History and Current situation of wastewater treatment in Japan and legal framework of Johkasou

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Ministry of the Environment
Government of JAPAN

https://www.env.go.jp/recycle/jokaso/

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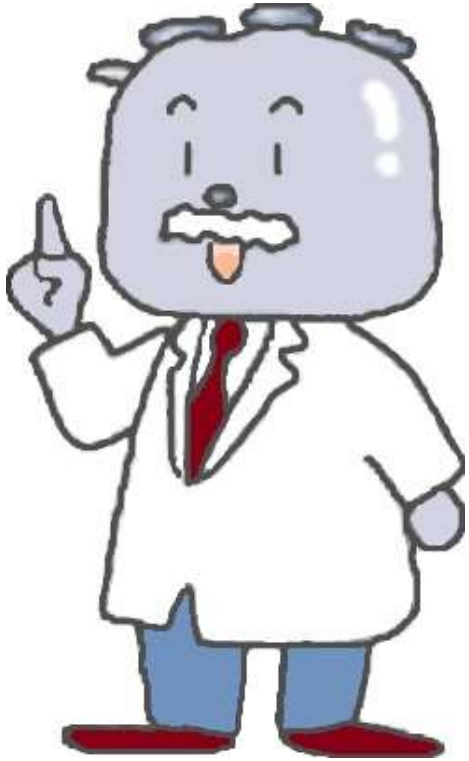


1. History and Current situation of wastewater treatment in Japan

■ Water pollution in Japan during rapid economic growth

Sumida River (Tokyo) in the 1970s

Dohkai Bay (Kitakyushu) in the 1960s

Chofu Weir, Tama River (Tokyo) in the 1970s

1. History and Current situation of wastewater treatment in Japan

■ History of wastewater treatment and infectious diseases

- Up to the 1950s, night soil had been used as agricultural fertilizer and regarded as resource.
- From the late the 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 the 1970s.

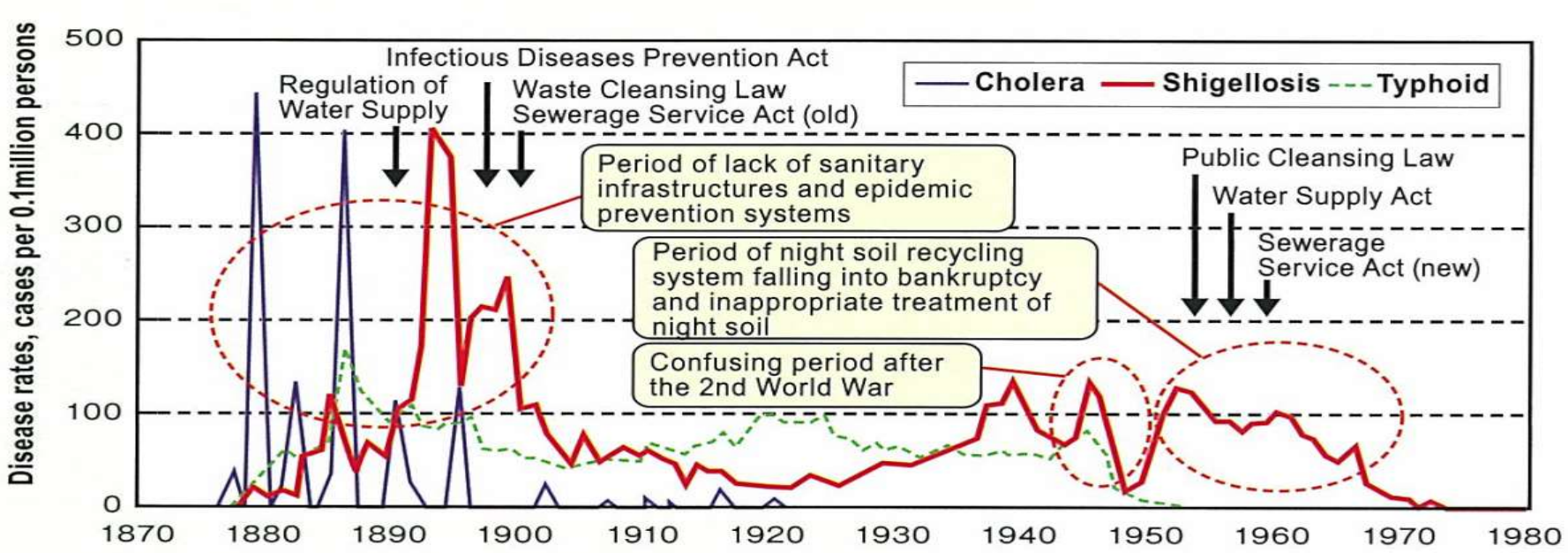


Figure 3 Trends of waterborne disease rates in Japan(3)

(3)Yuzo Inoue, History and technology of night soil treatment in Japan, J. of Monthly Johkasou

1. History and Current situation of wastewater treatment in Japan

■ Domestic wastewater issues and outcomes over time

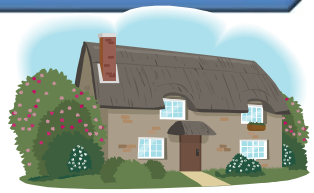
Late 1950s to around 1970

Water pollution is an environmental problem

Mainly by factory wastewater

Late 1970s/early 1980s

Domestic wastewater creates localized pollution



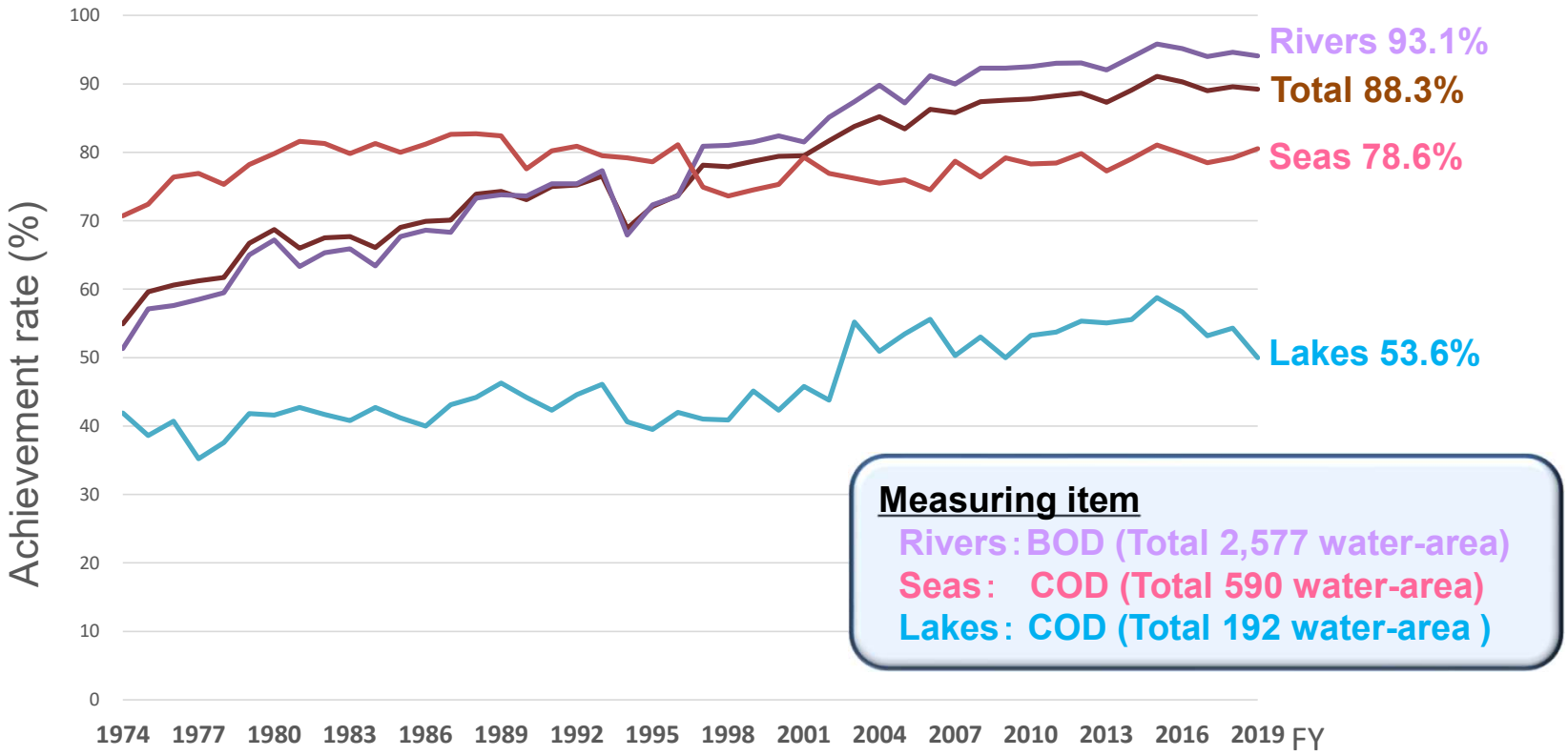
Widespread use of flush toilets

Present day

Resolved by preventing the spread of contaminated water

1. History and Current situation of wastewater treatment in Japan

■ Achievement of water quality standards related to domestic environmental standard

