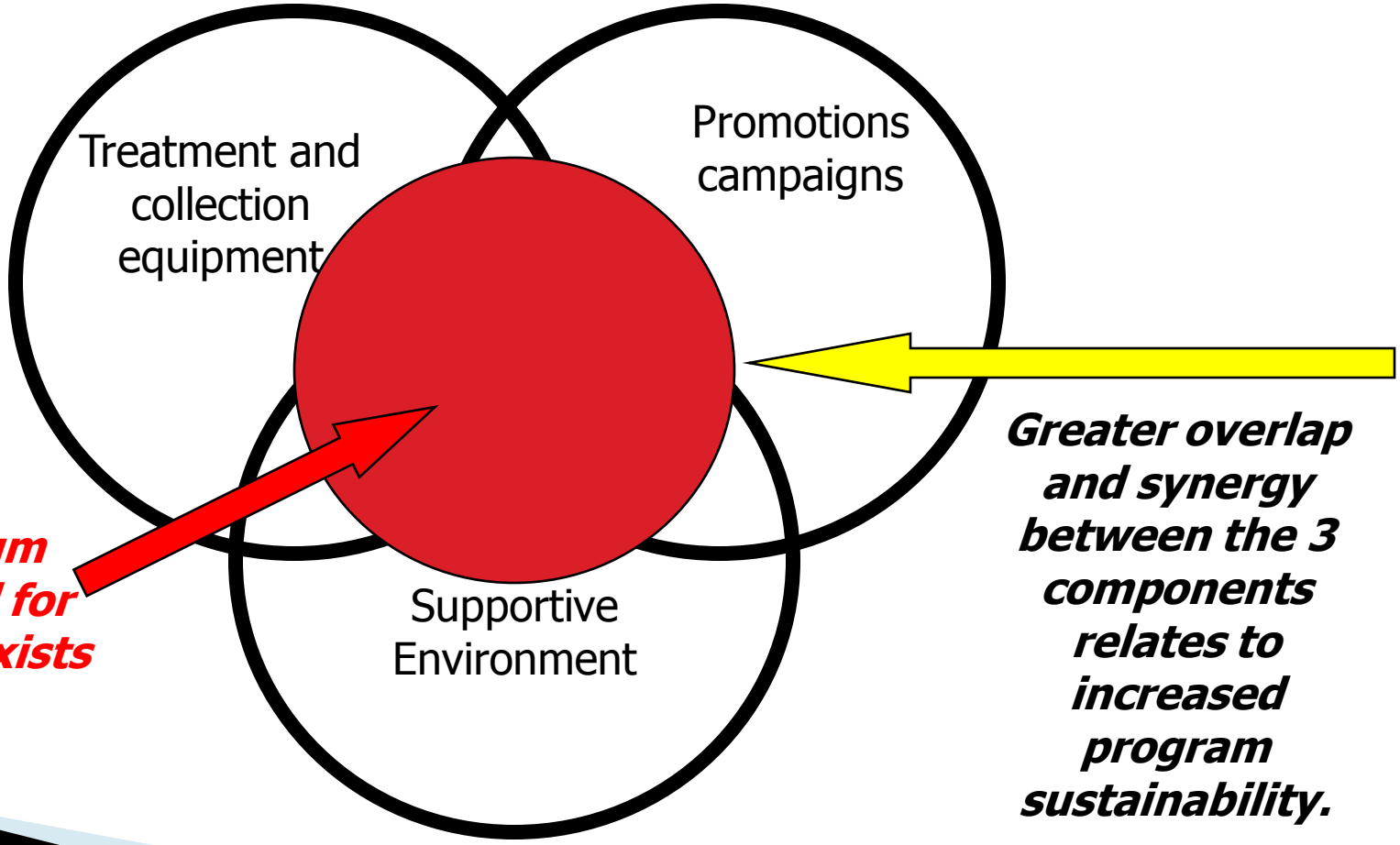
Case Studies in Fecal Sludge Management for Sanitation Improvement

