

Brief introduction of the performance testing method for a decentralized domestic wastewater treatment plant "Johkasou" in Japan

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Johkasou

○ The Building Standards Act

Johkasou must be installed when domestic wastewater is not discharged to public sewerage.

○ What is Johkasou?

1. Wastewater treatment facilities which are produced according to the structure standard enacted by Minister of Land, Infrastructure and Transport.
2. Wastewater treatment facilities which are **certified by Minister of Land, Infrastructure and Transport.**



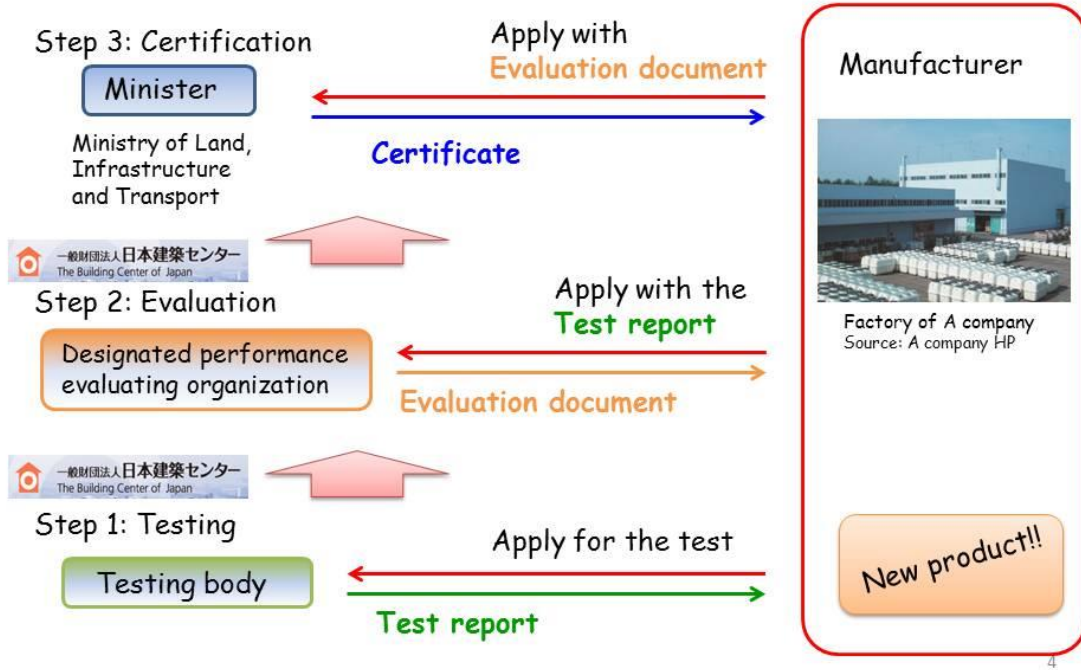
Johkasou certified by Minister

Various distinctive Johkasou can be developed to meet market needs such as compact, low-cost, and advanced treatment.

Johkasou certified by Minister has been a staple in a market in the last decade.

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Procedure to get certificate for a new product



4

Brief introduction of Step 1: Testing

Two types of testing methods

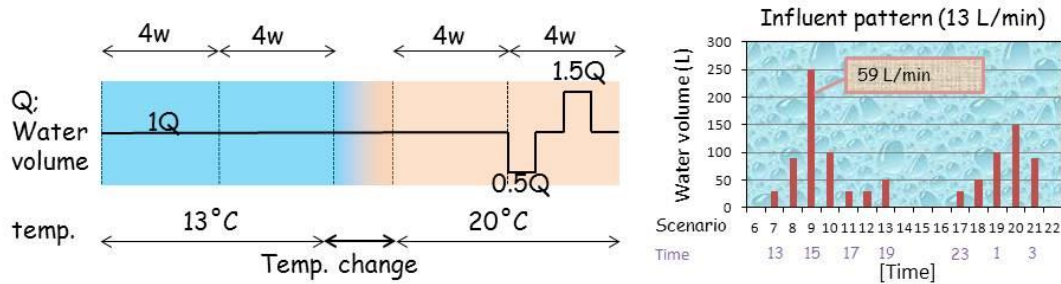
	Water and room temperature	Duration of the test
Field test	No-control in the field or simple building (13-25°C)	48 weeks including winter season
Temperature-controlled short term test	Controlled at 13°C or 20°C inside the building	Minimum 8 weeks with two test products Minimum 16 weeks with one test product

BCJ implements temperature-controlled short term test in our research laboratory.

