/>



# Reference

# Development of Sewerage Service Area



1970



2000s



Development of Hiagari Sewerage Treatment Plant

# Development of Kitakyushu's Sewerage System

● Kitakyushu's sewerage system: Construction started in 1963

(Priority roles) {

- Storm water drainage
- Flush toilet

City Center

Transition from pit latrines to flush toilets with move to modern lifestyles

Combined sewerage system started in city center where sewerage services were urgently required. The reasons for this are as follows:

- Lower cost than constructing separate sewers
- Difficult to construct due to traffic congestion & limited pipe space
- Private sewers are combined sewers

Residential Area

Separate sewerage system constructed because:

- Storm water drainage systems were mostly in place
- Collaboration could be carried out with housing development projects

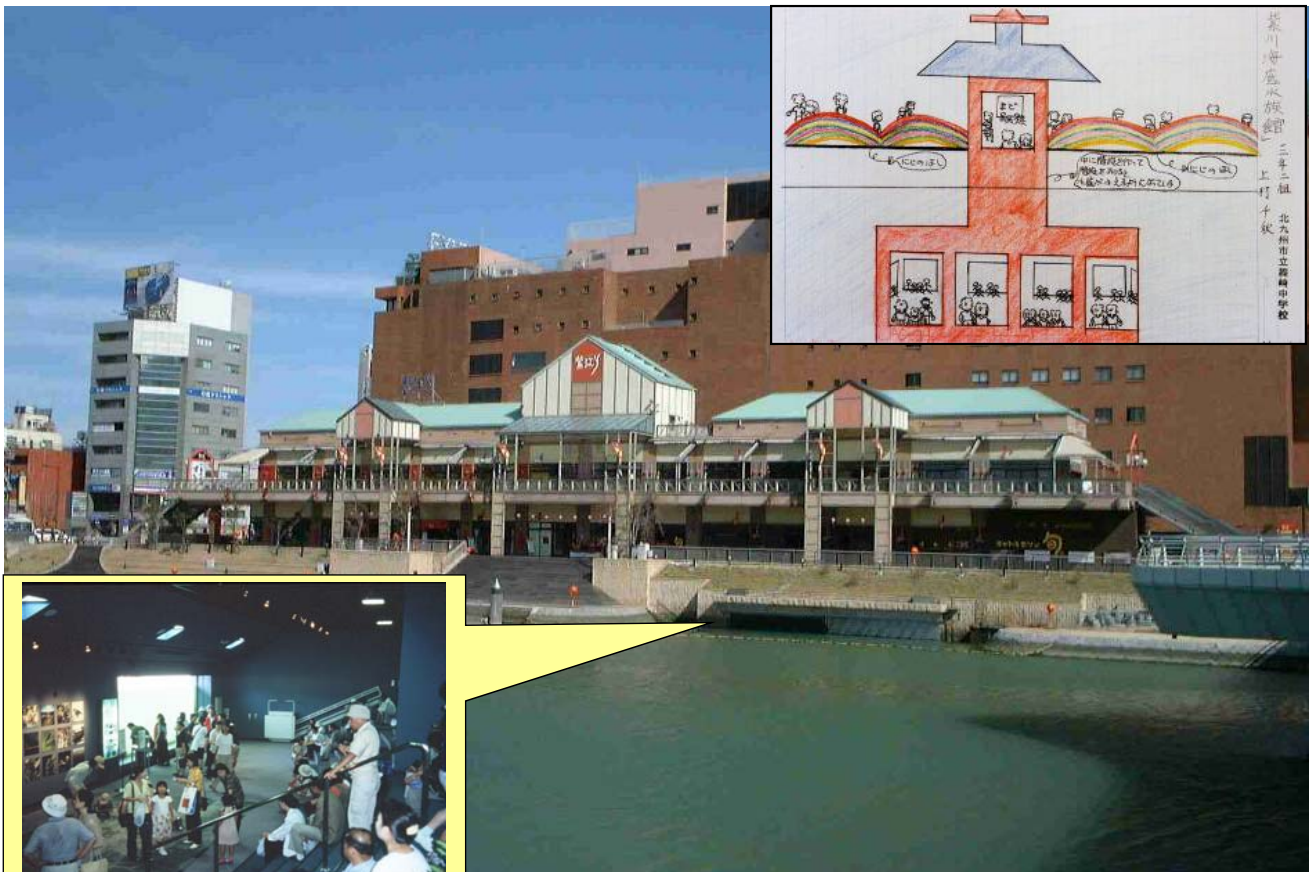


Consequently, Kitakyushu was able to smoothly and successfully construct the city's sewerage system

# Results of City Development: Murasakigawa River Today



# Environmental Museum of Water



## Environmental Museum of Water



## Change in Water of Murasakigawa River





# Hitachi's Sewage Treatment Technologies

30<sup>th</sup> January, 2014  
Hitachi, Ltd.

