Septage Characterization in Indian Urban Centres and Standalone Treatment Options for Septage Handling & Disposal

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Flow

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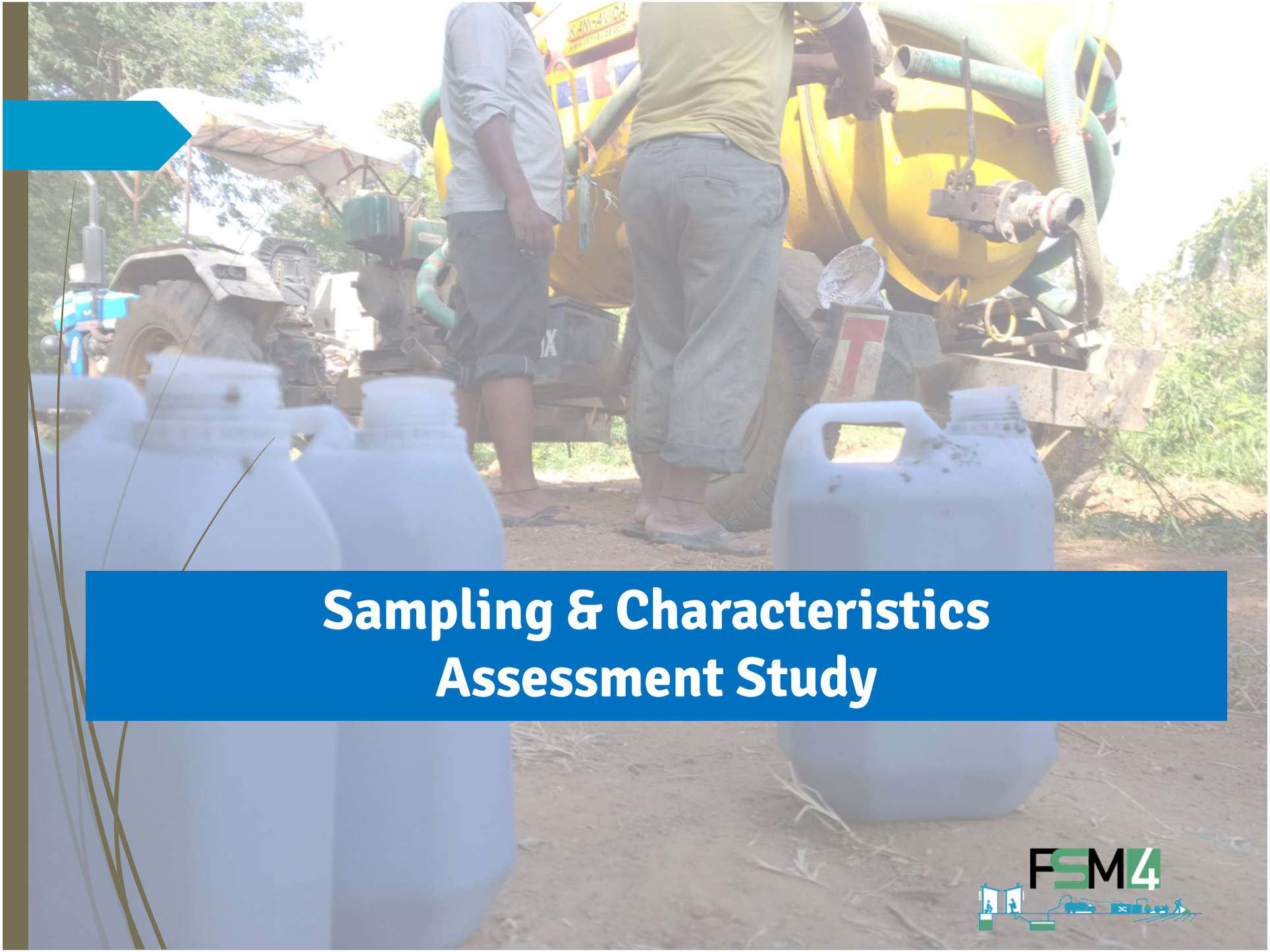
Background

- International Water Management Institute (IWMI), Colombo, intended to update Advisory Note 'Septage Management in Urban India' published by Ministry of Urban Development, Government of India
- Tide Technocrats worked with IWMI in providing technical support for updating Advisory Note
- Tide Technocrats
  - conducted septage characteristics assessment study and
  - prepared design document with technology options for standalone septage treatment, reuse & disposal



Sampling & Characteristics Assessment Study

STUDY PROCESS

- **Study Area:** Urban Centres
- **Point of Sampling :** Septage hauling trucks
- **Parameters for Analysis**: 16 parameters including Helminth Egg count.
- **No. of samples:** 3/location
- **Samples source:** HHs
- **Analysing Agency**: SGS India.
- **Method of Analysis**: using standardized procedures

Septage Variability in the Indian Urban Centres

- Extent of urbanization
- Water supply – frequency of supply and availability
- Cultural / traditional practices
- Awareness levels on water conservation
- Availability / non-availability of alternate disposal for greywater
- Availability / non-availability of soak-pits post septic tanks
- Desludging intervals
- Size of septic tanks
- Water added during desludging

Septage Variability

- **Factors influencing variability in septage:**
  - **source** - receive black and/or grey water and separate the liquid from the solid components
    - Blackwater without soak pit
  - **frequency of de-sludging** - age of septage
    - 1-4 years
  - **water usage** – dilution factor
    - cistern capacity - avg. 2-6 litres per flush
  - **household cleaning chemicals** – alters chemical characteristics
    - only generic cleaning chemicals, no water softeners
  - **season** - Rainy season results in higher dilution
    - sampling carried out in summer