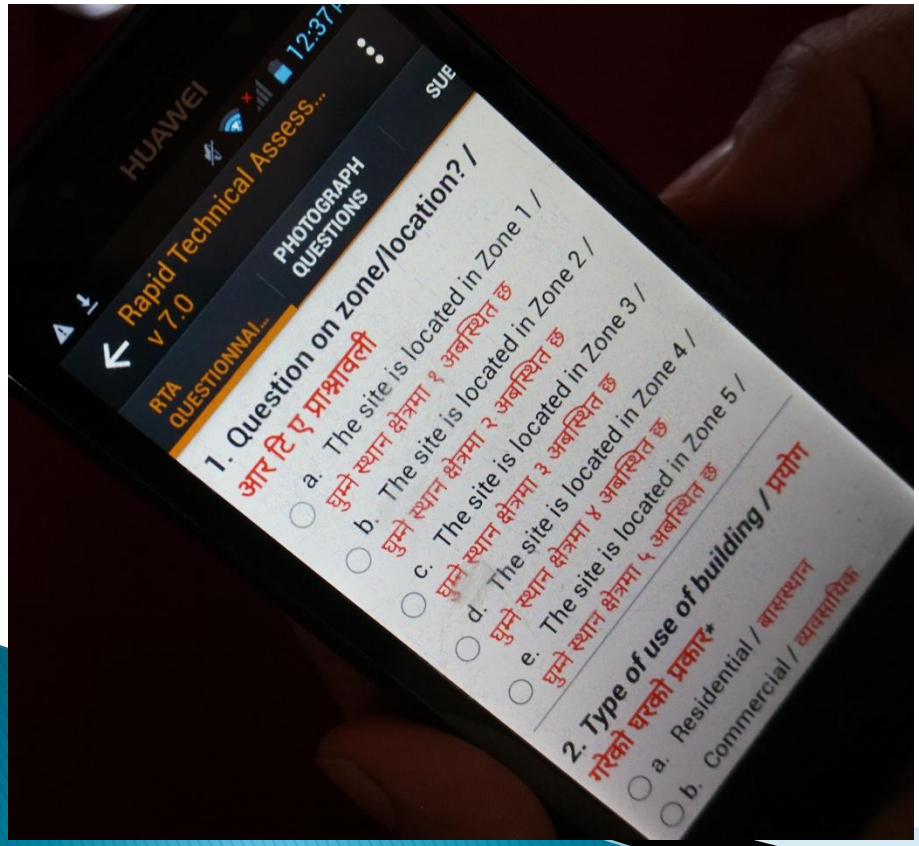
Philippines, Indonesia, Myanmar

Three components of successful septage management programs

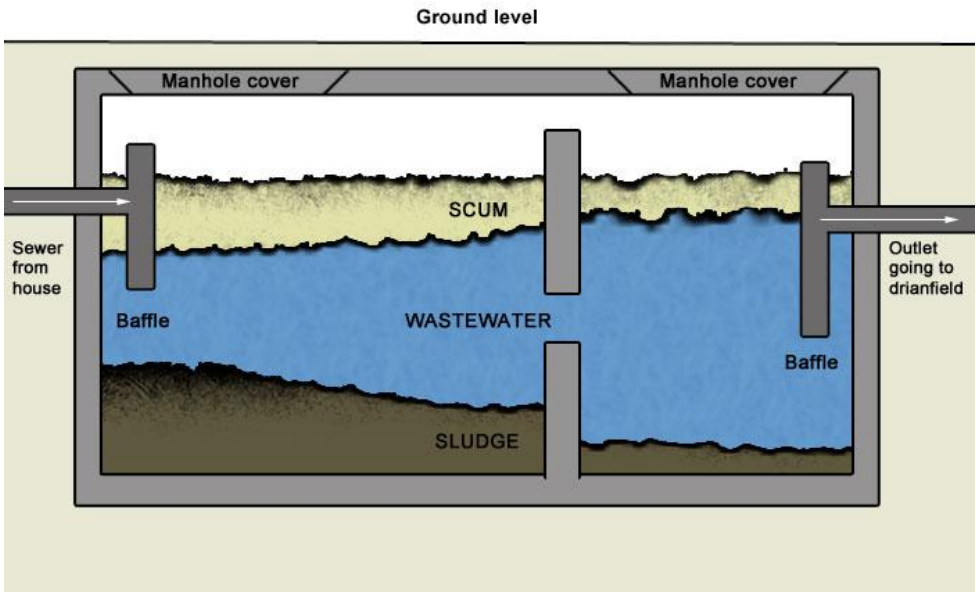


Rapid Technical Assessment

- How much waste the program will likely collect?
- How easy or difficult it will be to collect it.



Containment



What type of containment tank is it? Septic tank, pit latrine, cesspool?

Cross section of a typical cesspool

Locating the tank

- Locate the containment tank on the property
- It might be in the back yard
- Or under the house or out-building