# Selamat datang ke Jepang !!



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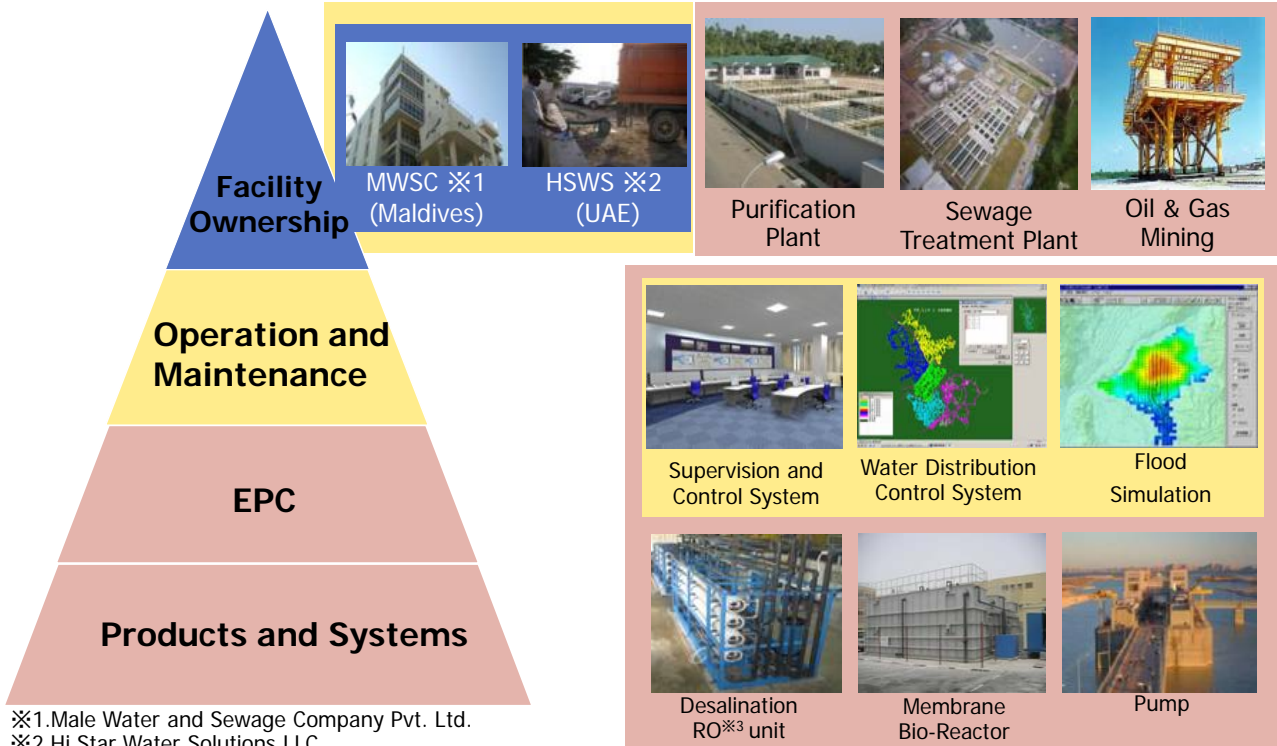
- 1. Introduction of Hitachi, Ltd.**
- 2. Solution of Hitachi, Ltd.**
  - a. Membrane Bio-Reactor**
  - b. Decentralized Wastewater Treatment Plant**
  - c. Injection of treated sewage**
  - d. Remix Water**

