Co-treatment of Septage with Municipal Wastewater in Medium Sized Cities in Vietnam

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Background – Can Tho, Vietnam

- 1,240,000 inhabitants
- 205,000 households
- 1 m3 of septage per household per year
- 17,000 m3 / month (**566 m3/day**)
- Actual amount collected: 200 m3 / month

Vietnam Wastewater and Septage Régulations

Decree 80/2014/ND-CP

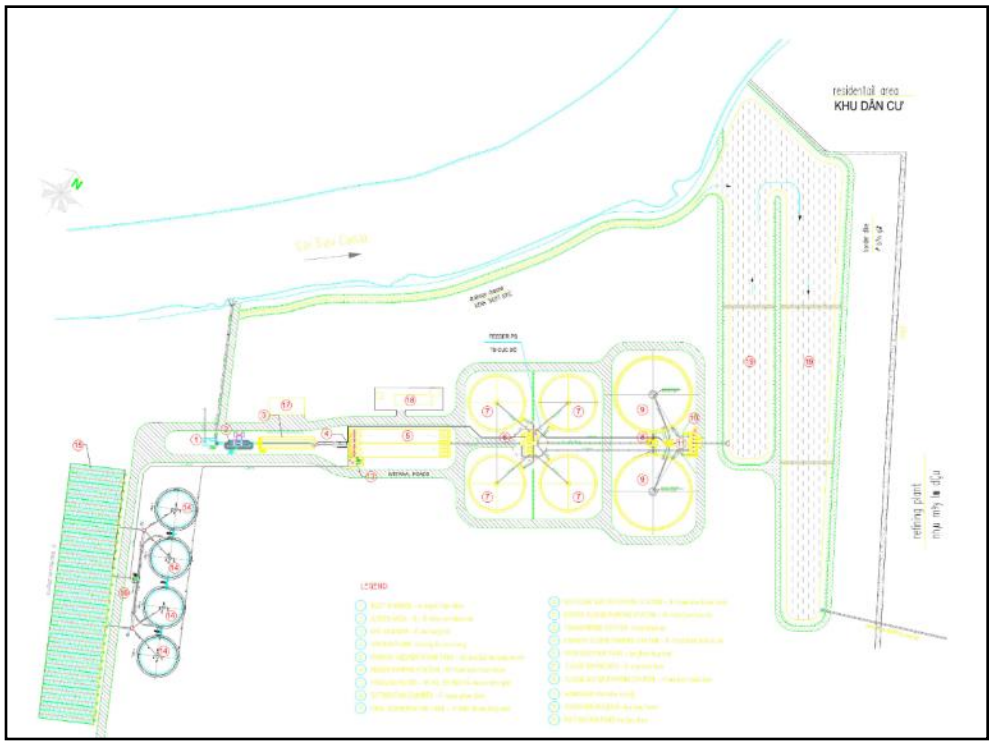
- Collection of fees for waste sludge management
- Requires characterization of waste sludge
- Sludge shall be brought to location of wastewater treatment plants, if no other licensed facility is available

