OPENING SESSION

Domestic Wastewater Management and the Johkasou System in Japan

From night soil recycling to a national on-site treatment system

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Disclaimer

The materials being presented represent the presenter's own opinions,
and do NOT reflect the opinions of NOWRA.

BEFORE WE START

Japan at a glance, for a US audience

378,000 km²

Land area

About 1/26 of the US — slightly smaller than California. Four main islands hold 97% of it.

123 million

Population

About 36% of the US population on 4% of its land: 330 people per km², nine times the US density.

14,125

Islands

Off the east coast of the Asian continent, 47 prefectures and 1,719 municipalities.

70%

Mountains and forest

Mountains and forest cover two-thirds; about 1,700 mm of rain a year, twice the US average.

Tokyo ↔ Denver

About 9,400 km (5,800 miles) and 15 time zones apart. Tokyo lies at the latitude of Las Vegas.

Why it matters for this talk

Small lots, dense settlements and abundant water are the geography behind a compact on-site treatment unit.

Japan is small, crowded, wet and mountainous. Every design choice in the johkasou system starts from that geography.

Sources: Geospatial Information Authority of Japan (island count, 2023); Statistics Bureau of Japan (population estimate, 2025); US Census Bureau; CIA World Factbook.

ABOUT THE PRESENTER'S ORGANIZATION

Who we are: JECES

Training

• Designated training body for the national Johkasou Operator and Installation Worker courses
• Courses for Technical Supervisors, Inspectors and Desludging Technicians

National examinations

• Examination body for the Johkasou Operator and Installation Worker national examinations
• License issuance on behalf of the ministries

Testing and research

• Influent-material effect tests, functional investigations and environmental technology verification
• Surveys commissioned by MOE — e.g. the FY2025 nationwide O&M cost survey cited in Section 5

International cooperation

• Johkasou System International Cooperation Center (since 2013)
• Annual Asian workshop on decentralized wastewater treatment; ISO standardization work



JECES

Japan Education Center of Environmental Sanitation — a public interest incorporated foundation in Tokyo, founded in 1966 as the Japan Johkasou Education Center.

Source: JECES, www.jeces.or.jp/en

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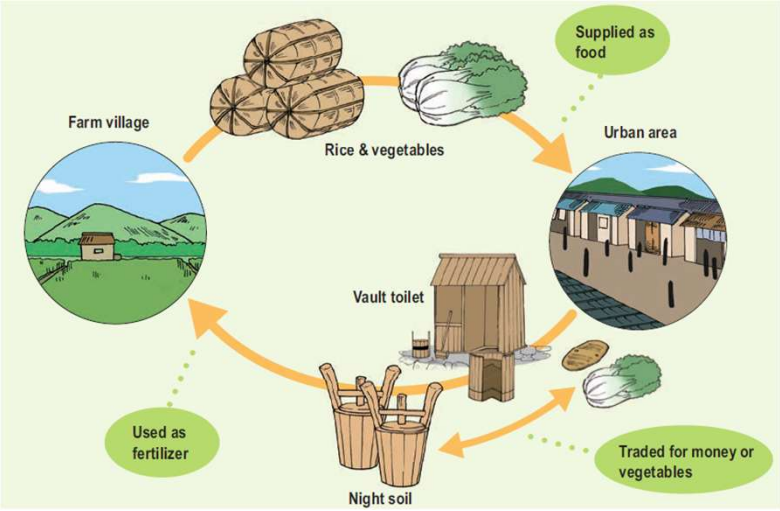
SECTION 1

Why Japan needed a Johkasou Act

Night soil as a resource, urbanization, flush toilets, and the 1983 Act

Night soil was not waste — it was a farm input

- Until the mid-20th century, human excreta collected from cities was sold to farmers as fertilizer
- In Edo, now Tokyo, collection was an organized trade with routes, contracts and prices
- A closed nutrient loop: city → farmland → food → city
- Urban sanitation was maintained by an agricultural market, not by regulation



> ***This is why Japan had no sanitation crisis of the European type, and why the crisis came later, from a different direction.***

Urbanization broke the loop

Demand collapsed

Chemical fertilizer replaced night soil after the war. Farmers stopped buying it.

Volume grew

Population concentrated in cities. Collected volume exceeded what farmland could absorb.

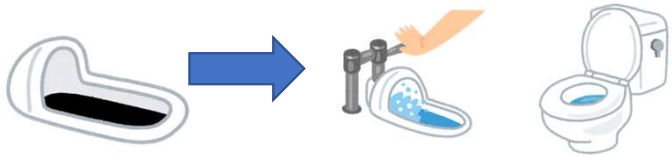
It became a public cost

Collection, transport and disposal turned into a municipal public health problem.

- Municipal night soil treatment facilities were introduced under waste legislation
- Handling excreta shifted from a private trade to a public service

Flush toilets turned it into a liquid problem

- Water-borne sanitation converted collectable night soil into a continuous liquid flow
- Where sewerage did not exist, the wastewater had to be treated on site before discharge
- The Building Standards Act required a treatment facility wherever a flush toilet was installed
- Tandoku-shori johkasou — "Old Type Johkasou" — treats toilet wastewater only, and spread rapidly from the 1960s



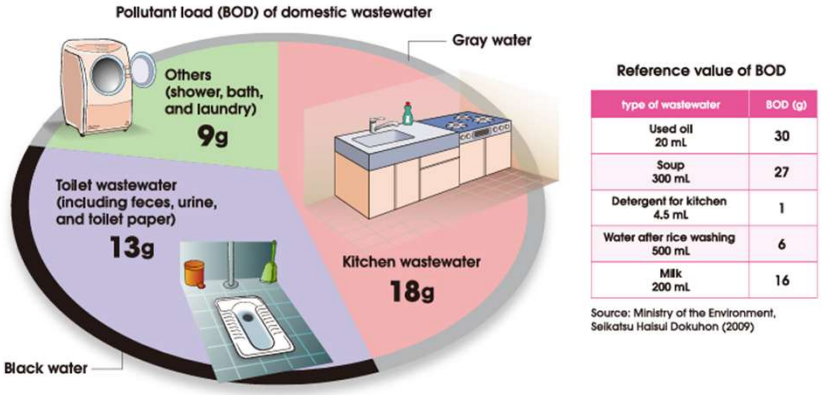


Vault toilet

> ***Flush toilets and Old Type Johkasou spread together. Outside sewered areas, the johkasou was the price of the flush toilet.***

Gray water still went straight to the river

- An Old Type Johkasou treats toilet wastewater only
- Kitchen, bath and laundry water was discharged untreated
- Gray water accounts for roughly two-thirds of the household BOD load
- Water quality in unsewered areas kept deteriorating even as flush toilets spread



Reference value of BOD

type of wastewater	BOD (g)
Used oil 20 mL	30
Soup 300 mL	27
Detergent for kitchen 4.5 mL	1
Water after rice washing 500 mL	6
Milk 200 mL	16

Source: Ministry of the Environment, Seikatsu Haisui Dokuhon (2009)

The figure above shows a breakdown of the pollutant load of BOD in the wastewater generated in one day by one person in Japan. BOD is used as an indicator of the degree of water contamination. The BOD load of toilet wastewater is 13g, while the BOD load of kitchen wastewater is 18g.