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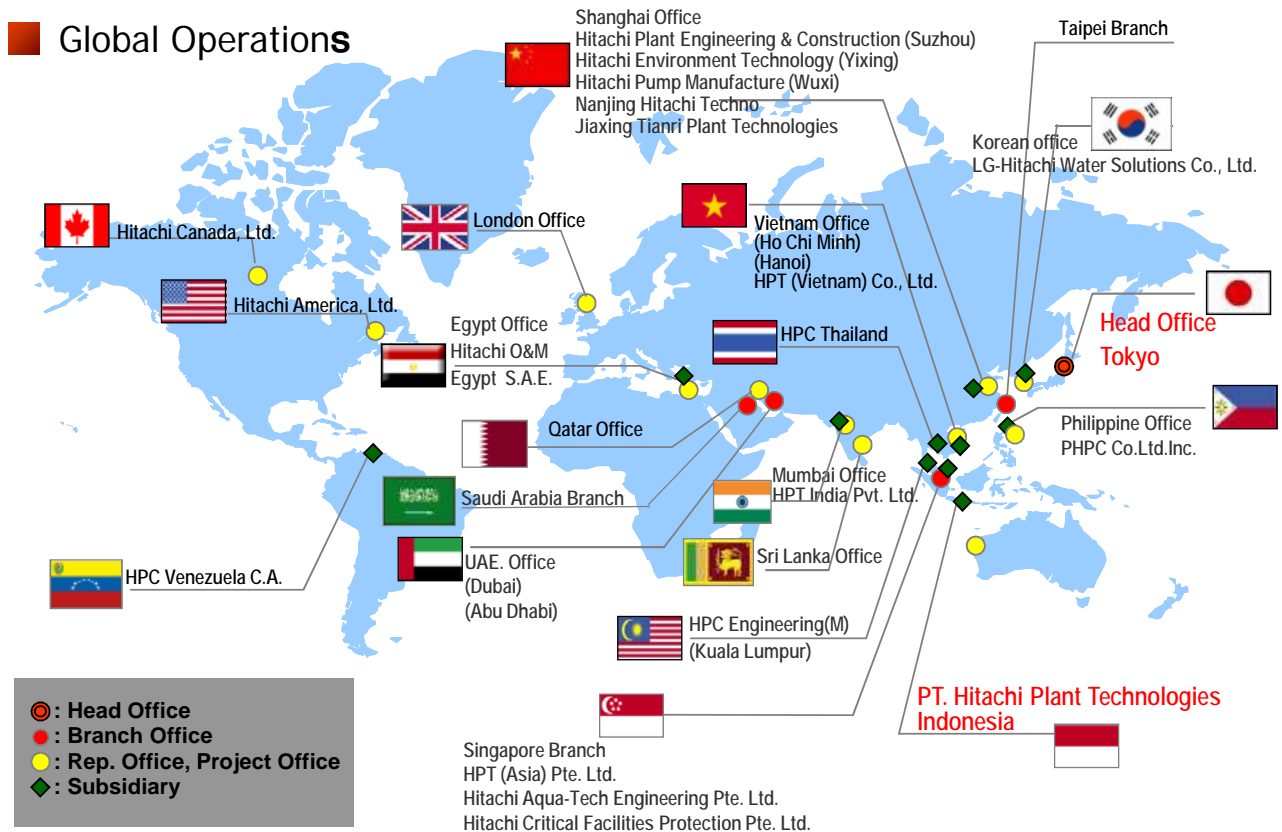
# 1.1. Hitachi's Water Business

## From Equipment and EPC to Business Operation



※1. Male Water and Sewage Company Pvt. Ltd.  
 ※2. Hi Star Water Solutions LLC  
 ※3. RO: Reverse Osmosis

# 1.2. Global Operation of Hitachi, Ltd.



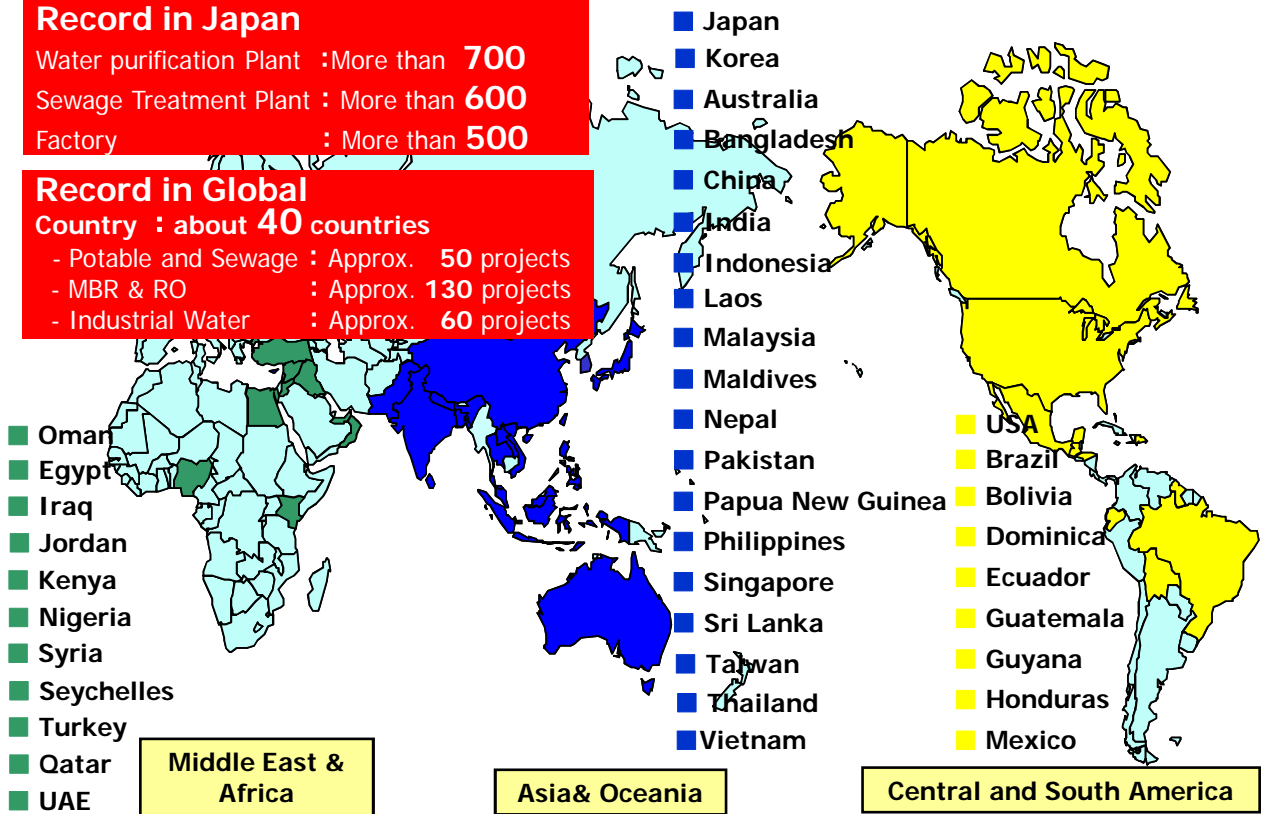
# 1.3. Track Record of Water Business

## Record in Japan

Water purification Plant : More than **700**  
 Sewage Treatment Plant : More than **600**  
 Factory : More than **500**

