Desludging in Indonesia: Bridging Service Gaps Towards Sustainable Sanitation

Focal points: collection & transport · charges & financing · worker health & safety · faecal sludge treatment plant

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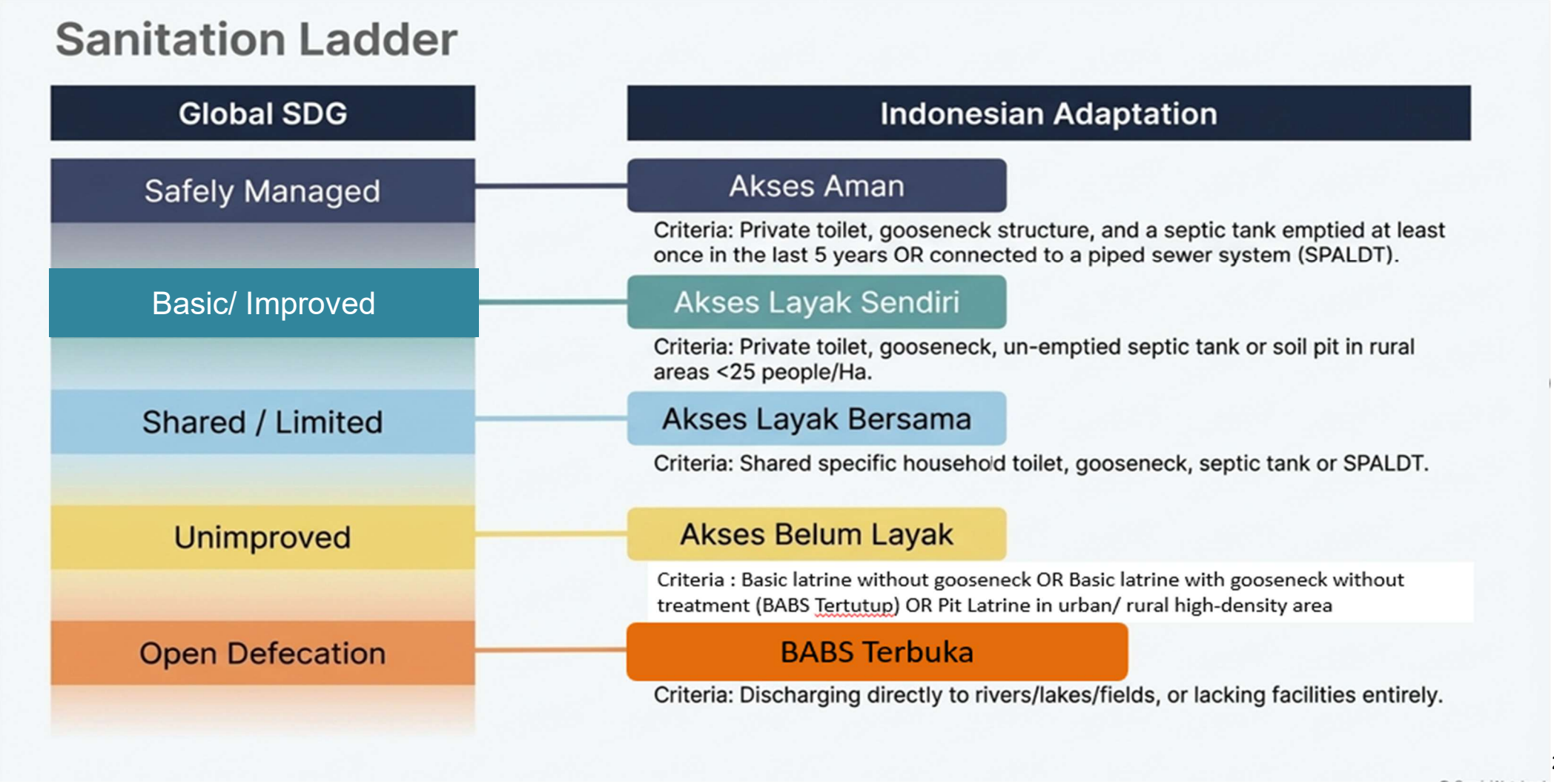
Country Profile

