Desludging in Thailand: Current Status, Service Chain, and Challenges for Decentralized Wastewater Treatment

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1. Country Profile

Toilets are near-universal (99.7%), yet only 27% of people have safely managed sanitation, while treatment plants operate at about half capacity.

65.8 million
Registered population (31 Dec 2025)

513,120 km²
Land area; 34.6% of people live in municipal areas

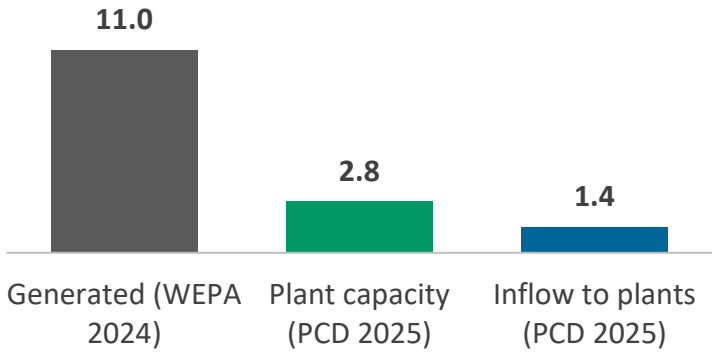
99.7%
Households with a toilet (2025)

27%
Safely managed sanitation (SDG 6.2.1a, 2024)

34%
Domestic wastewater safely treated (SDG 6.3.1, 2024)

THB 266,103
GDP per capita, 2024 (about USD 7,500)

Domestic wastewater (million m³/day)



Community wastewater systems: 216 systems (121 central, 95 cluster) receive 1.4 million m³/day, about half of their 2.8 million m³/day capacity.

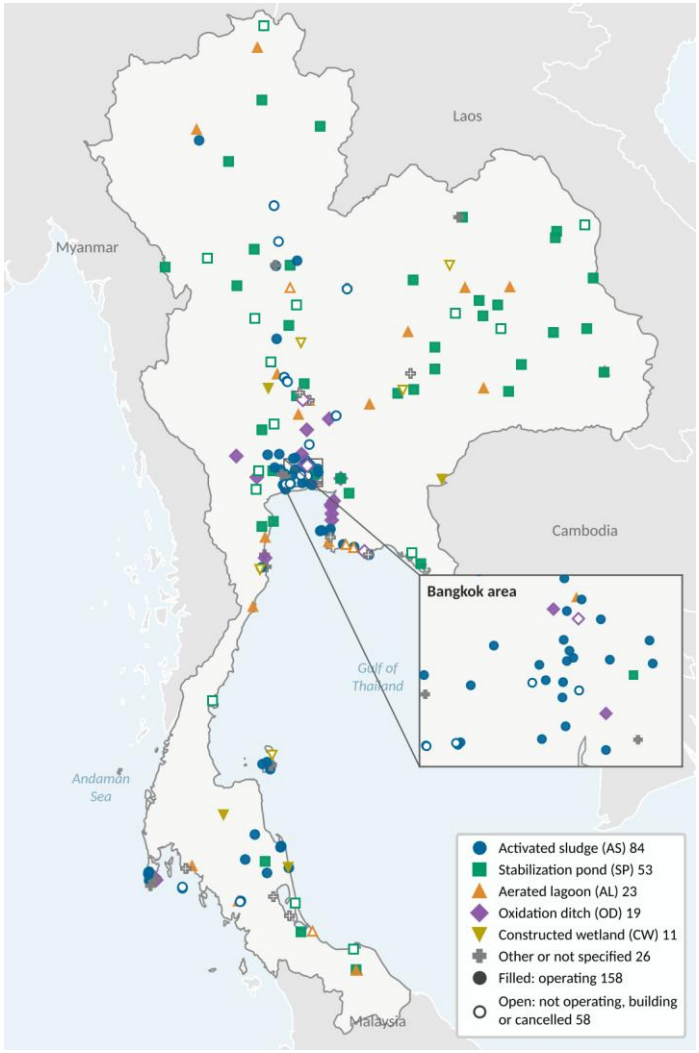
Rural areas: Outside community system service areas, on-site sanitation predominates. Only 153 of 7,767 local authorities (2%) operate a central or cluster system.

Black water: In designated areas*, new houses and shophouses must have an on-site sewage disposal system of at least 1,000 L.
Grey water: on-site septic systems are designed primarily for blackwater; greywater is treated centrally where sewer connections are available.

Sources: National Statistical Office, Statistical Yearbook Thailand 2026; Pollution Control Department, Thailand State of Pollution Report 2025; WEPA Outlook 2024 (Ministry of the Environment, Japan); UN-Water SDG 6 Data; Ministry of Public Health Notification (2018). Map: Natural Earth.
*Designated areas: Bangkok, Pattaya and city/town municipalities in 34 provinces; applies to systems installed from July 2019 (MOPH Notification, 2018).