Table 1: QCVN 14: 2008 -- National Technical Regulations on Domestic Wastewater

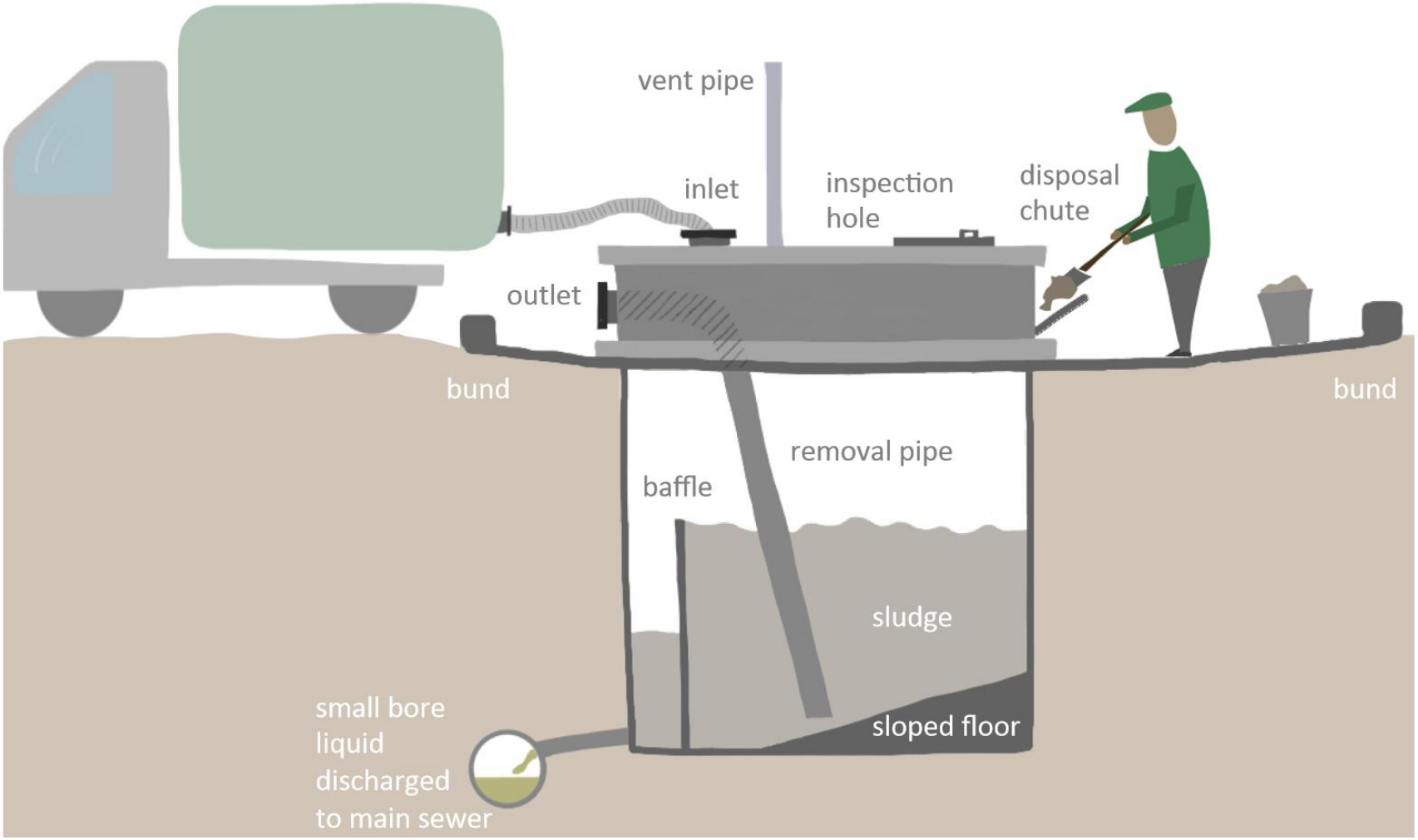
No.	Parameter	Unit	A	B
1	pH	---	5 - 9	5 - 9
2	BOD5 (20 ^{o}C)	mg/L	30	50
3	Total suspended solids (TSS)	mg/L	50	100
4	Total dissolved solids	mg/L	500	1000
5	Sulfide (as H_2S)	mg/L	1.0	4.0
6	Ammonium (as N)	mg/L	5	10
7	Nitrate (NO_3^-)	mg/L	30	50
8	Animal fat and vegetable grease	mg/L	10	20
9	Total surface-active substances	mg/L	5	10
10	Phosphate (PO_4^{3-})	mg/L	6	10
11	Total coliforms	MPN/ 100mL	3.000	5.000

A is for wastewater discharged into a water body used for the purpose of domestic water supply. B is for a water body not used for domestic water supply

Co-treatment system for Can Tho - 17,000 m^3 / day



Septage discharge stations



One proposal for septage collection and discharge to the WWTP

Estimating impacts of co-treatment

- (% septage x constituent septage concentration) + (% sewage x constituent sewage concentration) = combined influent concentration of the constituent

- (100% - % constituent reduction) x (combined influent constituent concentration) = effluent concentration of constituent

- Compare effluent concentration to GoV QCVN 14: 2008 -- National Technical Regulations on Domestic Wastewater.