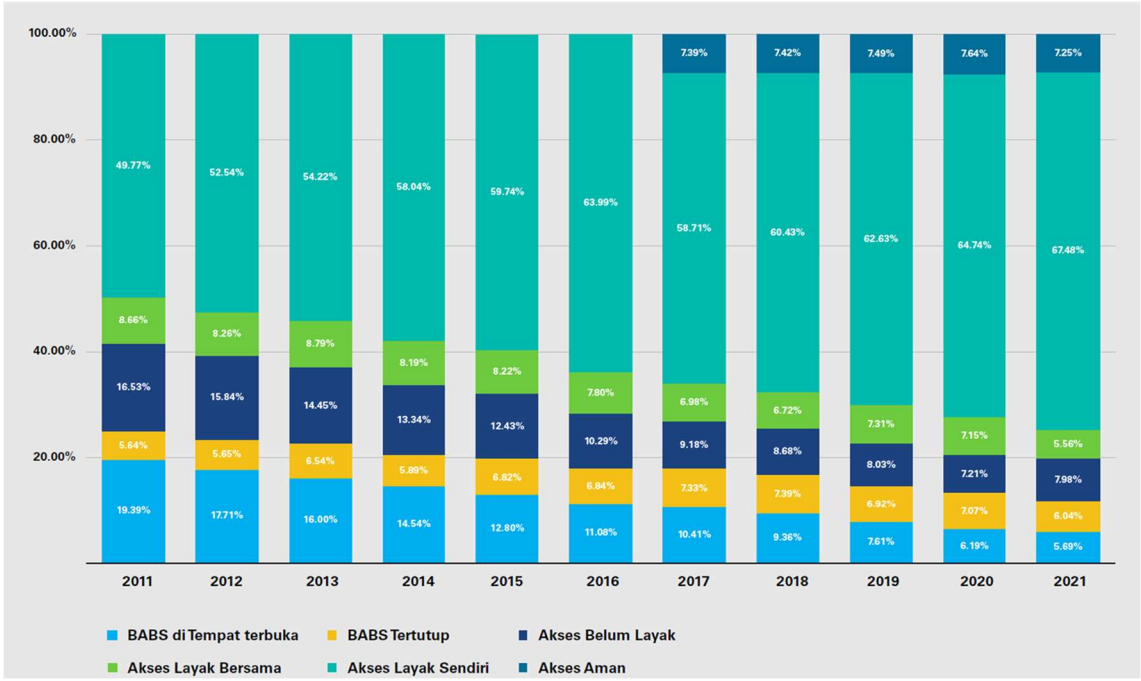
Indonesia adopt an adjusted version of sanitation global terminologies to assess sanitation access



Country Profile

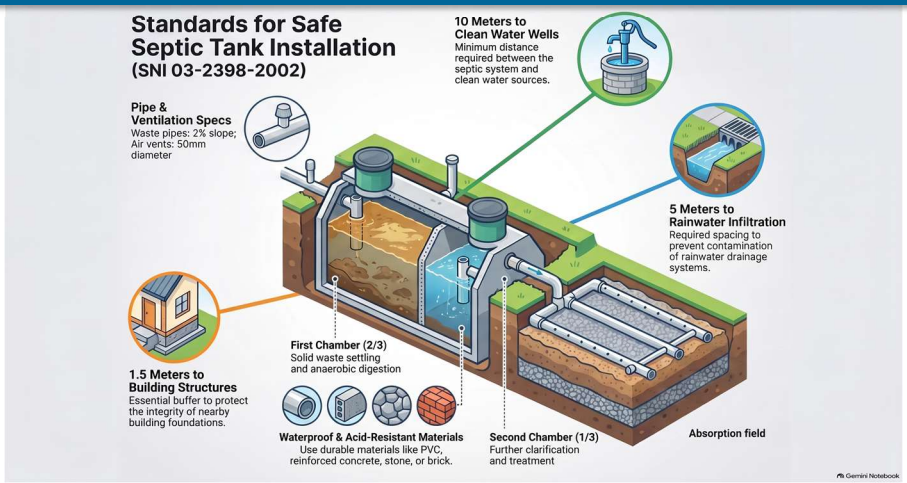
- From 2011 to 2021, access to sanitation services, specifically to ***basic/ improved sanitation (sanitasi layak)*** **and safety managed sanitation (*sanitasi aman)* had increased significantly** from **55,5% in 2010** to **80,92% in 2022**
- While 80.92% have improved (*layak*) sanitation, but **only 7.3% is safely managed**; 11.7% still without treatment (BABs Terbuka and BABs Tertutup)
- Improved sanitation in urban area is slightly higher (84,6%) than in rural area (79,9%) (BPS, 2023)
- Around 49.0 million (67%) households flush blackwater to an on-site treatment, <1% are connected to a sewer/treatment plant
- Grey water is either mixed with blackwater to on-site containment/sewer, or separated and discharged directly to drainage channel or soak pit

Source: Bappenas, 2023 (Peta Jalan Sanitasi Aman 2030)