- Assess the route for the hose. It might be through the house.

Assess truck access

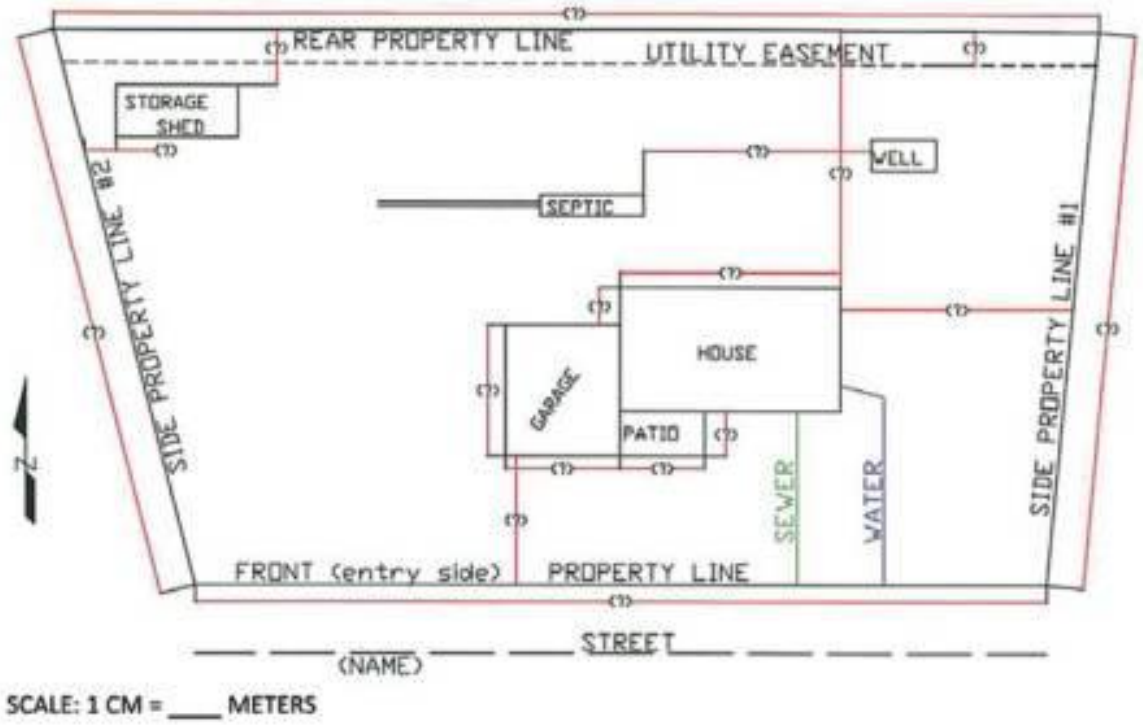
- Are the streets wide enough for a truck to pass?
- Are their any weight restrictions on the roads or bridges?
- Are their any seasonal flooding issues
- Are their places to turn a big truck around?

Be aware of narrow roads

Look for bridges that may wash out or have weight limits

Desludging truck parking

- Is there a designated parking place for the vehicle?
- Is the parking area located off the road?
- Is the parking area level?
- What is the distance from truck to tank?