## Record in Global

Country : about **40** countries  
 - Potable and Sewage : Approx. **50** projects  
 - MBR & RO : Approx. **130** projects  
 - Industrial Water : Approx. **60** projects



# 1.4. Track Record of Large Sewage Treatment Plant

## Malaysia Project

Modernization of Five (5) Sewage Treatment

Plant Name	Population (person)	Capacity (m <sup>3</sup> /day)
1) Bunus	352,000	87,000
2) Pantai	377,000	93,000
3) Bandar Tun Razak	100,000	25,000
4) Puchong	150,000	37,000
5) Southern Klang Valley	24,000	5,400
<b>Total</b>	<b>1,003,000</b>	<b>247,400</b>

### 1) Bunus STP



#### <Before Construction>

- Population : 85,000  
 - Capacity : 19,000 m<sup>3</sup>/day  
 - Process : Oxidation pond



#### <After Construction>

- Population : 352,000  
 - Capacity : 87,000 m<sup>3</sup>/day  
 - Process : Conventional Activated Sludge Process



# 1.4. Track Record of Large Sewage Treatment Plant

2) Pantai STP



3) Puchong STP



4) Bandar Tun Razak STP



5) Southern Klang Valley STP



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# Problems in Indonesia and our solution

## Problems in Indonesia

- **Limited space for sewage treatment plant**
- **Ground subsidence**
- **High OPEX of desalination plant**

## Solution of Hitachi

- **Membrane Bio-Reactor (MBR)**  
Approx. 40~50% of standard activated sludge process
- **Decentralized small sewage treatment plants**  
Compact MBR unit can contribute to decentralization
- **Injection of treated sewage into underground**  
Wastewater treated by MBR is high quality and can be injected into underground
- **Remix water**  
Energy-saving and low OPEX desalination technology

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## Contents

### 1. Introduction of Hitachi, Ltd.

### 2. Solution of Hitachi, Ltd.

- a. Membrane Bio-Reactor
- b. Decentralized Wastewater Treatment Plant
- c. Injection of treated sewage
- d. Remix Water

