



Decentralized wastewater treatment system and its legal framework in Japan

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Ministry of the Environment
Government of Japan

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Outline

1. History of Wastewater Treatment and Current Situation

2. General Information on Johkasou and Its Pending Issues

3. Legal Framework on On-site Wastewater Treatment

Dr.Johkasou



1. History of Wastewater Treatment and Current Situation

▪ History of domestic wastewater treatment in Japan

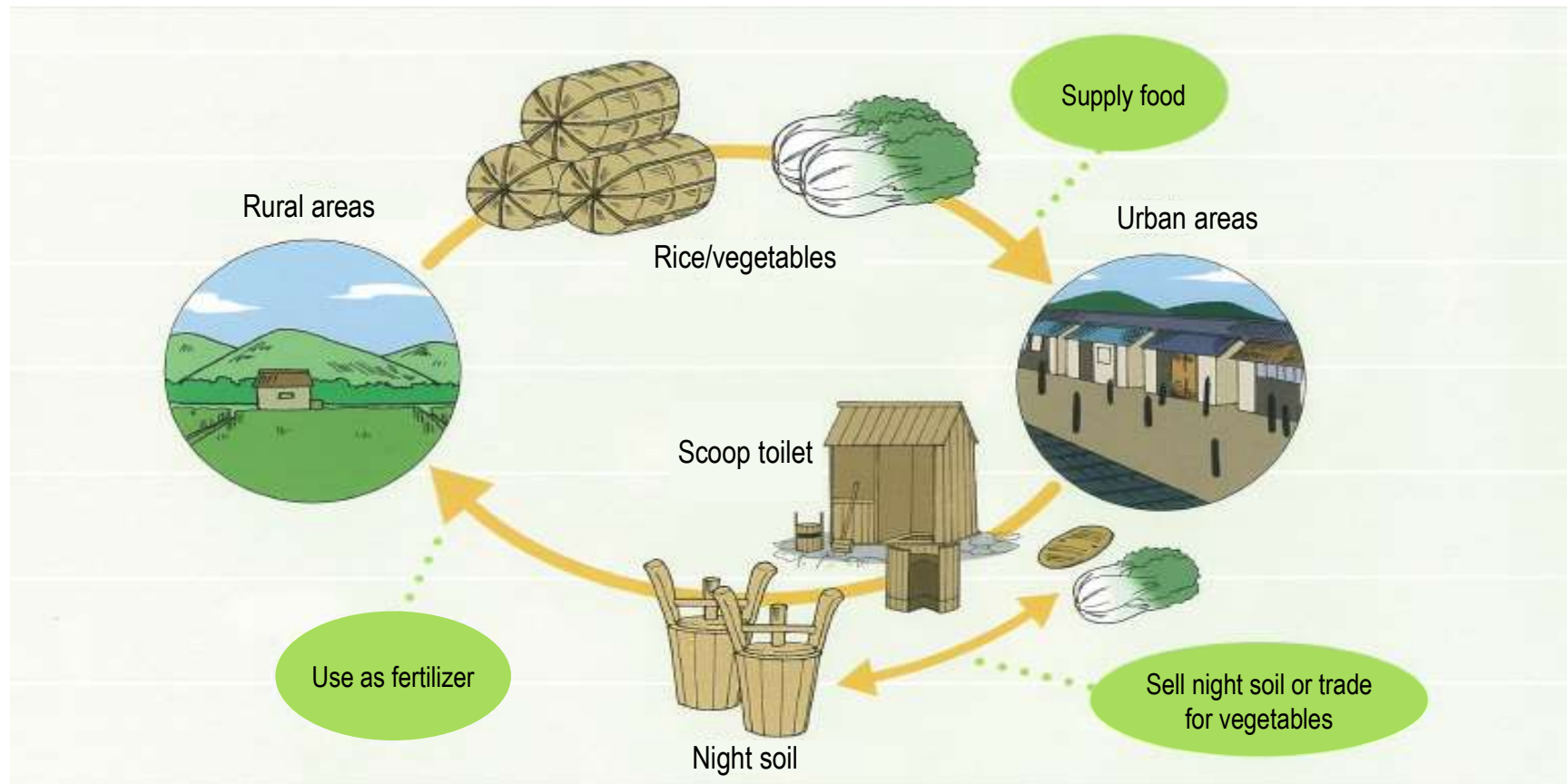


Figure 1. The night soil cycle during the Edo period



Figure 2. Night soil collection and transport during the Edo period

1. History of Wastewater Treatment and Current Situation

- Water pollution in Japan during rapid economic growth



Sumida River (Tokyo) in '70s



Dohkai Bay (Kitakyushu) in '60s



Chofu Weir, Tama River (Tokyo) in '70

1. History of Wastewater Treatment and Current Situation

▪ History of wastewater treatment and infectious diseases

- Up to 1950s, night soil had been used as agricultural fertilizer and regarded as resource.
- From the late 1950s, night soil had become “waste” due to introduction of chemical fertilizers and urbanization. Lack of night soil treatment facilities and hygienic treatment had become big problems.
- Spread of infectious diseases had continued until the rapid economic growth period of 1970s.

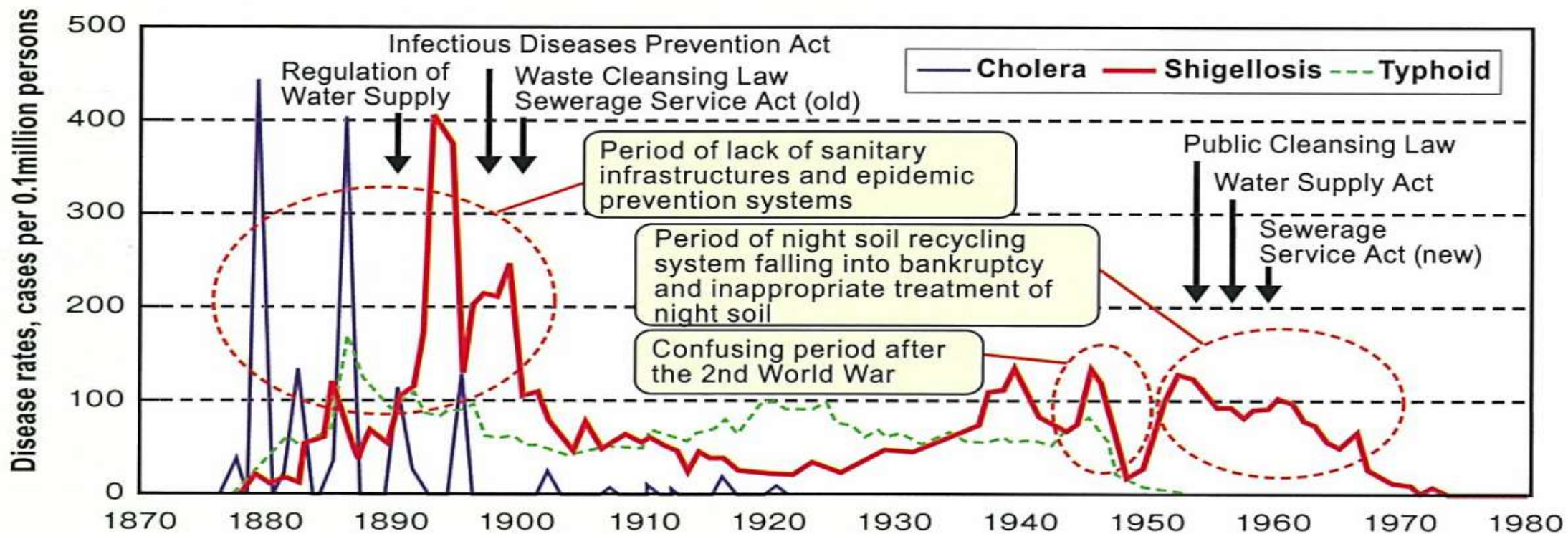
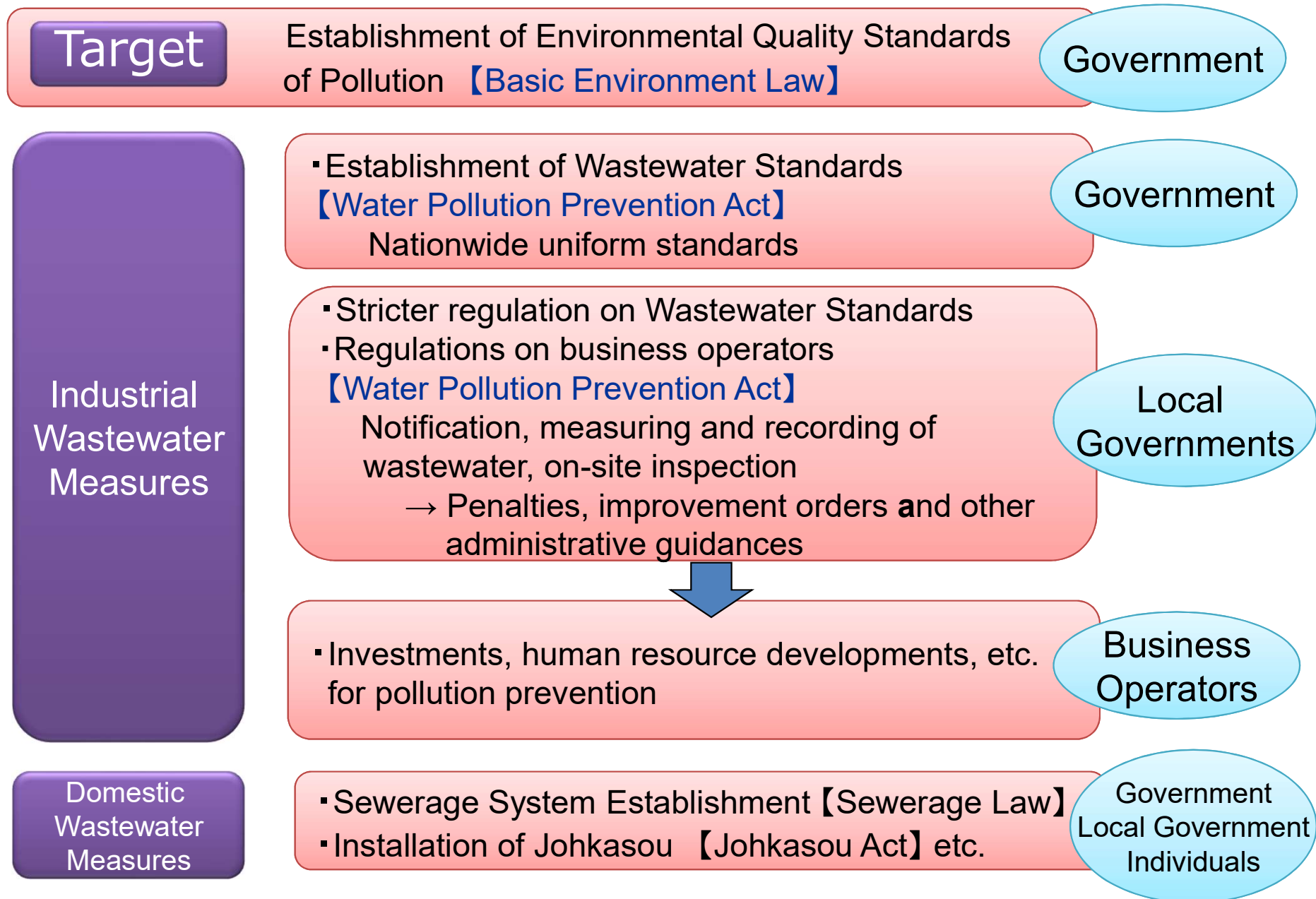