Table 2: Hanoi Septage Characteristics

		Measured (mg/L)			
Parameter	Abbreviation	Max	Min	**Average**	Reference
Biological Oxygen Demand	BOD_5	22,400	12,000	**16,033**	M. Bassan, H. Harada, L. Schoebitz, L. Strande, N. Viet Anh, and V. T. Hoai An
Chemical Oxygen Demand	COD	83,830	2,830	**30,526**	
Suspended Solids	SS	71,077	1,380	**21,173**	
Ammonium Nitrogen	NH_4 -N	1,670	50	**390**	
Total Nitrogen	T-N	1,670	180	**1,285**	
Total Phosphorus	T-P	2,490	30	**202**	

Table 3: Hanoi WWTP Influent Concentrations*

	Influent Concentrations (mg/L)				
	Kim Lien	Truc Bach	Bac Thang Long	Yen So	Median
BOD_5	115	135	85	45	100
COD	145	155	135	132	140
TSS	85	85	65	51	75
NH_4-N	18	---	---	28	23
T-N	40	34	38	34	36
T-P	6.5	6.5	5.4	7.2	6.5

** Source: Figure 11 in Sandec/Eawag SFD Promotion Initiative Hanoi Vietnam (2016).*

Table 4: Hanoi Yen So SBR WWTP % Removal

	Influent	Effluent	
	mg/L		% Removal*
BOD_5	45	6	87%
COD	132	24	82%
TSS	51	10	80%
NH_4-N	28	0.5	98%
T-N	34	8	76%
T-P	7.2	6.5	10%

% removal = (influent – effluent) / influent

Table 5: Estimated WWTP Effluent Concentrations with 1% Septage

	Constituent Concentration (mg/L)					
	% Septage	% Influent	Combined		Yen So WWTP	Effluent Concentration
parameter	1%	99%	100%		Reduction	mg/L
BOD_5	160	99	259		87%	34
COD	305	139	444		82%	80
SS	212	74	286		80%	57
NH_4-N	3.9	22.8	26.7		98%	1
TN	13	36	48		76%	12
TP	2.0	6.4	8.5		10%	8

Combined influent concentration =

(% septage x constituent septage concentration) +

(% sewage x constituent influent concentration)

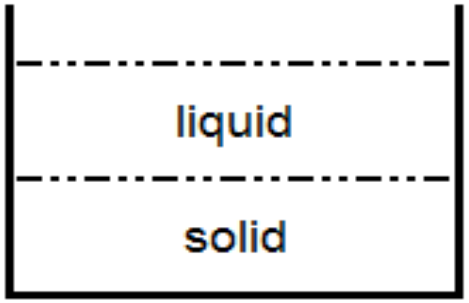
Table 6: Comparison of Results to Required Discharge Standards at 1% septage

	Effluent Concentration (mg/L)	GoV Standard (mg/L)	
parameter	1% septage	Class A	Class B
BOD_5	**34**	30	50
COD	80	---	---
SS	**57**	50	100
NH_4-N	1	5	10
TN	12	---	---
TP	**8**	6	10

Fails for class A effluent: BOD, SS and TP

Table 7: Septic Tank Effluent (mg/L)