Household load

approx. 40 g-BOD per person per day

Old Type Johkasou

discharges roughly 8 times the load of a johkasou

Today's johkasou

treats both flows in one tank

Illustration: MOEJ leaflet on domestic wastewater treatment

Why a dedicated Johkasou Act was needed

Before 1983	Johkasou were covered in fragments: structure under the Building Standards Act, sludge under waste legislation
The gap	No rules on how units were installed or maintained, and no rules on who was allowed to do that work
The result	Field performance fell far short of design performance, and varied by installer and by area
The answer	One statute covering manufacture, installation, use, O&M, desludging, businesses and qualifications

The Johkasou Act, and the shift to today's johkasou

1983	Johkasou Act promulgated (Act No. 43, 18 May 1983)
1985	Main provisions in force — registration, permission and national qualifications begin
1980s–1990s	Subsidy and administrative guidance move from Old Type Johkasou to today's johkasou (gappei-shori: toilet wastewater and gray water together)
2001	New installation of Old Type Johkasou prohibited

Purpose, Article 1: appropriate treatment of night soil and gray water — conserving water quality in public water areas, preserving the living environment, and improving public health

Meanwhile, the collection business was disappearing

- Night soil collection was a licensed municipal service run by private contractors — vacuum trucks, depots and crews
- Every house that switched to a flush toilet was one house no longer collected

Act on Special Measures concerning the Rationalization of General Waste Disposal Businesses accompanying the Development of Sewerage Systems — "Gotoku-ho", Act No. 31 of 1975

Meanwhile, the collection business was disappearing (cont.)

- The contractors could not simply close: they had to keep serving the remaining houses right up to the day of connection
- Vacuum trucks and depots cannot be redeployed to anything else



Act on Special Measures concerning the Rationalization of General Waste Disposal Businesses accompanying the Development of Sewerage Systems — "Gotoku-ho", Act No. 31 of 1975

Rationalization plans and alternative work

The municipality prepares a rationalization business plan, with the consent of the businesses concerned, and obtains the approval of the prefectural governor.

Alternative work

Johkasou desludging and O&M
Night soil and sludge treatment facilities
Sewer pipe network maintenance
Rural community sewerage O&M
Other work the municipality outsources

Financial measures

Compensation for vehicles and equipment that can no longer be used

Support for the cost of converting the business

Employment measures

Vocational retraining

Help for staff to obtain the qualifications the new work requires

Job placement support

Why this matters for johkasou

- Much of the alternative work was johkasou desludging and O&M
- The crews, the vehicles and the local coverage moved from night soil collection into johkasou service
- So when the Johkasou Act created O&M duties in 1983, the service industry to carry them already existed
- Japan did not build an O&M industry from nothing. It redirected one.

The same mechanism is in use again today, as population decline and conversion to sewerage shrink the workload a second time.

SECTION 2

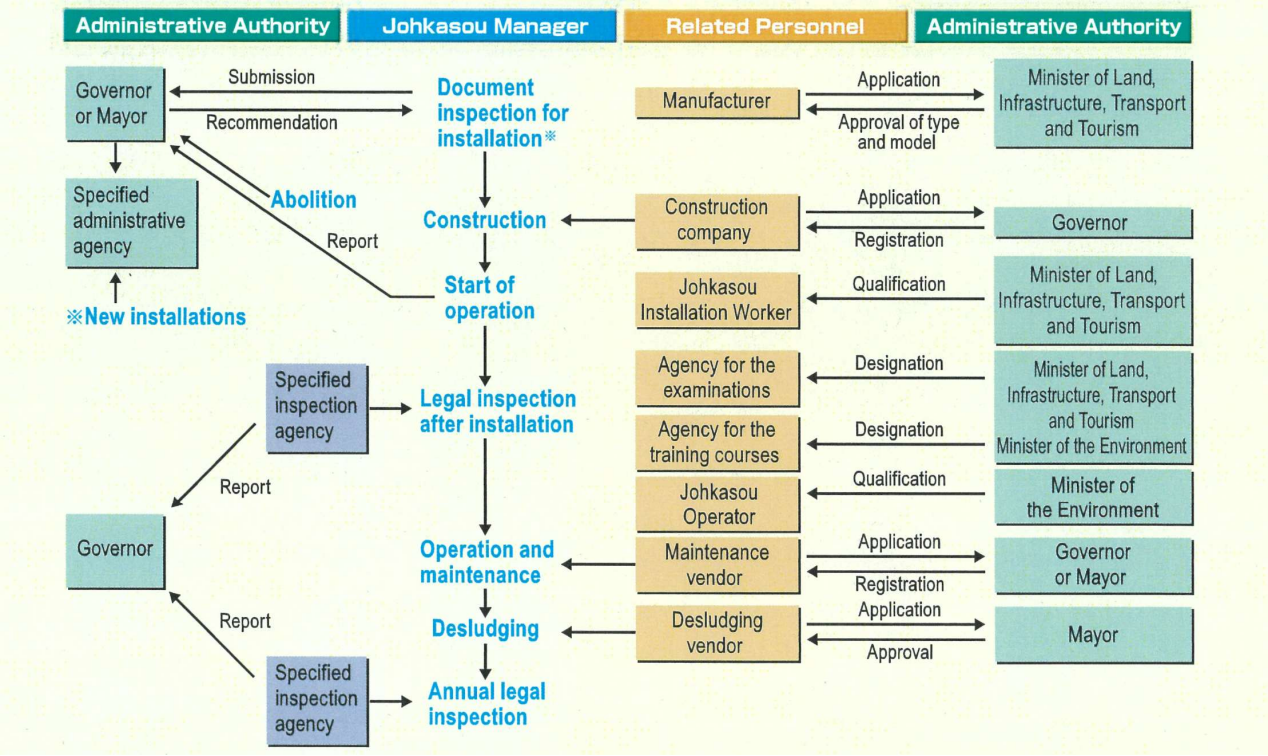
What the Johkasou Act regulates

From the factory to the annual legal inspection — one law across the whole life cycle

One law across five stages

Manufacture	Type approval by the Minister of Land, Infrastructure, Transport and Tourism (Art. 13)
Installation	Notification to the governor (Art. 5), installer registration (Art. 21), Installation Worker on site (Art. 29)
Use	Rules of use to be observed by the user (Art. 3-3)
O&M	Operation & Maintenance (Art. 8, 10) and desludging (Art. 9, 10) to technical standards
Inspection	Legal inspection after installation (Art. 7) and annual legal inspection (Art. 11) by a designated agency

The whole framework on one page



Read it top to bottom
Manufacturer → type approval (MLIT)
Installer → registration (governor),
Installation Worker on site
Manager → start of use, Art. 7 inspection
O&M contractor with Johkasou Operator; desludging contractor permitted by the mayor
Annual Art. 11 inspection by the designated agency; reports to the governor
Blue: administrative authorities; orange: manager; red boxes: national qualifications

Figure: JECES, Capacity development for johkasou related technicians in Japan (training materials for MONRE Vietnam).

2. LEGAL FRAMEWORK

Three instruments held together

Technical standards

Effluent standard (MOE Ordinance)
Structural standard (Building Standards Act)
Standards for construction, O&M and desludging

Qualifications

Johkasou Installation Worker (MLIT)
Johkasou Operator (MOE)
Technical Supervisor, Desludging Technician, Inspector

Administrative supervision

Registration and permission of businesses
Reports and on-site inspection (Art. 53)
Advice, recommendation and orders (Art. 12)

A standard with nobody qualified to apply it, and a qualified person with nobody to check the work, would each fail on their own.

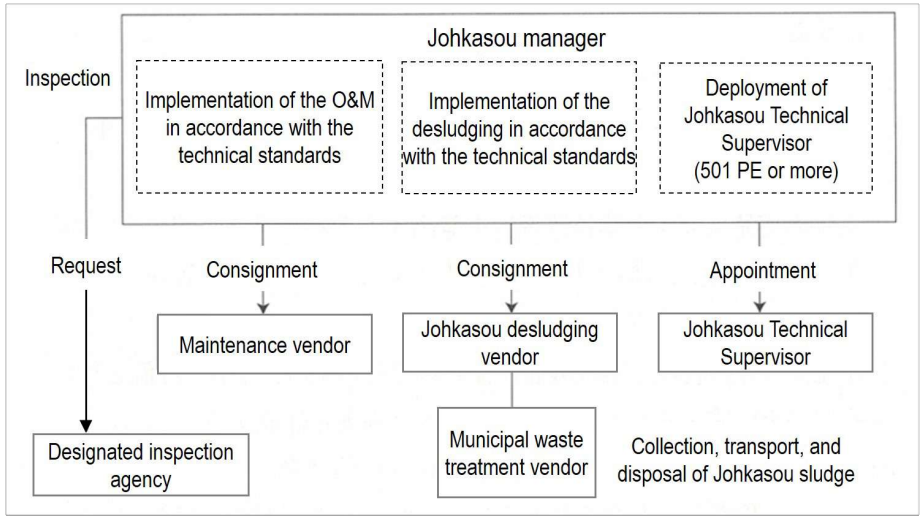
The duties fall on the owner and the user

- The Act creates the "johkasou manager" — the owner, occupier or other person with authority over the unit
- Carry out O&M and desludging (Art. 10)
- Receive the legal inspection after installation (Art. 7) and the annual legal inspection (Art. 11)

Work may be entrusted to registered contractors, but the legal responsibility stays with the manager.