Septage Management Decision Support Toolkit

Interactive Septage Management Toolkit

for

Developing Comprehensive Septage Management Programs

Septage Collection

+

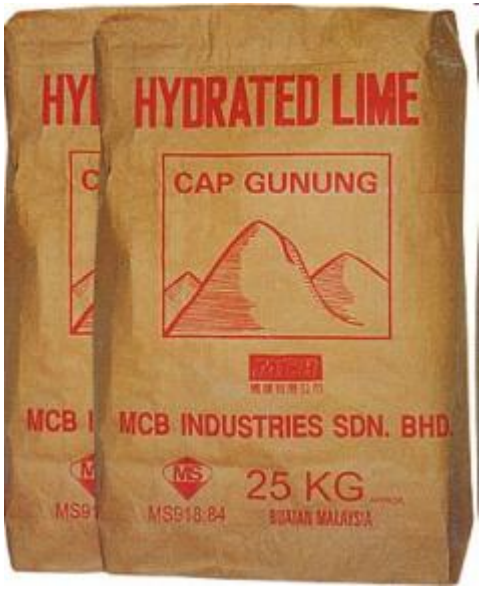
Septage transportation

+

Septage Treatment

Toolkit outputs

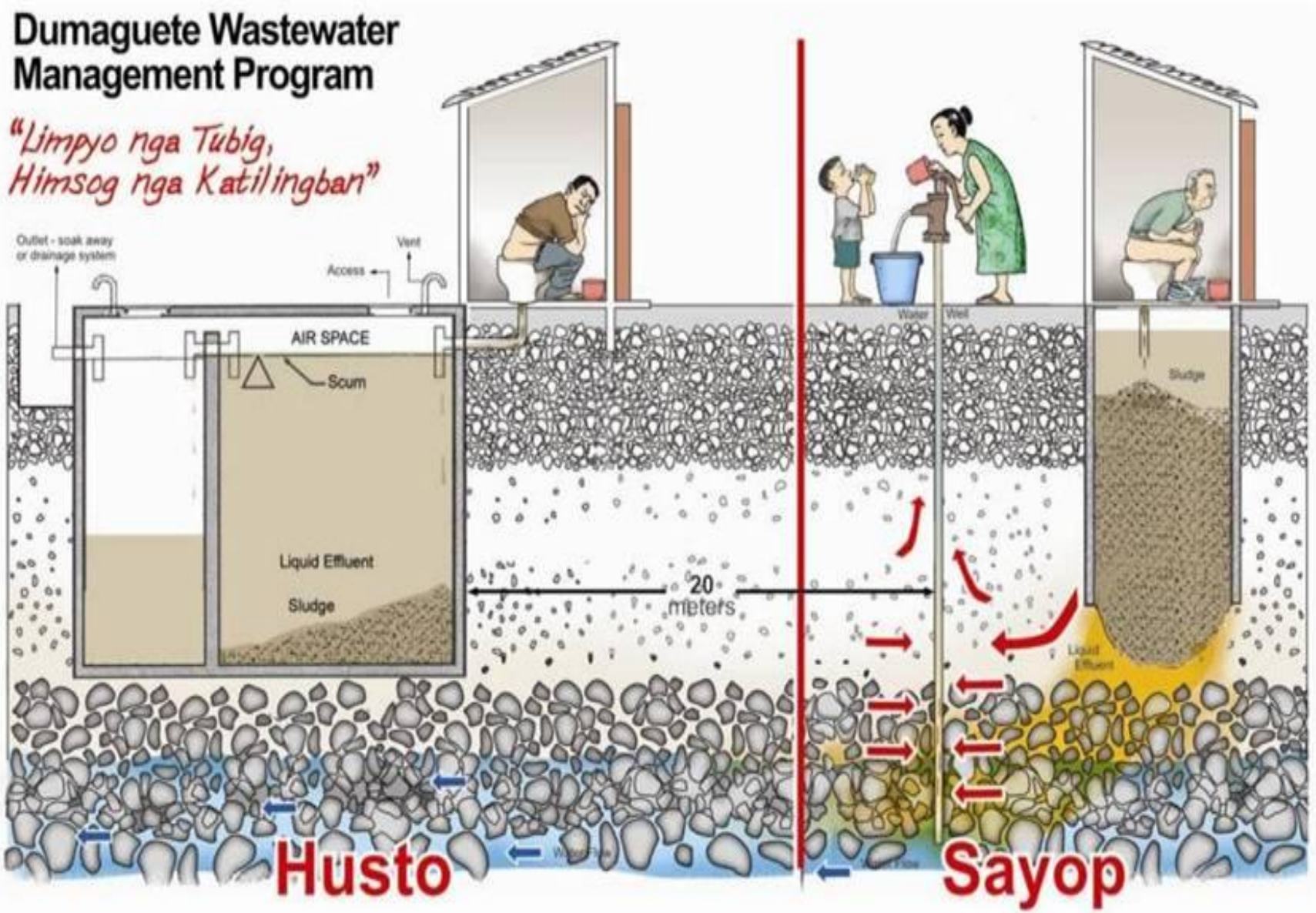
- Volume – design flow
- CAPEX
- OPEX
- Tariff