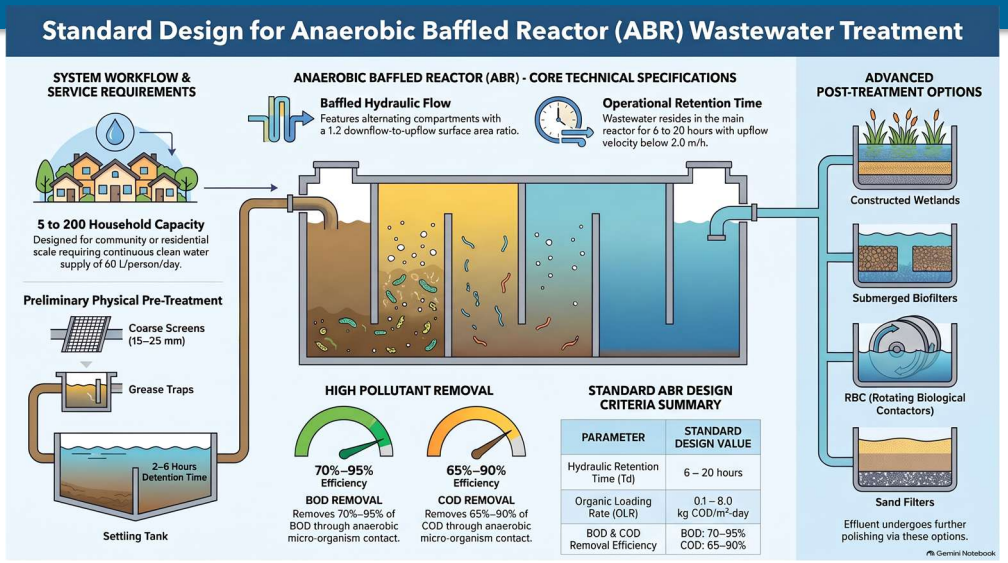


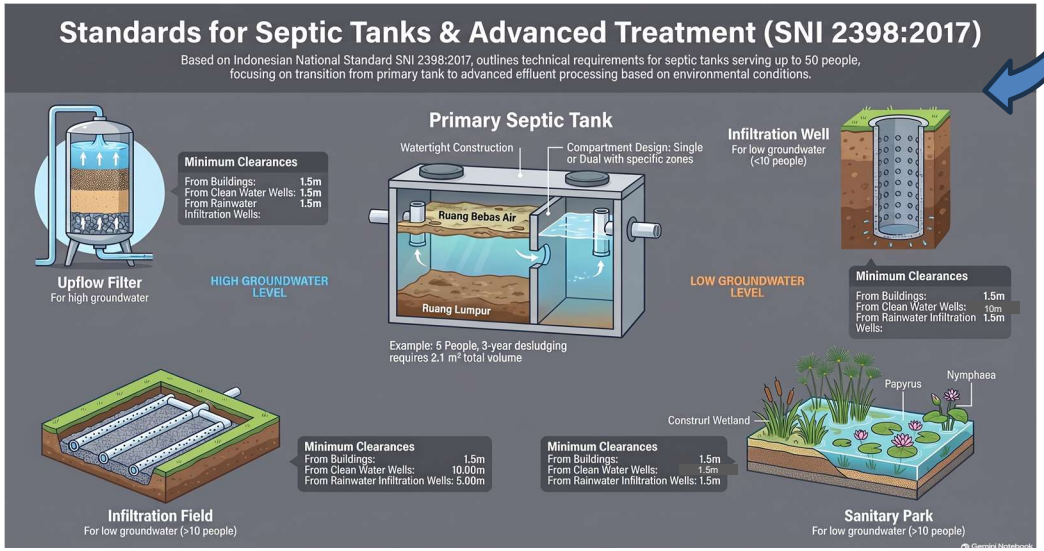
Growth of national domestic wastewater access 2011-2021

Current Status of Decentralized Wastewater Treatment - Standards



One option, limited to low groundwater treatment implementation





More options facilitate High-groundwater condition & Reduces distance from water well

Fabricated On-Site Treatment – ensuring waterproof materials

Current Status of Decentralized Wastewater Treatment

On site system are the backbone of Indonesia sanitation system with 49 million households depend on on-site systems that must be emptied

Scope of on-site system (Public Work Ministry Regulation no 20/ 2026)

- Individual on site system
- Communal on site system (max 50 persons service)

- In communal system, a bigger anaerobic system, such as Anaerobic Baffled Reactor (ABR) is commonly used to serve 2-10 houses or public toilet blocks (MCK). Indonesia accelerated sanitation access through its community-based SANIMAS (community based) program.
- 72.8 million households use a goose-neck toilet; 49.0 million drain to a septic tank (+17% since 2017), 0.4 million to an IPAL, 8.1 million to ponds/other.

Toilet use	2017	2018	2019	2020
Own (private) toilet	50,412,647	52,396,252	54,907,963	57,510,214
• Own toilet → septic tank	41,890,034	43,809,649	45,813,738	49,032,253
• Own toilet → treatment plant (IPAL)	443,369	387,816	443,024	411,467
• Own toilet → pond, etc.	8,079,244	8,198,787	8,651,202	8,066,494
Shared toilet (with specific households)	5,464,608	5,319,895	5,701,050	5,704,991
Total households	69,311,717	70,102,195	71,438,289	72,792,286

Households by toilet and disposal type, 2017-2020

Current Status of Desludging

From L2T3 to LLTT

Parameter	Unscheduled service (L2T3)	Scheduled service (LLTT)
Initiated by	Customer	Operator
Timing	When the septic tank / settlement IPALD user needs it	Fixed period and schedule set by regulation
Customers	Anyone based on request; pay after the service is provided	Registration based service