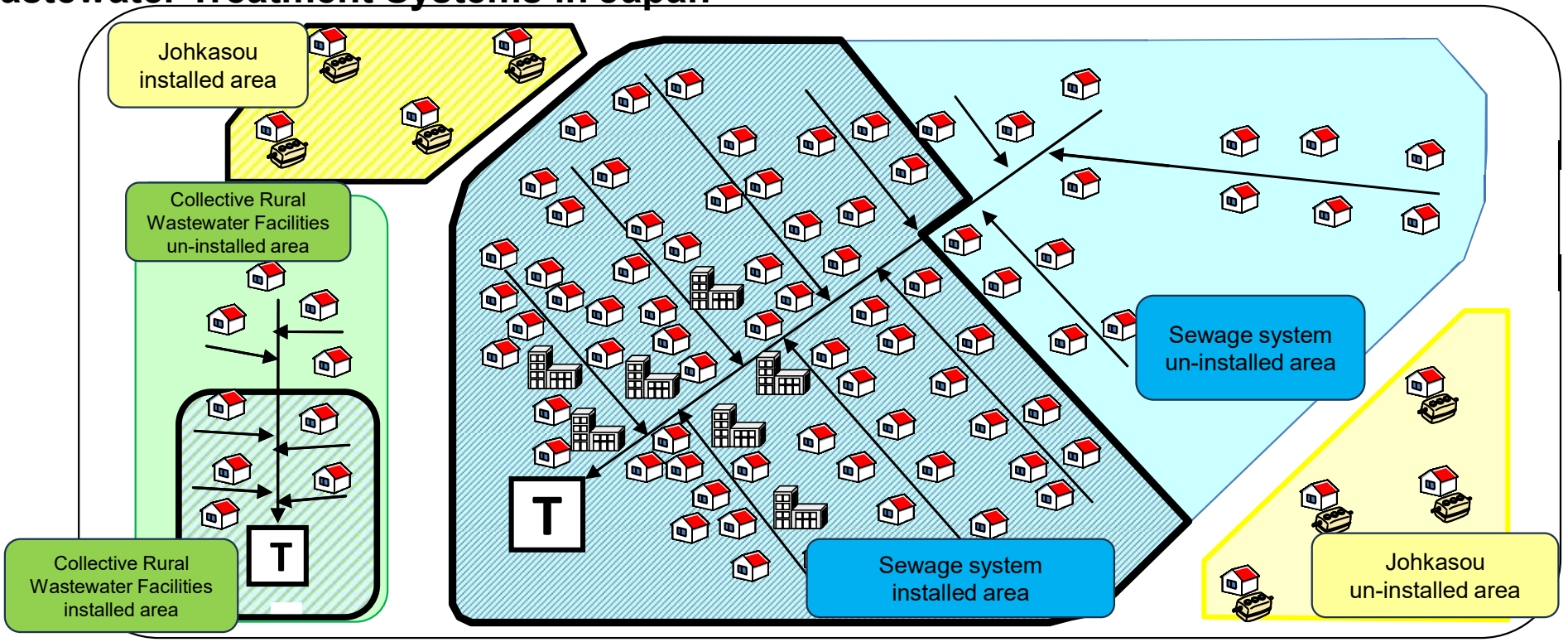


※Public waters water quality measurement results（2021）

Ministry of the Environment, Government of Japan

1. History and Current situation of wastewater treatment in Japan

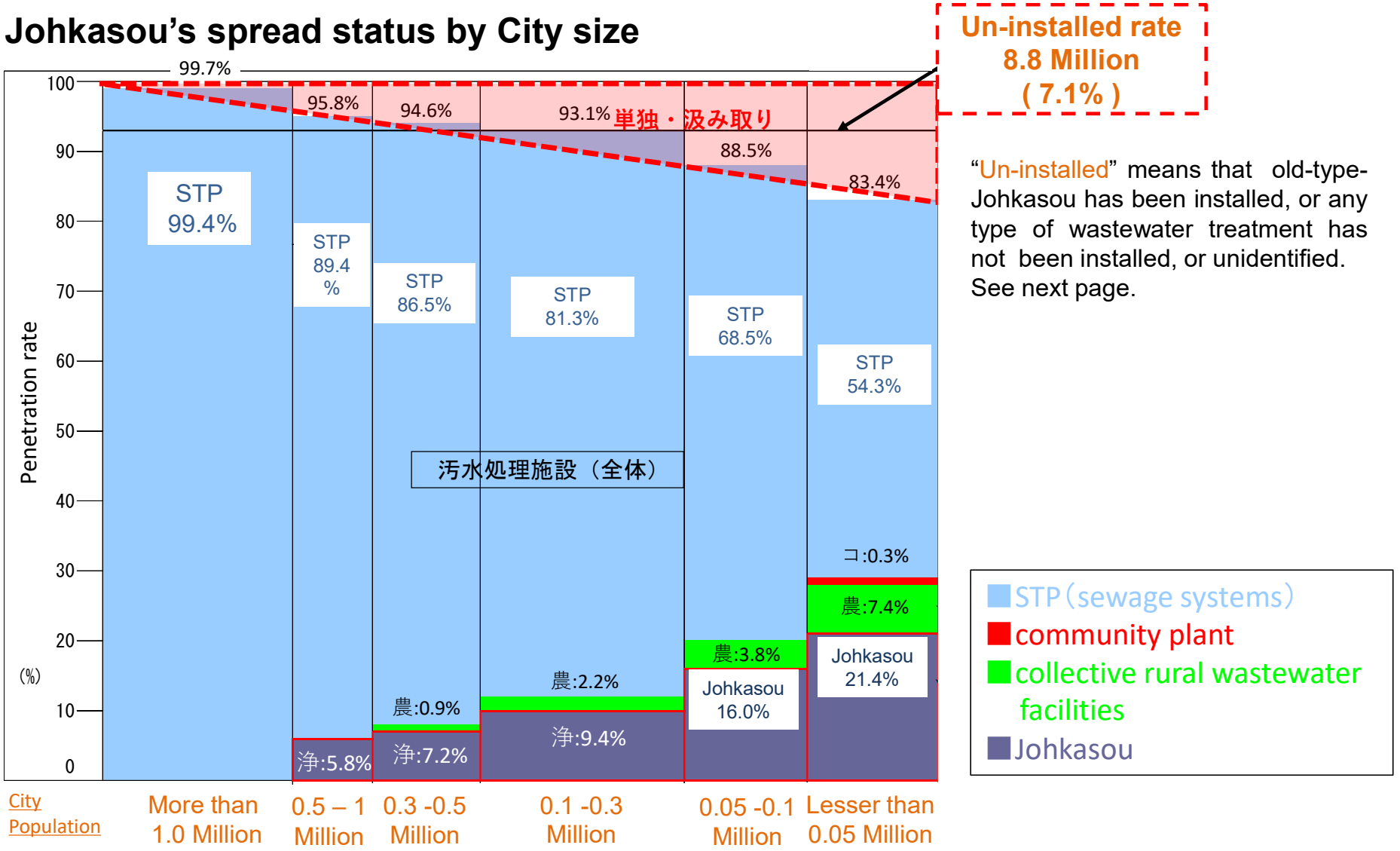
■ Wastewater Treatment Systems in Japan



- **Sewage System** : managed by the Ministry of Land, Infrastructure, Transport and Tourism
- **Collective Rural Wastewater Facilities** : managed by the Ministry of Agriculture, Forestry and Fisheries
- **Johkasou**: managed by the Ministry of the Environment

1. History and Current situation of wastewater treatment in Japan

■ Trend of Johkasou's spread status by City size



"Un-installed" means that old-type-Johkasou has been installed, or any type of wastewater treatment has not been installed, or unidentified.
See next page.