Figure 3 Trends of waterborne disease rates in Japan⁽³⁾

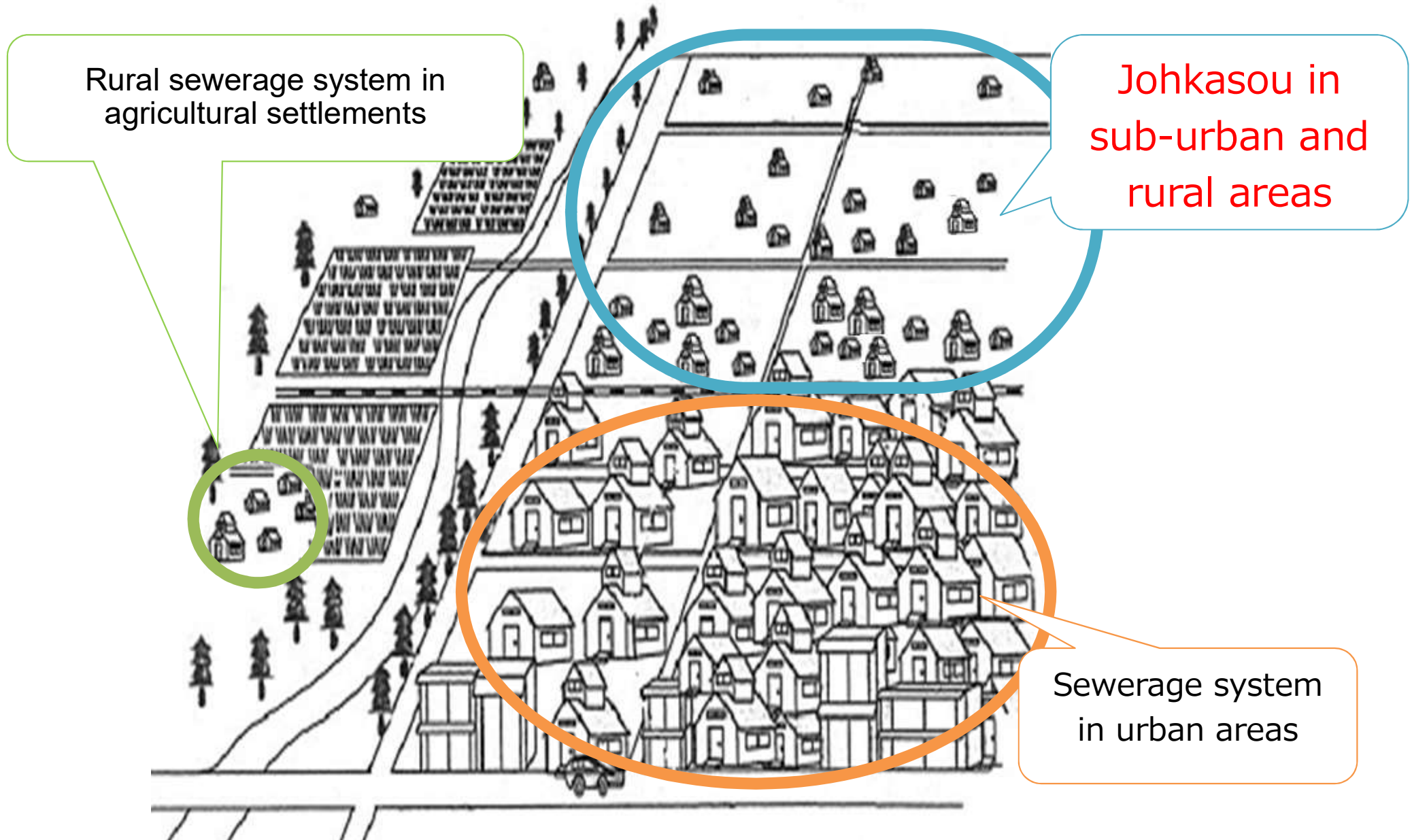
1. History of Wastewater Treatment and Current Situation