PE here means nin-sou, the design capacity in persons calculated from building use and floor area under a national standard — not the organic-load population equivalent used in Europe and the US.

The duties fall on the owner and the user (cont.)



- Appoint a Johkasou Technical Supervisor for units of 501 PE or more (Art. 10(2))
- Notify start of use, change of manager, and discontinuation (Art. 10-2, 11-2)

The manager entrusts
O&M to a registered contractor, desludging to a permitted contractor, and appoints a Technical Supervisor for 501 PE or more — but asks for the legal inspection in their own name.

Work may be entrusted to registered contractors, but the legal responsibility stays with the manager.

PE here means nin-sou, the design capacity in persons calculated from building use and floor area under a national standard — not the organic-load population equivalent used in Europe and the US.

Rules of use — what the household must do

- Do not pour oil, solvents, medicines or disinfectants into the drain
- Do not flush non-degradable items
- Do not switch off the blower, even when the house is empty
- Keep manhole covers closed, undamaged and accessible for maintenance
- Do not obstruct the inlet, the outlet or the disinfection unit

Prescribed by MOE Ordinance under Article 3-3. Much of the gap between design performance and field performance starts here.

Operation & Maintenance — keep it working

Purpose	Maintain normal treatment performance
Definition	Inspection, adjustment, and the repair accompanying them (Art. 2 (iii))
Content	Sludge and scum accumulation, water quality, mechanical equipment, replenishment of disinfectant
Frequency	At least three times a year, varying with size and treatment process (MOE Ordinance)
Who	Registered O&M contractor employing a qualified Johkasou Operator

Desludging — restore the capacity

Purpose	Recover the treatment capacity that accumulated sludge has taken away
Definition	Extraction of sludge and scum, conditioning of the tank contents, washing of units and appurtenances (Art. 2 (iv))
Frequency	At least once a year
Who	Desludging contractor permitted by the mayor of the municipality (Art. 35)
Sludge	Treated at the municipal night soil treatment facility (Art. 52)

Two legal inspections by a third party

Article 7 — after installation

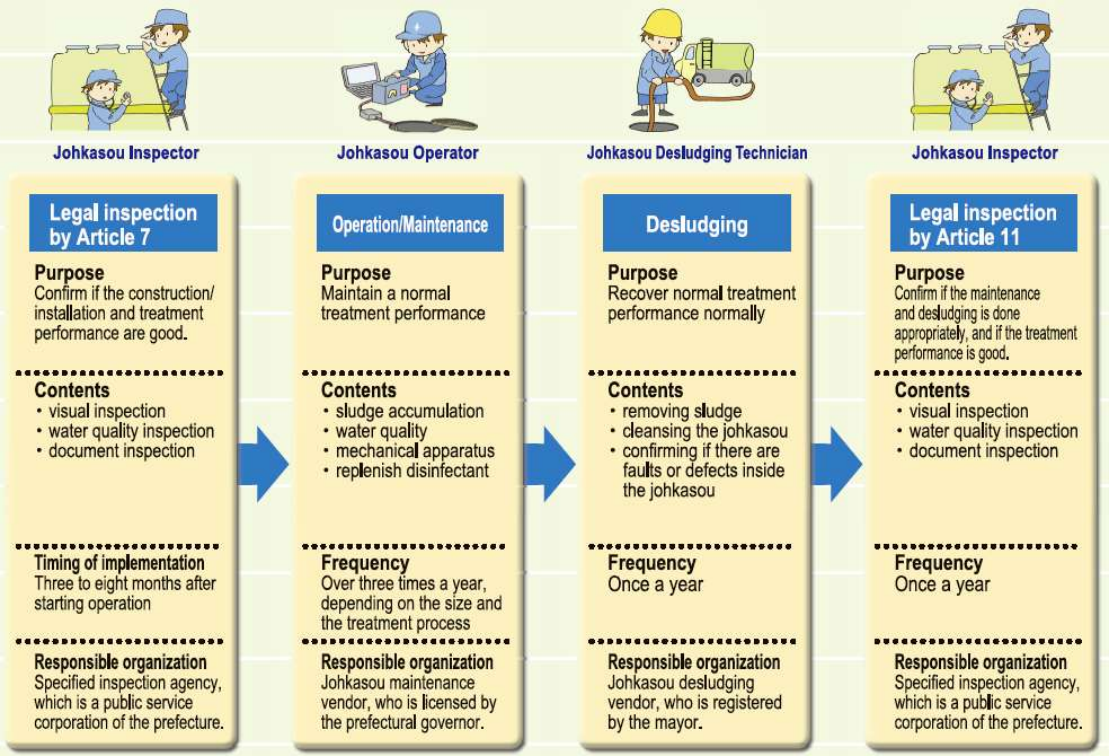
Three to eight months after start of use. Confirms that construction and initial performance are sound.

Article 11 — every year

Confirms that O&M is actually being done and that treatment performance is maintained.

- Visual, water quality and documentary inspection, by an agency designated by the governor
- Independent of the O&M and desludging contractors — the three functions cannot substitute for each other

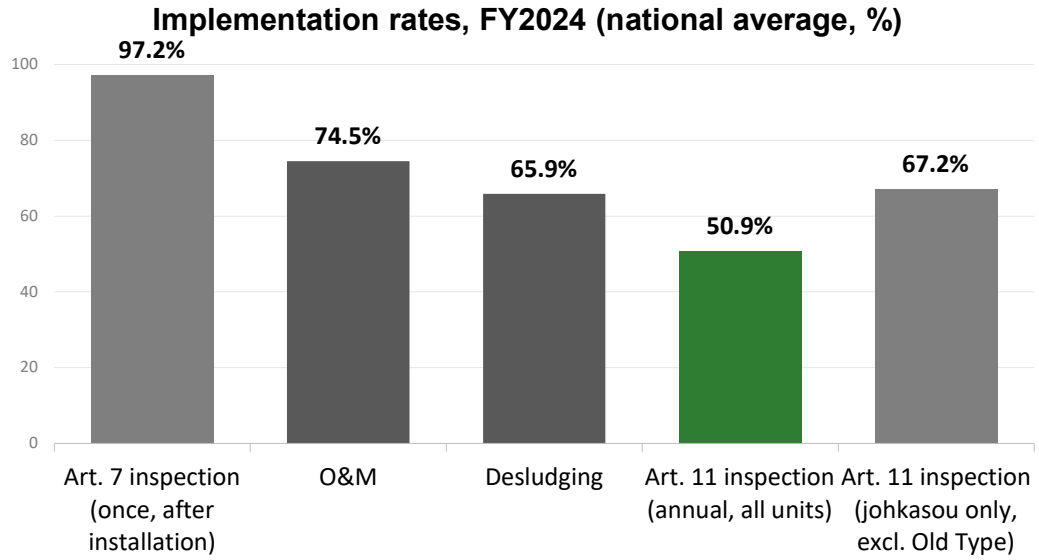
Four functions, four responsible parties



Art. 7 legal inspection
Inspector — 3 to 8 months after start of use
O&M
Johkasou Operator — three or more times a year
Desludging
Desludging Technician — once a year or more
Art. 11 legal inspection
Inspector — once a year
Each party is different, and none can sign off for another.