- Primarily **private truck operators** on demand do the desludging. **Public operators** consists of local government units (e.g. UPTD PALD in Bekasi and Makassar) or water utilities/BUMD (e.g. Surakarta, Medan).
- The primary difference between L2T2 with L2T3 is that scheduled service (LLTT) is driven by the operator, while unscheduled service (L2T3) by the customer. Most households call only when the tank is "full", which is when they experience blockage.
- Based on the ministry regulation, desludging should be done regularly at least every 3 years (Public Work Ministry Regulation no 20/ 2026)
- From 260 Fecal Sludge Treatment Plant (IPLT) built, 156 regencies/cities own desludging trucks, 107 do not; Around 248 trucks procurement funded between 2018-2021
- LLTT customers (2021): Surakarta 10.852, Bekasi 8.788, Makassar 6.400, Medan 1.830.

Truck Owned By The Public Operator

Funding source	2018		2019		2020		2021		Have trucks	No trucks
	Regencies/cities	Trucks	Regencies/cities	Trucks	Regencies/cities	Trucks	Regencies/cities	Trucks		
DAK (special allocation fund)	27	41	89	137	2	3	28	35		
APBN (state budget)	0	0	0	0	15	15	17	17		
Total regencies/cities	27		89		17		45		156	107
Total trucks		41		137		18		52		

Desludging Service Flow

Sanitation value chain (Permen PU No. 20/2026): User Interface → Containment → Emptying & transport → Treatment (IPLT) → Disposal / reuse

	User Interface	Containment & on-site treatment	Emptying & transport	Sludge treatment (IPLT)	Disposal/Resource recovery	
					Liquid	Solids & gas
Infrastructure / means	Toilet & non-toilet pipes, grease/oil trap, control box, inlet pipe	Anaerobic septic tank with follow-up treatment (infiltration, upflow filter, kolam sanita) or aerobic unit	Vacuum truck (steel tank, pump, hose, ID marks); also ships, trains, three-wheelers	Dumping station > receiving unit > pre-treatment > sludge unit + liquid unit	Discharge pipe; water reuse unit	Compost, briquette & brick sheds; gas capture
Key requirements	Every house or building producing wastewater must run a SPALD	Biological treatment; individual (1 house) or communal (2-10 houses or MCK); SNI certification for factory-made units; keep rubbish out	Desludge at least every 3 years per SOP; deliver only to an FSTP, or WWTP with co-treatment, or another approved facility	Technology chosen to meet quality standards and the intended use of the sludge; co-treatment allowed as an alternative	Must meet the domestic wastewater quality standard before discharge	Non-food compost or fertiliser, building material, biogas as energy; must follow the law
Responsibility Arrangement	Households / building owners	Households (individual); community groups (communal)	Desludging operator / service provider	IPLT operator (regional govt, UPTD, BLUD, BUMD)	IPLT operator	IPLT operator / partners

Legal & Institutional Framework

A new national Domestic Wastewater (SPALD) regulation (2026) now sets desludging, vehicle, and reuse rules. Local governments deliver the service

- Snaitation related law is now under Public Work Ministry Regulation no 20/ 2026) on SPALD (replaces Permen PUPR 04/2017); local regulation on wastewater and retribution based on minimum similar with national level or stricter (e.g. Gresik Perda 09/2018 & 13/2018).
- Responsible authorities**:** Ministry of National Planning (Bappenas); Health (e through STBM behaviour change); Home Affairs (through institutional arrangements and mandates); Public Works (infrastructure and technical guidance context); Environment (through effluent standards).
- Regencies/cities own the service via their local units or utilities (e.g. UPTD P/ or BUMD)
- **Licensing / certification:** factory-made units tested by the MoPW settlemen research institute against SNI 2398:2017 and ISO 30500.
- **Effluent quality: Env Ministry Regulation** No. 11/2025 (replaces P.68/2016).
- **Sludge quality:** no dedicated biosolids standard; reuse is checked against organic-fertiliser standards (SNI 7763:2024; Kepmentan 261/2019).
- **Service & vehicles:** Permen PU 20/2026 - desludge ≥ every 3 years per SOP; trucks need storage tank, suction pump and ID marking; sludge only to IPLT/co-treatment.