• Overall concept of water environment improvement



1. History of Wastewater Treatment and Current Situation

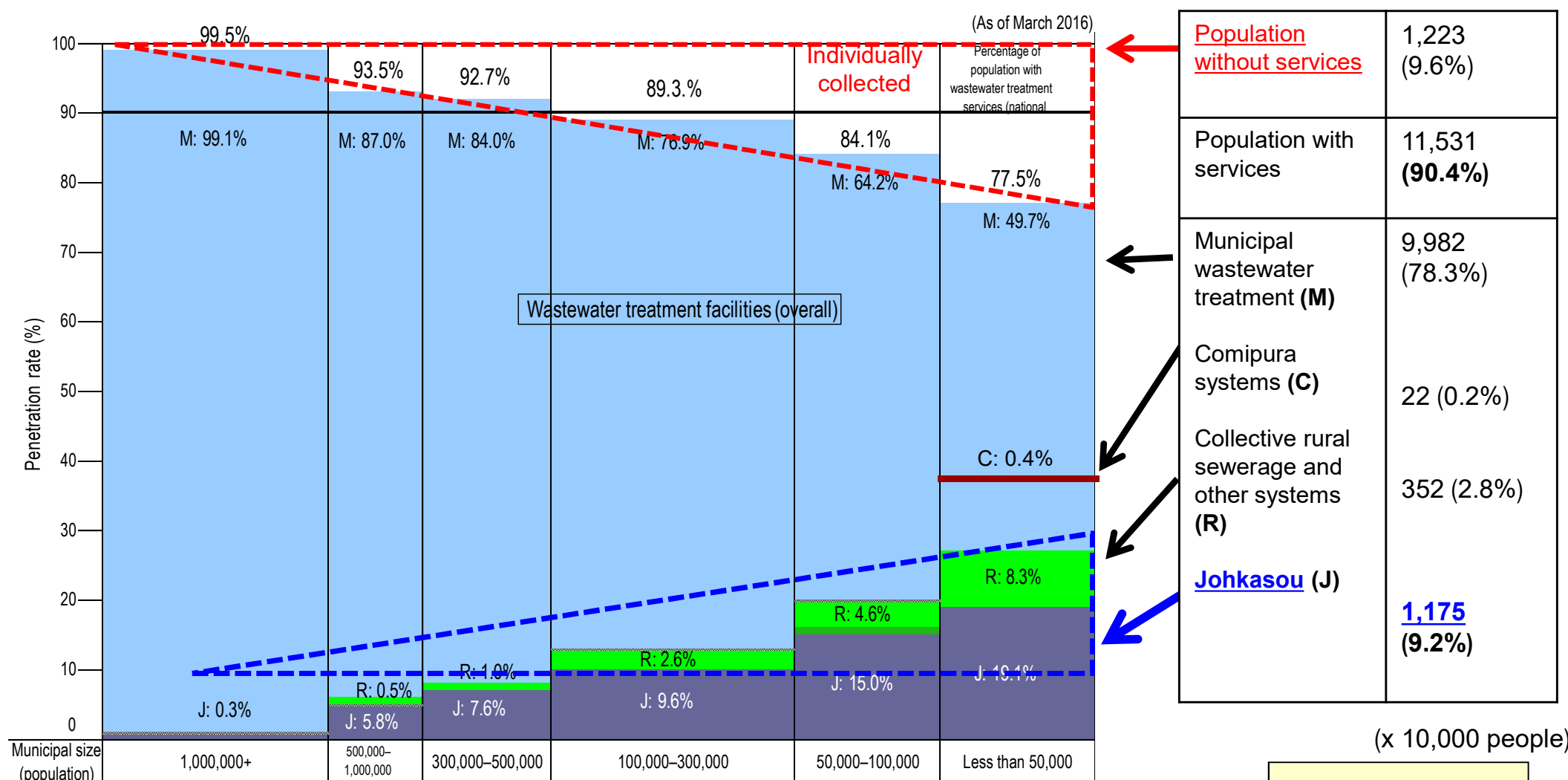
- Demarcation of wastewater treatment systems



1. History of Wastewater Treatment and Current Situation

- Percentage of population with wastewater treatment services by municipal size

- Around 12.23 million people still do not have wastewater treatment services (about 10% of Japan's total population)
- The percentage increases in more sparsely populated areas, where there is a larger percentage of johkasou users.



Note: Does not include results from 11 municipalities that could not be surveyed due to the Great Tohoku Earthquake

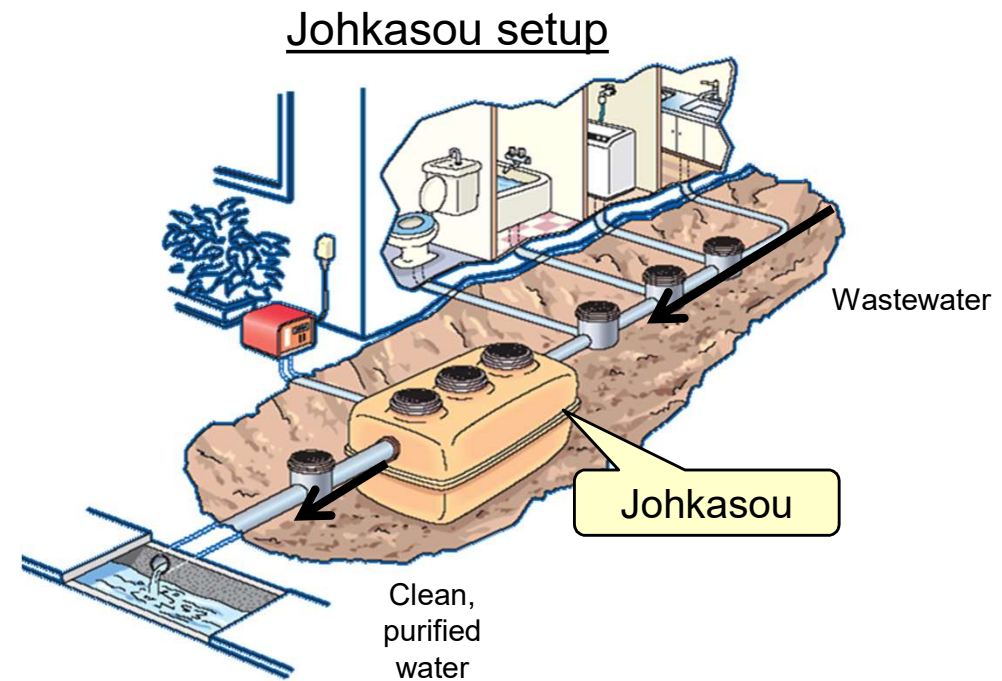
2. General Information on Johkasou and Its Pending Issues

▪ General idea of johkasou

- Johkasou are decentralized wastewater treatment devices that are designed for individual households or other structures and typically handled by the private sector
- Johkasou have a combined purification structure capable of treating both night soil (black water) and domestic wastewater (gray water)

Key features of johkasou

- Utilizes the purification capacity of microorganisms to turn out treated water on par with water treated at municipal sewage treatment plants (BOD 20mg/L or less)
- Low-cost equipment
- Efficient wastewater treatment equipment in hilly, mountainous, and other rural areas
- Installation is quick, requiring only about a week
- Can be set up in a compact space (equivalent to just one parking spot)
- Treated water is discharged on location, contributing to sound water cycles and maintaining consistent river flow volume
- Resistant to earthquakes, supporting swift recovery in the wake of a disaster



Size comparison (example)