### a.1. Outline of Membrane Bio-Reactor

## Outline of Membrane Bio-Reactor Process

Membrane  
Filtration Process

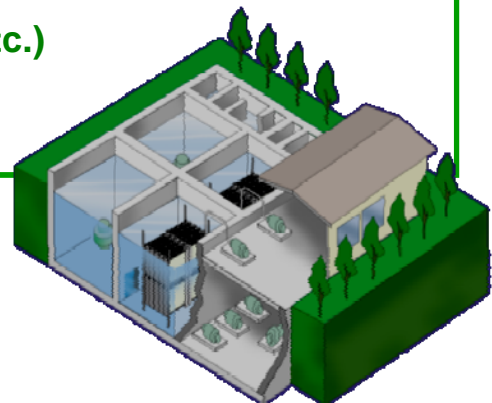
+

Activated Sludge  
Process

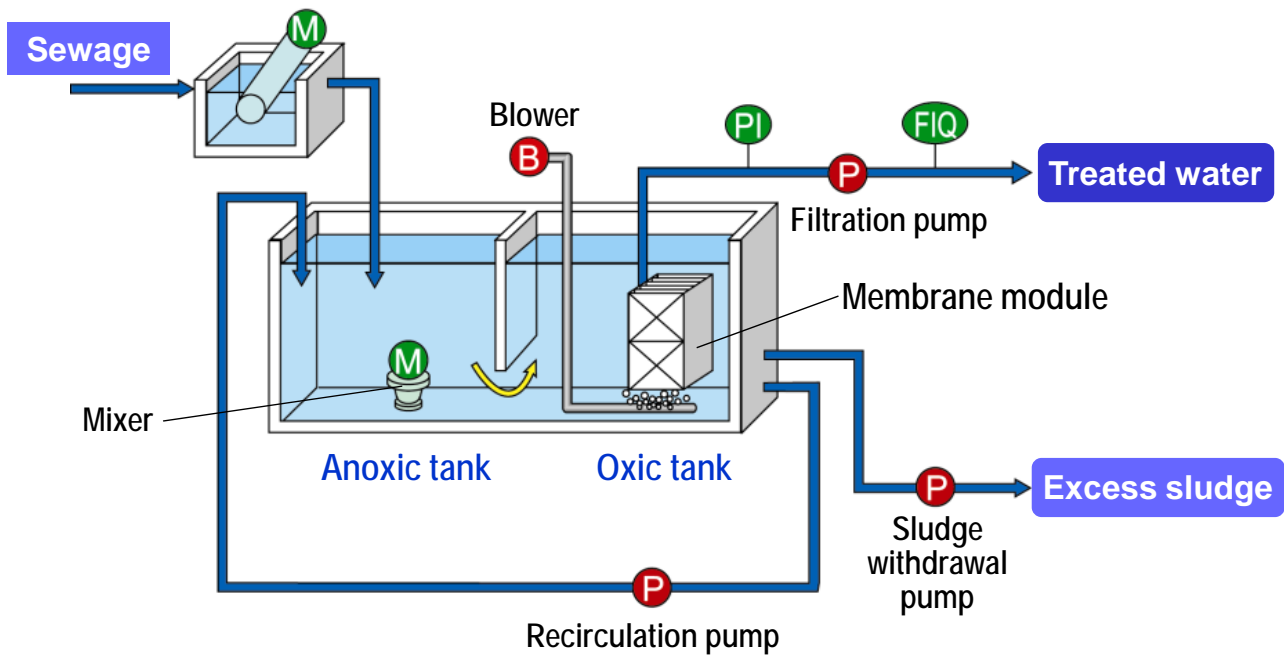


## The next generation type sewage treatment system

- Space saving
- High water quality (Reuse for Irrigation, etc.)
- Advanced treatment (N, P removal)
- Easy process control