Promotions

Link the message to the motivators, then select a medium appropriate for the target audience.

Ang Husto nga Septic Tank




CHECK YOUR SEPTIC TANK
OR SWALLOW THE CONSEQUENCES.
POSO 'DI NEGRO
A Septic Tank Maintenance Program for Safe, Reusable Wat
A PROJECT OF
USAID

Local Ordinance on Septage Management

- Applicability
- Standard designs
- Desludging requirements
- Fee Schedule
- Incentives
- Penalties for non-compliance

Reference: Dumaguete City Septage Management Ordinance

Dumaguete Philippines

22,000 homes
3,500 commercial / inst.
Desludging frequency: 5 years
Flow = 60 m^3 / day
Res. TARIFF = $1/month
Com. TARIFF = $1.3 /month

People pay a small amount for the service on their water bill – not a large amount at the door

Incentive: Desludgers get paid based on amount of waste they deliver to the plant – each load has a manifest form for accountability

Myanmar – FSM for IDP Camps

In-pit Lime Stabilization

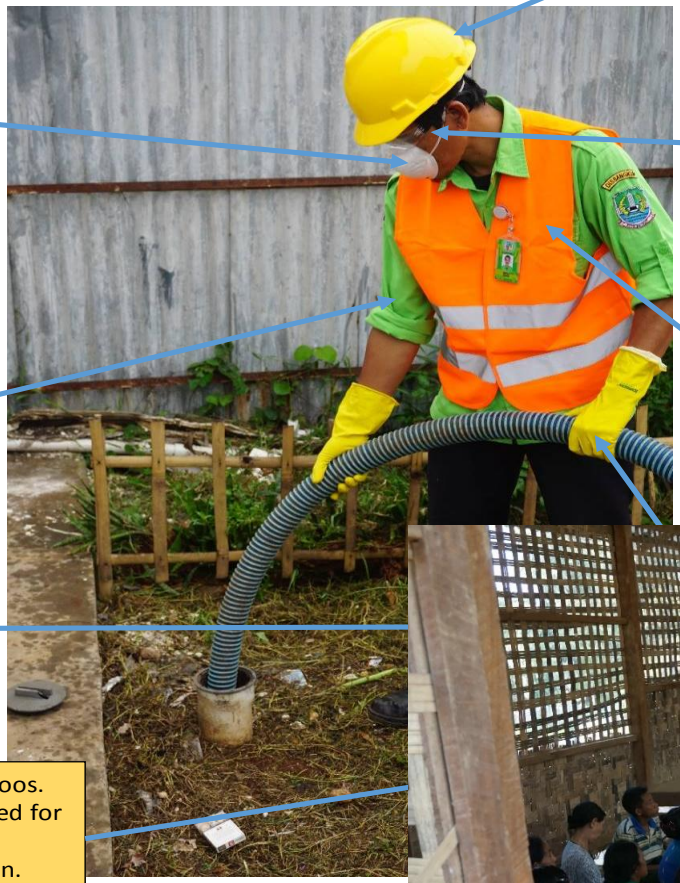

LIFAN

Personal Protective Equipment for Septage Workers

Hard hat for head protection

Face mask to reduce contamination due to splashing

Safety glasses for eye protection



Splash resistant uniform for skin protection and professionalism

Safety vest for enhanced visibility

Splash resistant clothing

Safety shoos. Rubberized for splash protection.