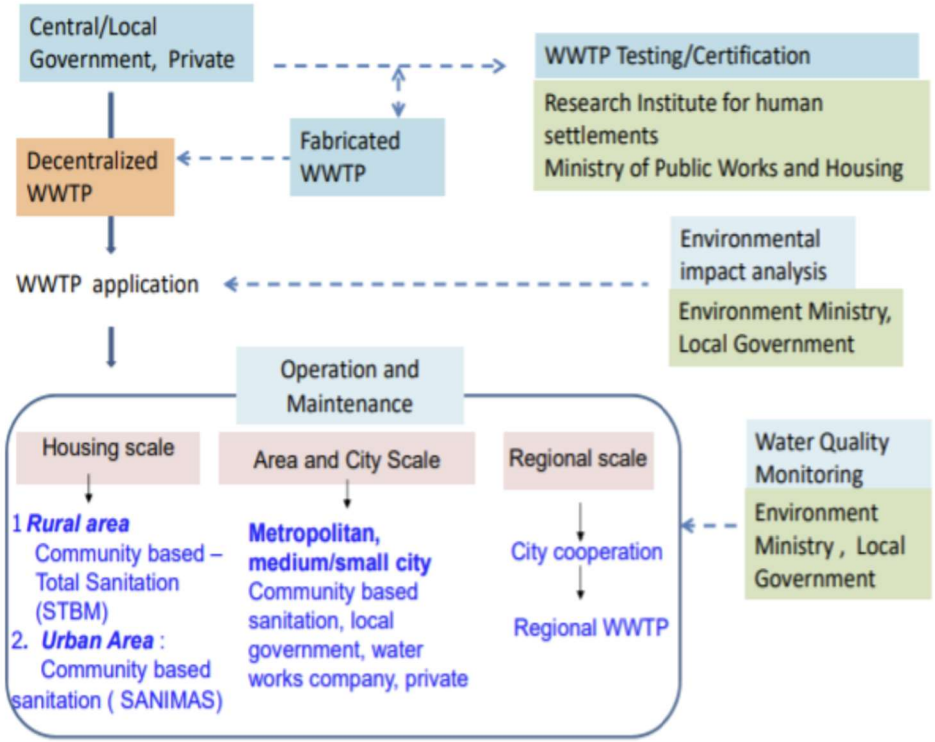


Figure 2-4 Institution Role- Decentralized WWTP Management

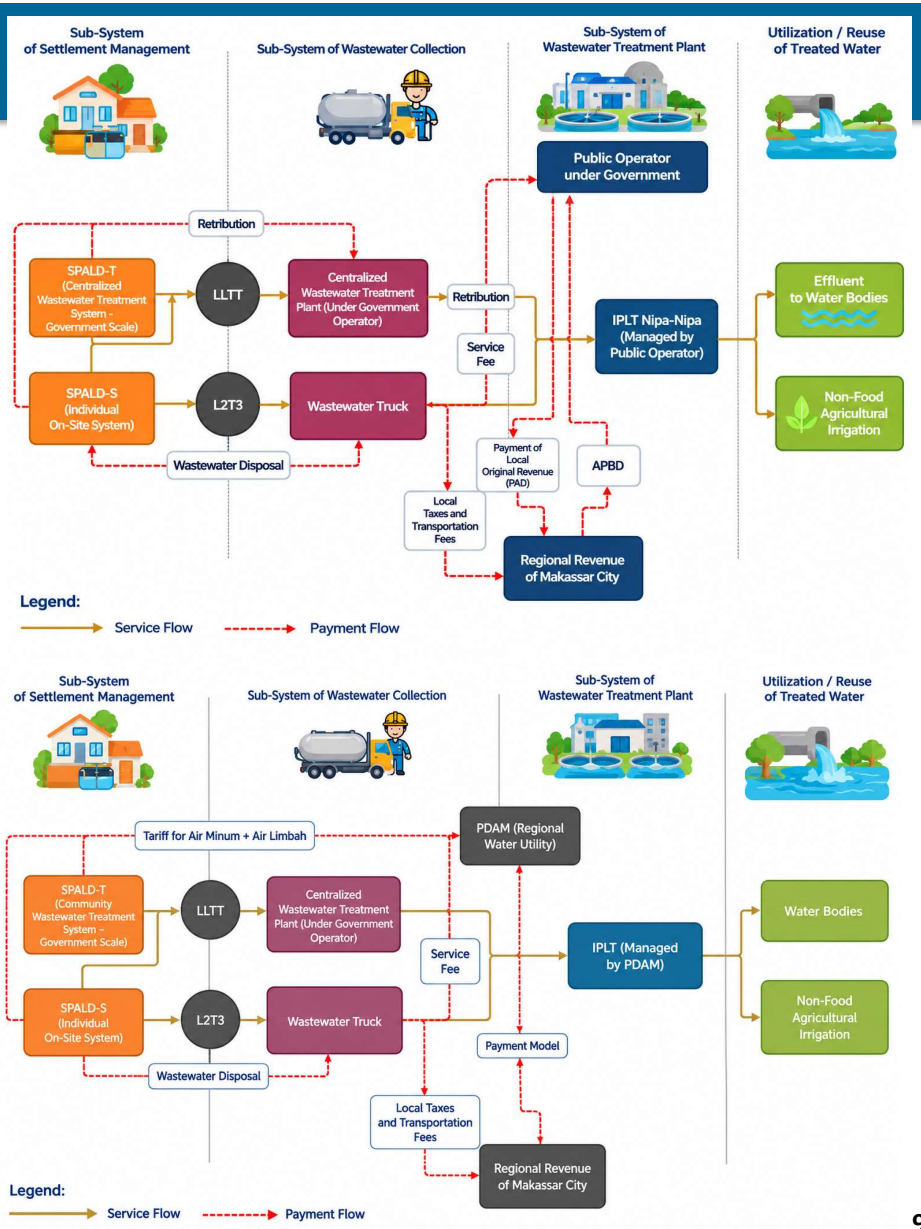
Business Model & Financing

Institution of Faecal Sluge Management Operator :