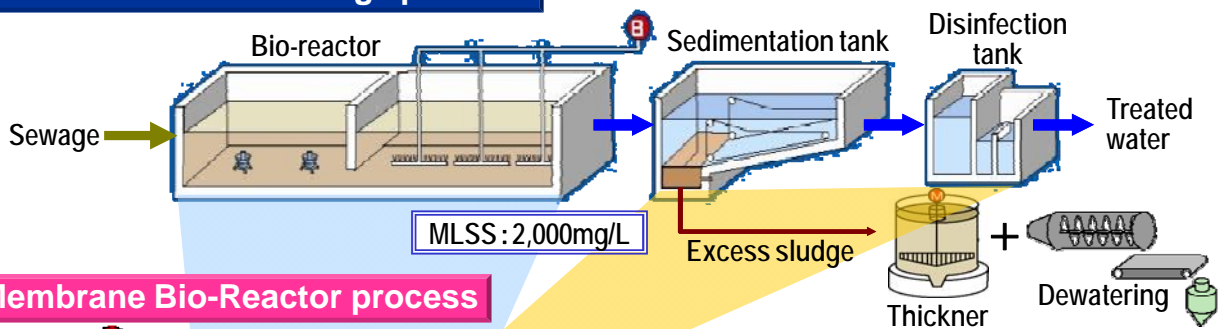


## General Flow Diagram of MBR

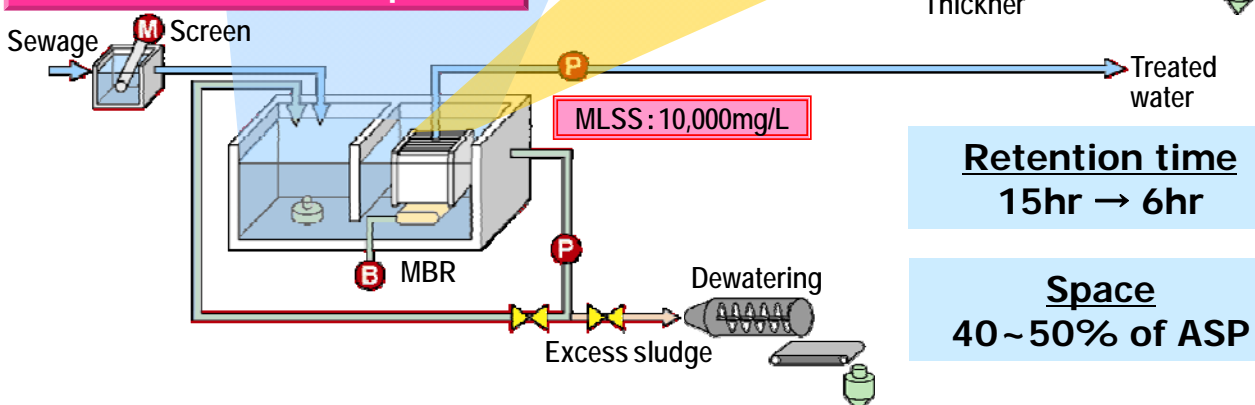


## Advantage: Space Saving

### Standard activated sludge process



### Membrane Bio-Reactor process



**Retention time**  
15hr → 6hr

**Space**  
40~50% of ASP

## Burj Khalifa Water Recycle System in UAE (3,000m<sup>3</sup>/day) EPC and O&M for 3 years



### Application

- Spray Pond (Max height: 150m)
- For cooling tower

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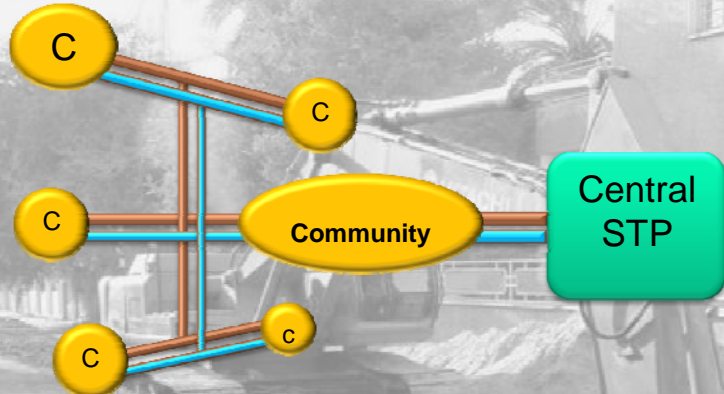
### 1. Introduction of Hitachi, Ltd.

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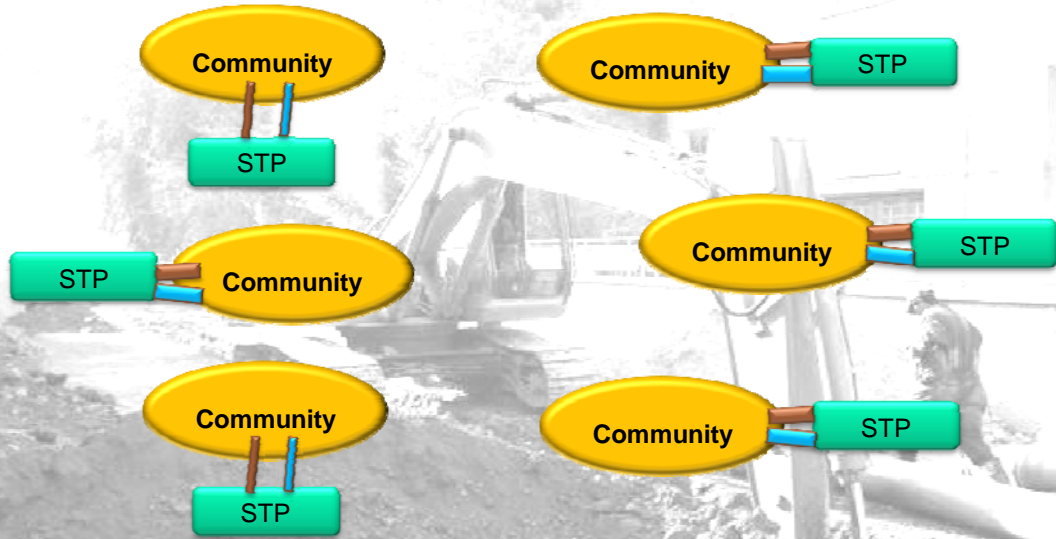
## b.1. Disadvantage of Central Sewage Treatment Plant



Disadvantage of central treatment plant

- STP can not starts before construction of network
- High CAPEX of constructing network
- Leakage in the network may cause environmental damage

## b.2. Advantage of Decentralization – small cluster STPs



Advantage of decentralization

- Fast start up of the STPs
- Very low CAPEX of constructing network
- No leakage in network and no environmental damage

### More than 50 contracts in the world



HASRE, Dubai,UAE (500m<sup>3</sup>/d × 2)



HASRE, Dubai,UAE (500m<sup>3</sup>/d × 5)



ACC, Dubai,UAE (250m<sup>3</sup>/d)



Dubai,UAE (250m<sup>3</sup>/d)