1. Country Profile (2/2): Community Wastewater Systems

Of 216 community systems, 158 are operating, 37 are not operating, 8 are under construction and 13 have been cancelled; activated sludge predominates in cities and stabilization ponds in the North and Northeast.



"Other or not specified" (26) = RBC 7 + SBR 4 + AnA 3 + Other 12.

Area	AL	SP	CW	RBC	AS	OD	SBR	AnA	Other	Total
Bangkok	1	1	–	–	19	2	–	–	–	23
REO 1 (Chiang Mai)	2	1	1	–	1	–	–	–	–	5
REO 2 (Lampang)	–	3	–	–	–	–	–	–	–	3
REO 3 (Phitsanulok)	–	4	–	–	6	–	–	3	–	13
REO 4 (Nakhon Sawan)	1	5	1	–	1	–	–	–	–	8
REO 5 (Nakhon Pathom)	1	3	1	–	17	–	1	–	1	24
REO 6 (Nonthaburi)	1	1	–	–	5	3	–	–	–	10
REO 7 (Saraburi)	1	1	1	–	1	2	–	–	3	9
REO 8 (Ratchaburi)	2	4	1	1	1	3	1	–	–	13
REO 9 (Udon Thani)	–	4	–	–	–	–	–	–	1	5
REO 10 (Khon Kaen)	2	6	1	–	–	–	–	–	–	9
REO 11 (Nakhon Ratchasima)	3	6	1	–	–	–	–	–	1	11
REO 12 (Ubon Ratchathani)	1	4	–	–	–	–	–	–	–	5
REO 13 (Chon Buri)	3	4	1	1	10	7	–	–	2	28
REO 14 (Surat Thani)	–	2	3	5	11	–	–	–	2	23
REO 15 (Phuket)	2	–	–	–	12	2	2	–	2	20
REO 16 (Songkhla)	3	4	–	–	–	–	–	–	–	7
Thailand	**23**	**53**	**11**	**7**	**84**	**19**	**4**	**3**	**12**	**216**

REO = Regional Environment Office

AL aerated lagoon · SP stabilization pond · CW constructed wetland · RBC rotating biological contactor · AS activated sludge · OD oxidation ditch · SBR sequencing batch reactor · AnA anaerobic · Other: type not given or piped elsewhere

216

systems: 121 central and 95 building-cluster

84

activated sludge (39%), mostly Bangkok and the east and south coasts

53

stabilization ponds (25%), mostly in the north and north-east

158

operating; 37 not operating, 8 under construction, 13 cancelled

Sources: Pollution Control Department, DSPOT database (2025 plant reports, accessed 8 Oct 2026) and Thailand State of Pollution Report 2025. Base map: Natural Earth (world-atlas).

2. Current Status of Decentralized Wastewater Treatment

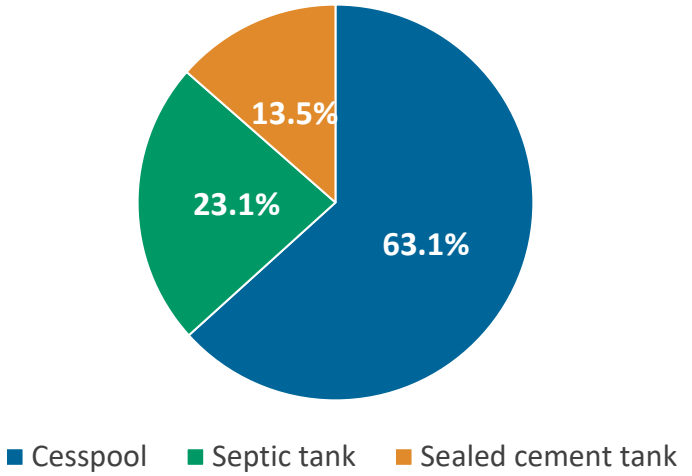
In Bangkok, cesspools are the most common on-site system; they provide only primary treatment, and leakage and overflow are frequently reported.

Facility type	Features and treatment performance	Share
Cesspool (lined pit, open bottom)	Concrete rings; liquid soaks into the soil. Settling and partial anaerobic digestion only.	63.1% of households in Bangkok
Septic tank	Sealed tank, often with an anaerobic filter. Treats black water only.	23.1% in Bangkok
Sealed cement tank	Rectangular tank without infiltration; used by dormitories, apartments and restaurants.	13.5% in Bangkok
Packaged treatment unit	Prefabricated tank; voluntary standard TIS 2962-2562. PCD promotes high-efficiency tanks that meet the effluent standard.	PCD efficiency label since 2024
Cluster system	Small shared plant for a group of buildings; 57 of 95 use activated sludge.	95 systems, 63 operating; about 30,000 m³/day (2025)