- **Public operators:** UPTD PALD (Bekasi, Makassar). Operations funded from the local budget (APBD).
- **Regional Public Service Agency – Regional Technical Implementation Unit for Domestic Wastewater Management (BLUD) -** Possessing flexibility in financial management as an exception to regional financial regulations
- **Public enterprise operators:** water utility/BUMD (Surakarta, Medan, Jakarta's Perumda Paljaya). Financing from service revenue plus local capital injection. Mostly embedded the wastewater services to water supply services
- **Example of private/partnership:** private trucks serve most on-demand calls; Surakarta and Gresik register private trucks into the public service.

Tariff

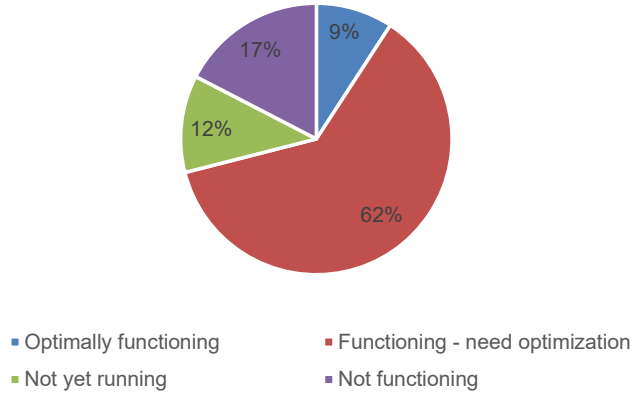
- **L2T3 Average charge:** private trucks IDR 500,000 per trip (Jakarta area, 2025); Paljaya IDR 150.000/m³ for households (min. 2 m³) up to 300.000/m³ for industry, incl. treatment.
- Retribution paid on the spot (Bekasi, Makassar).
- Monthly bill retribution (Jakarta)
- Households pays through monthly water bill (Surakarta, Medan) - 1 billing system with water supply
- Innovative payment : e.g bank account for specific purposes, solid waste bank payment,



FSM business model in Makassar and Medan *Gumilangsari et al (2021)*

Sludge Treatment & Disposal

Treatment plants: around 260 IPLTs in Indonesia (2023)



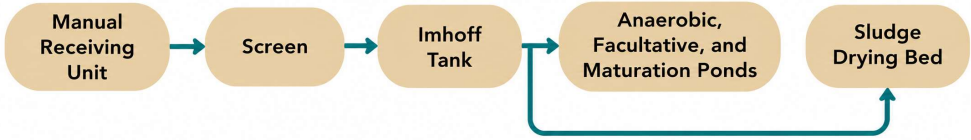
Public Work Ministry Data (2025)

Co-treatment Approach Development

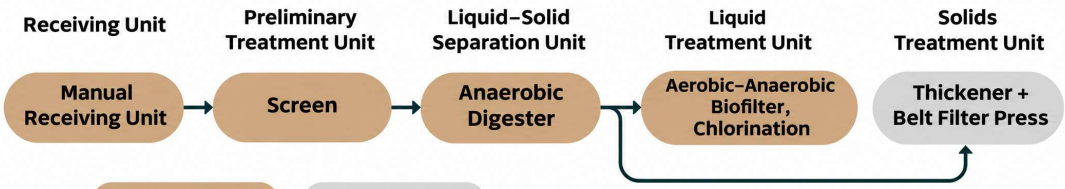
CONSTRUCTION OF WASTEWATER TREATMENT PLANT IN MAKASSAR (MAKASSAR WWTP B1)

1. Inlet
2. Inlet Channel
3. Equalization Tank
4. Primary Clarifier Tank
5. MBBR Media Tank
6. Secondary Clarifier Tank
7. Disinfectant Tank
8. Ground & Effluent Tank
9. Site Building
10. Sludge Processing Facility