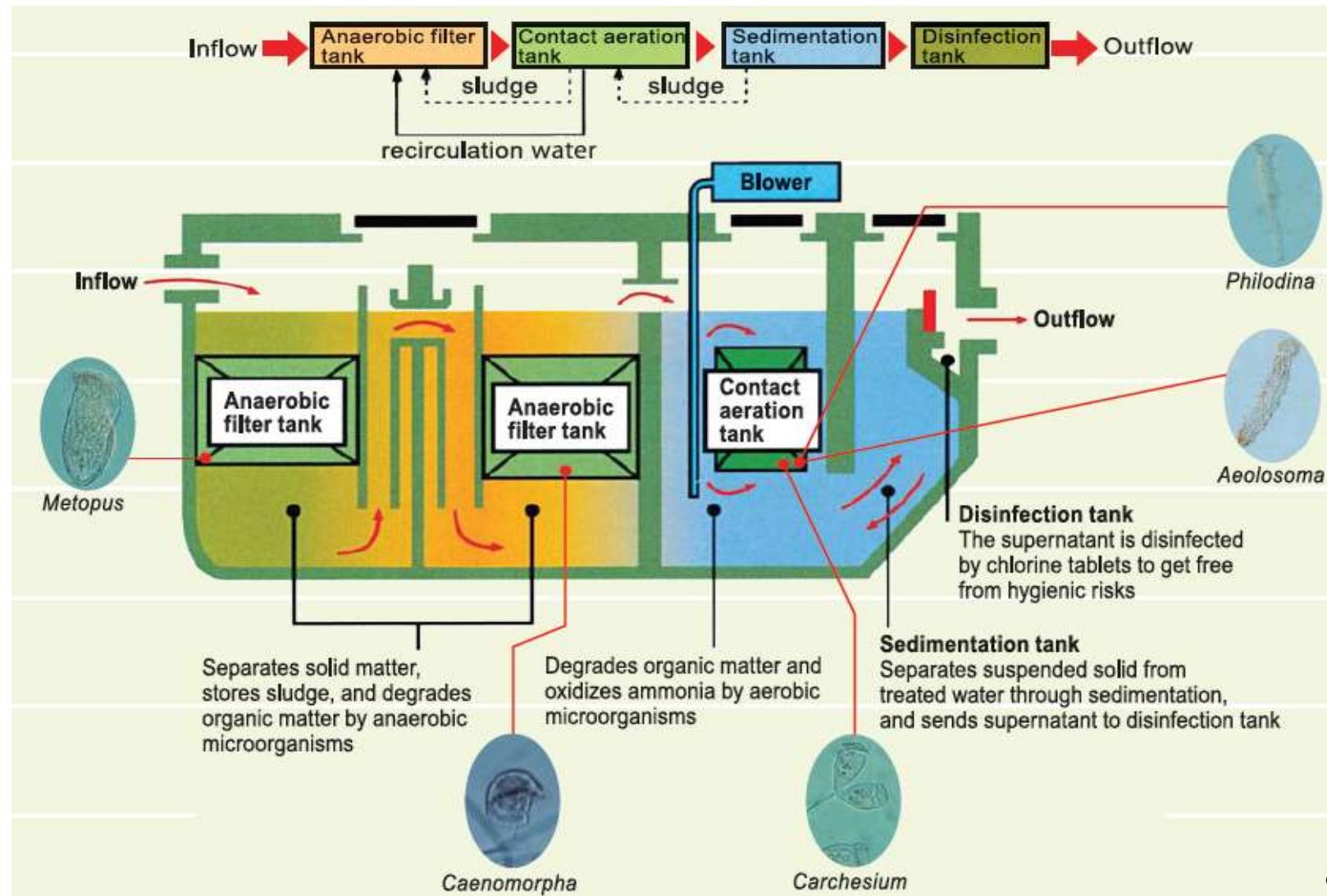


2. General Information on Johkasou and Its Pending Issues

▪ Structure and treatment principle of johkasou

- Johkasou tanks contain bacteria and other microorganisms, which are used to break down and purify the contaminants contained in wastewater
- They include a solid-liquid separation function, sludge storage function, and disinfection function in order to maximize purifying capabilities

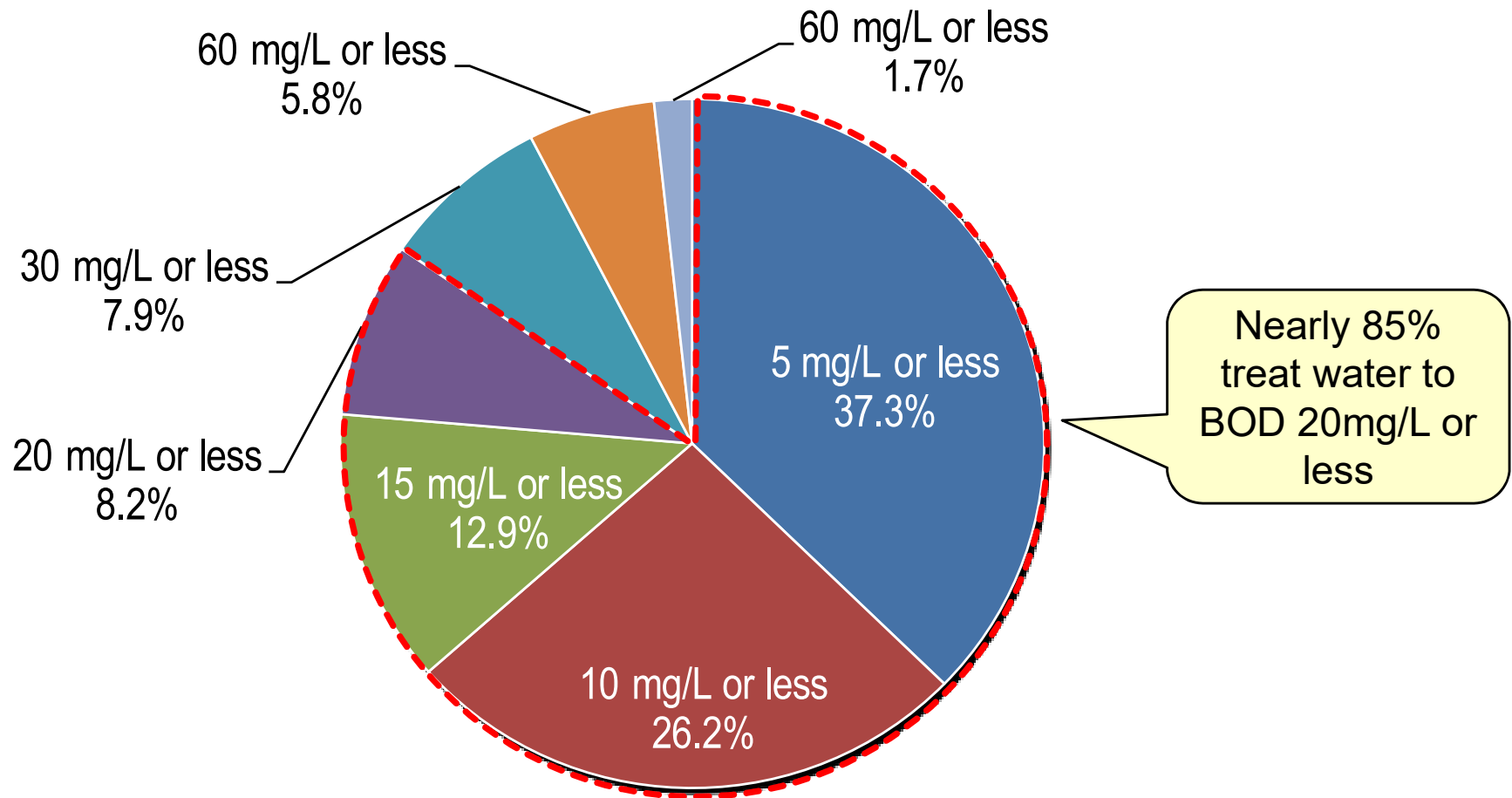
Graphic representation



2. General Information on Johkasou and Its Pending Issues

▪ Result of survey on johkasou water quality

- There are 1,077,092 johkasou capable of turning out treated water with a BOD concentration of 20 mg/L or less, making up 84.6% of the total
- The vast majority of johkasou are capable of maintaining a level of treated water quality on par with municipal sewage treatment plants



- Survey of 1,273,945 johkasou built with a structural standard of BOD 20 mg/L or less
- Results of FY2016 BOD measurements as required by Article 11 of the Johkasou Act

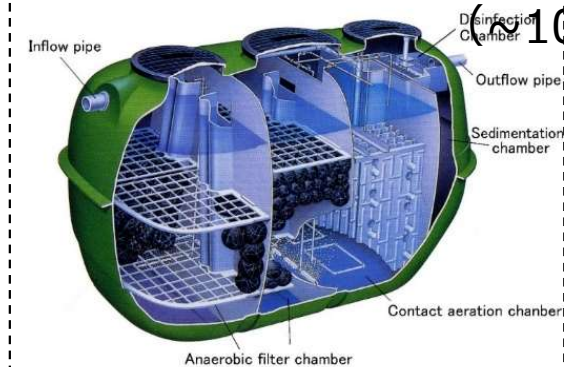
2. General Information on Johkasou and Its Pending Issues

▪ Capacities of johkasou

- Size of the johkasou is for a minimum of 5 people, the maximum is several tens of thousands people.
- Depending on the size of the city, you can change the size of johkasou.
- In Japan, johkasou are installed in each household, so the size for five to ten people is widely used.
- Johkasou with advanced treatment performance are capable of removing BOD to 10 mg/L or less and removing phosphorus and nitrogen.