Septic Tank Liquid and Solid Layers



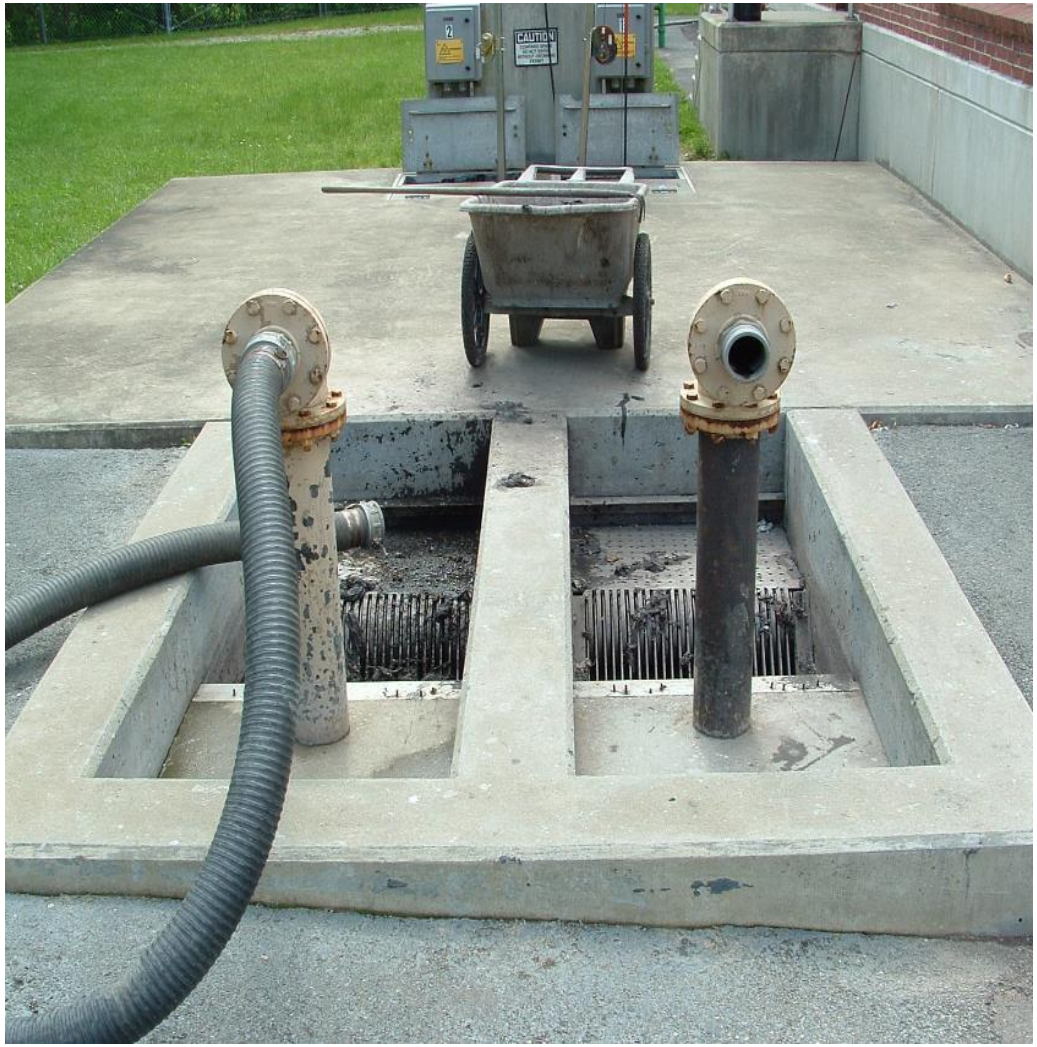
Parameter	Minimum	Average	Maximum
BOD	60	259	920
COD	91	413	1780
SS	12	134	733
T-N	1.3	38	349
T-P	0.9	9.5	72.4

Reference: Hidenori Harada, Pham Nguyet Anh, Nguyen Viet Anh, Shigeo Fujii (2015). Desludging Effect on the Performance of Septic Tanks in Hanoi. Hanoi, 2015. Data is for 36 septic tanks.

Table 8: Estimated WWTP Effluent with 5% of Septage effluent after sedimentation

Parameter	Septage Effluent	WWTP Influent	Combined Influent	Removal Efficiency	Estimated Effluent	GoV Class A
BOD	259	100	108	87%	14	30
COD	413	140	154	82%	28	---
SS	134	75	78	80%	16	50
T-N	38	36	36	76%	9	---
T-P	9.5	6.5	7	10%	6	6