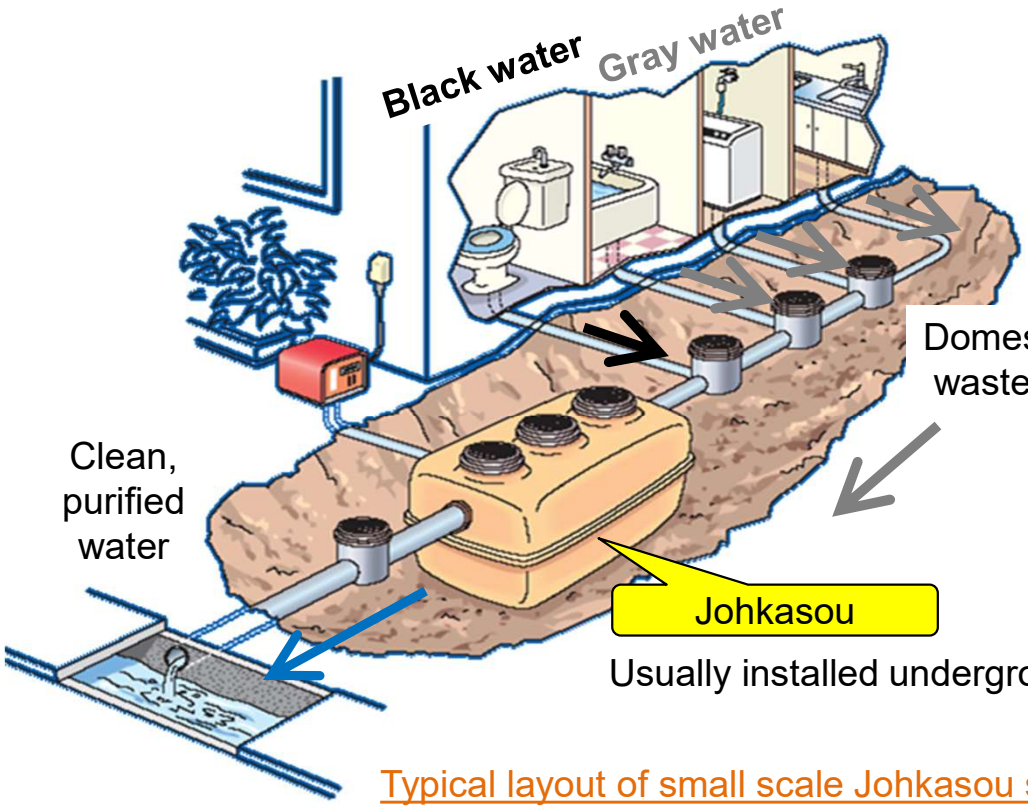
1. History and Current situation of wastewater treatment in Japan

■ **Current situation of population served for treating domestic wastewater by different wastewater treatment facilities**

Type of treatment facility		Population served (x 1,000 people)	
		End of FY2022	End of FY2021
Municipal sewage systems		**101,280 (81.0%)**	**101,181 (80.6%)**
Collective rural wastewater facilities, including Facilities for fishing villages, Facilities for forestry villages, Simple wastewater facilities		**3,018 (2.4%)**	**3,103 (2.4%)**
Johkasou		**11,784 (9.4%)**	**11,758 (9.4%)**
	Municipal Johkasou Installation Program	**825**	**831**
	Johkasou Installation and Maintenance Program	**6,229**	**6,203**
	Other Johkasou	**4,730**	**4,725**
Community plants, etc.		**160 (0.1%)**	**171 (0.1%)**
Total population served		**116,242**	**116,213**
Percentage of population served		**92.9%**	**92.6%**
Total population		**125,065**	**125,540**
Total population not served		**8,823**	**9,327**
Un-installed rate		**7.1%**	**7.4%**

2. General Information of Johkasou

- "Johkasou" is categorized as decentralized wastewater treatment system for domestic wastewater discharged by household, building and so-on."
- Johkasou have a combined purification structure capable of treating both night soil (black water) and miscellaneous wastewater (gray water)
- Johkasou attains high and stable performance as same as that of sewage treatment plant and it has been installed totally more than 3.9 million unit in Japan.



Typical layout of small scale Johkasou setup for household

Industrial wastewater, **Domestic wastewater**

Sewage treatment, **Decentralized treatment**

Septic tank, wetland,DEWATS, etc., **Johkasou**

BOD removal, Nitrogen and/or Phosphorous removal

2. General Information of Johkasou

■ **Domestic wastewater = Black water (Night soil) + Gray water(kitchen drainage, bath drainage etc**

○ Current Johkasou in Japan

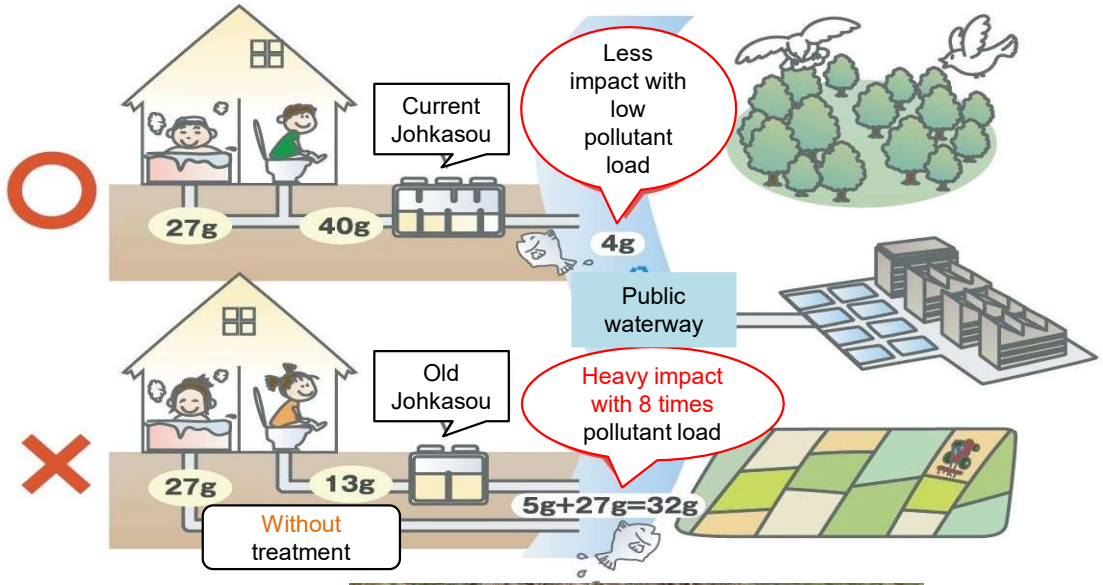
Both Black water & Gray water are treated.

× Old type Johkasou in Japan

Only Black water is treated and have low treating ability

⇒ Heavy impact with 8 times pollutant load

In Japan, old type Johkasou are treated as untreated domestic wastewater.