Figure: MOE, Night Soil Treatment and Decentralized Wastewater Treatment Systems in Japan.

Implementation rates — the law does not reach 100%



Art. 7 is near-universal

It is tied to the installation itself and to the subsidy, so almost every new unit receives it.

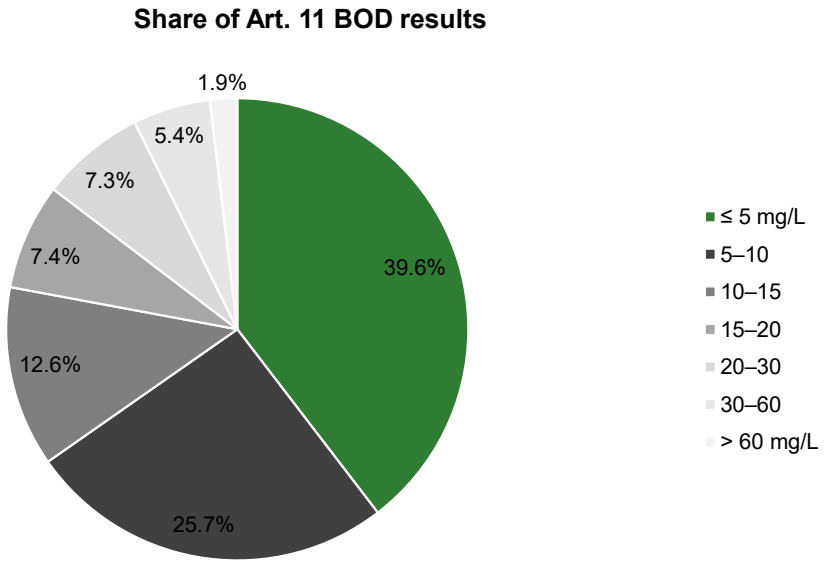
The recurring duties fall away

Only half of all units receive the annual Art. 11 inspection. Old Type units pull the average down: for johkasou alone it is 67.2%.

Even with a dedicated Act, implementation is not 100%. Raising these rates is one of Japan's standing challenges.

Source: MOE, FY2024 Survey Results on Guidance and Promotion of Johkasou — status at the end of FY2024, national averages.

What the annual inspection finds: effluent BOD



85% meet the 20 mg/L standard

FY2024, 2.11 million Art. 11 BOD tests on 5–50 PE units rated for BOD 20 mg/L: 85.3% at or below 20 mg/L; mean effluent BOD 11.7 mg/L.

The other 15% are why it exists

7.3% were between 20 and 30 mg/L, 7.4% above 30. These units are flagged for follow-up — this is how poor O&M becomes visible.

The annual inspection is not only a compliance check. It is the national dataset that shows the standard is actually met in the field.

Source: MOE, FY2025 Survey Results on Guidance and Promotion of Johkasou, Table 10(2): Art. 11 BOD test results in FY2024, 5–50 PE units with BOD ≤ 20 mg/L performance (n = 2,110,289).

Who is qualified to do what

Installation Worker	Supervises johkasou construction on site (Art. 42, MLIT)
Johkasou Operator	Carries out O&M (Art. 45, MOE) — 41,816 holders
Technical Supervisor	Required for units of 501 PE or more (Art. 10(2)) — 8,084 holders
Desludging Technician	Specialized knowledge and skills for desludging practice
Johkasou Inspector	Carries out the Art. 7 and Art. 11 legal inspections — 1,495 registered

Figures for FY2024. Source: MOE, FY2024 Survey Results on Guidance and Promotion of Johkasou.

Old Type Johkasou prohibited

- 2000 amendment, in force 1 April 2001
- New installation of Old Type Johkasou prohibited nationwide
- Existing units were renamed "deemed johkasou", minashi johkasou
- Their owners are placed under a duty of effort to convert to a johkasou
- Roughly 3 million deemed johkasou of 5–10 PE are still in service

2. LEGAL FRAMEWORK

Four pressures on the system today

Conversion is slow

Replacing an Old Type Johkasou is paid for by the household. There is no direct compulsion, only a duty of effort.

Units are aging

Many units installed in the 1970s and 1980s are now over 40 years old, together with their blowers and pumps.

Users are declining

Rural depopulation reduces the number of units per area, and the revenue base of the local contractors.

Duties are not fully met

FY2024: O&M 74.5%, desludging 65.9%, annual Art. 11 inspection 50.9% of all units (67.2% of johkasou, excluding Old Type).

2019 amendment: where a deemed johkasou poses a risk to the living environment, the governor may designate it as a "specified existing Old Type Johkasou" and issue advice and orders.

2019 amendment — in force April 2020

Public johkasou	The municipality installs, owns and manages units; a Johkasou Treatment Promotion Area may be designated
Johkasou ledger	Prefectures are required to compile and keep a register of every unit in their area
Johkasou council	Municipalities, contractors and inspection bodies coordinate on conversion and on O&M
Operator training	Johkasou Operators are required to take periodic training

The direction of the amendment: from regulating each unit, towards managing the whole stock of units in an area.

SECTION 3

Structure and treatment performance

The johkasou, the performance evaluation system, and what it made possible

One tank for both flows

- A johkasou (gappei-shori) treats toilet wastewater and gray water together in a single unit
- Small units: 5 to 50 PE, up to 10 m³ per day — the domestic size range
- Medium and large units: 51 PE and above
- The discharge point is usually a roadside ditch or a small stream a few meters from the house

Because the receiving water is small and close, effluent quality is not an abstract standard. It is visible to the neighbours.

Effluent quality and performance requirements

BOD ≤ 20 mg/L

Effluent standard set by MOE Ordinance under Article 4

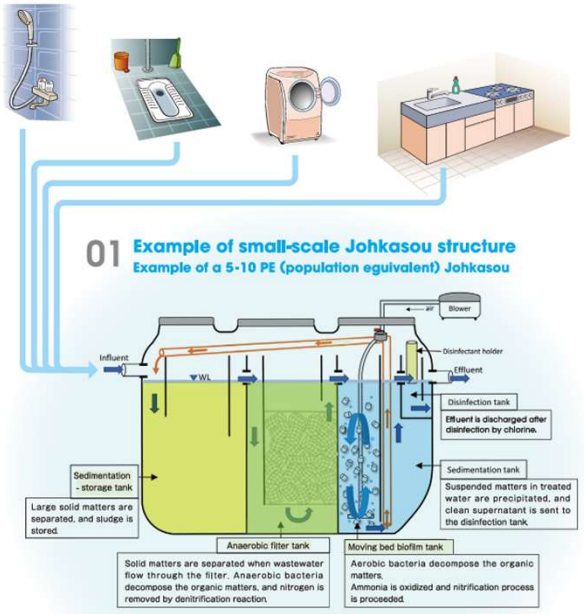
BOD removal ≥ 90%

Required as a removal rate, not only as a concentration

N and / or P

Additional targets for advanced units where the receiving water needs them

- The standard must be met under real household conditions, not at steady state
- Intermittent flow, morning and evening peaks, near-zero flow at night, and long absences
- Prefectures may set stricter requirements for particular water bodies (Art. 4-6)



How a new process reaches the market

Johkasou test on an actual unit → **Performance evaluation by a designated body** → **MLIT approval of the structural method** → **Type approval for factory-made units**

- Performance evaluation is carried out by a body designated by MLIT under the Building Standards Act
- Approval of the structural method: Building Standards Act, Article 31-2
- Type approval of factory-produced units: Johkasou Act, Article 13, renewed every five years (Art. 16)
- Approved units carry a label; imported units require the same approval and label (Art. 17)

The test reproduces a household, not a laboratory

- Testing is done on an actual unit over a long period, not on a bench-scale model
- Hourly flow variation through the day, with morning and evening peaks
- Peak flow and shock load conditions
- Low-load and no-load periods, and restart after a period of absence
- Water quality is measured across the whole cycle, not only at steady state