From conventional to mechanical treatment



Kalimulya Fecal Sludge Treatment Plant Configuration, Depok



Cibinong Fecal Sludge Treatment Plant Configuration, Bogor Regency

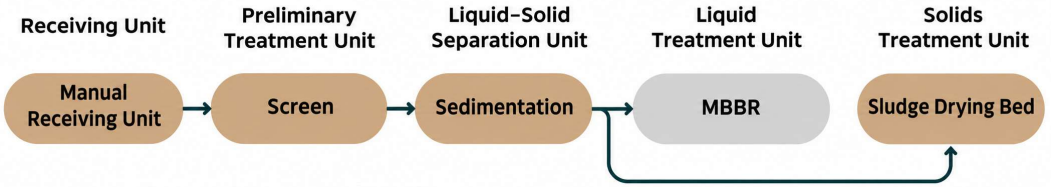
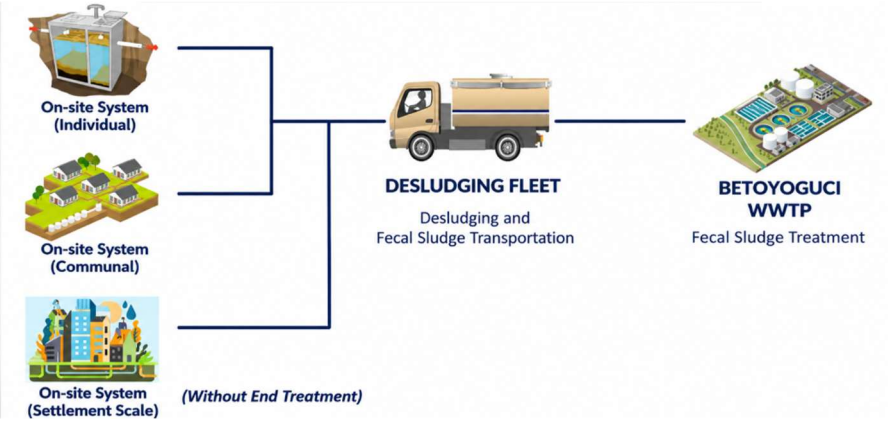


Figure 4. Treatment configuration diagram of the Cibinong Fecal Sludge Treatment Plant

Best Practise of Desludging Innitiative (Gresik)



LOCAL GOVERNMENT INITIATIVES FOR SCHEDULED DESLUDGING

JADI SAYANG

Healthy toilets and wastewater treatment, happier communities

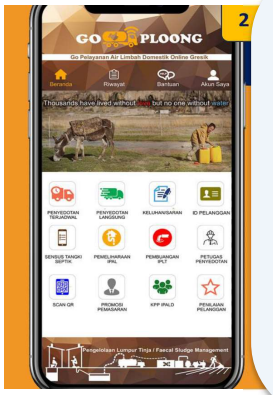
GO-PLOONG

Gresik Online Domestic Wastewater Services

KAMPUNG PUDAK AYU

Community-led collective, safe and continuous desludging through Dasawisma groups

Gresik Online Domestic Wastewater Services (Go-Ploong)



Digital service governance

App- and website-based domestic wastewater service management

Involves government, communities and the private sector

Development started in November 2017

First place: Indonesia Entrepreneur ICT Innovation 2019, public-sector category

Best Practise of Desludging Innitiative (Sidoarjo Regency)

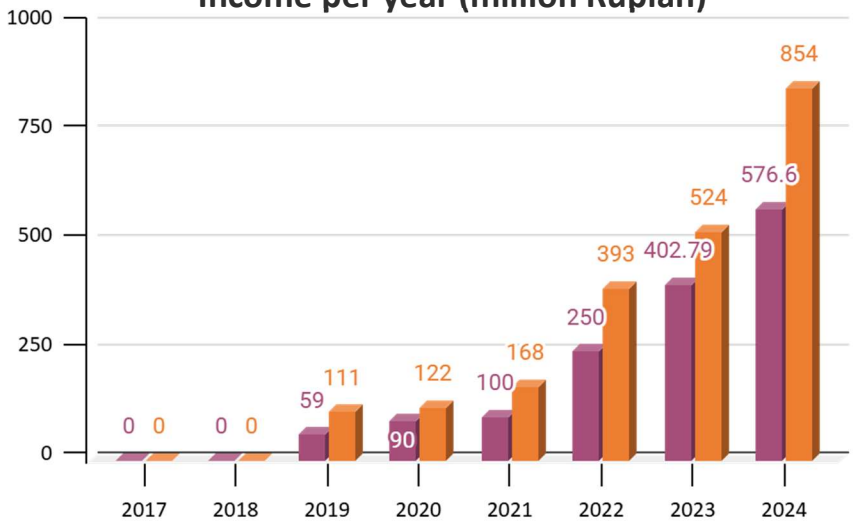
LLTT Registered Customer

2021	2022	2023	2025
7268 Housing/Unit	12.841 housing/unit	13.875 housing/unit	16.868 housing/unit

Training Of Trainers (communities organization) :

Family Empowerment and Welfare,
Community self-help group,
Micro financial agency

Income per year (million Rupiah)



Innovative financing : Financing for on-site sanitation systems (LLTT) through a savings/loan mechanism with low-interest ratesMicrocredit for the construction or upgrading of septic tanks

IUWASH Tangguh, 2023

Accidents and/or Troubles

Septic-tank fatalities

- **31 Dec 2025, GBK complex, Jakarta:** 3 cleaning workers died of toxic gas inside a septic tank; each went in to rescue the one before.
- **1 Feb 2019, Jember, East Java:** 4 people died after a septic tank collapsed and rescuers were overcome by gas.