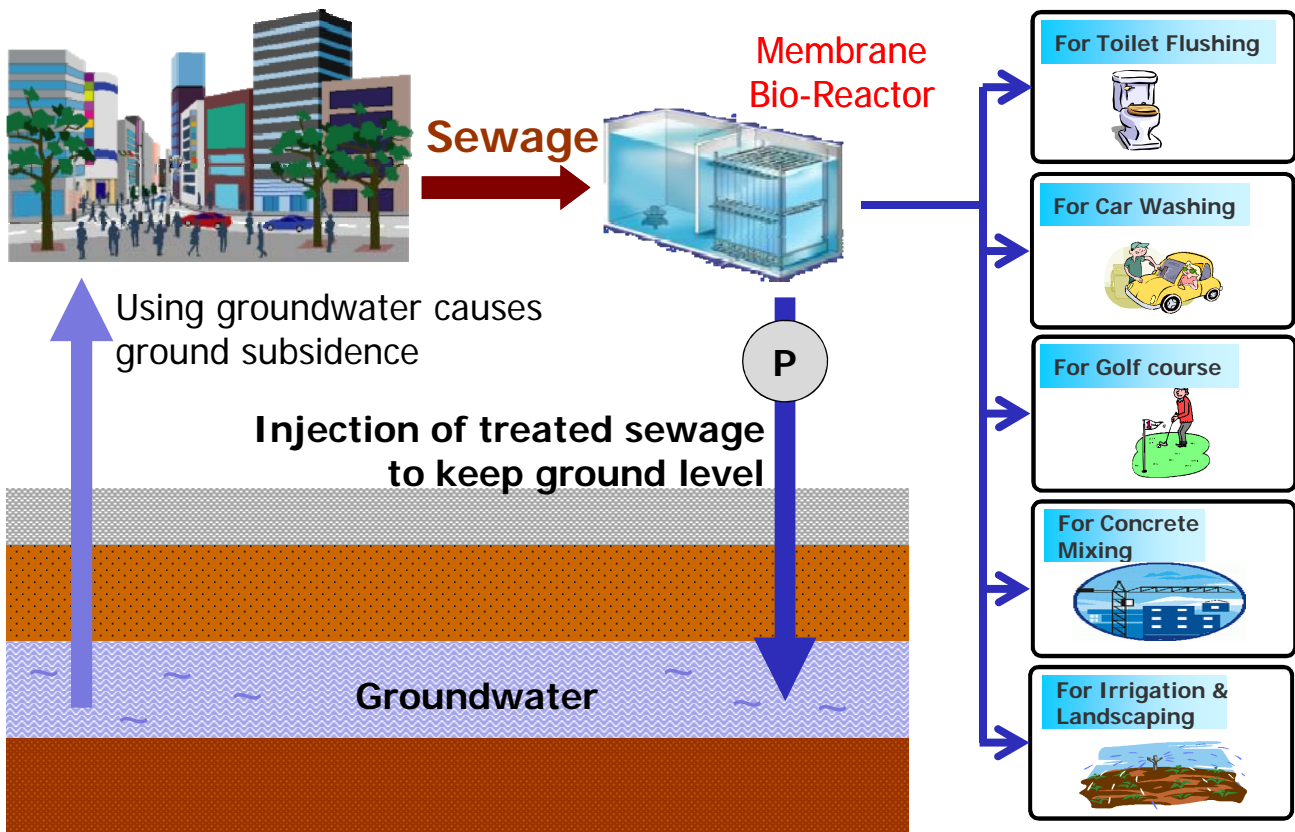
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## d.1. Disadvantage of conventional desalination plant

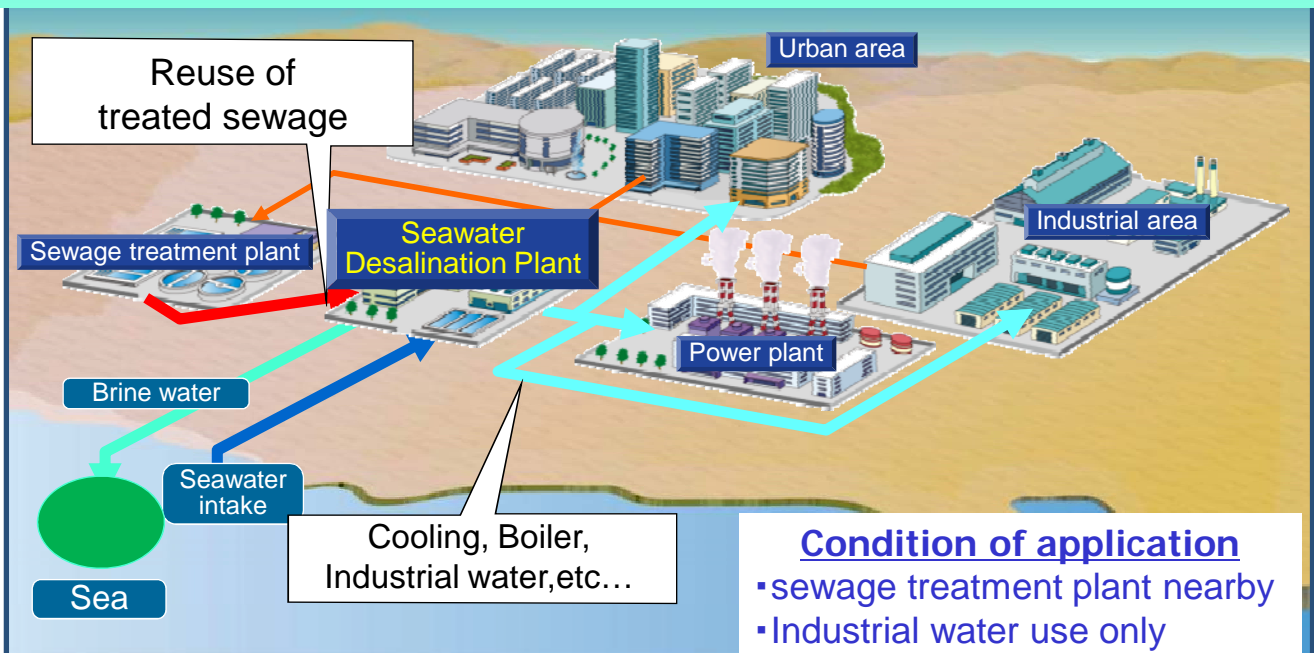
### Conventional desalination plant have two demerits