Source: National Institute for Environmental Studies

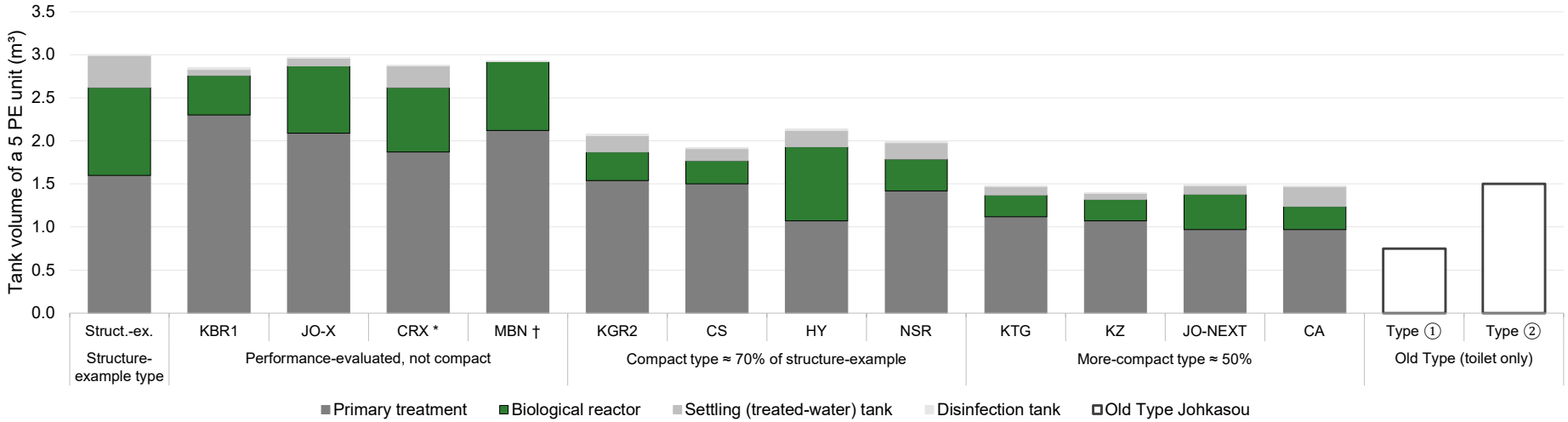
This is why a small unit installed at a single house can be expected to reach its design performance in the field.

From a prescribed drawing to a proven result

Structure-example type	The Ministry notification prescribes the tank arrangement and the volume of each chamber. Compliance is shown by building to the drawing.
Performance-evaluated type	The manufacturer proposes any process it chooses. Compliance is shown by demonstrating the effluent quality in a test.
What changed	Development moved from following a prescribed drawing to proving a result. Competition shifted to process design.

Structure examples are set out in the 1980 Ministry of Construction Notification No. 1292, as amended.

Smaller reactor, smaller site



*Redrawn from JECES JICA training text, Fig. 2-2 (approximate values). Model codes: JO = Johka-oh; * P-removal type; † membrane type; Old Type ① all-aeration, ② separate aeration.*

Less excavation A smaller tank means a smaller hole, a narrower working space and a lighter crane.

More sites become feasible Small urban lots, and the footprint left by an Old Type Johkasou being replaced — the most compact units are about the size of the Old Type unit they replace.

Downsizing is not only a cost question. It decides whether converting from an Old Type Johkasou to a johkasou is physically possible on a given lot.

One common target, several processes

- Because the requirement is written as effluent quality, different processes compete on equal terms
- Selection depends on influent characteristics, the need for nitrogen or phosphorus removal, available area, power supply and access for O&M
- The O&M points differ from process to process
- The Operator has to know which process is in front of them before opening the lid

This is the link to the O&M sessions that follow: the technology is diverse, so the qualification has to be general.

Three representative structures

Anaerobic filter + contact aeration

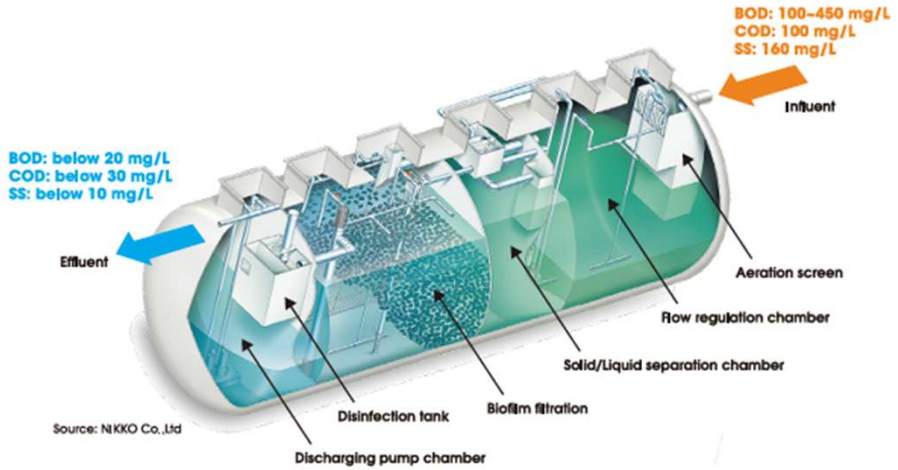
The standard small johkasou. Simple, robust, widely installed, and understood by every technician.

Circulation + denitrification

Advanced treatment for nitrogen removal, for lakes, enclosed bays and other sensitive water bodies.

Carrier fluidized bed or biological filtration

Higher volumetric loading in a smaller tank. Backwash and carrier condition become key O&M points.



SECTION 4

Domestic wastewater treatment coverage

Four public systems, one shared indicator, and a persistent gap

4. COVERAGE

Four systems, three ministries

Sewerage	Ministry of Land, Infrastructure, Transport and Tourism
Rural community sewerage	Ministry of Agriculture, Forestry and Fisheries — also fishing, forestry and simple facilities
Johkasou	Ministry of the Environment
Community plants	Small collective facilities, counted together with johkasou

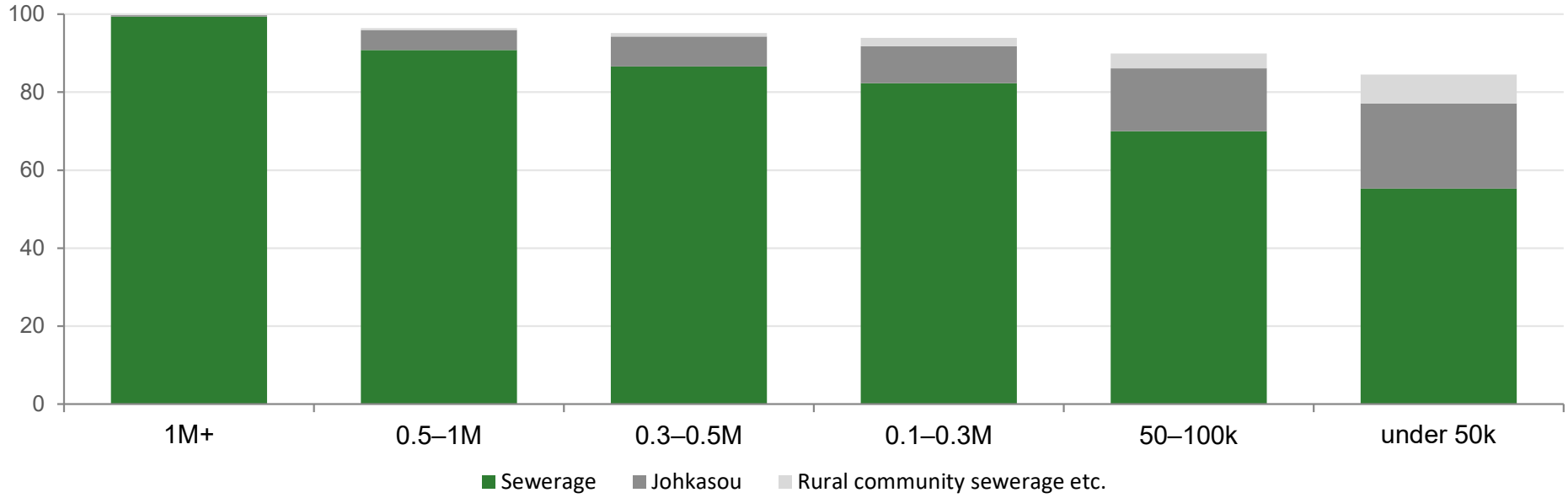
Different ministries and different funding routes, but one shared indicator: the domestic wastewater treatment coverage rate, published jointly every year.