Design flow – *Robert Camp*

608 households, 46 Pits and tanks

Type in the information in the yellow *boxes below. Find the calculated values for your septage for your program in the* blue *box at the bottom of the page*

How many households are there in the coverage area?	46
What is your compliance target? As a percentage of the homes in the target area, what percentage do you think will participate?	100%
From the survey, of the homes that have tanks, what is the percent of the tanks that are desludgable?	100%
From the survey, what is the average volume of residential septic tanks in the target community?	1.8
What is the target desluding frequency for your program?	0.5
How many days a week will your program operate?	2

The design flow of your septage treatment facility is **1.86** **cubic meters per day*** Working days per month

Working days per year

14 **cubic meters per month**

166 **cubic meters per year**

The crew works 2 days/week and collections 1.86 m^3 of septage per working day

How many collection vehicles?

Note: Currency expressed in United States Dollars "$"		
Design flow (from Tab 1):	2	cubic meters per day
Amount to be removed from containment tank at each desludging event:	1.8	cubic meters
Number of contain tank volumes accommodated on the transport vehicle (motorcycle cart)	0.4	
Capacity of the motorcycle cart	0.8	cubic meters
Number of Loads Per Day per Truck (Fill in the yellow boxes to estimate loads per day)		
Estimated set up time	0.25	hours
Estimated time to mix the lime in the containment tank	1	hours
Estimated time to pump the containment tank using Sludge Diggers	0.75	hours
Estimated unloading time at the drying site	0.5	hours
Estimated drive and set up time at next containment tank	0.5	hours
Hours of operation per day	8	hours
Number of loads per day per truck	3	
Efficiency of trucking operation	0.85	
Adjusted loads per day per truck	2.3	
Answer: Number of trucks needed:	**1.03**	**Motorcycle carts**

1 motorcycle cart is enough to collect the design flow

Collection costs

Cost of the motorcycle trailer			$3,750			
Cost per year: Labor	$9/day	per worker	$801			
			Unit	Number of units	Cost per unit ($)	Total
Motorcycle Operating Costs						
		Workers	Cost/year	3	$801	$2,403
		Annual Fuel Cost (5 km per liter)	Cost/yr	133.28	$1	$137
		Annual equipment Maintenance				
		-Motorcycle engine Oil (oil change every 3,000 km)	Cost/year	10	$2	$21
		-Tool maintenance	Cost/year	1	$125	$128
		-Tires (new set every 2 years)	Cost/year	0.50	$250	$128
		-Hoses (new set every 2 years)	Cost/km	0.50	$100	$51
		-Other parts and minor repair	Cost/km	1.00	$100	$103
		-Tune-ups (1 time per year)	Cost/Tune-up	1	$25	$26
		-Battery three years	Cost	0.33	$100	$34
		-Insurance	Cost/Yr	0	$0	$0
		-Registration	Cost/Yr	0	$0	$0
Sub-Total Vacuum Truck Operating Costs						**$3,030**
Motorcycle tanker depreciation			Cost/Yr	1	($95.11)	**$1,141**
		Replacement Cost of motorcycle and trailer	Cost/Truck		*3,750*	
				interest rate	10%	
				Term (months)	48	
Pump, gulper or excravator			Cost/Yr	1.00	-63	**$761**
		Replacement Cost of 1-unit	Cost/Water pump		***2,500***	
		10% at 48 months				
Operating Costs - Septage Collection						**$4,932**
		Cost of collection per cubic meter				**$30**