Other troubles

- Sludge spills from hoses, illegal dumping, tank collapse, odour complaints near FSTP/IPLTs
- Desludging unit can't approach the small street (slum area)
- Manual removal of sludge in FSTP – required safety procedure

Other health risks

- Hydrogen sulphide and methane exposure; contact with pathogens (diarrhoea, typhoid, worms, skin infection); leaking tanks contaminating shallow wells.

Illegal dumping still seen in some area with trucks discharging onto open land to save travel time and fees.

Illegal discharge of faecal sludge onto open land

BETOYOGUCI FECAL SLUDGE TREATMENT PLANT (FSTP)

Plant profile

- Constructed: 2014
- Operational since: 2016
- Site area: 4,740 m^2
- Design capacity: 45 m^3/day

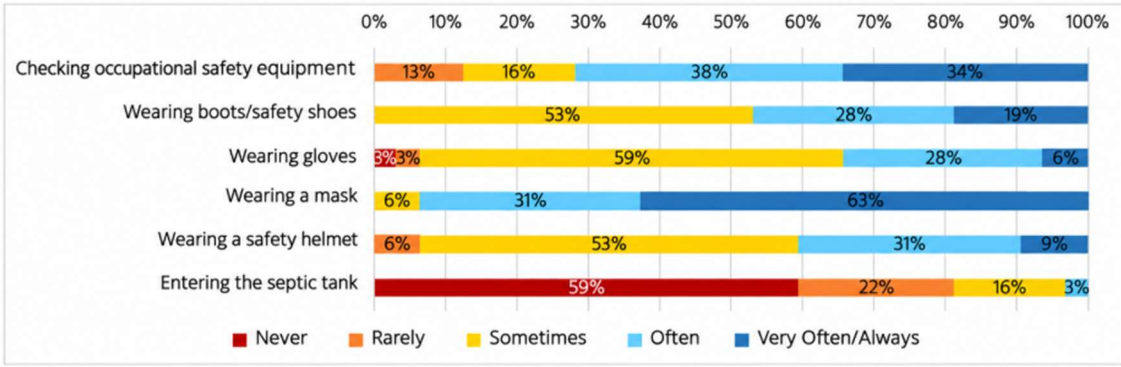
Treatment sequence

Inlet tank → Solid Separation Chamber (SSC) → Stabilization pond → Wetland → Receiving water

Measures for Prevention and Avoidance

- **PPE:** 94% often/always wear a mask, but 53-59% wear boots, gloves and helmets only "sometimes" PPE is mainly worn for factory/company jobs.
- **Tank entry:** 41% of workers have entered a septic tank - mechanical emptying alone does not remov the risk (SNV, 2018).
- **Information & training:** SOP-based training is mostly within public operators and donor programmes; private crews are rarely reached.
- **Health monitoring:** no routine health checks or vaccination required for desludging workers.
- **Safety regulations:** Law 1/1970 on Work Safety and PP 50/2012 (OHS management system); Permen PU 20/2026 requires desludging per SOP

Figure 6. Frequency Distribution of Desludging Practices – Worker Safety



- PPE is used only occasionally, mainly when desludging at factories/companies.
- Certain conditions require workers to enter the septic tank.
- SNV (2018): *Mechanical emptying* does not resolve occupational health and safety issues.
  → Workers still neglect their own safety (by not wearing PPE).

Survey of desludging workers - rows: checking safety equipment, boots, gloves, mask, helmet, entering the septic tank. Scale: never · rarely · sometimes · often · always.

Putri et al (2021)

Challenges

- **Limited scheduled desludging:** Most households request emptying only when tanks overflow or become blocked.
- **Unequal service access:** Limited truck availability and narrow streets restrict collection, particularly in densely populated settlements.
- **Financial sustainability:** Operators face challenges funding routine services, while households need affordable payment options.
- **Optimization of treatment :** Majority FSTP need to optimize, when the procedure becomes LLTT optimization need to be adjusted again
- **Incomplete treatment chains:** Collection and transport must connect to functioning treatment facilities to prevent illegal dumping.
- **Worker health and safety:** Inconsistent PPE use, septic tank entry and limited training expose workers to serious risks.
- **Coordination across operators:** Public agencies and private providers need clear responsibilities and consistent service monitoring.

Key Messages

- **Regular desludging is essential for safely managed sanitation**, especially given Indonesia's dependence on on-site systems.
- **Scheduled services need affordable, convenient payment mechanisms** to support household participation and reliable operations.
- **Every collected load must reach an authorized treatment facility**, supported by service records and monitoring.
- **Treatment technology must match local capacity**, including area availability, staffing, maintenance and available funding
- **Worker protection must be part of every service**, with safe procedures and training that reach private crews.
- **Local initiatives offer approaches for wider adoption**, including digital service management, community participation and sanitation savings schemes.

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