National coverage, end of FY2024

System	Population served (thousand)	Share of total population
Sewerage	101,397	81.8%
Rural community sewerage etc.	2,835	2.3%
Johkasou	11,746	9.5%
Community plants etc.	148	0.1%
Total served	**116,126**	**93.7%**
Not served	**7,838**	**6.3%**

Source: MLIT / MAFF / MOE joint release, coverage at the end of FY2024. Johkasou includes 817 thousand under the public johkasou program.

The gap is a question of municipality size



Total coverage	**99.8%**	**96.4%**	**95.2%**	**93.9%**	**89.9%**	**84.5%**
Johkasou share	0.3%	5.1%	7.7%	9.5%	16.1%	21.8%

End of FY2024. 1,231 of the 1,719 municipalities are in the under-50,000 group. Shares below 0.5% are not published separately.

4. COVERAGE

Where the remaining 7.8 million people are

- Coverage in municipalities under 50,000 people is 84.5%, against a national average of 93.7%
- 1,231 of the 1,719 municipalities fall into that group
- Mountain valleys, coastal settlements and scattered farmhouses — long distances, few houses
- Population is falling fastest in exactly the areas where the gap is largest
- Johkasou already carries 21.8% of the population there, against 9.5% nationally

The remaining task is not a scaled-down version of the sewered city. It is a different problem, and it needs a different tool.

SECTION 5

How johkasou installation is subsidized

National grant, municipal programs, and the share the household still pays

5. FINANCING

Two subsidy routes since the 1980s

Individual-installation type

Since 1987 · the norm

- The household buys and owns the unit
- The municipality pays a fixed subsidy toward the installation cost
- National grant covers 1/3 of that subsidy
- The owner is the "johkasou manager" and pays for O&M, desludging and inspection

Municipal-installation type

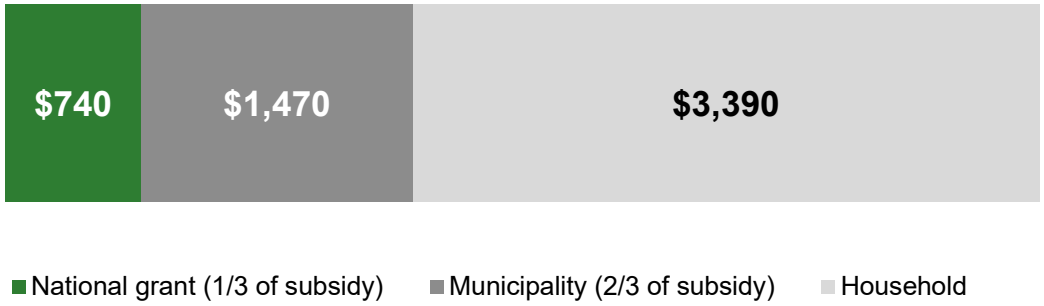
"Public johkasou" · since 1994 · a minority

- The municipality installs and owns the unit, like a sewer
- The household pays about 10% of the cost, then a monthly usage fee
- The municipality is the manager and contracts the O&M and desludging
- FY2020: 189 municipalities, 5,490 new units — roughly 6% of all new johkasou

Source: MOE, Johkasou Promotion Office briefing (Oct 2022) and FY2020 grant statistics. Municipalities: 1,719 in total.

Most johkasou in Japan are bought by the household with a subsidy. The public-johkasou route exists, but it is the exception, not the rule.

Who pays for a standard 5 PE household unit



Typical installation cost ≈ US$5,600 (¥840,000)

Subsidy base = 40% of cost (US$2,210); the household pays ~60%. Up to 80% of the municipal share is refunded through local allocation tax.

Why public money for a private tank? Clean public water areas are a public benefit — the Article 1 purpose — so the state shares the cost.

Subsidy base amount (MOE standard)	
5 PE	**US$2,210**
6–7 PE	**US$2,760**
8–10 PE	**US$3,650**
5 PE, N/P removal	**US$2,400**

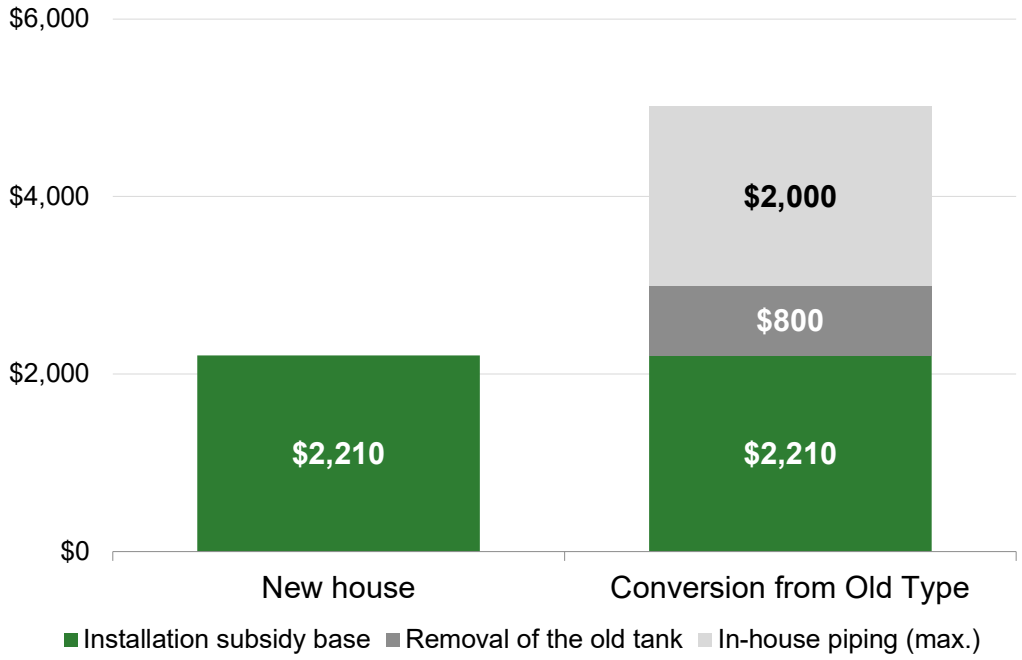
Household units are 5–10 PE. Extra amounts apply in heavy-snow areas, Okinawa and remote islands.
Municipal programs can be far more generous: one city pays US$4,900 toward a US$7,010 unit (MOE FY2023 report).

Source: MOE grant standards (FY2023 revision); cost example from Kitakyushu City. Converted at ¥150 = US$1 and rounded to the nearest US$10.

Public money buys about 40% of the tank because clean public water is a public benefit. The household still pays the majority — and every year of O&M.

5. FINANCING

Converting an Old Type Johkasou earns extra support



US$800 removal of the Old Type tank raised from US$600 in FY2023

up to US$2,000 re-piping inside the lot kitchen, bath and laundry drains are connected to the new unit

839 municipalities offered removal or piping subsidies at the end of FY2022 up from 788 one year earlier (of 1,719 nationwide)

Source: MOE, national administrators meeting materials (Mar 2023, Jul 2024). MOE base amounts; municipal programs vary. ¥150 = US$1.

Up to US$5,010 of support for a conversion — about 2.3 times the amount for a new house. The money follows the policy priority.