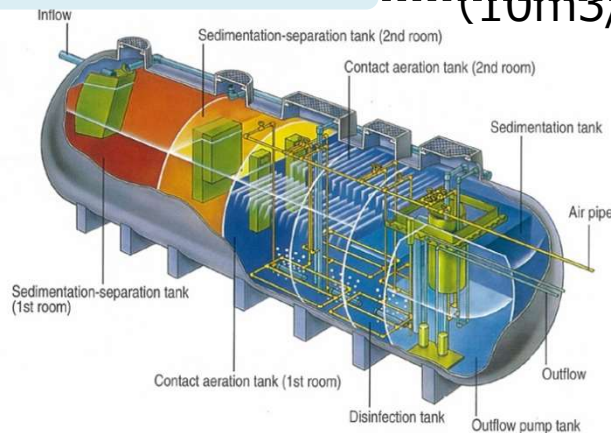
Small size

For 5~50 people
(~10m³/day)



Middle/large size

For 51~
(10m³/day~)



Case of overseas installation



Restaurant(China:10m³/d)



Hospital(Vietnam:250m³/d)



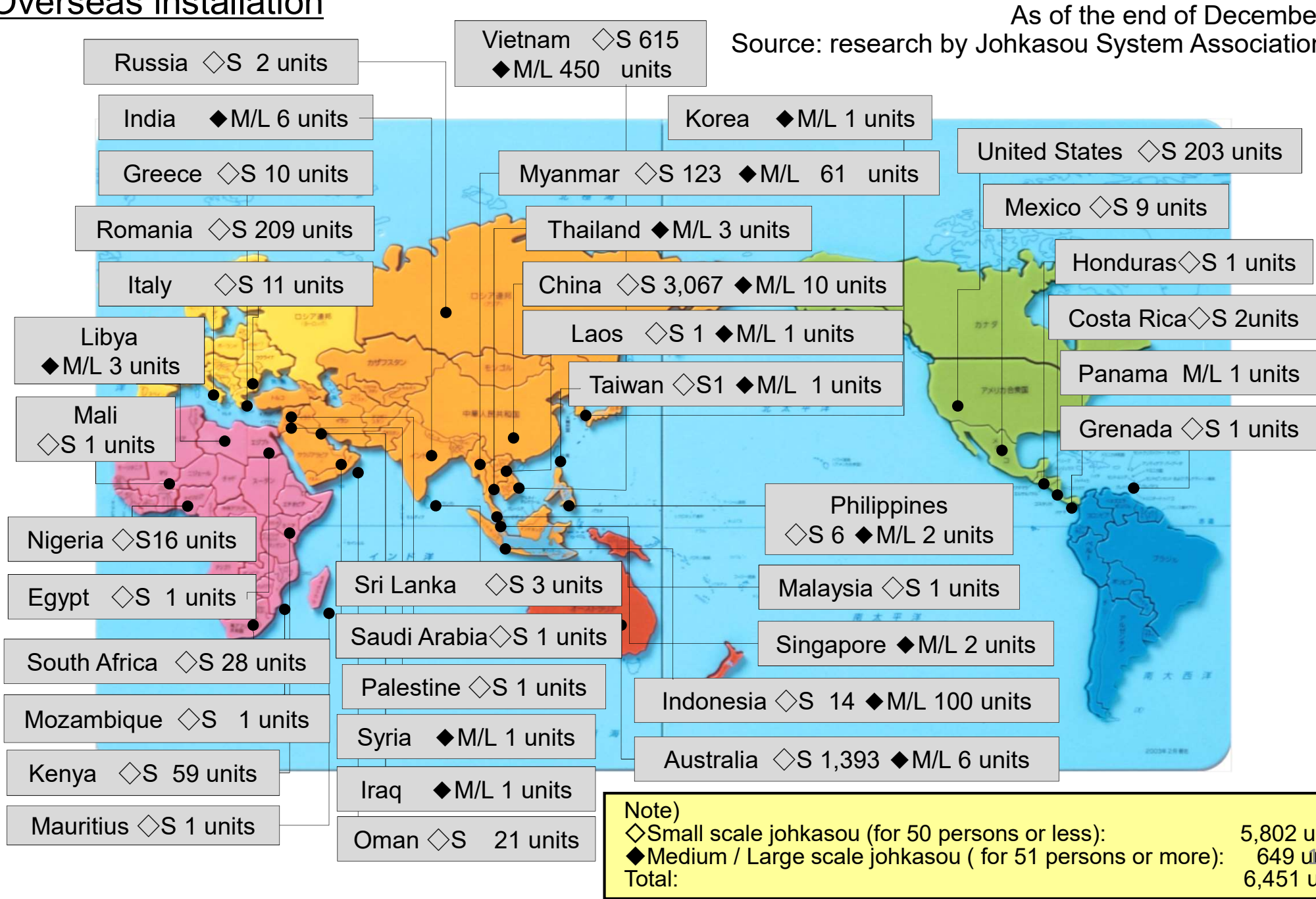
Employee dormitory
(Saudi arabia:530m³/d)



Factory(Myanmar:30m³/d)

2. General Information on Johkasou and Its Pending Issues

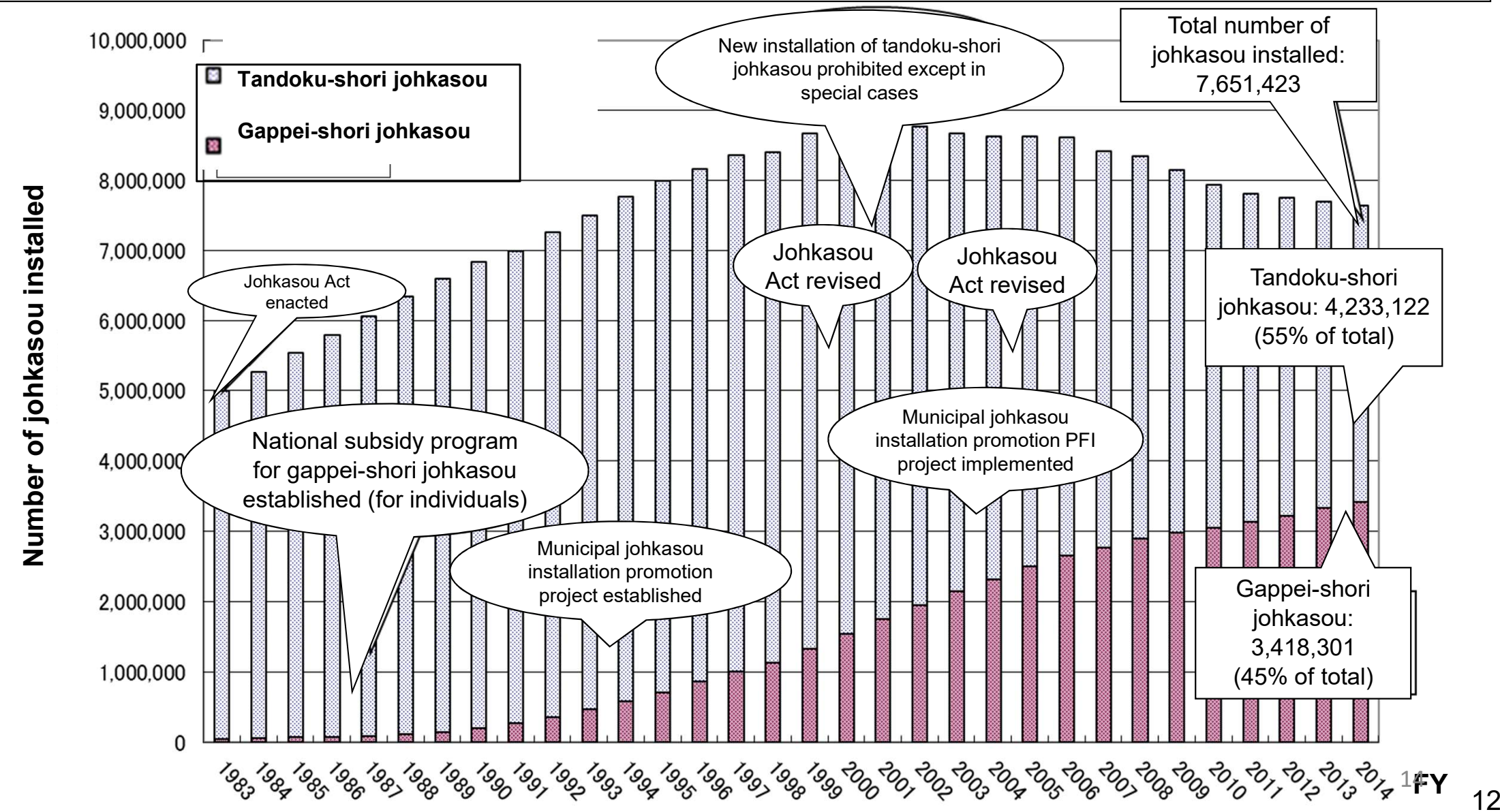
Overseas installation



2. General Information on Johkasou and Its Pending Issues

▪ Tandoku-shori johkasou vs. Gappei-shori Johkasou - 1

- There are still some 4.2 million tandoku-shori johkasou in Japan, treating nothing but night soil
- Encouraging the transition to gappei-shori johkasou is a critical step in improving water quality