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Brief introduction of Step 1: Testing

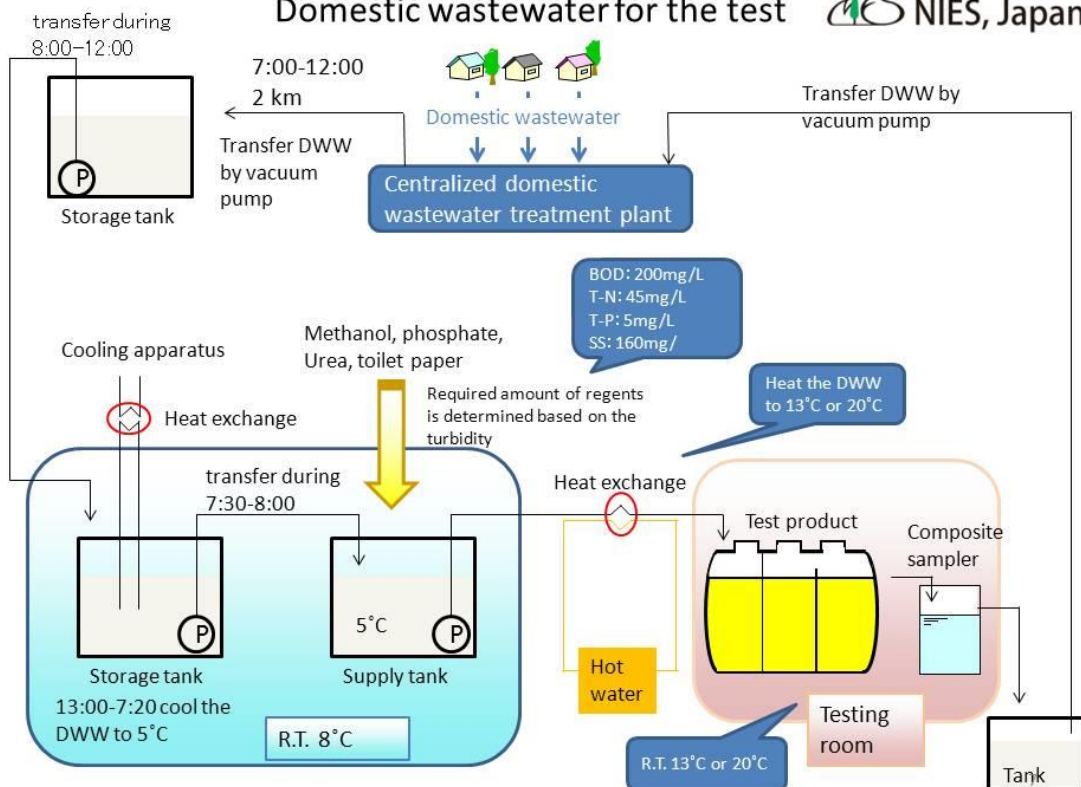
An outline of the temperature controlled short term test with one test product (for 5 PE, 1,000 L/day)



- Frequency of water analysis
 - once a week for 16 weeks
- Acceptability criteria
 - meet target water quality over 75% (12 times)

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Domestic wastewater for the test



Influent and effluent water quality

○ Average influent water quality

	pH	BOD (mg/L)	COD (mg/L)	SS (mg/L)	T-N (mg/L)	T-P (mg/L)
Min	5.8	180	90	145	40	4
Max	8.6	220	110	175	50	6

○ Target water quality which is declared by applicant

	BOD (mg/L)	COD (mg/L)	SS(mg/L)	T-N (mg/L)	T-P (mg/L)
Example 1	20	-	-	-	-
Example 2	20	30	20	20	-
Example 3	10	20	10	10	1

Common evaluation items

pH: 5.8-8.6, Coliform group: less than 3,000 N/mL

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Challenges in Southeast Asia

Sustainable Development Goals



Goal 6.3
Halving the proportion of untreated wastewater by 2030

MDGs
Sanitary issues

- Open defecation
- Bucket/container
- Pit latrine without slab
- Shared
- No tank/sewer pipe