5. FINANCING

What the subsidy covers — and what it does not

Installation
subsidized

- New johkasou, 5–50 PE
- Removal of the Old Type tank and re-piping on conversion
- Higher base for N/P-removal units
- One-off payment; the household applies to the municipality before construction

O&M, desludging, legal inspection
paid by the user

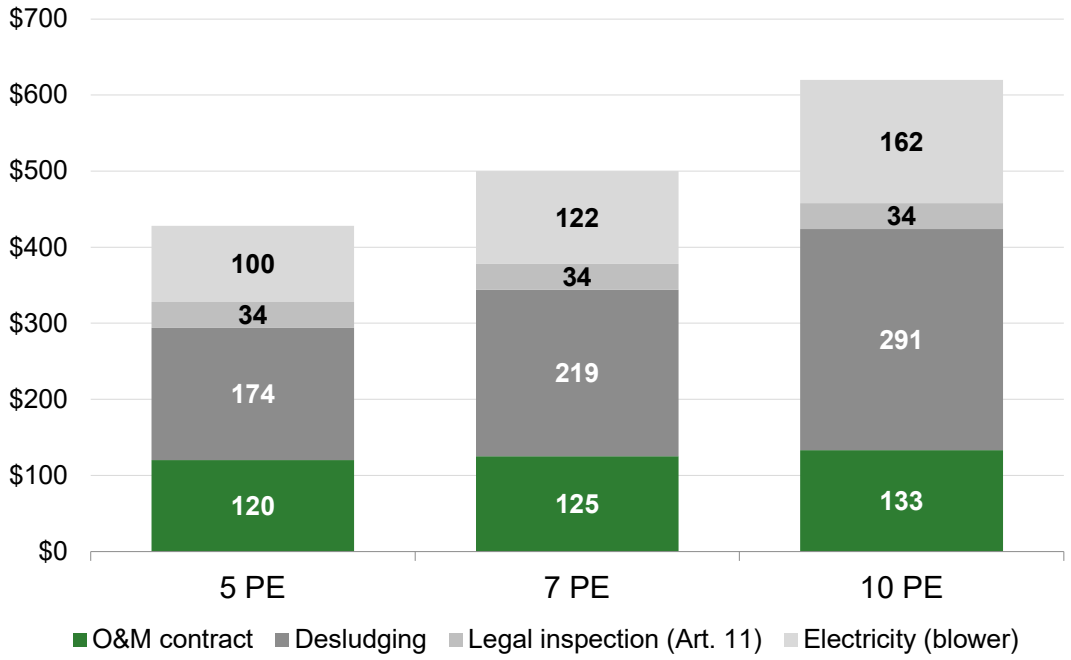
- O&M contract: 3–4 visits a year for a household unit
- Desludging: at least once a year
- Legal inspection (Art. 11): once a year
- 5 PE average US$430 a year incl. electricity (¥64,291) — no routine subsidy
- Exception: small elderly households, national 1/3 up to US$160 a year

Annual cost: national average, MOE FY2025 survey of contractors (see next slide).

The subsidy buys the tank. The Johkasou Act keeps the running costs — and the responsibility — with the user. That is what keeps units working.

5. FINANCING

What the user pays every year — survey of contractors



US$430 a year for a 5 PE unit
¥64,291 — roughly US$36 a month

Desludging is the largest item
about 40% of the total; it rises with tank size

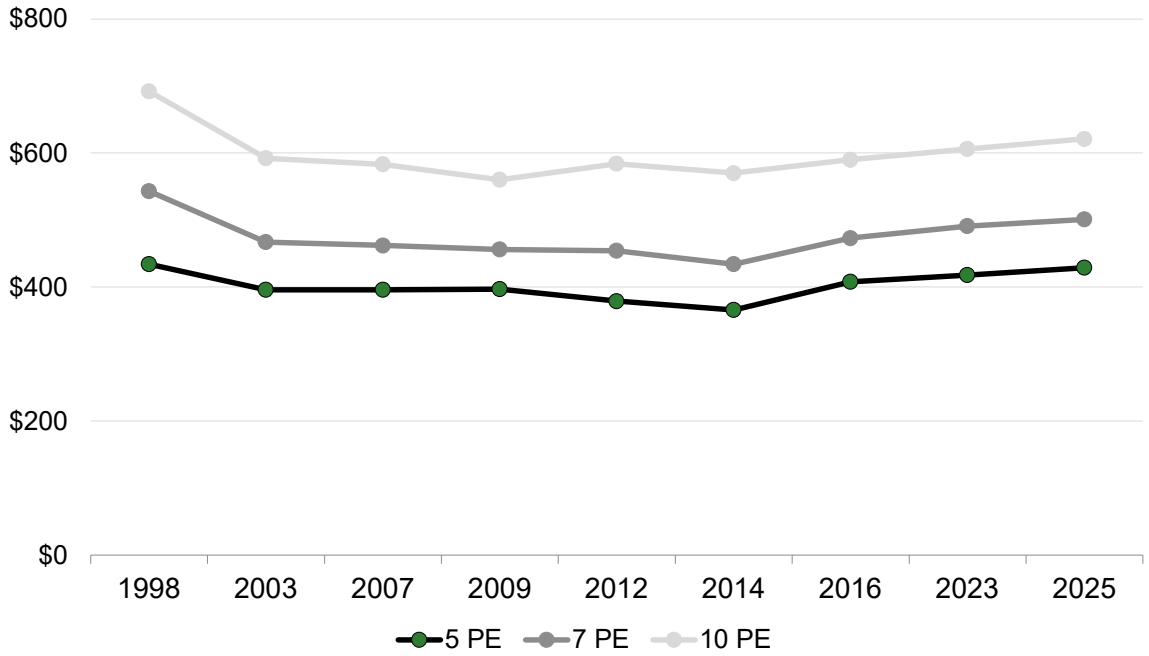
No routine subsidy
the household pays each contractor directly; a few municipalities add their own support

Source: MOE FY2025 O&M survey (JECES, Mar 2026). National averages of contractor prices, individual-installation units. ¥150 = US$1.

For a 5 PE household, keeping the unit running costs about US$430 a year — about 8% of the installation cost, every year, paid by the user.

5. FINANCING

The annual cost has been flat for 25 years



5 PE: US$435 → US$430
1998 to 2025, nominal yen converted at ¥150 = US$1

Contractor prices barely moved
O&M and desludging fees are set in a competitive local market

Rising since 2014
mainly electricity: 15 → 22 US cents per kWh

Source: MOE FY2025 O&M survey (JECES, Mar 2026). O&M + desludging + inspection + electricity, nominal yen at ¥150 = US$1.

A user-pays system is only sustainable if the price stays affordable. Twenty-five years of flat prices is the evidence that it has.

SECTION 6

Collective or individual treatment

How Japanese municipalities decide, and why the answer is changing

Where johkasou sits in waste legislation

General waste	Night soil and johkasou sludge are general waste. The municipality is responsible for treating them.
General Waste Management Plan	Every municipality must prepare one under the Waste Management and Public Cleansing Act.
Domestic Wastewater Treatment Basic Plan	The part of that plan setting out how domestic wastewater in the municipality will be treated.
What it decides	Which area is served by sewerage, by rural community sewerage, or by johkasou — and by when.

Two ways to treat the same wastewater

Collective treatment

One plant plus a pipe network.

Cost is dominated by the pipes, not by the plant.

Gains from density: the more houses per kilometer, the cheaper it is per house.