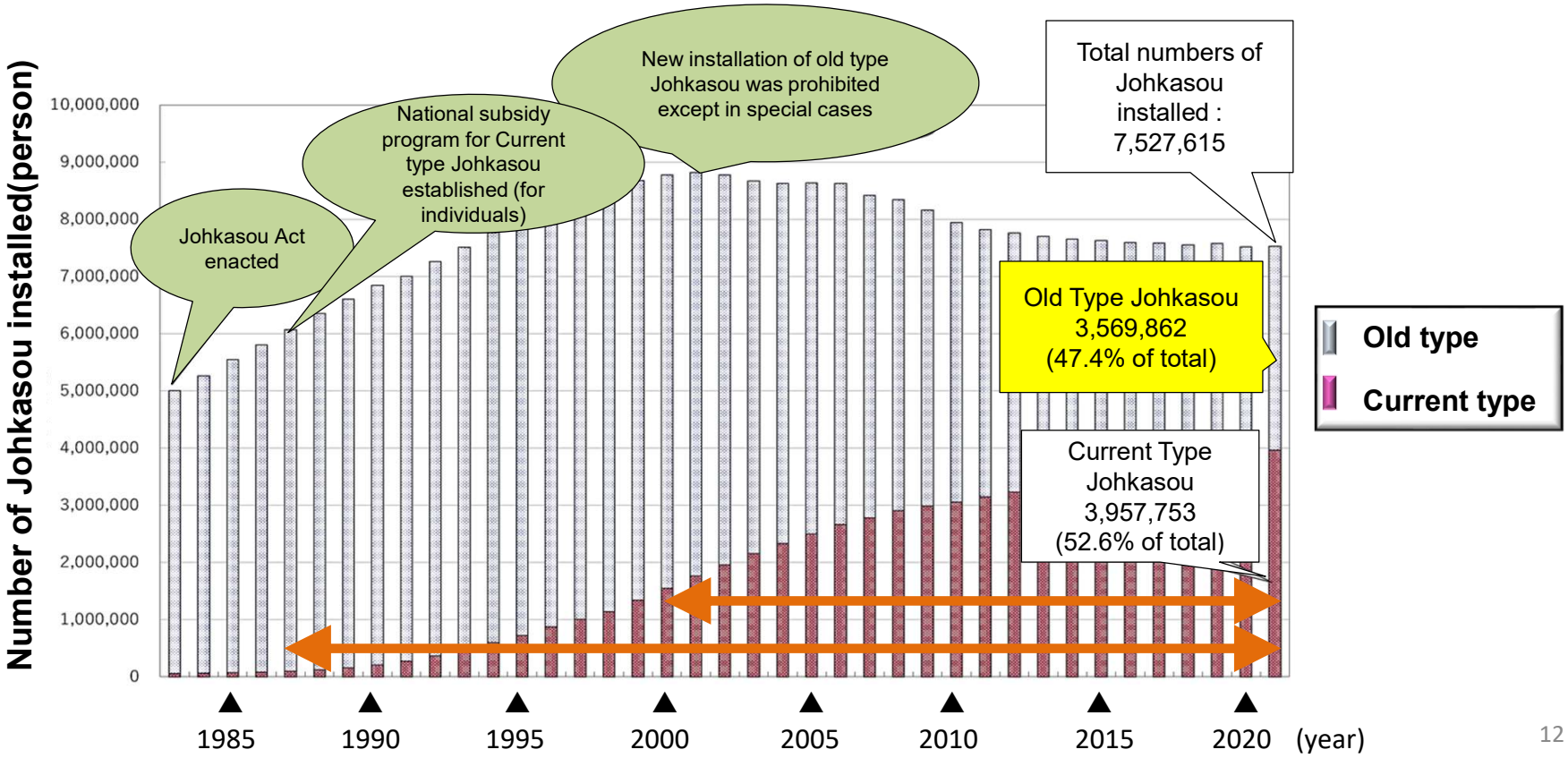


Discharge of untreated wastewater

2. General Information of Johkasou

■ Configuration of old & current type Johkasou

- Though new installation of old type Johkasou was prohibited in 2000, still approx. 3.6 million sets of old type Johkasou are used in Japan.
- It is necessary to promote the conversation to the current type of Johkasou.



3. Legal Framework of Johkasou in Japan

■ Overall concept of water environment improvement

Target

Establishment of Environmental Quality Standards of Pollution 【Basic Environment Law】

Industrial Wastewater Measures

- Establishment of Wastewater Standards 【Water Pollution Prevention Act】
  Nationwide uniform standards

- Stricter regulation on Wastewater Standards
- Regulations on business operators 【Water Pollution Prevention Act】
  Notification, measuring and recording of wastewater, on-site inspection
  → Penalties, improvement orders and other administrative guidances

- Investments, human resource developments, etc. for pollution prevention

Domestic Wastewater Measures

- **Sewerage System Establishment【Sewerage Law】**
- **Installation of Johkasou 【Johkasou Act】etc.**

National Government

- Vision
- Law & Regulations
- Technical Standards
- National Subsidies

Sharing Responsibility

Local Government

- Treatment Master plan and its implementation
- Ordinance
- Construction, Operation and Management of sewerage facilities
- Advice and guidance on Johkasou operation and maintenance

3. Legal Framework of Johkasou in Japan

■ History of Johkasou Act

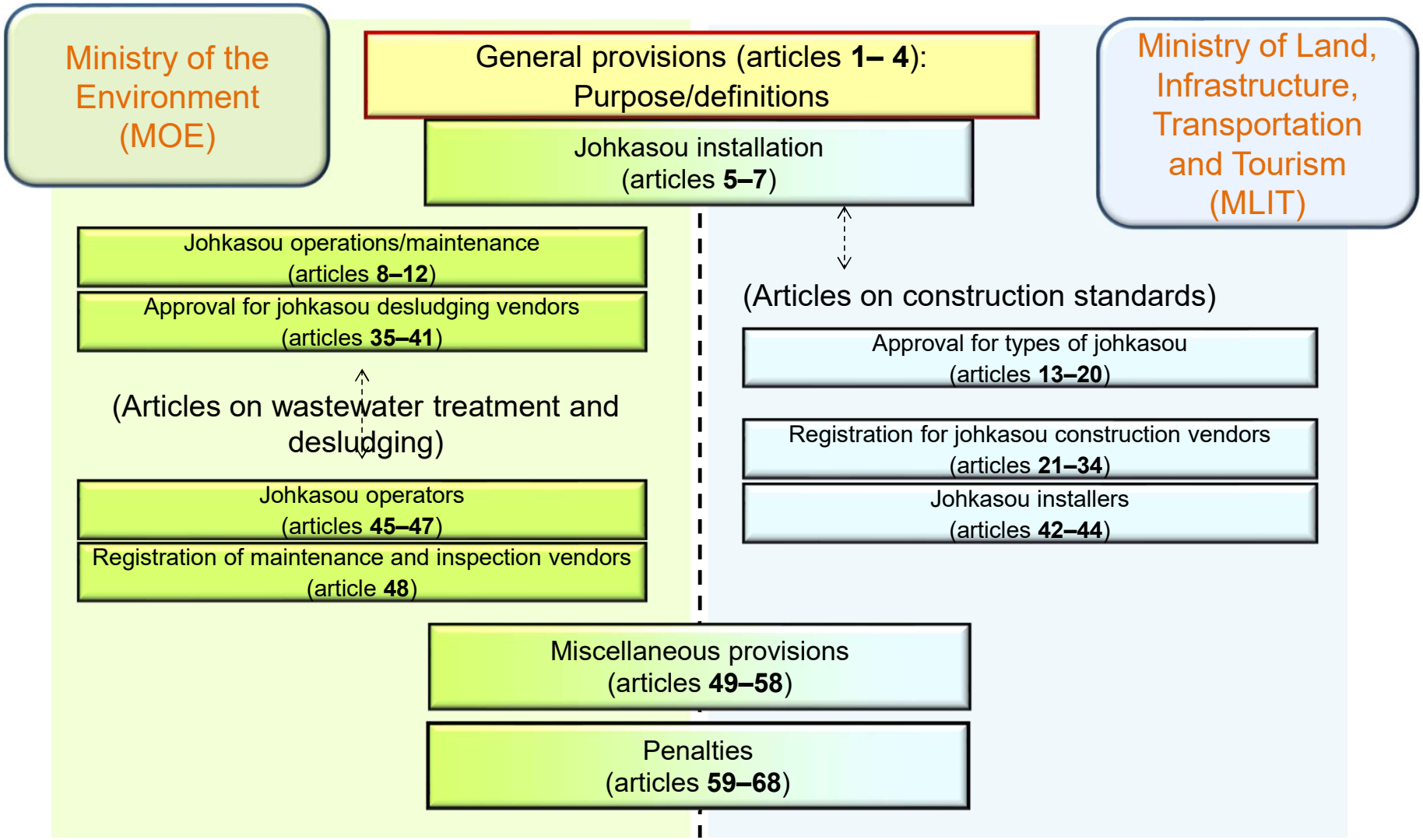
Year	Item
1960 to around 1980	With increasing population of flush toilet, rapid installation of Tandoku (old type) Johkasou to treat black water only
1983	Johkasou Act enacted (legislation introduced by a Diet member, came into force in 1985)
2000	Amendment: New installation of Tandoku-shori (old type) Johkasou was prohibited
2005	Amendment: Stricter water quality management systems introduced
2019	Amendment: ➢ Strengthening the authority of prefectural governors for conversion from Tandoku Johkasou (old type) to Gappei Johkasou (current type) ➢ Clarification for proceeding Johkasou installation as a public works ➢ Others

■ Purpose of Johkasou Act

- ✓ Promotion of domestic wastewater (both black and gray water) treatment by Johkasou for conservation of water quality in public water area
- ✓ Preservation of the living environment
- ✓ Improvement of public health

3. Legal Framework of Johkasou in Japan

■ Outline of each article from 1 (one) to 68 (sixty eight) and its jurisdiction in Johkasou Act



3. Legal Framework of Johkasou in Japan

■ Johkasou Installation Procedure and related Article of Johkasou Act

Installation notification (Article 5)

(Certify under the Building Standards Act when necessary)

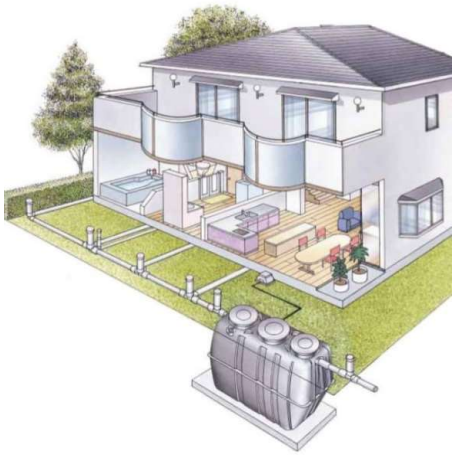
Construction (Article 6)

- Johkasou contractor must register with the prefectural governor (Article 21)
- Johkasou contractor must dispatch the certified installation technician on each office (Article 29)

(Can issue administrative recommendations when necessary)

Post-installation legal inspections (Article 7)

Discontinuance notification (Article 11-2)