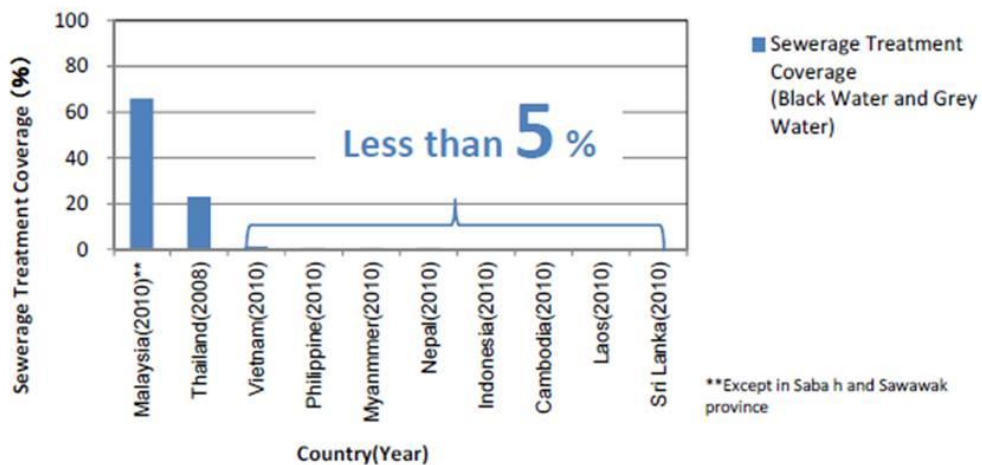


SDGs
Environmental issues

- Primary treatment
- Secondary treatment
- Tertiary treatment

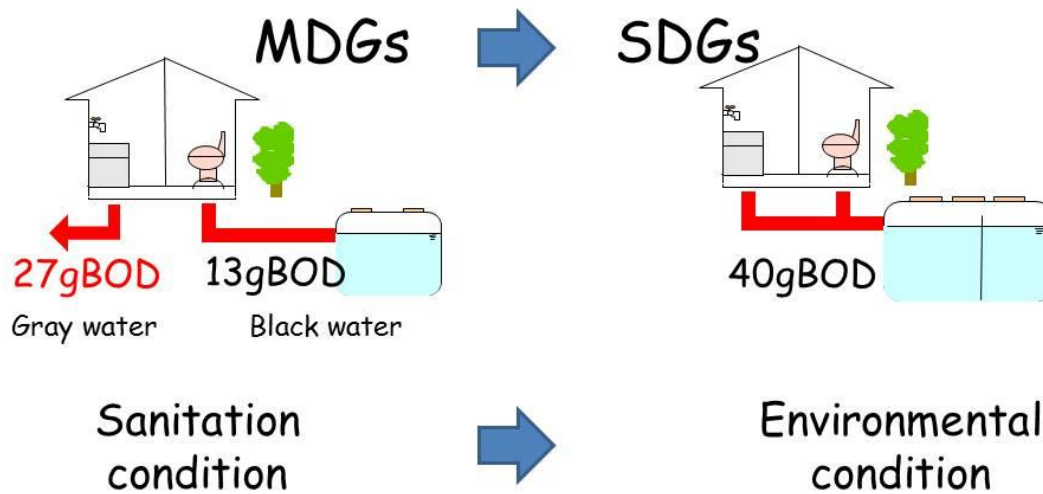


Coverage of centralized sewerage treatment systems



Decentralized treatment systems!!

Decentralized treatment facilities in Southeast Asia



Regulation

- Ministry of Environment and Forestry has issued new effluent standard for domestic wastewater (2016).
- This new and **stringent regulation for domestic wastewater is a major step forward** to improve water environment.

Parameters	Unit	Old Regulation	New Regulation
pH	-	6-9	6-9
BOD	mg/L	100	30
COD	mg/L	-	100
TSS	mg/L	100	30
Oil and Grease	mg/L	10	5
Ammonia	mg/L	-	10
Total Coliform	N/100 mL	-	3,000
Discharge	L/person/day	-	100

The Stakeholders Meeting in Indonesia

To tackle this urgent problem, we have launched "the Stakeholders Meeting on domestic wastewater treatment" in 2015.

Central gov.



Industry-Academia-Government Collaboration

Manufacturers



Univ.



Local gov.



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Summary of discussion

- **We need more manufacturers** to distribute domestic wastewater facilities in all Indonesia.
- However, it's easy to make a profit if they produce **poor performance and/or weak tanks**.



To eliminate low quality treatment facilities from the market



Performance testing method and Reliable certification system are required!!

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Significance of this study for the Workshop

Summary

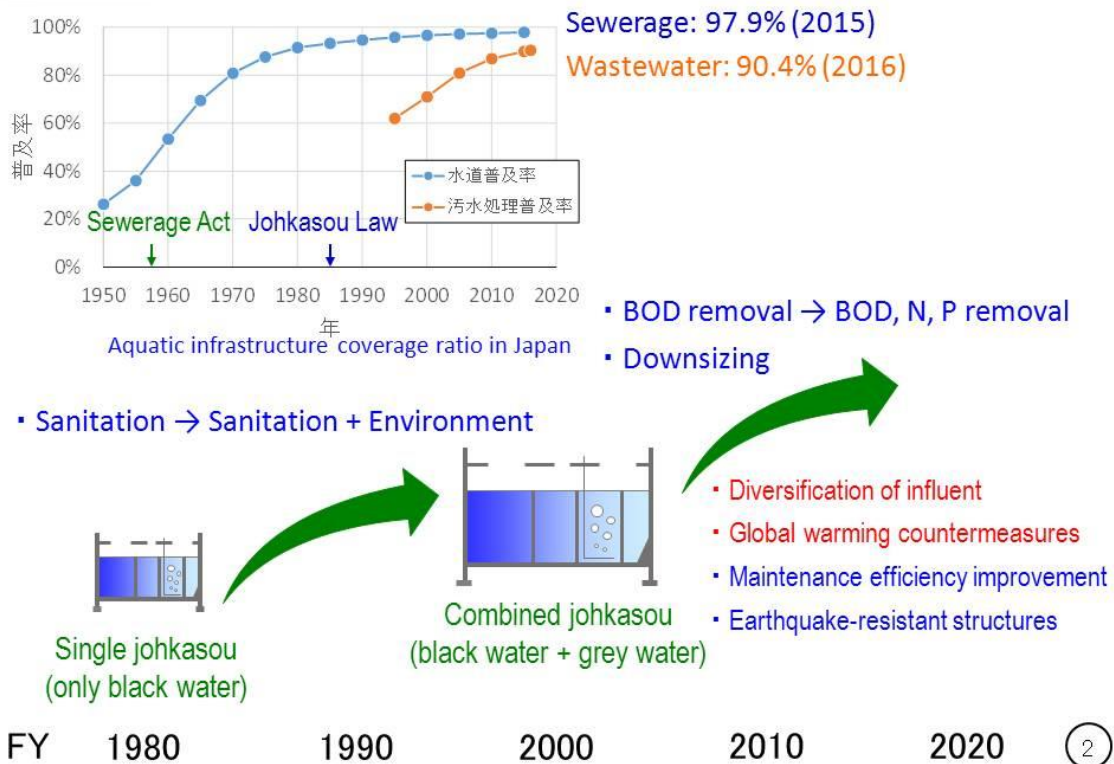
1. Proposal for treatment process for low-volume, high-load effluent
2. Proposal for means of greenhouse gas emissions reduction