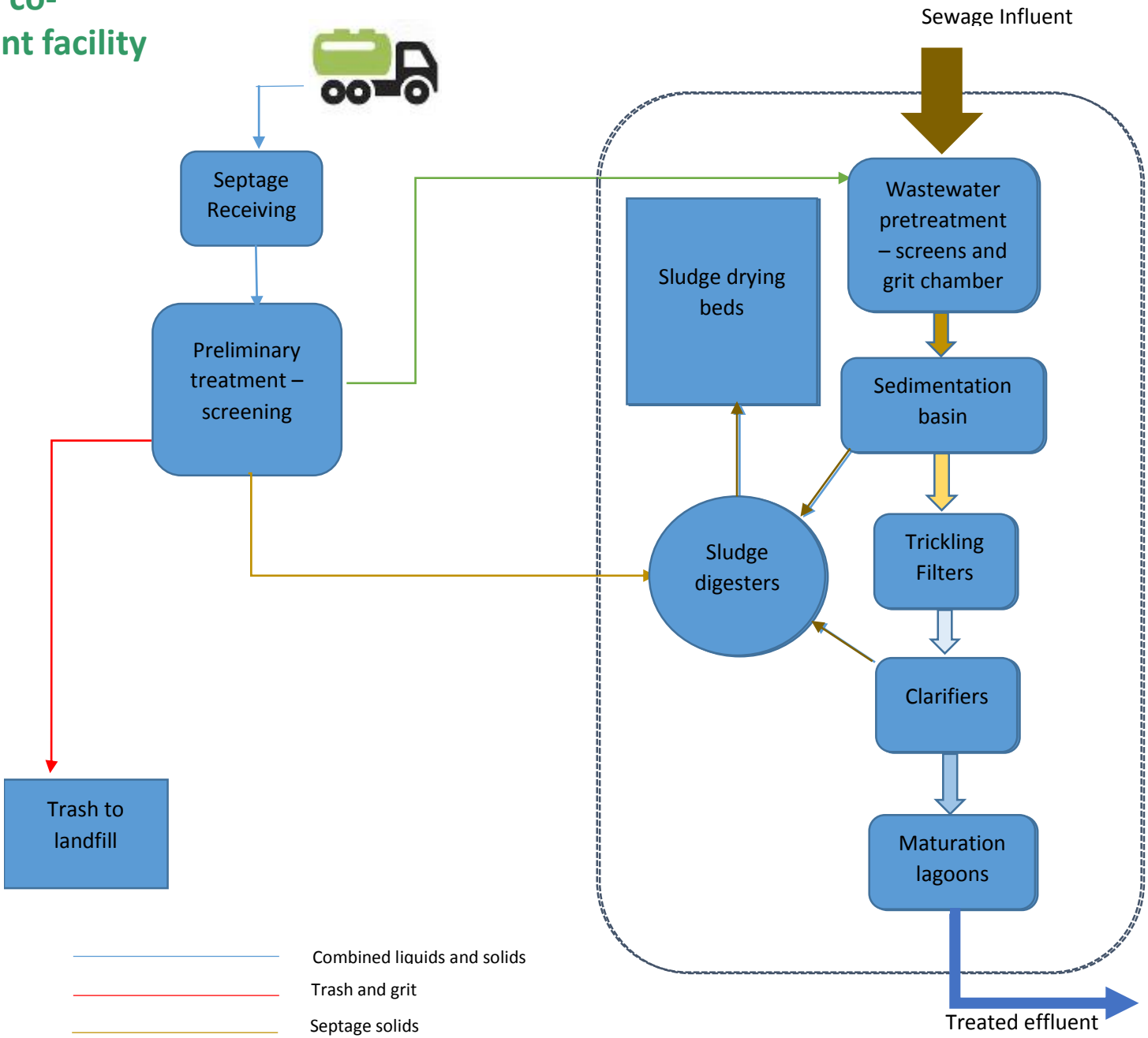
Proposed septage receiving station



- Easy connection for trucks
- Coarse screening
- Sedimentation. *Grit and inorganic solids removal in tank*
- Pumps liquids to existing treatment plant headworks, and solids to solids processing unit
- **Good for up to 2% of WWTP capacity, then mechanical dewatering**

Can Tho co-treatment facility

Phase 1 – Septage receiving with screening only



Conclusions

- Plant scale testing should start by adding only the liquid fraction of the settled septage.
- Start at 2% and work upward to about 5% monitoring the WWTP effluent concentrations for parameters specified in the GoV regulation
- Pay special attention to nutrients as potential limiting factors.
- Mechanical dewatering will likely be required when septage volume exceeds 2%

Thank you!

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