1. High OPEX (especially electricity cost)
2. Salinity of brine causes environment damage in sea water

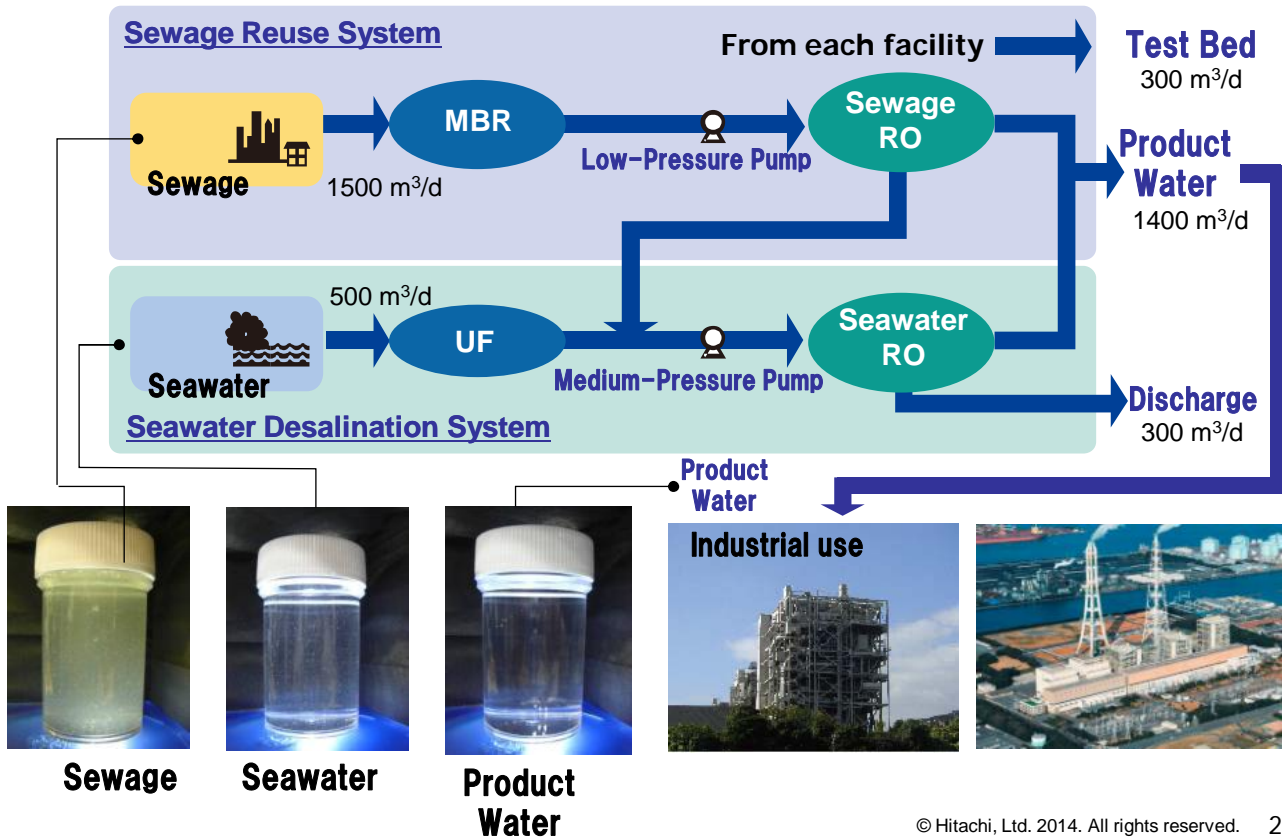


## d.2. Outline of Remix Water

Integrated system of seawater desalination and sewage-reuse



### d.3. Outline of Remix Water (How to reduce OPEX?)



### d.4. Advantage of Remix Water

Lower  
OPEX

40% reduction of OPEX compared with conventional desalination plant

Lower  
CAPEX

- Smaller intake facility
- Smaller pressure pump

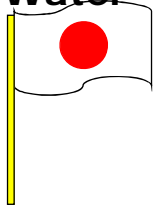
Eco-  
friendly

Salinity of brine from Remix Water is equals to sea water level


High  
reliability

Two years operation experience in Kitakyusyu, Japan

Water




**Project funded by Japanese government**

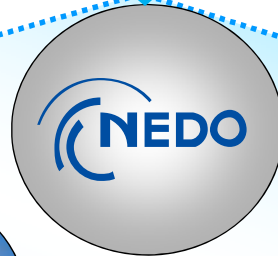
 Ministry of Economy,  
Trade and Industry

**Government**

Concession

 **NEDO**  
New energy and industrial technology  
development organization

 **GWSTA**  
Global Water Recycling and Reuse Solution  
Technology Research Association



**Government**




  
北九州市  
Kitakyusyu  
-city

**Local Government**





**Private Companies**

Conducted verification test project by **public-private partnerships**

**Terima kasih !!**



**Thank you very much!!**

**Please feel free to contact us**

**HITACHI**  
Inspire the Next

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