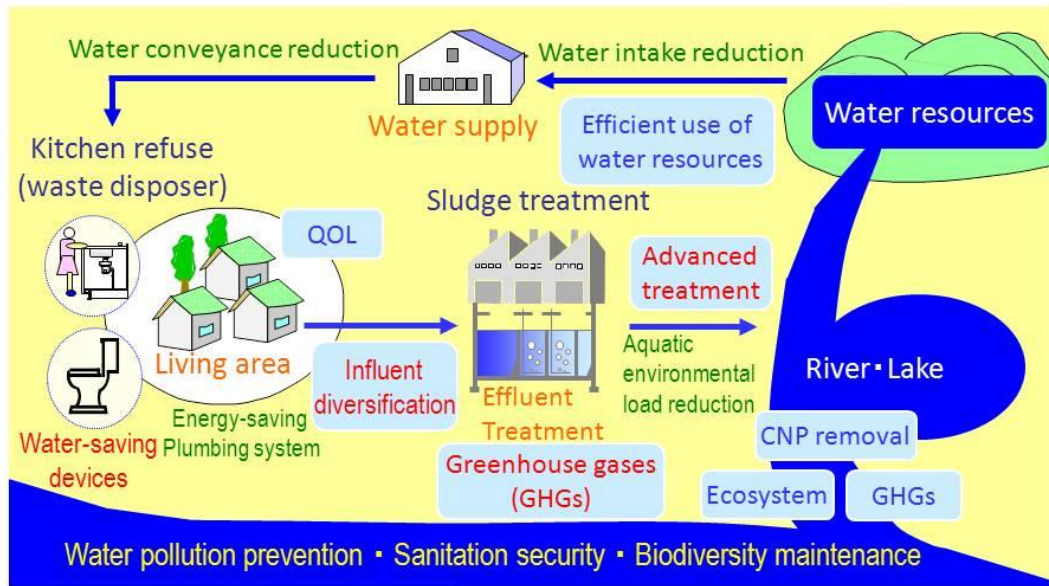
Objectives

1. Contribution to “halving the proportion of untreated wastewater” in the SDGs
2. Contribution to “the mitigation of greenhouse gas emissions” in The Paris Agreement (COP21)

Transition of johkasou development goals



The system to minimize environmental loads in the water cycle



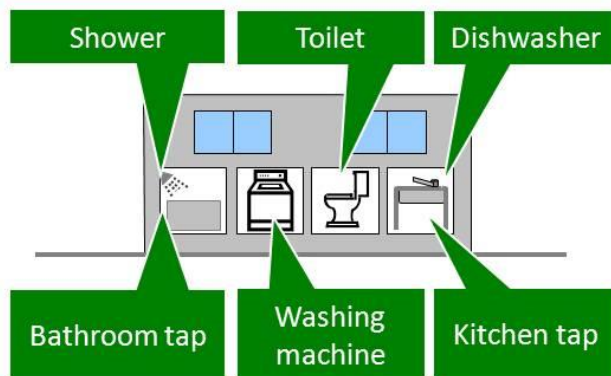
Build the system to minimize environmental loads in the water cycle

3

Water resources security, Carbon reduction, Promotion of water-saving devices available in emergencies

- Efficient use of water resources, Carbon reduction, Promotion of water-saving devices for water use in emergencies

Maintenance · Improvement of QOL (Quality of Life)



Water-saving devices for ordinary homes (example)

Low-flush toilets

Sanitation security }
Toilet cleaning } Functionality
Waste conveyance }

Other water-saving devices (shower)

Hot water saving }
Energy-saving devices } Functionality
Carbon reduction }

Correlation coefficient of greenhouse gas emissions with water consumption

0.20 kg-CO₂ m⁻³-water

Water-saving devices contribute to efficient use of water resources, reduce carbon, enable use of water in emergencies

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Aquatic environmental load discharge and greenhouse gas emissions

Aquatic environmental load discharge

$$= \text{Water quality} \times \text{Water volume}$$

Advanced treatment



This study

Advanced treatment reduces effluent concentration, requires heavier facility (higher blower capacity)