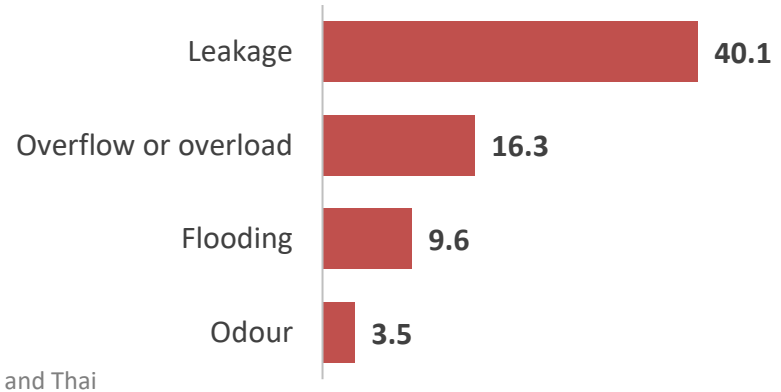
Number installed

No national inventory of on-site units. Scale: 29.5 million registered houses and 99.7% of households with a toilet (2025).
Requirement: at least 1,000 L for new houses in designated areas*.

On-site containment in Bangkok — 2024 survey (n = 311 households)



Problems reported (% of households)

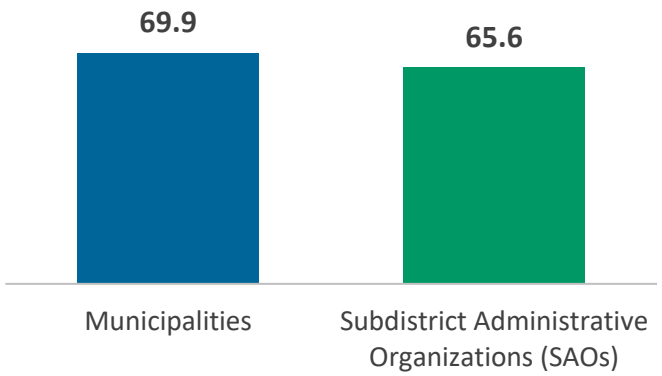


Sources: Sudsandee et al. (2025), J. Water Sanit. Hyg. Dev. 15(10); PCD State of Pollution Report 2025 and DSPOT database (2025 reports); PCD and Thai Environment Institute (2024); Ministry of Public Health Notification (2018); NSO Statistical Yearbook 2026.
*Designated areas: Bangkok, Pattaya and city/town municipalities in 34 provinces; applies to systems installed from July 2019 (MOPH Notification, 2018).

3. Current Status of Desludging

Desludging is demand-driven. Houses in designated areas* must be desludged at least once every four years, but many households desludge rarely or never.

Local authorities served by licensed private operators (%), Health Region 9



Regular or on-demand?

- On-demand: households call when the tank is full and pay per trip
- Legal interval in designated areas* (2018): houses at least once every four years; other buildings and public toilets once a year

Interval in practice

- Bangkok survey (2024, n = 311): every 26 months on average, 1.62 m³ per emptying
- 46.2% of surveyed households have never had their tank emptied

Coverage

- 164 of 225 city and town municipalities have an emptying service (2024)
- 48.4% of household members used a service provider (MICS 2022), while 36.3% never emptied or buried on site (MICS 2022)
- Bangkok city trucks collect 390 of 3,000 m³/day (13%)

Statistics

- 1,005 registered vacuum trucks (2020)
- Bangkok: 189 city trucks; 16.9% of emptied households used unlicensed trucks
- No national data on sludge volumes yet; the electronic trip-tracking system (F-Manifest) is being piloted