Individual treatment

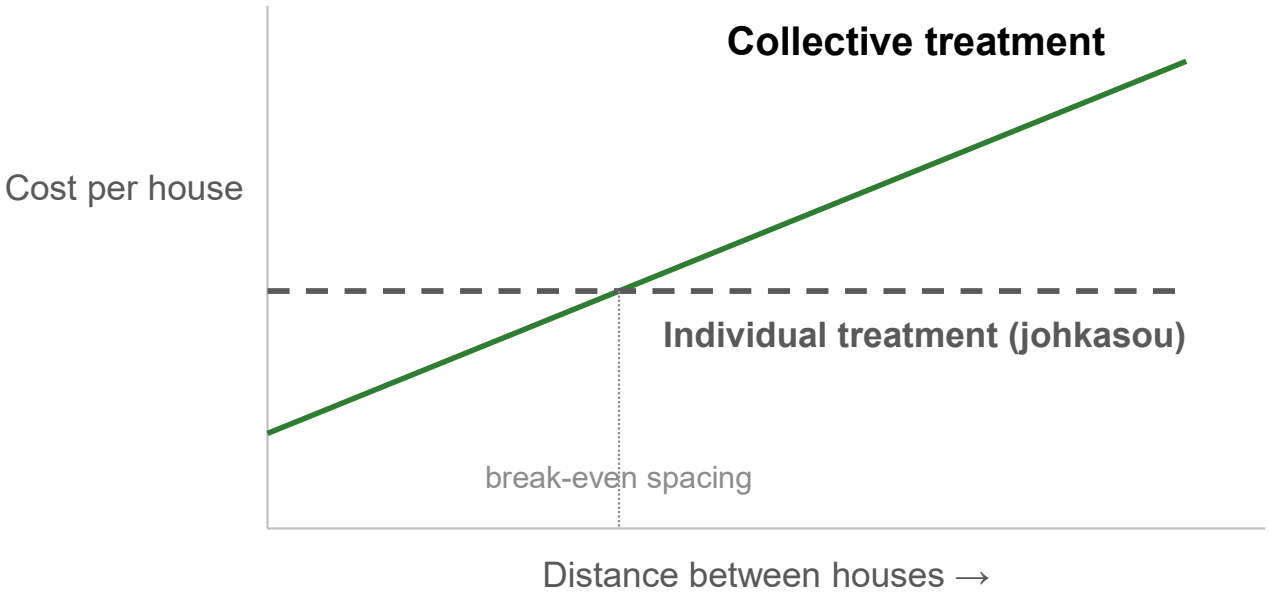
One johkasou per house.

Cost is roughly proportional to the number of houses.

Indifferent to density: the same cost whether the houses are close together or far apart.

There is also a difference in timing: a collective system serves nobody until the network is finished, while a johkasou serves one house on the day it is installed.

House spacing decides the pipe cost



- Pipe length per house is roughly the distance between houses
- As houses spread out, collective cost per house rises steeply
- Johkasou cost per house stays flat
- The two lines therefore cross

The critical inter-house distance (threshold value)

- The spacing at which collective and individual treatment cost the same per house
- Below it, collective treatment is cheaper; above it, johkasou is cheaper
- This comparison is the standard screening step in the prefectural and municipal plans
- It is not a single national number — it depends on terrain, ground conditions, pipe depth, pumping, subsidy rates, and the period over which costs are compared
- Operation and replacement costs, not only construction cost, belong in the comparison

Depopulation is changing the answer

- Plans drawn during population growth assumed the sewered area would fill up with houses
- With fewer houses, cost per house rises after the network has been built — and the network cannot be un-built

The choice between collective and individual treatment is not made once. It is revisited as the population changes.

Depopulation is changing the answer (cont.)

- Many municipalities have reviewed their plans, reduced the planned sewerage area, and reassigned the outer areas to johkasou
- Aging sewerage assets are pushing the same reassessment in areas already served

Source: Fuji City Domestic Wastewater Treatment Long-term Plan; MOE prefectural concept manual. Green: sewerage planning area; red line: expressway.

Fuji City, Shizuoka — sewerage planning area reduced in successive plans

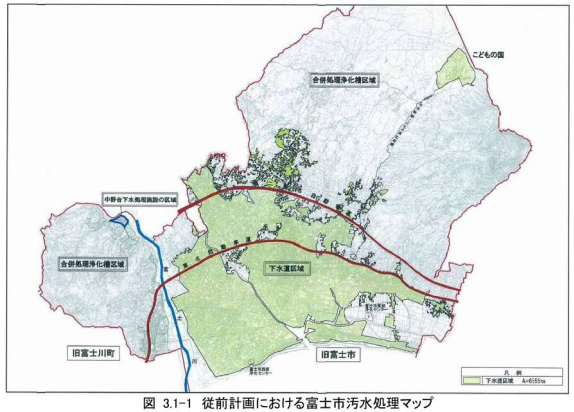


図 3.1-1 従前計画における富士市汚水処理マップ

Before the FY2010 plan: 6,573 ha

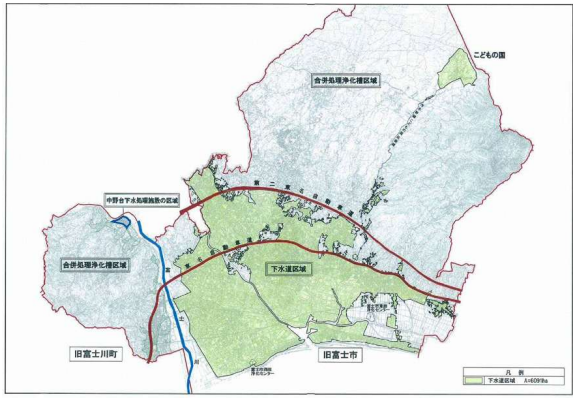
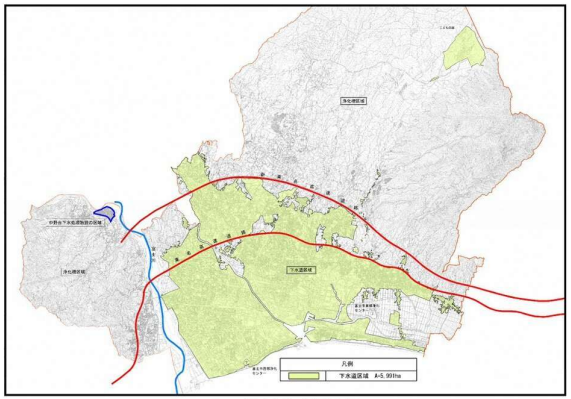


図 3.1-2 現行計画（平成 21 年 9 月）における富士市汚水処理マップ

FY2010 plan: 6,091 ha



FY2018 plan: 5,991 ha

The choice between collective and individual treatment is not made once. It is revisited as the population changes.

SECTION 7

Relevance to the US context

Difference of the onsite system between US and Japan

Johkasou and US onsite systems, side by side

Item	United States: septic / ATU	Japan: johkasou
Treatment principle	Septic tank + drainfield (conventional); ATUs add aerobic treatment	Factory-built package unit — anaerobic filter + contact aeration — the same family as an ATU
Effluent quality	NSF/ANSI 40: CBOD5 25 mg/L, TSS 30 mg/L NSF/ANSI 245: 50% nitrogen reduction	BOD ≤ 20 mg/L (statutory) Nitrogen-removal types: T-N ≤ 20 or ≤ 10 mg/L
Performance evaluation	26-week NSF test, no servicing during the test	Performance evaluation test (JECES) + type approval

Johkasou and US onsite systems, side by side (cont.)

Item	United States: septic / ATU	Japan: johkasou
Siting and permitting	State or county permit; depends on soil and lot conditions	Uniform national rules under the Johkasou Act; notification + Article 7 legal inspection
Operation and maintenance	Owner's responsibility; service contracts required only for ATUs, and only in some states	Statutory: O&M by a certified Johkasou Operator + desludging + Article 11 annual legal inspection
Qualifications	State licensing; industry training (NOWRA, NAWT)	National qualifications: Johkasou Operator, Installer, Technical Supervisor

Summary

- Japan did not choose johkasou instead of sewerage. It uses both, allocated by area.
- The johkasou works because the Act ties together a standard, a qualified person and an inspection.
- The performance evaluation system is what allows a small on-site unit to be trusted.
- The remaining coverage gap sits in small, dispersed, shrinking municipalities.
- The right answer for an area changes as its population changes.
- Public money buys the tank; the user pays to keep it working
- Instead of the Johkasou Act, not 100 % user contract the O&M, desludging, nor legal inspection.

Thank you

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