Reduces aquatic environmental load discharge without heavier facility

Energy consumption rises^{3)~5)}
Greenhouse gas emissions increase

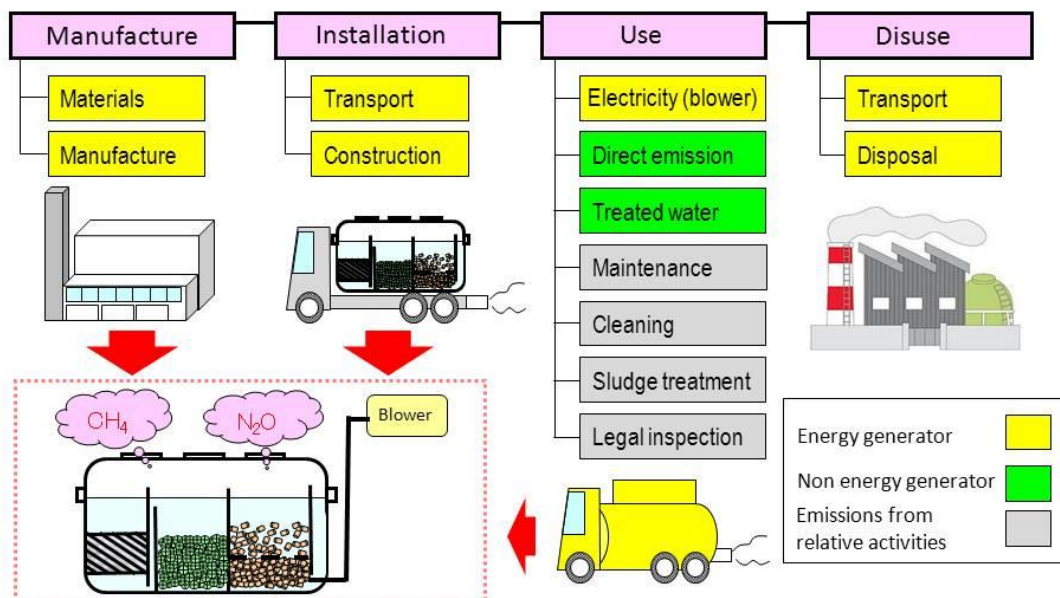
Greenhouse gas emissions?

- 3) Japan Institute of Wastewater Engineering and Technology: 下水処理場におけるエネルギーマネジメントに関する技術資料 (Japanese), pp.15-16, 2009
- 4) Reiji Suda et al: Trend Analysis of Specific Energy Consumption at Sewage Treatment Plants, JSWA Journey, 45, 552, pp.107-112, 2008
- 5) S.Soda.et.al.:Statistical Analysis of Global Warming Potential and Eutrophication Potential, and Sludge Production of Wastewater Treatment Plants in Japan; Journal of Sustainable Energy & Environment 4, pp.33-40, 2013)

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Scope & object of johkasou greenhouse gas emissions study

Scope of johkasou greenhouse gas emissions study

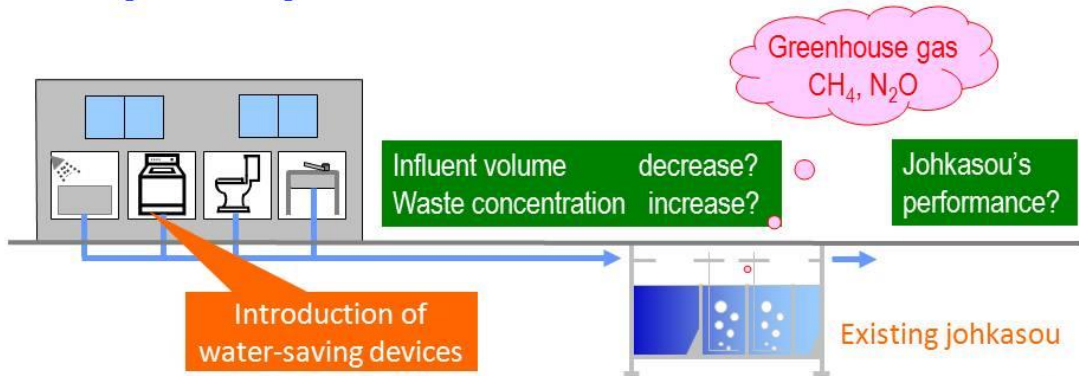


Object of study: johkasou for detached households (over 90% of shipped johkasou)

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Purpose of study

- Assess the influence of water-saving devices on johkasou's performance and greenhouse gas emissions



Assess the influence of water-saving devices on johkasou's performance and greenhouse gas emissions

- Influence on effluent quality before & after the introduction of water-saving devices
- Influence on GHGs emissions before & after the introduction of water-saving devices

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Summary

Decentralized small-scale johkasou is easily influenced by users' water use

Unstable performance

Increased GHG emissions

Water-saving devices

Circulation from aerobic chamber to anaerobic chamber

Flow control function

Counter-measure

Saving water by 22%

C·N reduction

GHG emissions reduction

Energy-saving blower

- Reduce BOD load by 24.8%
- Remove N by nitrification · denitrification
- Reduce GHG emissions by 38%

Efficient use of water resources · Aquatic environment protection · Global warming countermeasures
Decentralized small-scale johkasou

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7.5 Johkasou Navigator Certification Organization