3. Legal Framework of Johkasou in Japan

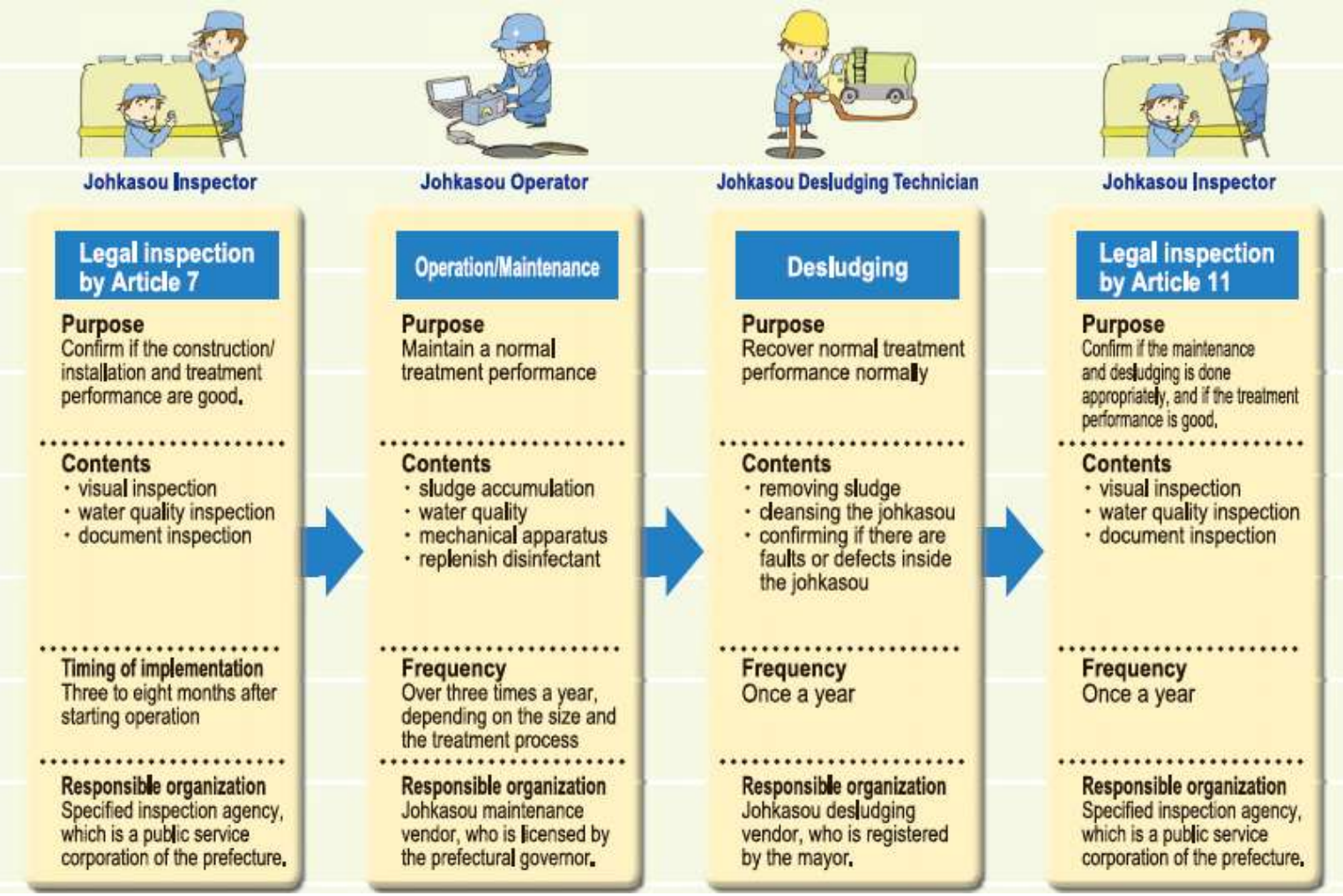
■ Post-installation water quality inspection (Article 7)

Within 3 to 5 months after staring the operation

Inspection category	Inspection items	
1) Visual inspection	(1) Installation status	(5) Foul odors
	(2) Operational status	(6) Usage of disinfectant
	(3) Direction of water flow	(7) Mosquitoes, flies, etc.
	(4) Usage status	
2) Water quality inspection	(1) Hydrogen ion concentration	(5) Chlorine ion concentration
	(2) Sludge settling ratio	(6) Residual chlorine concentration
	(3) Dissolved oxygen (DO)	(7) Biochemical oxygen demand (BOD)
	(4) Transparency	
3) Document inspection	Maintenance inspection record	

3. Legal Framework of Johkasou in Japan

■ Inspections and Maintenance



MOEJ “Night Soil Treatment and Decentralized Wastewater Treatment System in Japan”

3. Legal Framework of Johkasou in Japan

■ Johkasou corporate registration process

National qualifications

Prefecture → Registration → Instructions, advice, recommendations, etc.

Johkasou construction company

【Certified Johkasou installation technician】
Person certified to supervise Johkasou construction

MLIT Ministry of Land, Infrastructure, Transport and Tourism

Municipality → Approval → Instructions, advice, recommendations, etc.

Johkasou desludging company

Prefecture or other → Registration → Instructions, advice, recommendations, etc.

Johkasou maintenance inspection company

【Certified Johkasou maintenance technician】
Person certified to supervise Johkasou maintenance inspections

Ministry of the Environment Government of Japan 環境省

3. Legal Framework of Johkasou in Japan

■ For Johkasou Technicians by Japan Education Center of Environmental Sanitation (JECES)

- Johkasou technicians should acquire 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 Maintenance Technician by Article 45

Fundamental of johkasou	8 H
Laws and regulations related with johkasou	4 H
Structure and function of johkasou	22 H
Introduction to installation of johkasou	4 H
Operation and maintenance of johkasou	30 H
Water quality management of johkasou	10 H
Introduction to desludging of johkasou	2 H

Total 80 Hours (13 Days)

+Test 2 Hours

Johkasou Installation Technician by Article 42

Fundamental of johkasou	8 H
Laws and regulations related with johkasou	3 H
Structure and function of johkasou	15 H
Management of johkasou installation	8 H
Introduction to O&M and desludging of johkasou	3 H

Total 37 Hours (5 Days)

+Test 2 Hours


THANK YOU FOR YOUR KIND ATTENTION.
At Kikuchi Gorge,Kikuchi City,Kumamoto Prefecture

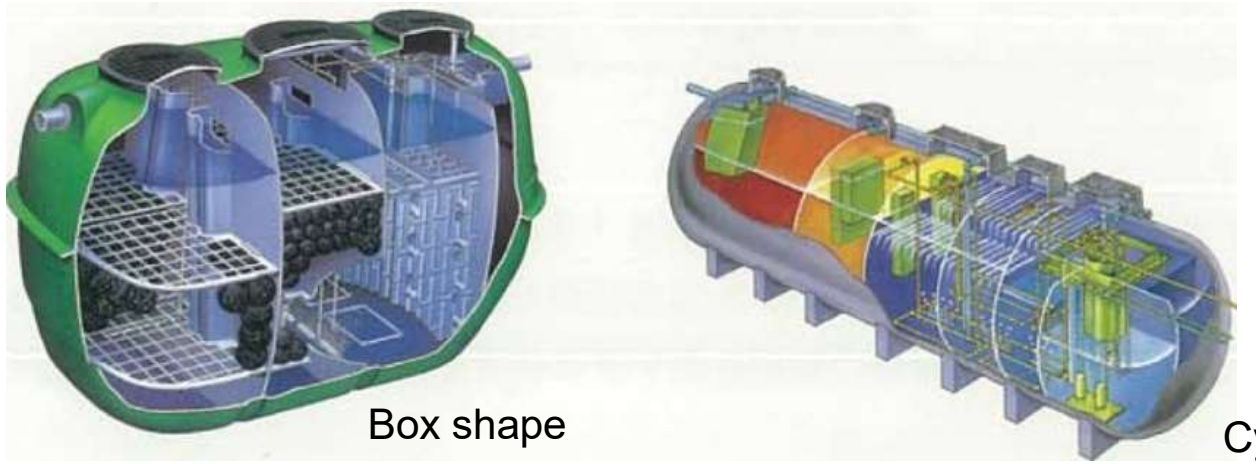
Appendix 1
Other Information of Johkasou

Appendix 1. Other Information of Johkasou

■ Typical figure and performance of Johkasou

Small and middle size (5 ～ 51 P.E.)