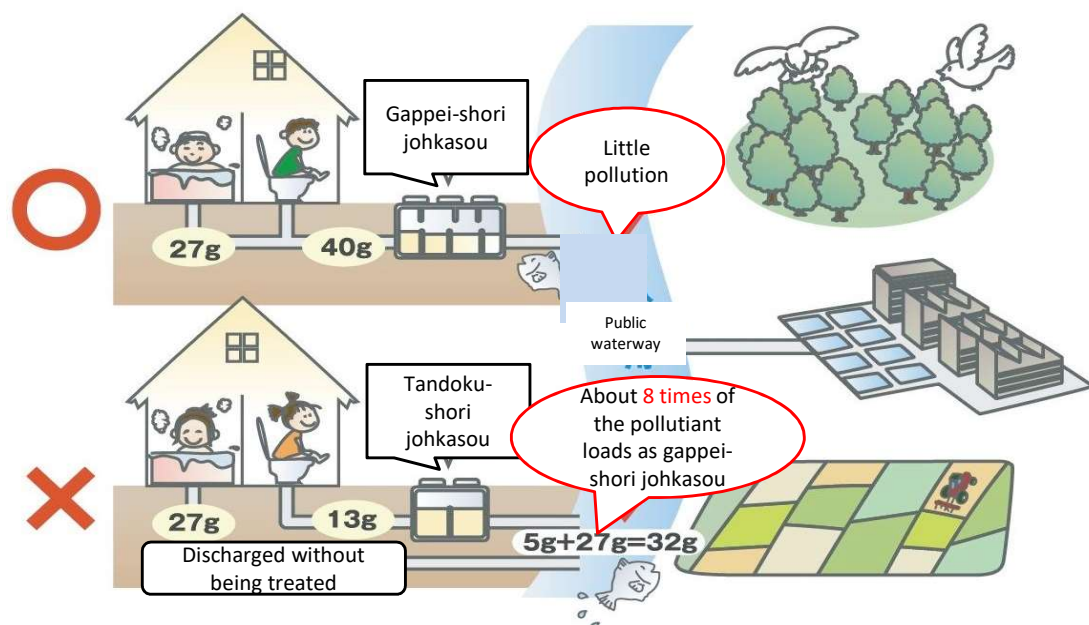


2. General Information on Johkasou and Its Pending Issues

▪ Tandoku-shori johkasou vs. Gappei-shori johkasou - 2

- Tandoku-shori johkasou release about eight times the pollution as gappei-shori johkasou
- Few closed water areas meet environmental standards, with tandoku-shori johkasou contributing about 30% of the pollution

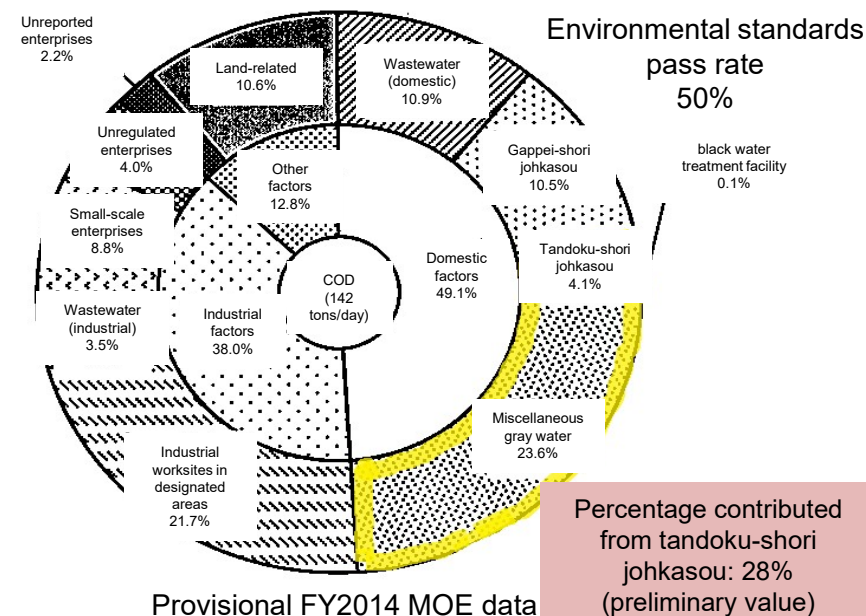
Gappei-shori johkasou vs. tandoku-shori johkasou Amount of pollutant load discharged



Factors inhibiting the transition from tandoku-shori johkasou

- Johkasou have a service life of 30 years or more, and owners are not required to replace them
- johkasou do purify water, offering no incentive for replacement
- Owners are responsible for major installation costs associated with replacement
- Fewer people feel a desire to invest in the future as a result of population drain in rural areas
- Many people do not even know the difference between tandoku-shori johkasou and gappei-shori johkasou

Factors generating pollution in Ise Bay



3. Legal Framework on On-Site Wastewater Treatment

- Purpose of Johkasou Act

Promotion of human waste and gray water treatment by johkasou for;

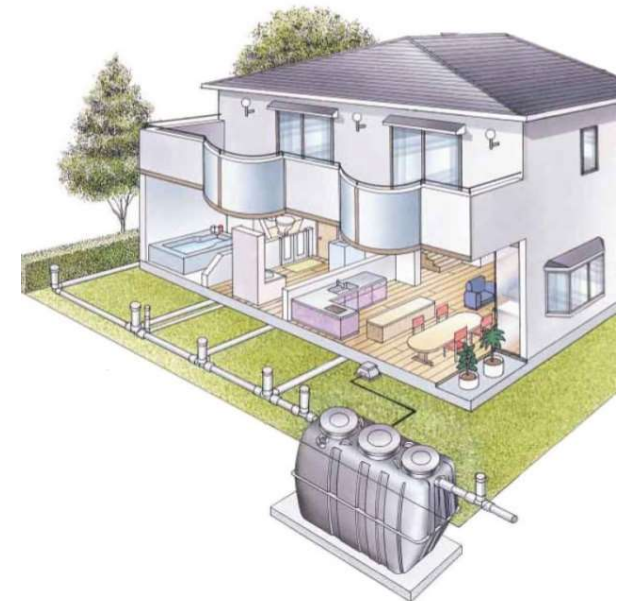
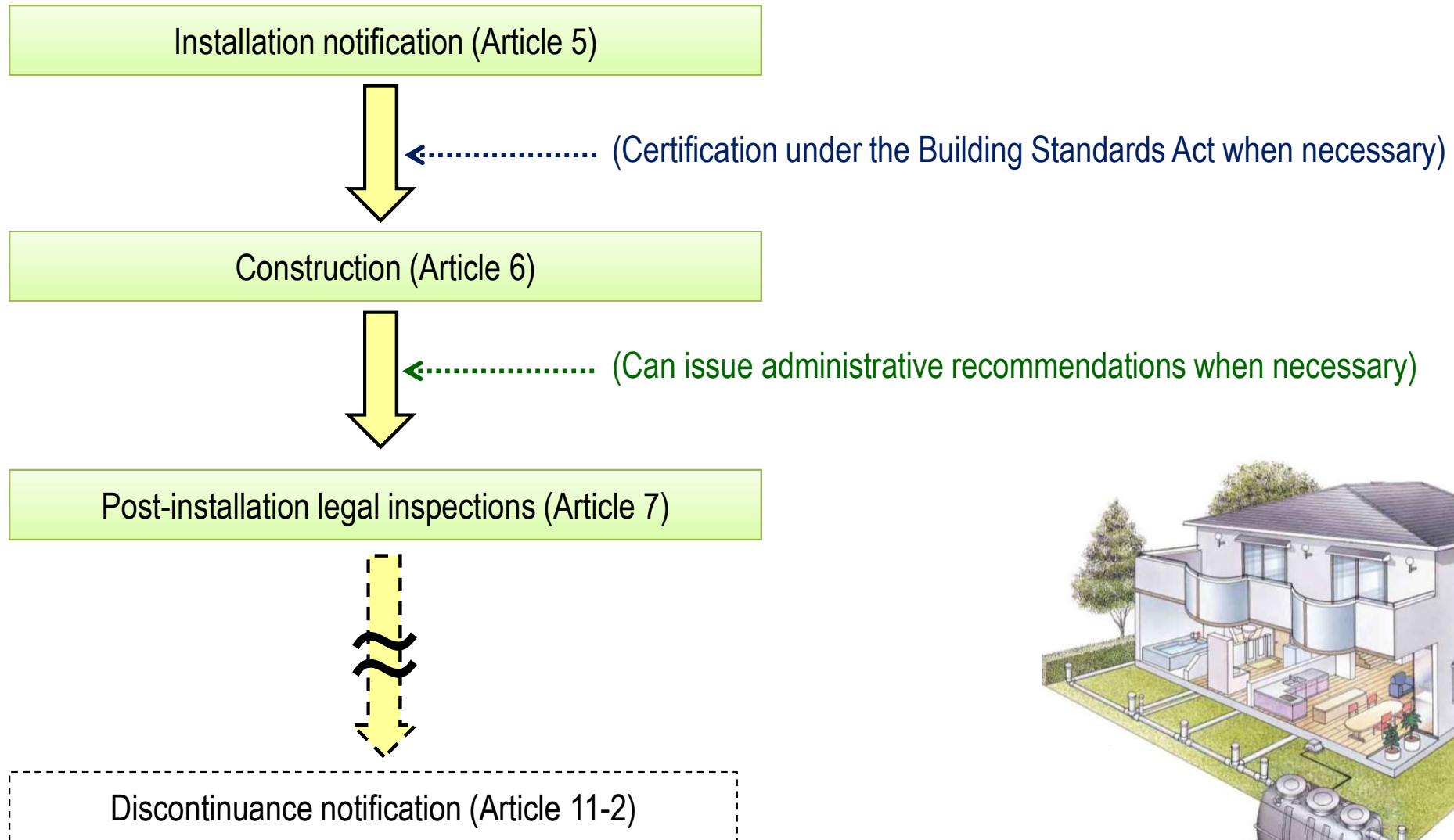
- Conservation of water quality in public water area,
- Preservation of the living environment and
- Improvement of public health