Contents

- (I) Intro - NPO Johkasou Navigator Certification Organization
- (II) Business system of johkasou in Japan
- (III) Operational management and its optimization
- (IV) Business model of diffusion
- (V) Summary - utilization of sustainable johkasou system

(I) Intro

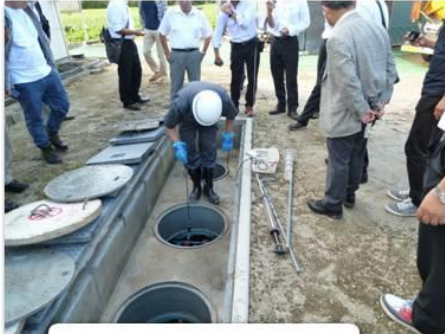
- NPO Johkasou Navigator Certification Organization



Logo mark

- Assessing and certificating domestic wastewater treatment technologies, products and services
- Spreading and developing johkasou system for urban development and life quality improvement
- Training, supporting business management and municipal administration
- Supporting overseas technology transfer and international businesses
- Building networks between academy-industry and public-private for aquatic environmental protection

(I) – 1 Activities



Practical training

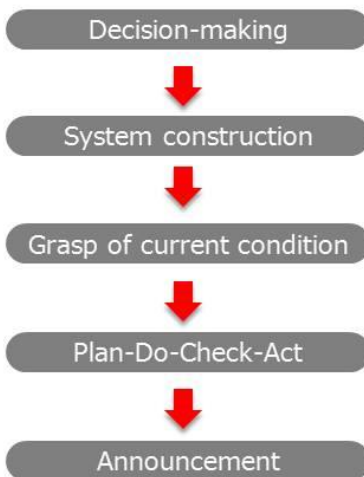


Presentation and lecture



Visiting research

(I) – 2 Assessment-certification system



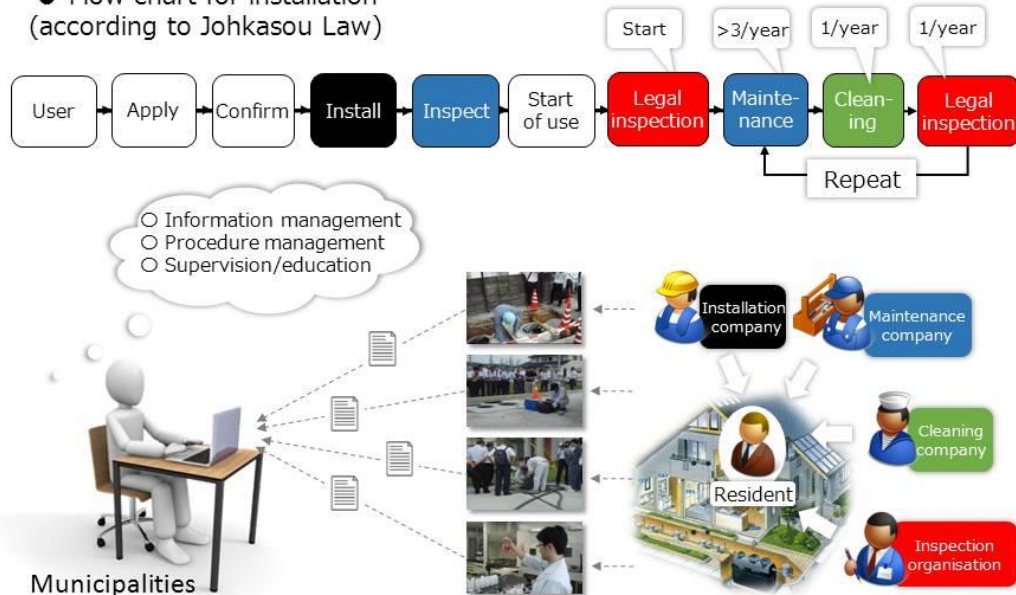
Points of corporate engagements

- Environmental load management
- Qualification registration management
- Maintenance management and **legal regulation**
- Maintenance checklist
- Inputs and outputs of business activities
- Environmental business system
- Business management planning
- Environmental control policy
- Correction management of environmental control system
- Training, education for emergency
- Quality management
- Inspection management
- Chemicals management
- Machinery management
- **Water quality maintenance/development management**

➔ Assessing and certificating the appropriateness of a range of johkasou business engagements

(II) Business system of johkasou in Japan

● Flow chart for installation
(according to Johkasou Law)



(II) - 2 Solutions for spread of the johkasou system

1. Access to installation and maintenance state
2. Information management for guidance on unmanaged plants
3. Access to information about inappropriate johkasou and its supervision
4. Promoting the legal inspection and the effective use of it
5. Promoting the transfer from cesspools to johkasou
6. Planning and reviewing domestic wastewater treatment scheme
7. Appropriate black water treatment during disaster
8. Residents' inquiry/claim handling system
9. Business management for johkasou promotion businesses
10. Information collection for policy drafting (development scheme)
11. Business efficiency improvement and cost reduction
12. Black water/sludge treatment scheme