Large size (51 P.E.～)



Box shape

Cylindrical shape

■ The performance criteria of Johkasou's performance evaluation system

BOD	≦ Standard type 20mg/L, Option 15, 10, 5mg/L
T-N (Total Nitrogen)	≦ Standard type (NIL), Option 20, 15, 10, 5mg/L
T-P (Total Phosphorous)	≦ Standard type (NIL), Option 2, 1, 0.5, 0.1mg/L

Appendix 1. Other Information of Johkasou

■ Comparison chart of Sewage, Johkasou and Septic tank

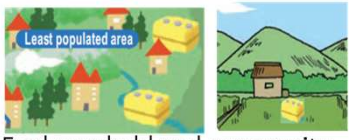
	Sewage（STP)	Johkasou	Septic tank
Category	Centralized	Decentralized	
Capacity(m3/day)	Large	Small to middle	Small
Application	City covering with pipeline network	For household, building, housing complex, community, hospital, school, public toilet, etc.	
Target	Black water & Gray water		Black water
Method	Aerobic (plus Anaerobic)		Anaerobic only
Treated water quality	- Good - BOD <20mg/L - Nitrogen & Phosphorous can be removed		- Poor, BOD ≒ 100mg/L - Nitrogen and Phosphorous can't
Discharge	Clean discharge is discarded directly to the river, lake, sea and so-on.		- Dirty discharge is penetrated into ground - Gray water is discarded without treatment
Main body	Civil structure constructed at site	FRP manufactured in factory	Civil structure constructed at site
Maintenance works	Checking and adjustment, desludging, inspection, changing spare parts		Desludging only (every 3 to 5 years)
Total period for operation start	Long for planning, financing, construction	Short	

Johkasou can be recognized as a "prefabricated small scale sewage treatment plant" in wastewater management

Appendix 1. Other Information of Johkasou

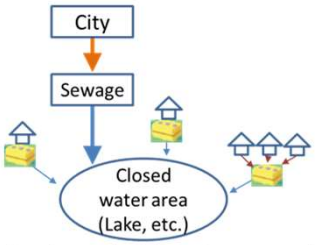
■ Application of Johkasou for domestic wastewater management

a) Rural, agricultural area, Geographical isolated area



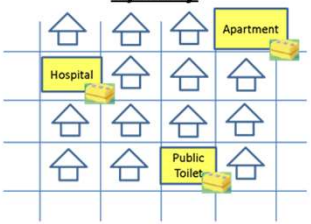
For household and community

b) Closed water area



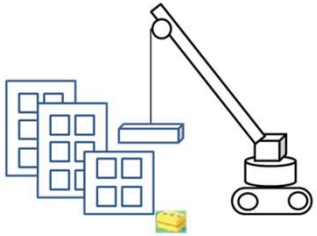
For household and community surround closed water area
(Ex., Taung Tha Man Lake)

c) City



For important point source
(Ex., Hospital, Public Toilet, Apartment)
(In advance before installing sewage system)

d) Rapid development area



(Ex. Huge apartment project)

e) Emergency hygiene improvement area (if any)

(Ex. Poverty houses where frequent water-born diseases are infected)

f) Monumental Area

(Ex. For natural reserve, world heritage, etc.)

■ Example of Johkasou installation overseas

Restaurant
(China: 10m^3/d)

Toilet in factory
(Vietnam: 5m^3/d)

Canteen & toilet
(Myanmar: 30m^3/d)

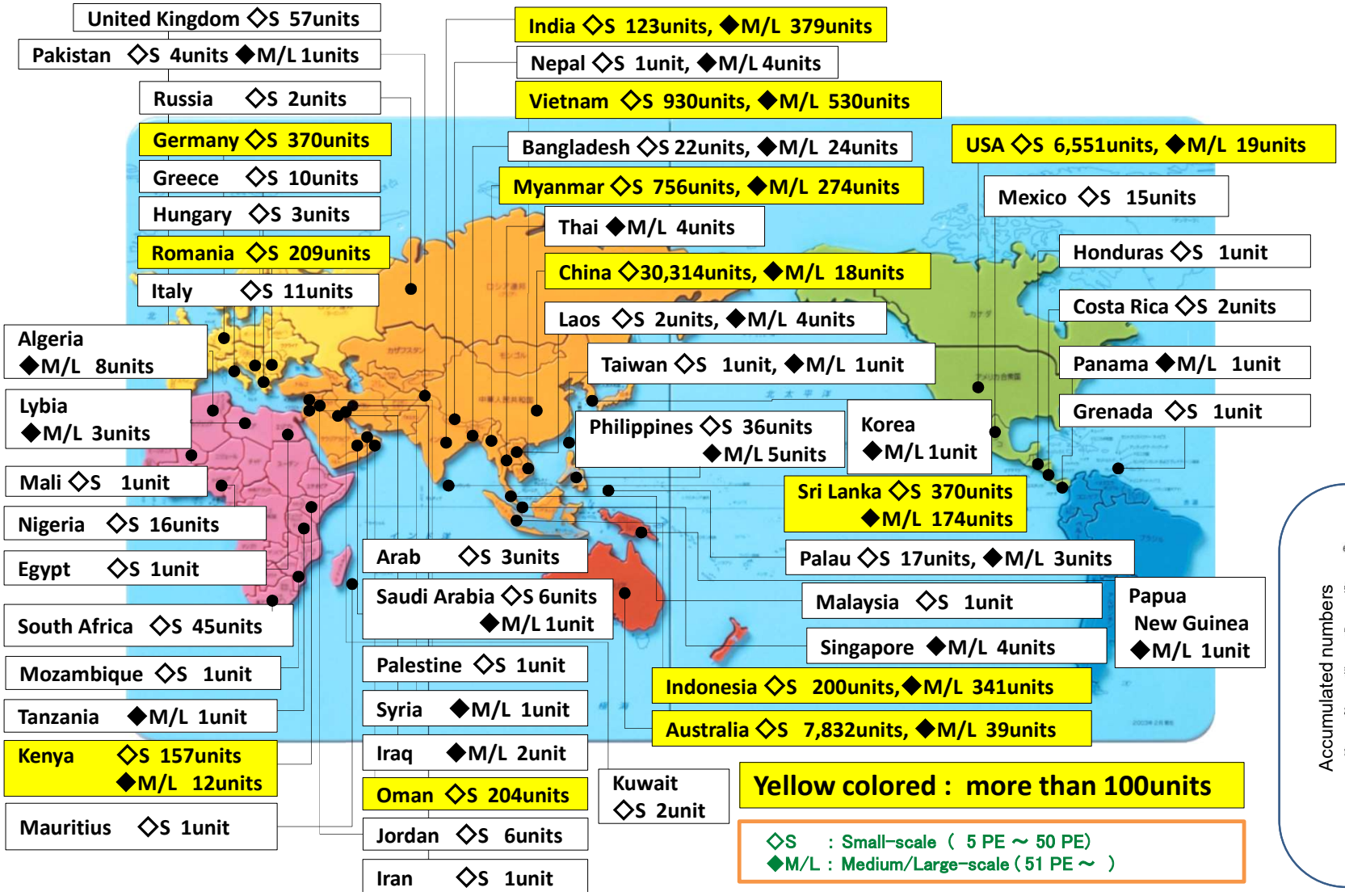
Employee dormitory
(Saudi Arabia: 530m^3/d)

At the end of 2022, totally over 50,000 sets of Johkasou are installed overseas

Appendix 1. Other Information of Johkasou

■ Installation records in Overseas (Total)

As of the end of December 2022 (Total) by Johkasou System Association



Yellow colored : more than 100units

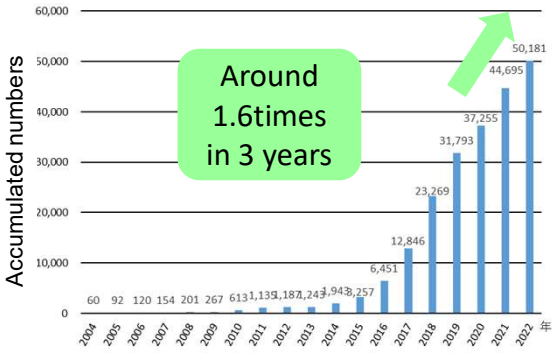
◇S : Small-scale (5 PE ～ 50 PE)
◆M/L : Medium/Large-scale (51 PE ～)

● 2022 recent (Total)

Small size 48,325units
M/L size 1,856units
Total 50,181units

Total 51 countries

■ Trend by years (Total)

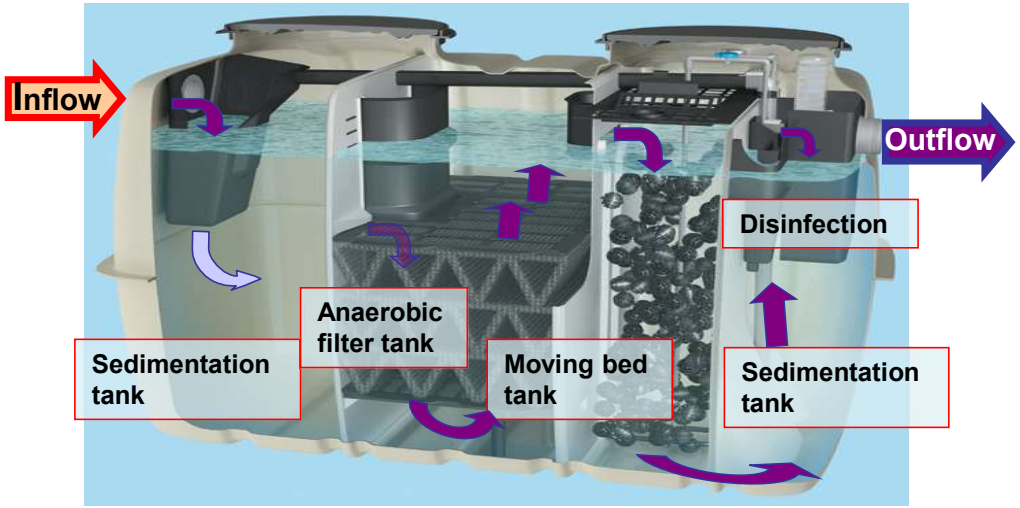


Appendix 1. Other Information of Johkasou

■ Approval process for types of Johkasou (Johkasou Act, Article 13)