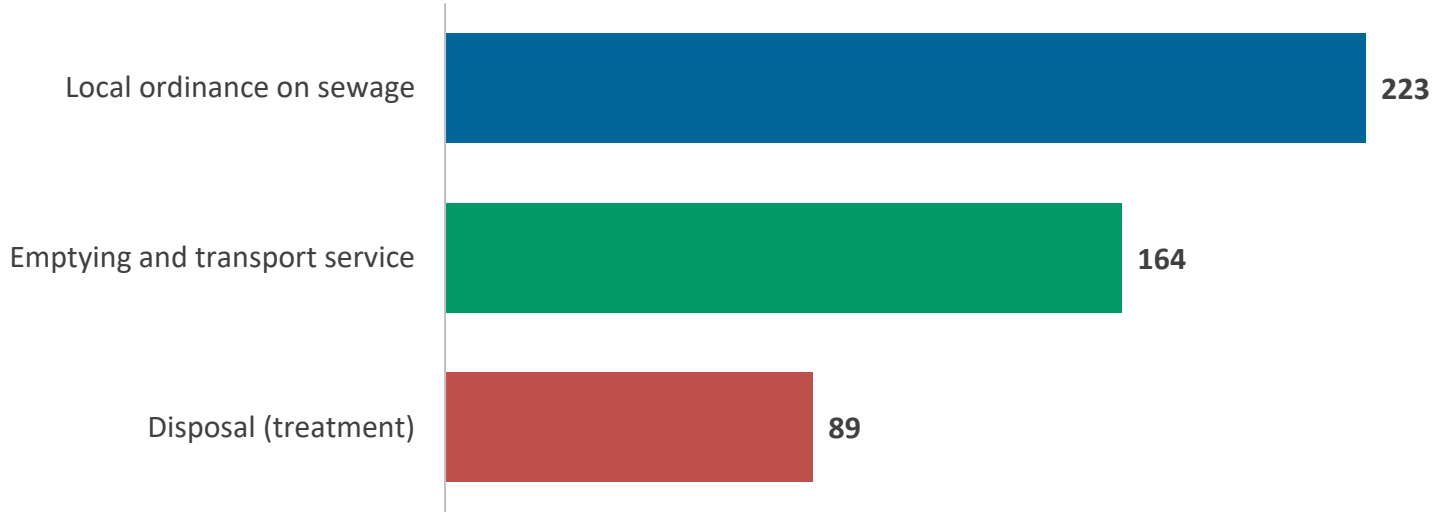
Sources: Ministry of Public Health Notification on desludging periods (2018); Department of Health KPI reports (2024–2025); NSO and UNICEF, MICS 2022; Sudsandee et al. (2025), JWSHD 15(10); Nairam (2024).
*Designated areas: Bangkok, Pattaya and city/town municipalities in 34 provinces; applies to systems installed from July 2019 (MOPH Notification, 2018).

4. Desludging Service Flow

Coverage narrows along the service chain: 164 of 225 city and town municipalities provide emptying services, but only 89 have treatment and disposal facilities.

Sludge generation	Collection	Transport	Treatment	Disposal or reuse
Cesspools and septic tanks; minimum 1,000 L for new houses in designated areas*	On-demand vacuum trucks, mostly licensed private operators	Trip manifest and monthly report to the local competent official; electronic F-Manifest under pilot	Anaerobic digestion for 28 days or more, drying beds or ponds	Where treatment capacity is lacking, illegal dumping has been documented.

City and town municipalities with each step in place (of 225, 30 Sep 2024)



48.4%
of household members: used a service provider (MICS 2022)

36.3%
never emptied or buried on site (MICS 2022)

Features of the chain

- Local authorities have primary responsibility for sewage management within their jurisdictions.
- Licensed private operators provide most collection services.
- National tracking of sludge destinations remains incomplete.

Sources: Department of Health KPI 3.34 reports (FY2025–2026), manual and guideline; NSO and UNICEF, MICS 2022; Ministry of Public Health Notifications (2018); Nairam (2024).
*Designated areas: Bangkok, Pattaya and city/town municipalities in 34 provinces; applies to systems installed from July 2019 (MOPH Notification, 2018).

5. Legal & Institutional Framework (1/2)

The Public Health Act assigns responsibility to local authorities; the 2018 Ministerial Regulation sets the technical requirements.

Law or regulation	What it requires
Public Health Act B.E. 2535 (1992)	Local authorities collect, transport and dispose of sewage, or license private operators. Operating without a licenses: imprisonment of up to six months, a fine of up to THB 50,000 or both.
Ministerial Regulation on Hygienic Management of Sewage B.E. 2561 (2018)	Hygiene rules for toilets, collection and transport, and disposal, including vehicles and workers.
Ministry of Public Health Notifications (2018)	Tank size and desludging in Bangkok, Pattaya and city/town municipalities in 34 provinces (systems installed from July 2019): houses and shophouses ≥ 1,000 L, desludged at least once every four years; other buildings and public toilets once a year. Limits for helminth eggs and E. coli in effluent and sludge.
Building Control Act B.E. 2522 (1979)	Buildings must have an on-site treatment system.
Enhancement and Conservation of National Environmental Quality Act B.E. 2535 (1992)	Effluent standards for buildings, housing estates and municipal plants; wastewater service fees.
Occupational Safety, Health and Environment Act B.E. 2554 (2011) and Confined Space Regulation (2019)	Permit, supervisor, rescuer, gas measurement and training for work in tanks, pits and pipes.

Sources: Public Health Act B.E. 2535; Ministerial Regulation on Hygienic Management of Sewage B.E. 2561; Ministry of Public Health Notifications (2018); Ministerial Regulation on confined spaces B.E. 2562; Department of Health manual (2020); NSO Statistical Yearbook 2026.
*Designated areas: Bangkok, Pattaya and city/town municipalities in 34 provinces; applies to systems installed from July 2019 (MOPH Notification, 2018).

National level

- Ministry of Public Health (Department of Health): regulations, standards, training, monitoring
- Pollution Control Department: effluent standards, wastewater policy
- TISI: product standard for packaged tanks

↓

7,767 municipalities and Subdistrict Administrative Organizations (SAOs) : 2,474 municipalities and 5,293 SAOs (2025), plus Bangkok and Pattaya.