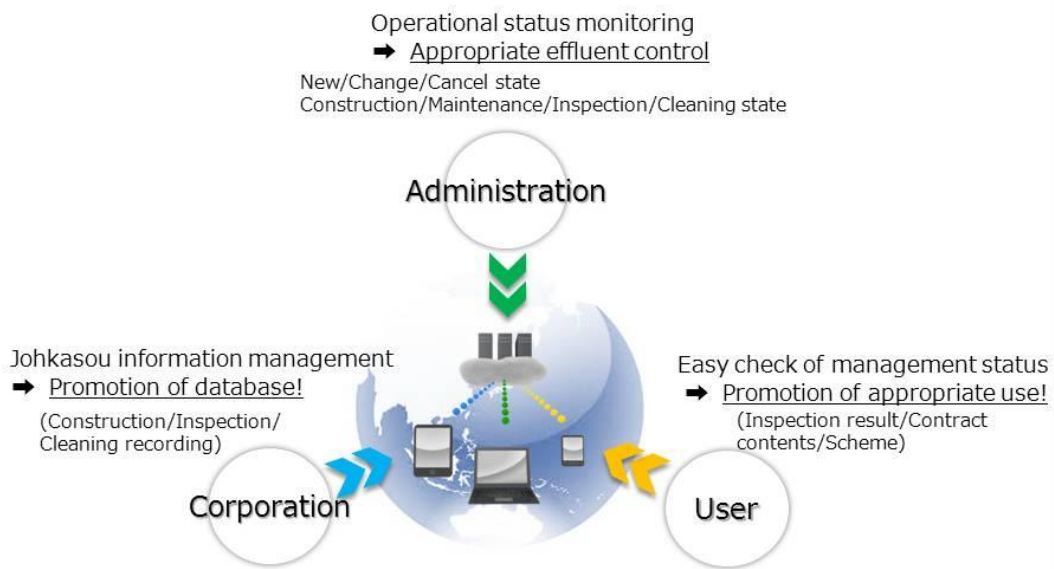
(III) Operational management and its optimization

1. Municipality-led promotion
2. Establishment of maintenance management system
3. Realization of appropriate operational management (supervision system)
4. Development of johkasou-related corporations and their skills
5. Waste treatment (sludge etc.)



➔ Proposing the johkasou operational management system that uses ICT

ICT Service Utilization



1. Standardize the unified management system using ICT!
2. Make management more timely and precise (PDCA and correction)
3. Effectively reduce municipal labour and operational costs

Main functions of ICT system

Objectives	Function	Description
1. Correction	1. Operation diagnosis	<ul style="list-style-type: none"> Diagnose the management status in 4 phases Technical knowledge free! Easy check
	2. Malfunction detection	<ul style="list-style-type: none"> Detect malfunction and notify the solutions
2. Unified management	3. PDCA state	<ul style="list-style-type: none"> Access to state of installation/operation Access to state of certificate/register
	4. Map	<ul style="list-style-type: none"> Enable access to distribution of installed johkasou Promote the efficiency of on-site check
3. Operation efficiency	5. Database	<ul style="list-style-type: none"> Promote the johkasou database



- **Appropriate operational management** even for **beginners!**
- Unified management enables **access to the status** to improve operational efficiency
- Supports **service quality improvement** of companies and supervisors!