- Parties intending to manufacture Johkasou in production plants shall obtain approval from the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) for the type of Johkasou to be manufactured (does apply to test manufacturing)
- This process is suitable to Performance Evaluation System

Performance Evaluation Test → Approval by the Minister of Land, Infrastructure,Transport and Tourism → Model Approval by Johkasou Act → Put into Market ← **Performance Ensured**



Sample of Performance Evaluation Type Johkasou

The Building Center of Japan

- ✓ Johkasou's Performance Evaluation System
- ✓ Detail of Johkasou's Performance Evaluation System

https://www.bcj.or.jp/upload/rating/bizunit/hyoutei/joushi_hyoukahouhou.pdf

Appendix 1. Other Information of Johkasou

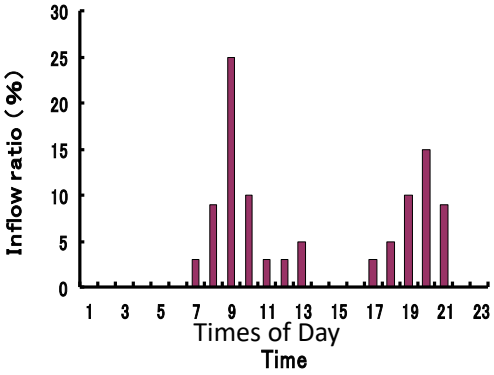
■ **Example of contents in Johkasou's Performance Evaluation System**

1) Performance Criteria

Applicant (Johkasou manufacture) chooses
the application value for test criteria in below

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) Inflow Pattern



3) Type of Performance Evaluation Test

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

4) Other Test

Test Method	Duration (weeks)	No. of unit	Evaluation Points
Maintenance evaluation test	-	Over 1	Ease of Maintenance
Sludge test	Breeding+over 12 wks	Over 1	Sludge

Note: In order to obtain approval, several tests are implemented in combination in the above tables.

Appendix 1. Other Information of Johkasou

■ JIS A3302-2000 Estimation of population for wastewater purifier of buildings

1 P.E. = 200L/day, 40g BOD/day

Example

- General household
  【Formula】If total floor area A (m^2) ≦130m^2 , Johkasou capacity (P.E.) shall be 5 P.E.

- Hotel with a wedding hall
  【Formula 】Johkasou capacity (P.E.) = 0.15 x (total floor area A (m^2))

- Large hospitals with commercial kitchens or laundry facilities and more than 300 beds
  【Formula 】Johkasou capacity (P.E.) = 11.43 x (number of beds B - 300) + 2,400

Large categories	Detail categories (Formulas)
1. A place where people gather	Theater, etc. (3)
2. Residence	Apartment, etc. (6)
3. Hotel	Motel, etc. (4)
4. Medical facility	Clinic, etc. (5)
5. Store	Restaurant, etc. (6)
6. Amusement facilities	Disco, etc. (13)

Large categories	Detail categories (Formulas)
7. Parking	Highway rest area, etc. (7)
8. School	Library, etc. (3)
9. Office	Office with canteen, etc. (2)
10. Work facility	Laboratory, etc. (2)
11.Others	Public toilet, etc. (6)

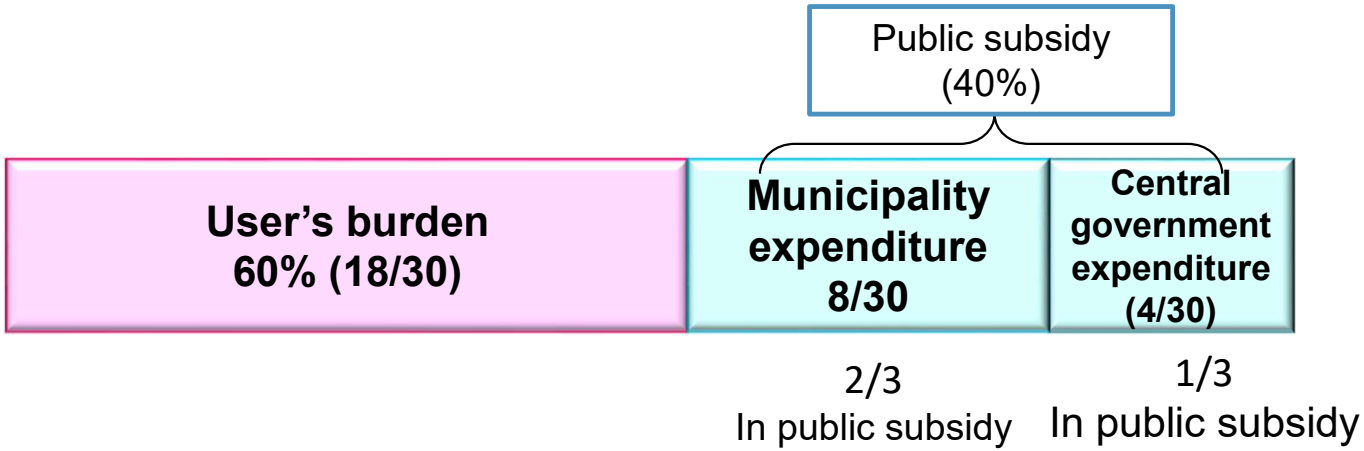
Total 11 large categories, 57 equations

Appendix 2
Subsidy for Johkasou

Appendix2. Subsidy for Johkasou

■ Subsidy for Johkasou private installation for house owner

■Subsidizes municipalities supporting their residents (private citizens) with current type Johkasou installation for Johkasou device fee and its installation fee



■Owner of Johkasou is responsible for operation and maintenance.

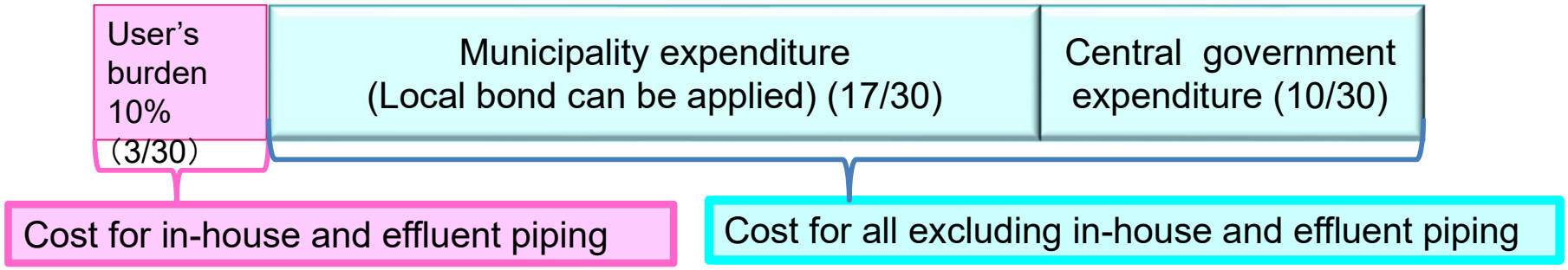
■Since 1987

Appendix2. Subsidy for Johkasou

Ref: over 300 projects as of 2016 (total municipalities in Japan 1,718 as of 2021)

■ Municipal Installation Project

- Municipalities install Johkasou as a public infrastructure like a Sewage treatment system
- Municipalities also carries out O&M works with collecting fee from house owners.



➢Advantage

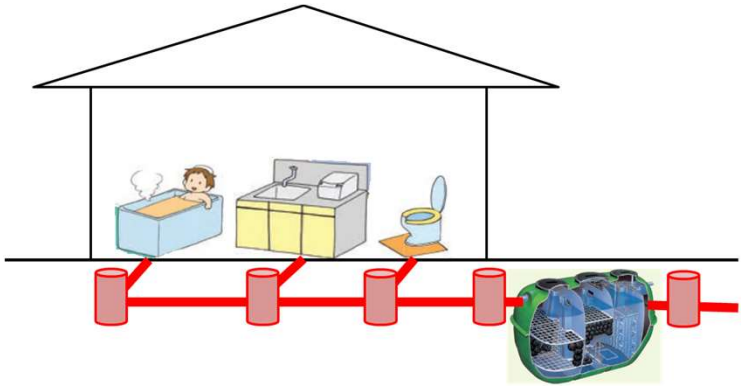
If applying this scheme, it would be easier to convert old type Johkasou to current one due to municipalities implement the conversion at once where many old type Johkasou are still remained.