Responsible for ordinances, licenses, fees, emptying services and treatment plants.

↓

Licensed private operators and households

(Translation)

Volume 136 Special Part 3 D Government Gazette 4 January 2019

Notification of the Ministry of Public Health

On Prescribing of Type, Size, Duration of Sludge Withdrawal and Standardised Water Drainage Method for Sewage Disposal System B.E. 2561 (A.D. 2018)

Clause 4. The owner or possessor of a building, residence, shophouse, or commercial building, be they used for commercial or residential purposes, shall procure to have a fixed sewage disposal system of which the volume is not less than 1,000 litres and withdrawal of sludge must be at intervals of no less than once per four years in order for it to be treated in the central sewage disposal system.

5. Legal & Institutional Framework (2/2)

Each local authority licenses operators in its own area; standards cover effluent, sludge and vehicles.

99.1%
of city and town municipalities have a local ordinance (223 of 225, Sep 2024)

61.8%
met the Department of Health's legal-compliance indicator on sewage management (139 of 225, as of 5 Aug 2025)

Licensing

- Commercial collection, transport or disposal of sewage requires a license from the local competent official.
- A license is valid only within the jurisdiction of the issuing local authority.
- License fee ceilings: THB 5,000 a year for collection and transport; THB 37,500 per 5 years for disposal
- Operators report the volumes carried every month

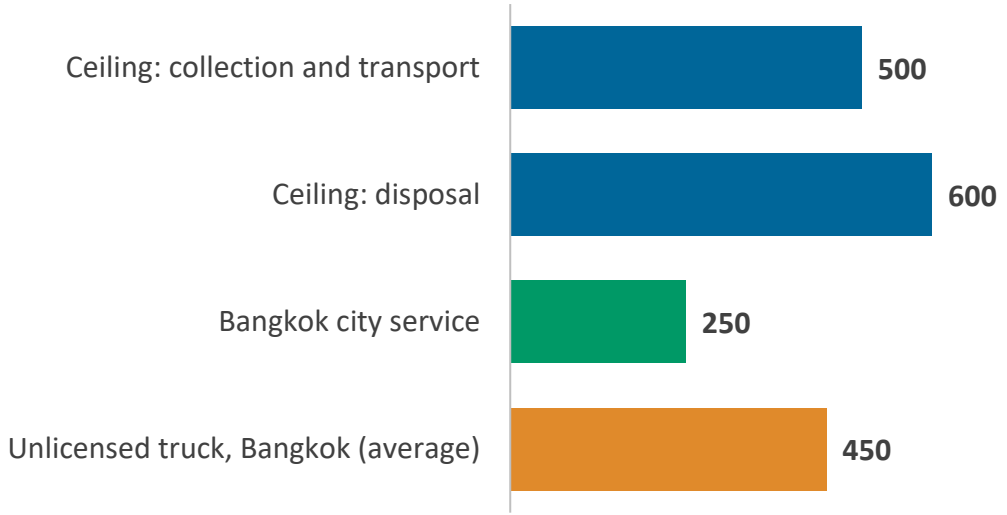
Item	Standard
Helminth eggs	Effluent: fewer than 1 egg per litre. Sludge: fewer than 1 egg per gram (dry)
E. coli	Effluent: under 1,000 MPN per 100 mL. Sludge: under 1,000 MPN per gram (dry)
Treatment plant effluent	pH 5–9, BOD up to 20 mg/L, suspended solids up to 30 mg/L
Desludging interval	In designated areas*: houses at least once every four years; other buildings and public toilets once a year
Vacuum truck	Sealed leak-proof tank, pump and volume gauge; marked "For sewage transport only"; no other use; washed at least daily
Packaged tank	TIS 2962-2562 (voluntary); high-efficiency label from PCD since 2024

Sources: Ministry of Public Health Notifications (19 Nov 2018); Ministerial Regulation on sewage and solid waste fees B.E. 2567 (Department of Local Administration summary); Department of Health guideline, manual, legal opinion 16/2563 and KPI reports (2024–2025).
*Designated areas: Bangkok, Pattaya and city/town municipalities in 34 provinces; applies to systems installed from July 2019 (MOPH Notification, 2018).