⇒ Articles in the Law

- ① Johkasou installation (✕ related to “Building Standard Law”)
- ② Operation/maintenance of johkasou
- ③ Approval of johkasou models
- ④ Johkasou business for Installation and Operation/Maintenance
- ⑤ Nationally qualified “Johkasou technicians”
- ⑥ Miscellaneous and penalties

3. Legal Framework on On-Site Wastewater Treatment

- Johkasou Installation Procedure



3. Legal Framework on On-Site Wastewater Treatment

- Approval process for types of johkasou (Article 13)

- Parties intending to manufacture johkasou in production plants shall obtain approval from the Minister of Land, Infrastructure, Transport and Tourism for the type of johkasou to be manufactured (does apply to test manufacturing).
- This process is subject to Performance Evaluation System.
- Parties intending to manufacture johkasou in production plants overseas for export to Japan may also obtain approval from the Minister of Land, Infrastructure, Transport and Tourism.

Benefits

- Ensures structural optimization
- Ensures proper capacity
- Simplifies/speeds up construction certification inspections and similar processes

Overseas approval

- Parties manufacturing johkasou overseas for export to Japan may also obtain approval, meaning that the johkasou type approval process eliminates trade friction in the form of so-called non-tariff barriers

3. Legal Framework on On-Site Wastewater Treatment

- Test methods and Criteria

1) Performance Criteria

BOD[20、15、10、5]、T-N[20、15、10、5]、T-P[2、1、0.5、0.1]

SS[20、15、10、5]、n-Hex[20、10、5、3]、COD[30、15、10]

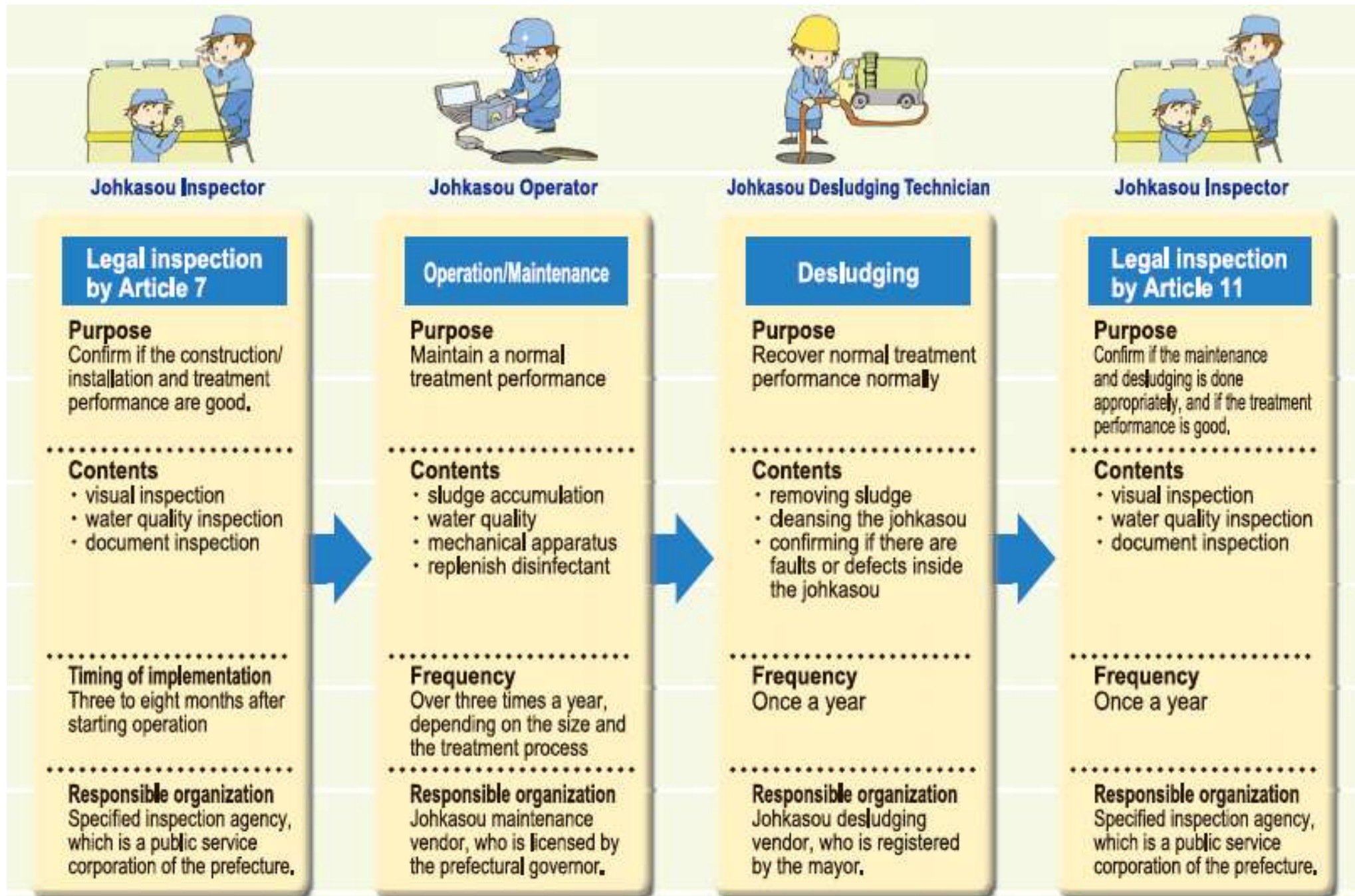
2) Test Categories and Duration

Sludge may be added in case of ①

Category	Test Method	Duration (weeks)	No. of unit	Evaluation Points
①	Short period constant temperature	Breeding - over 16 wks (13 & 20°C 8 wks respectively)	1 or 2	Water Quality/Sludge/Management
②	On-site test 1	Breeding + over 48 wks	1	Water Quality/Sludge/Management
③	On-site test 2	Breeding + over 48 wks	3	Water Quality/Sludge/Management

3. Legal Framework on On-Site Wastewater Treatment

• Inspections and Maintenance



3. Legal Framework on On-Site Wastewater Treatment

- Johkasou corporate registration process

Prefecture

Registration

Instructions, advice,
recommendations, etc.



Johkasou
construction company

Municipality

Approval

Instructions, advice,
recommendations, etc.



Johkasou Desludging Technician

Johkasou
desludging company

Prefecture
or other

Registration

Instructions, advice,
recommendations, etc.