Sample1 Main Menu

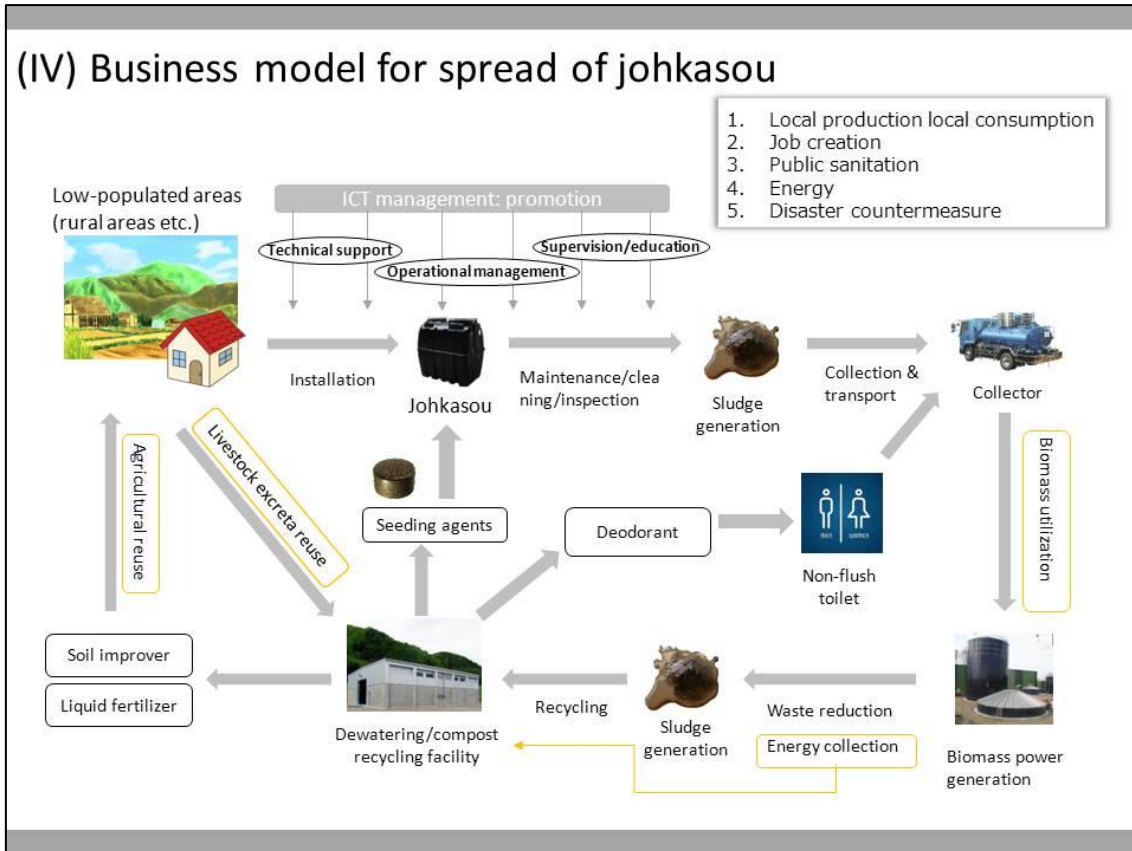
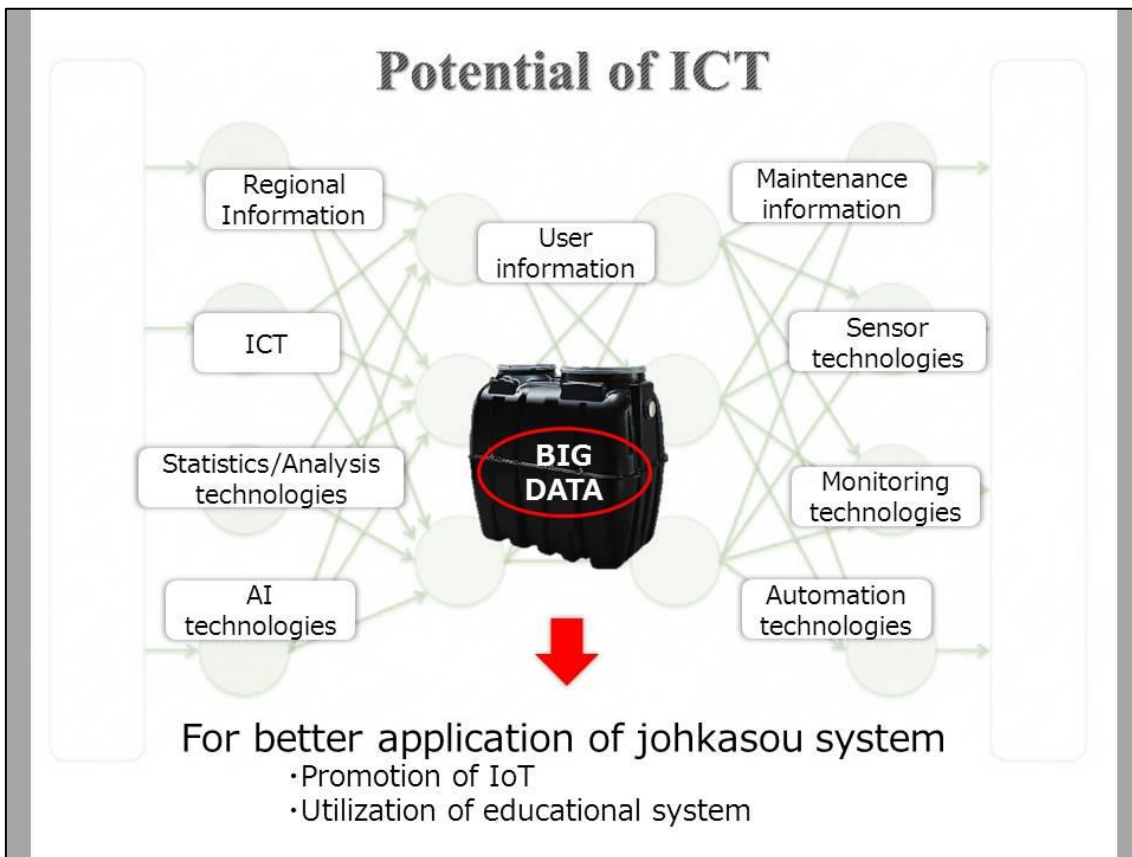
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Sample5



Utilization of sludge



Sludge generated during the process of wastewater treatment can be recycled and reused as treatment function adjuster for johkasou

(V) Summary – utilization of sustainable johkasou system

○ Municipality-led promotion

- ➔ Contributes to local development
 - public sanitation
 - job creation
 - energy
 - waste treatment
 - disaster countermeasure

○ Business system construction scheme development

- ➔ Legal system scheme construction
 - Installation
 - Maintenance
 - Cleaning
 - Inspection
 - Waste treatment

○ Operational management correction Management optimization

- ➔ High utilization through technology cooperation
 - ICT
 - Sensor
 - Control
 - IOT



Approach to the sustainable development of wastewater treatment plants!!