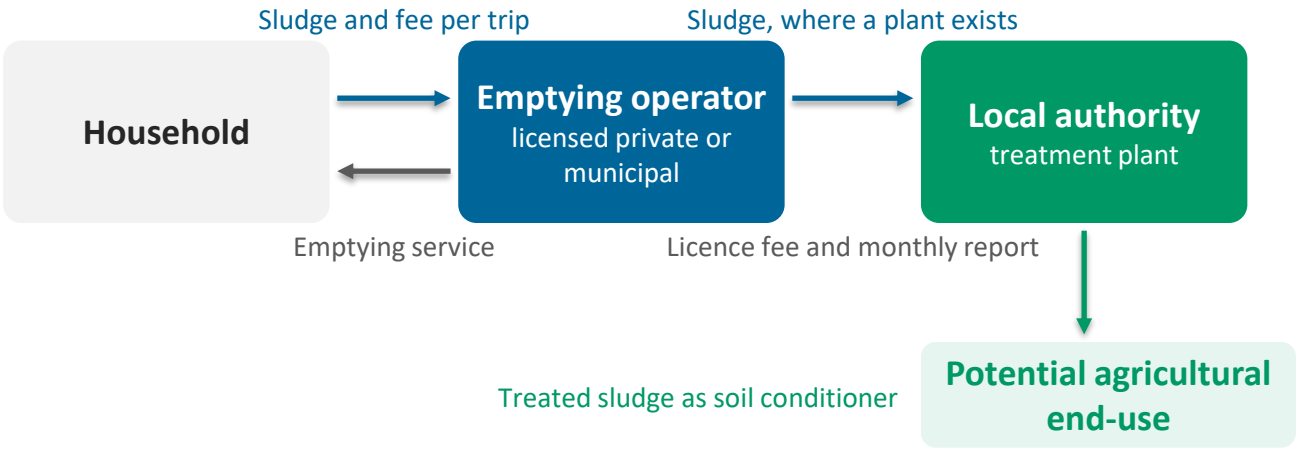
6. Business Model & Financing

Households pay per trip within fee ceilings set by ministerial regulation; treatment relies on local government budgets.

Fee ceilings and fees in practice (THB per m³)



Flow of money, sludge and service



Providers

- Licensed private operators, or the local authority itself
- Health Region 9: private operators serve about 70% of municipalities (2024)
- Licence: up to THB 5,000 a year for collection and transport

Charges: who pays and how

- Households pay per trip, on demand
- Ceilings: THB 250 per 0.5 m³ for collection and transport; THB 300 per 0.5 m³ for disposal
- Bangkok: THB 250 per m³; THB 150 for up to 0.5 m³

Funding

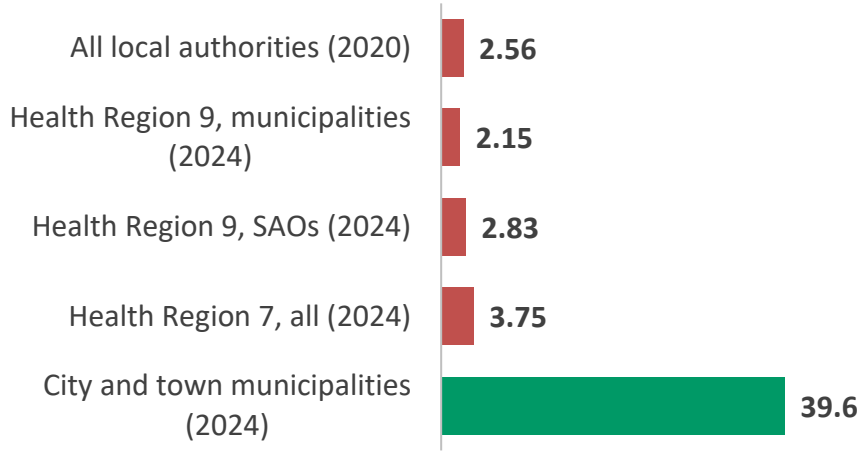
- Treatment plants are built and run from local budgets
- New fee regulation in force since 17 November 2025
- Wastewater treatment fees: collected by only 22 local authorities (2025)

Sources: Ministerial Regulations on sewage and solid waste fees B.E. 2559 and B.E. 2567; Bangkok Metropolitan Administration (Thung Khru District Office); Sudsandee et al. (2025), JWSHD 15(10); Nairam (2024); PCD State of Pollution Report 2025.

7. Sludge Treatment & Disposal

Treatment and safe disposal capacity remains limited.

Local authorities with faecal sludge treatment (%)



Buriram Province

Nakhon Ratchasima Province

Treatment plants

- 199 sludge treatment systems nationwide (2020), equivalent to about 2.6% of local authorities
- Standard design: anaerobic digester (28 days or more) with drying beds
- Health Region 7: 27 systems, of which only 15 are functional
- Bangkok: two plants, operating below design capacity

Reuse and co-treatment

- Wastewater treatment plants reuse sludge in some cases (not faecal sludge): Phuket City ~50 t/month; Patong ~5 m^3/day as soil conditioner
- PCD (2025) recommends treating faecal sludge together with central wastewater plants

Disposal and illegal dumping

- Health Region 7: a 2024 study found that 75.9% of local authorities reported sludge disposal on roadsides or public land
- Health Region 9: illegal dumping found in 28.0% of municipalities and 18.4% of SAOs (2024)
- Kalasin: helminth eggs in 10.4% of 328 samples from dumping sites (2023)
- Bangkok: unlicensed operators have been reported discharging to drains, canals and roadsides

Sources: Department of Health (2020, in Nairam 2024), guideline and KPI reports (2024); PCD DSPOT database and State of Pollution Report 2025; Chancharoen et al. (2024); Nairam (2024); Chanjreung & Duangmontri (2023); Sudsandee et al. (2025).