Johkasou Operator

Johkasou
maintenance
inspection company

- National qualifications

【Certified Johkasou Installer】

Person certified to supervise johkasou construction



【Certified Johkasou Operator】

Person certified to supervise johkasou construction



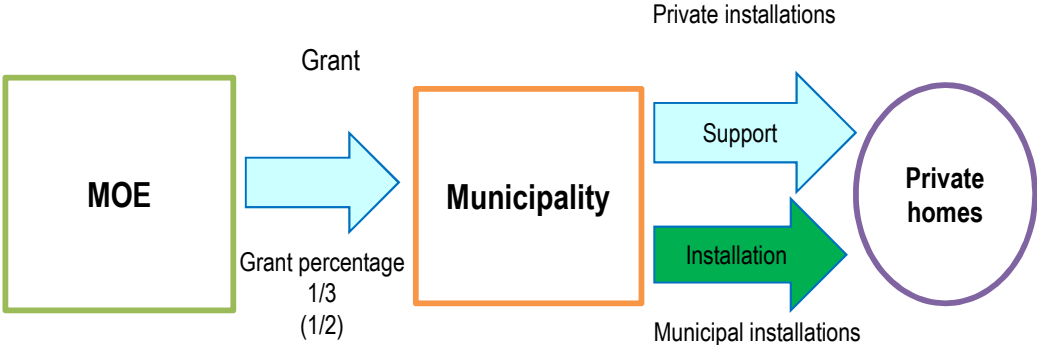
3. Legal Framework on On-Site Wastewater Treatment

Subsidies for Johkasou Installation

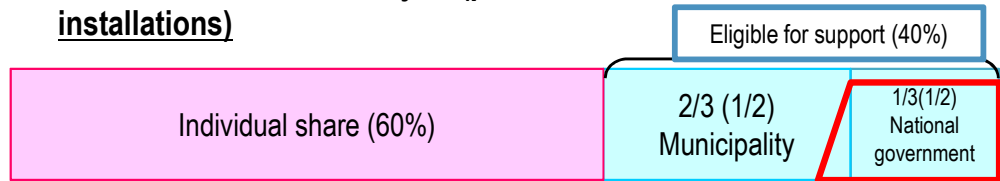
- There are still **some 1.3 million people who do not have wastewater treatment**, particularly in Japan's hilly rural areas, which have a low population density. **This issue requires urgent resolution.**
- Three Japanese ministries (MLIT, MAFF, and MOE) are working together to require municipalities to revise their wastewater treatment facility development plans with the aim of rapidly **setting up sustainable wastewater treatment facilities (generally within the next 10 years).**
- Johkasou have several advantages, including **(1) treatment capabilities on par with municipal sewage systems, (2) low-cost installation, and (3) seismic resistance.** These features become even more important in sparsely populated areas.
- There are still about **4.37 million tandoku-shori johkasou** in operation, though new installations are now prohibited. There is an **urgent need to convert them** to gappei-shori johkasou **as soon as possible.**
- The goal in promoting johkasou infrastructure development is to **conserve local water environments and build a society of independent, decentralized communities.**

Project overview

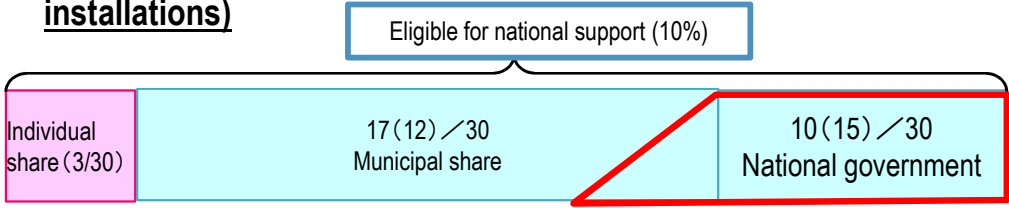
- Johkasou Installation Project (private installations)**
Subsidizes municipalities supporting their residents (private citizens) with johkasou installation
- Johkasou Municipal Installation Project (municipal installation)**
National subsidy program for municipalities taking the lead in installing johkasou systems. The municipality is responsible for operations and maintenance.



Johkasou Installation Project (private installations)



Johkasou Municipal Installation Project (municipal installations)



3. Legal Framework on On-Site Wastewater Treatment

• Human Resource Development

- ◆ Johkasou technicians should be equipped with extensive knowledge on not only wastewater treatment/johkasou, but also water environment conservation and public health.
- ◆ Curriculums for johkasou operator and johkasou installation worker are as shown below

Johkasou operator		Johkasou installation worker	
➤ Fundamental of johkasou	8 H	❑ Fundamental of johkasou	8 H
➤ Laws and regulations related with johkasou	4 H	❑ Laws and regulations related with johkasou	3 H
➤ Structure and function of johkasou	22 H	❑ Structure and function of johkasou	15 H
➤ Introduction to installation of johkasou	4 H	❑ Management of johkasou installation	8 H
➤ Operation and maintenance of johkasou	30 H	❑ Introduction to O&M and desludging of johkasou	3 H
➤ Water quality management of johkasou	10 H		
➤ Introduction to desludging of johkasou	2 H		
		Total	37 Hours
Total	80 Hours		



3. Legal Framework on On-Site Wastewater Treatment

- Miscellaneous Provisions of Johkasou Act

Report collection and on-site inspections (Article 53)

- Government agencies may require the following parties to report on tasks associated with johkasou maintenance inspections, desludging, and the like.
 - 1) Johkasou managers
 - 2) Johkasou manufacturing companies
 - 3) Johkasou construction companies
 - 4) Johkasou desludging companies
 - 5) Designated inspection agencies
 - 6) Others (e.g. those who have taken the Johkasou Installer or Johkasou Operator exam)
- Government agencies may, with the approval of the tenant, enter the property or structure where a johkasou is located in order to inspect documents or any other items and ask questions of the persons involved.
- The government may, when necessary in the enforcement of this act, demand the required reports to ensure that work is carried out properly.
- On-site inspections are not intended as administrative punishment, but rather to provide broad-based instructions and supervision on johkasou-related matters.

3. Legal Framework on On-Site Wastewater Treatment

- Penalties of Johkasou Act

The following penalties shall be assessed in cases of illegal action in order to ensure that the stipulations of the Johkasou Act are properly followed.

Penalties for unapproved companies (Article 59)

- E.g. unapproved johkasou desludging companies or those who have obtained approval through fraudulent means and perform johkasou desludging operations

Penalties for violations of provisions (articles 62, 66, and 66-2)

- E.g. those who do not follow improvement orders related to maintenance inspection, desludging, or method inspections

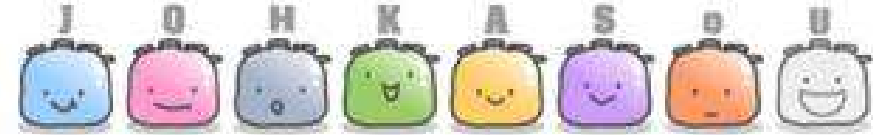
Penalties for violation of notification duties (Article 61)

- E.g. those who do not submit notifications or who submit false notifications for johkasou installation and the like

Penalties for refusal to cooperate with reporting or on-site inspection demands (Article 62)

- Those who are not registered in line with ministerial ordinances
- Those who misleadingly use the title “johkasou operator”
- Johkasou operators and other who do not submit the necessary reports or who submit false reports

Conclusions



- ◆ Japan has difficulties in converting tandoku-shori johkasou to gappei-shori johkasou. For other countries, septic tanks shall be replaced with more sophisticated systems such as johkasou.
- ◆ As a basic regulation to spread johkasou and to eliminate inferior products, Performance Evaluation System is necessary.
- ◆ Most of the countries have regulations on treated wastewater, however monitoring systems of the water quality are important.
- ◆ Promoting of treatment systems is essential, so is its maintenance such as drawing of sludge.
- ◆ Governments should take the lead to promote sewerage systems, and on-site wastewater treatments as the other option. In the case of Japan, promotion of gappei-shori johkasou has not proceeding as expected because its responsibility rests with individual residents.



Conclusions



Based on the lessons from the Japan's experience on on-site wastewater treatment, I would like to give some key messages to other countries as my conclusions:

- ◆ As it becomes a huge challenge for Japan to replace tandoku-shori johkasou with gappei-shori johkasou, septic tanks of low treatment performance should be replaced with advanced systems such as johkasou.
- ◆ In order to promote on-site wastewater treatment by good-quality products and to push inferior products out of the market, a product certification system including a testing method for performance evaluation is necessary.
- ◆ In most of the countries, the effluent standards was established. However, it is more important to establish an effective monitoring mechanism and to provide strong guidance and supervision when illegal action occurred.
- ◆ It is important to conduct operation and maintenance including desludging regularly after the treatment facilities were constructed.
- ◆ Governments should take the leadership in promoting both sewerage systems and on-site wastewater treatment systems as their option. In Japan, installation of gappei-shori johkasou has not proceeded as expected because the responsibility rests with house owners.



A photograph of a small waterfall in a forest. The water is white and foamy as it falls over a series of large, moss-covered rocks. The surrounding area is lush with green moss and foliage. The text "THANK YOU FOR YOUR KIND ATTENTION." is overlaid in white, bold, sans-serif font across the middle of the image.

THANK YOU FOR YOUR KIND ATTENTION.

At kikuchi gorge, Kikuchi City, Kumamoto Prefecture