Cost of motorcycle amortized at 48 months at 10% interest

Total cost to collect 1 m^3 =$30

Biosolids program

Drying trays	100	$3/ tray			
Cost Component	**Cost/yr**	**Units**	**% of Full time**	**Cost/yr**	**Totals**
Staff Salaries and Wages					
Worker	801	3	1.0	2,403	
Subtotal Salaries/Wages					2,403
Other Operating and Maintenance Costs					
c. Tools, pH meter	1	60		60	
e. Protective gear for operation team	375	1		375	
g. Lime	3	166		497	
Subtotal - Other Operating and Maintenance Costs	**1**				**934**
Principal and Interest Calculator					
Principal Amount		300			
Interest Rate		0.10			
Number of years for loan		3			
Interest and principal expense per month		-10			
Annual loan payment					**116**
TOTAL annual operating expenses					3,453

The crew of 3persons works 2 days per week on the soils enhancement program at an annual cost of $3,453

Revenue

Tariff per month	1	$
Number of homes participating	608	homes
Total septage monthly revenue residential	608	
Total monthly revenue	608	
Total Annual revenue	7,296	
Annual collection costs	3,601	
Annual operations costs	3,453	
Total program annual costs	7,054	
Surplus (year 1)	242	

Indonesia – 716 m^3 per day

Projections

Recommended septage montly tariff	440	IDR			Average monthly cost per residential user				10560	IDR
	0				Average monthly cost per commercial user				0	IDR
Community Growth Rate - residential	2%									
Community Growth Rate - Commercial/Institutional	2%									
Adjusted overall growth rate	2.0%									
Annual Inflation rate	7%									
Daily flow at year 0	716	cubic meters								
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Number of homes	210,442	214,651	218,944	223,323	227,789	232,345	236,992	241,732	246,566	251,498
Number of commercial/institutional	0	0	0	0	0	0	0	0	0	0
Daily flow (cubic meters per day)	716	730	745	760	775	790	806	822	839	855
Monthly Income - Residential	2,222,267,520	2,266,712,870	2,312,047,128	2,358,288,070	2,405,453,832	2,453,562,908	2,502,634,167	2,552,686,850	2,603,740,587	2,655,815,399
Monthly Income - Commercial	0	0	0	0	0	0	0	0	0	0
Total monthly income	2,222,267,520	2,266,712,870	2,312,047,128	2,358,288,070	2,405,453,832	2,453,562,908	2,502,634,167	2,552,686,850	2,603,740,587	2,655,815,399
Total Annual income	26,667,210,240	27,200,554,445	27,744,565,534	28,299,456,844	28,865,445,981	29,442,754,901	30,031,609,999	30,632,242,199	31,244,887,043	31,869,784,784
Total residual (annual)	4,244,782,203	3,605,572,648	2,874,471,500	2,042,669,826	1,100,565,521	37,692,632	-1,157,355,594	-2,497,010,531	-3,994,819,457	-5,665,544,970
Collection expenses	11,377,619,548	12,401,605,307	13,517,749,785	14,734,347,265	16,060,438,519	17,505,877,986	19,081,407,005	20,798,733,635	22,670,619,662	24,710,975,432
Operation expense subject to inflation	2,122,400,000	2,270,968,000	2,429,935,760	2,600,031,263	2,782,033,452	2,976,775,793	3,185,150,099	3,408,110,606	3,646,678,348	3,901,945,832
Fixed Operations Expenses	8,922,408,490	8,922,408,490	8,922,408,490	8,922,408,490	8,922,408,490	8,922,408,490	8,922,408,490	8,922,408,490	8,922,408,490	8,922,408,490
total Expenses	22,422,428,037	23,594,981,797	24,870,094,034	26,256,787,018	27,764,880,460	29,405,062,269	31,188,965,593	33,129,252,730	35,239,706,500	37,535,329,754
Total Residual (cumulative)	4,244,782,203	7,850,354,851	10,724,826,351	12,767,496,177	13,868,061,698	13,905,754,330	12,748,398,736	10,251,388,205	6,256,568,748	591,023,778

Monthly Tariff: IDR 10,560 / Family
= $0.9 per family per month

Thank You!

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