8.1 Accidents and/or Troubles

Confined-space incidents caused 112 deaths in 2017–2024 (66 incidents); 22 of these deaths occurred in treatment ponds and septic tanks.

66
incidents, all confined spaces

112
deaths, all confined spaces

22
deaths in treatment ponds and septic tanks

Confined-space incidents reported to the Department of Disease Control, 2017–2024 (62 people injured)

Reported	Cleaning, repair or pumping of a pond or septic tank	Casualties
8 Dec 2019	Workplace, Songkhla	4 deaths, 1 injured
30 Aug 2020	Workplace, Pathum Thani (sewage-emptying crew)	3 deaths
19 Jul 2022	Home, Bangkok	3 deaths, 1 injured
24 Sep 2024	Workplace, Samut Prakan	1 death, 2 injured
25 Dec 2024	Workplace, Samut Prakan	1 death, 3 injured

Treatment ponds and septic tanks: 8 incidents, 22 deaths and 14 injured; 5 happened during cleaning, repair or pumping. Causes recorded: oxygen deficiency or toxic gas. In 2024 alone: 21 incidents and 29 deaths in all confined spaces.

Actions during COVID-19 (2021)

- Field hospitals: wastewater treatment sized at 800 litres per bed per day; free residual chlorine at least 1 mg/L, checked daily
- Isolation centres: chlorination for at least 4 days after closing; toilets disinfected with 0.1% sodium hypochlorite
- Septic tanks and pipes kept intact and leak-free

Other health risks

- Helminth eggs, including liver fluke, in 10.4% of samples from sludge dumping sites (Kalasin, 2023)
- Bangkok (2025 study): households with leaking tanks have 4.27 times the odds of diarrhoea (OR 4.27; 95% CI 1.92–9.49)
- 453,930 hospital in-patients with diarrhoea and gastroenteritis in 2024
- 51 of 59 major water sources do not meet the standard for their designated class; faecal coliform bacteria are among the parameters exceeded

Sources: Department of Disease Control, open data on confined-space events 2017–2024; Thailand Institute of Occupational Safety and Health (2020); Department of Health COVID-19 guidance (2021); Chanjreung & Duangmontri (2023); Sudsandee et al. (2025); NSO Statistical Yearbook 2026; PCD State of Pollution Report 2025.

8.2 Measures for Prevention and Avoidance

PPE, health monitoring and worker training are required under relevant regulations and guidance; confined-space requirements were strengthened in 2019.

Personal protective equipment

- Mask covering mouth and nose
- Thick rubber gloves
- Closed clothing or rubber apron
- Rubber boots

Health monitoring

- Yearly health check for every worker
- Includes a test for intestinal parasites

Before entering a tank or pit

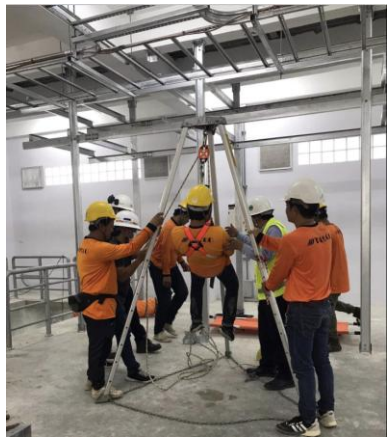
- Written permit for every entry
- Test oxygen and flammable gas before and during work
- Supervisor on site; trained rescuer with rescue equipment
- Only trained and medically fit workers
- No sparks or smoking: methane may be present

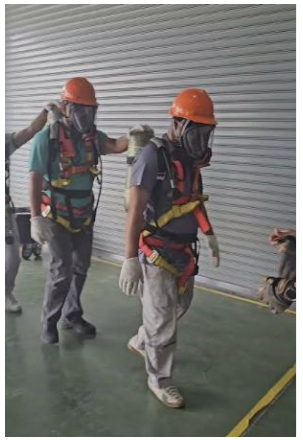
Information transfer and training

- Workers must complete Department of Health training
- Trip manifest and monthly report; digital F-Manifest on trial
- In practice, 9 of 14 operators surveyed in Kalasin (64.3%) learned the work from relatives

Safety regulations

- Confined spaces (2019): permit, supervisor, rescuer, gas test, training; oxygen 19.5–23.5%, flammable gas below 10% of the lower flammable limit (LFL)
- Hygiene (2018): disinfect hoses and spills, wash the truck daily





Sources: Department of Health manual for sewage collection workers (2020) and KPI reports (2025); Ministerial Regulation on confined spaces B.E. 2562 (2019); Ministerial Regulation on Hygienic Management of Sewage B.E. 2561; Chanjreung & Duangmontri (2023).