➢Disadvantage

Responsibility for finance and management would be a burden of Municipalities.

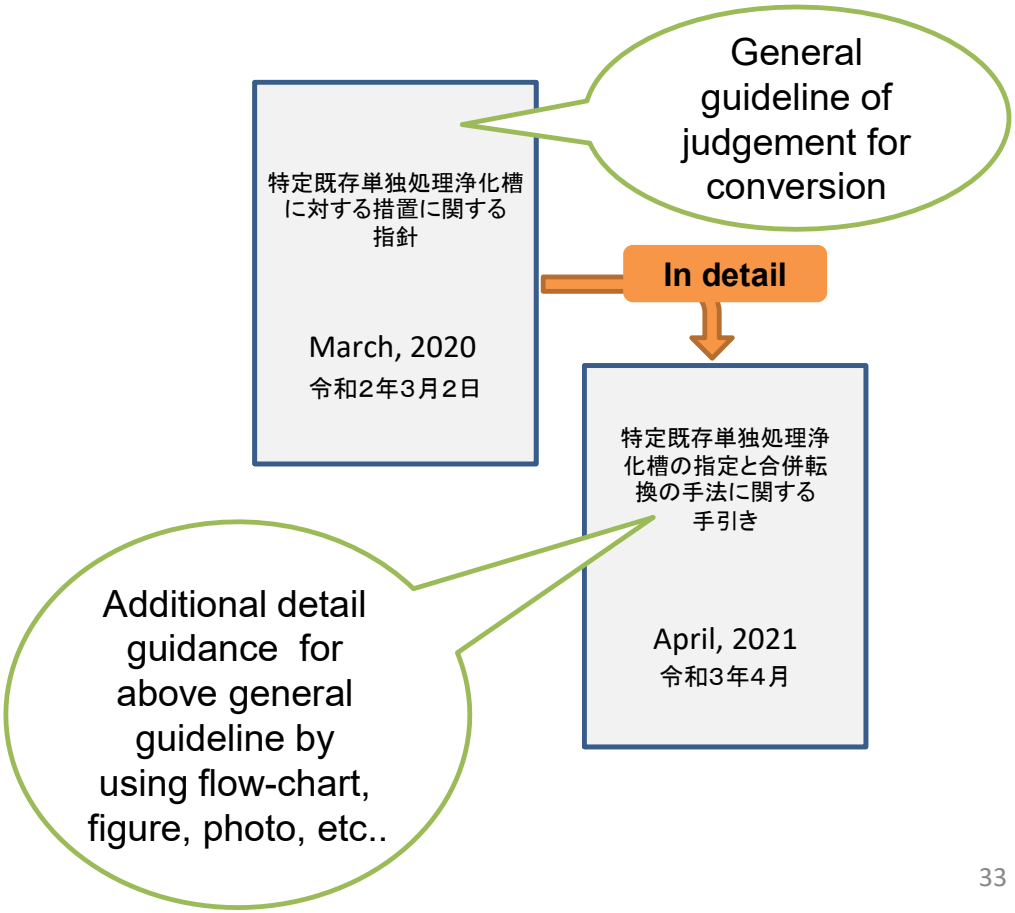
Appendix2. Subsidy for Johkasou

■ Additional subsidy for installing in-house piping works for conversion from old type Johkasou to current type Johkasou



- Subsidizes municipalities supporting their residents (private citizens) for in-house piping work

■ Furnishing the conversion manual



Appendix2. Subsidy for Johkasou

■ Application of Johkasou PFI project in Japan

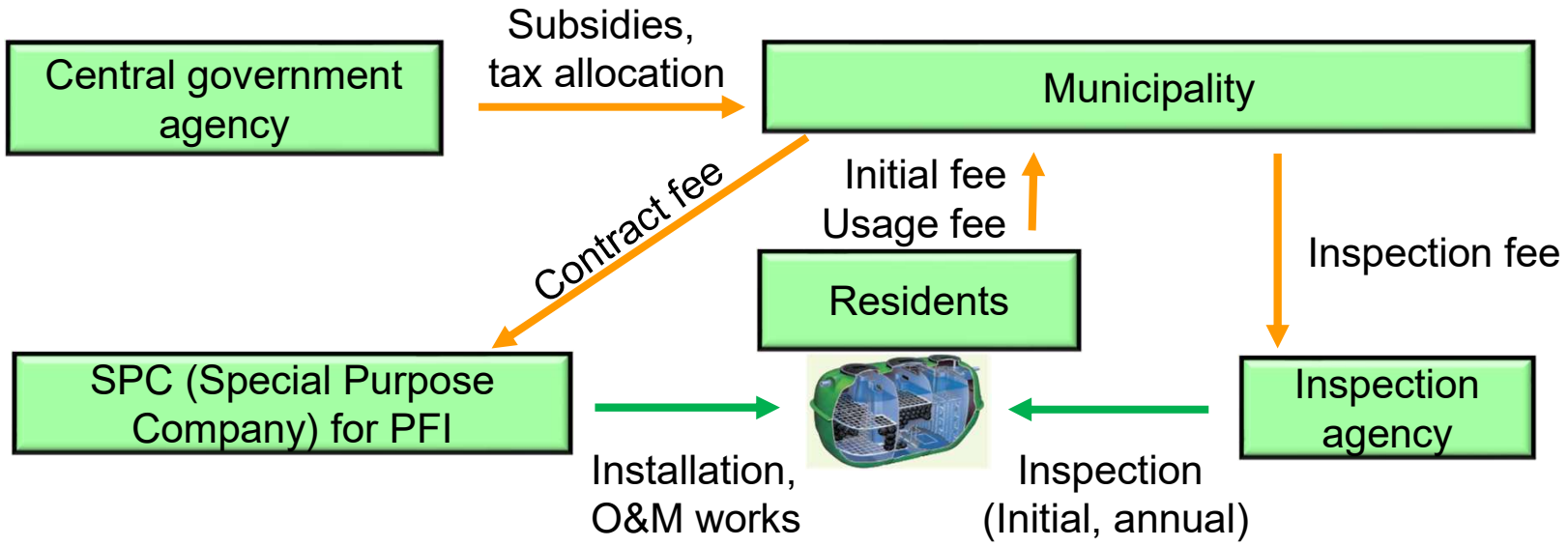
Example of Type of PFI scheme is “BTO” (Built, Transfer and Operate)

Disadvantage of Johkasou Municipal Installation Project

- Increase of financial burden on municipalities
- Increase of workload on municipalities without enough human-resource

Advantage of Johkasou PFI projects

- PFI operators are responsible for installation, operation and maintenance.
- Municipalities can utilize private financing, technology and know-how on business.
- Decrease of overall project cost and workload on municipalities, and improvement of residential services due to the bulk contract and implementation by private business.



Appendix2. Subsidy for Johkasou

■ Example of Municipal Subsidies for Maintenance and Operation

M: Maintenance, C: Cleaning, LI: Legal Inspection

Name of Municipality	Subjects of Subsidy	Amount of Subsidy (Maximum Approx. US$)
Fujisawa City, Kanagawa Pref.	C	US$ 20 in case of 2m3 plus US$ 7 x (α(m3) – 2m3)
Fukaya City, Saitama Pref.	M, C, LI	US$ 140
Fukuroi City, Shizuoka Pref.	M, C, LI	(M+C+LI of Johkasou) – Sewage usage fee (assuming)
Iida City, Nagano Pref.	C	US$ 110, or Half of Cleaning fee
Kakogawa City, Hyogo Pref.	M, C, LI	US$ 140
Kawagoe City, Saitama Pref.	LI	US$ 50
Kiyosu City, Aichi Pref.	C	40% of cleaning fee
Kumagaya City, Saitama Pref.	M, C, LI	US$ 110 in case of 5P.E.
Machida City, Tokyo Metropolitan	M, C, LI	US$ 140 in case of 5P.E.
Matsumoto City, Nagano Pref.	C	US$ 140, or Half of Cleaning fee,
Mitoyo City, Kagawa Pref.	M, C, LI	US$ 210
Ogose Town, Saitama Pref.	M, LI	US$ 70
Tatebayashi City, Gunma Pref.	C	US$ 70 in case of 5P.E.
Yokkaichi City, Mie Pref.	M, C, LI	US$ 90 in case of 5P.E.

Ref: Annual O&M fee of small Johkasou for household in Japan is around **US$430** including Cleaning, Maintenance, Legal Inspection Electricity.

The Original is Japanese Yen and the rate is = 140 JPY / US$.