9. Challenges

Five key challenges along the desludging service chain.

1	**Technical**	Open-bottom cesspools are prone to leakage and overflow; many buildings do not meet effluent standards	**Bangkok survey: 40.1% of households report leakage. Nationwide: 33% of inspected condominiums met effluent standards (64 of 192, FY2025)**
2	**Institutional**	Responsibility is distributed across more than 7,700 local authorities; enforcement capacity and data systems remain limited	**139 of 225 city and town municipalities meet the legal-compliance indicator**
3	**Financial**	Fees are capped and paid per trip; few local authorities charge for or fund treatment	**Only 22 local authorities collect a wastewater fee**
4	**Public awareness**	Households desludge only when tanks are full, and some use unlicensed operators	**46.2% of surveyed Bangkok households have never desludged**
5	**Treatment capacity**	Treatment facilities exist in only a small share of local authorities	**199 sludge treatment systems (2.56%); disposal in 89 of 225 city and town municipalities**

Sources: Department of Health (2020, 2024–2025); PCD State of Pollution Report 2025 (Table 25); Sudsandee et al. (2025), JWSHD 15(10).

10. Key Messages

Thailand has achieved near-universal toilet access; the next challenge is safe management along the entire sanitation service chain.

1

Toilet access is near-universal; safe management is not yet

99.7% of households have a toilet, yet only 27% of people have safely managed sanitation

2

Desludging is on-demand, although the law sets an interval

In designated areas*, houses must be desludged at least once every four years; in Bangkok, 46.2% of surveyed households have never desludged.

3

Treatment and disposal remain the weakest link

Only 89 of 225 city and town municipalities have treatment and disposal facilities, and only 34% of domestic wastewater is safely treated (SDG 6.3.1, 2024). Co-treatment at central wastewater treatment plants is recommended.

4

Wastewater is the largest source of greenhouse gas emissions in Thailand's waste sector

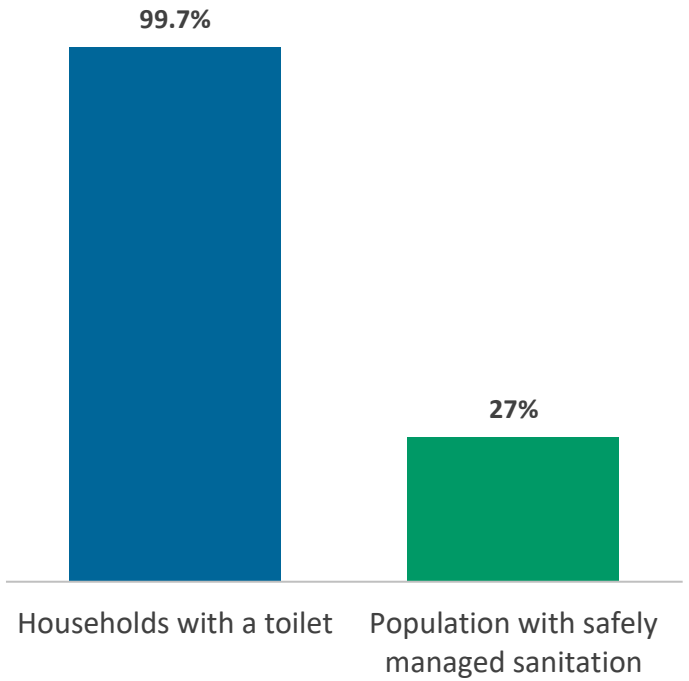
Wastewater treatment and discharge emitted 11.8 $MtCO_2e$ in 2022 (53% of waste-sector emissions), including 2.7 $MtCO_2e$ from domestic wastewater. Better desludging reduces methane emissions only if the removed sludge is properly treated.

5

Worker safety requires stronger enforcement of existing regulations

Permits, gas testing, equipment, health checks and training are already required by law

From Toilet Access to Safe Sanitation (%)
Thailand: toilet access is near-universal, but safely managed sanitation remains much lower.



Households with a toilet: NSO (2025). Population using safely managed sanitation: UN-Water SDG 6 Data (2024).

Sources: NSO Statistical Yearbook 2026; UN-Water SDG 6 Data (2024); PCD State of Pollution Report 2025; Department of Health (2024); Ministry of Public Health Notification (2018); DCCE (2024), Thailand's First Biennial Transparency Report (BTR1); IPCC (2019)
*Designated areas: Bangkok, Pattaya and city/town municipalities in 34 provinces; applies to systems installed from July 2019 (MOPH Notification, 2018).

References (1/2): Official documents

1. Bangkok Metropolitan Administration, Thung Khru District Office (2026). Sewage emptying service and fee. webportal.bangkok.go.th (accessed Oct 2026).

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