Sample features

Study Outcome – State Average

Sampling in Summer

Parameter	Unit	CPHEEO	USEPA	KA	WB	DL	MP	GJ
O&G	mg/L	NA	5600	18	26	22	54	83
P	mg/L	NA	210	6.14	35	6.13	4.78	6.75
TS	mg/L	<30,000	34106	30858	50361	24982	25760	17675
NO3	mg/L	NA		22.8	23	25	25	28
FC	MPN/100ml	NA	10^6-10^8	320	862	156	220	645
Alk. CaCO3	mg/L	NA	970	1445	984	1951	1184	1326
pH at 25°C	-	NA	6-7	7.06	7.24	6.98	6.76	6.65
KJN	%	NA	588	88	124	538	365	270
Coli	MPN/100ml	NA	10^7-10^9	725	581	303	956	837
COD	mg/L	< 15,000	31900	34052	31128	6700	33853	4040
TSS	mg/L	NA	12862	28204	43059	23462	23850	14731
BOD	mg/L	NA	6480	27627	20042	4849	26349	2740
TSS(Vol.&Org.)	mg/L	App. 7,000	NA	22882	NA	23462	NA	10600
NH3-N	mg/L	<1,000	97	237	123	252	292	212
MLVSS	mg/L	NA	NA	2526	29434	3155	18755	NA
Helminth eggs	Numbers/L	4000	NA	17	10	7	21	3

Analysis

- West Bengal – Highest P, TS, TSS and BOD

concentrated - desludging frequency 4 years

- Karnataka, MP and Delhi – Similar septage characteristics

Common sample features : desludging – 3 years, Water aid during desludging, pourflush system

- Gujarat – Relative lower concentrations of all parameters

desludging frequency – I year

- Gujarat and Delhi – Higher TS but relatively lower COD

Study Outcome – Septage Characteristics (India)

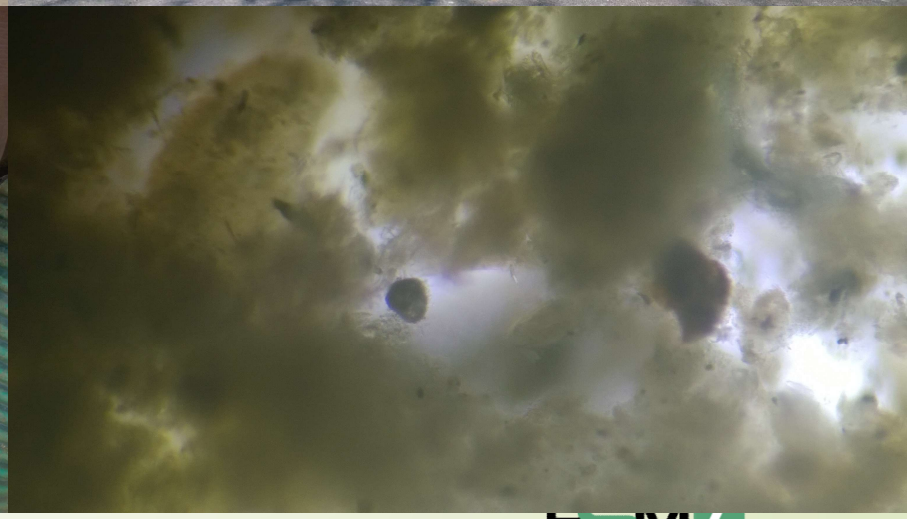
Sl.No	Parameter	Units	Range of all samples	Average of all Samples
1	Oil & grease	mg/L	5-108.9	41
2	Total phosphorus as P	mg/L	BDL(DL:0.1)- 89.41	12
3	Total solids	mg/L	1216-103167.2	29927
4	Nitrate as NO3	mg/L	12.13-39.9	25
5	Feacal coliforms	MPN/100ml	110-1600	440
6	Total Alkalinity as CaCo3	mg/L	400.4-3403.4	1378
7	pH at 25°C	-	6.32-7.45	6.93
8	Coliforms	MPN/100ml	170-1600	553
9	COD	mg/L	1000-150000	21954
10	Total suspended solids	mg/L	500-20083.3	33824
11	BOD at 27°C for 3 days	mg/L	611-115001	16321
12	Total suspended solids (volatile or organic)	mg/L	3020-71925.5	16741
13	Ammo. Nitrogen as N	mg/L	78.4-800.8	223
14	Kjeldhal nitrogen as N	mg/L	BDL(DL:0.5)-968.8	307
15	MLVSS	mg/L	400-23096.67	10774
16	Helminth eggs	Numbers/L	2-45	12

Outcome Comparative Chart

Parameter	Units	Range	TT/IWMI	NUSP	NIUA	Philipines	CBCL, Canada	CPHEEO
Oil & grease	mg/L	5-109	41	NA	NA	NA	5600	NA
P	mg/L	BDL(DL:0.1) - 89	12	210	NA	4900	210	NA
TS	mg/L	1216-103167	29927	34106	44296.5	NA	34000	NA
NO3	mg/L	12.13-39	25.16	NA	NA	NA	NA	NA
FC	MPN/100ml	110-1600	441	NA	NA	NA	NA	22672
Alkalinity,CaCO3	mg/L	400.4-3403	1378	970	4878.9	NA	1000	NA
pH at 25°C	-	6.32-7	7	7.05	7.8	8.99	NA	NA
Coliforms	MPN/100ml	170-1600	554		NA	NA	NA	NA
COD	mg/L	1000-150000	21955	31900	34408.3	NA	30000	1232

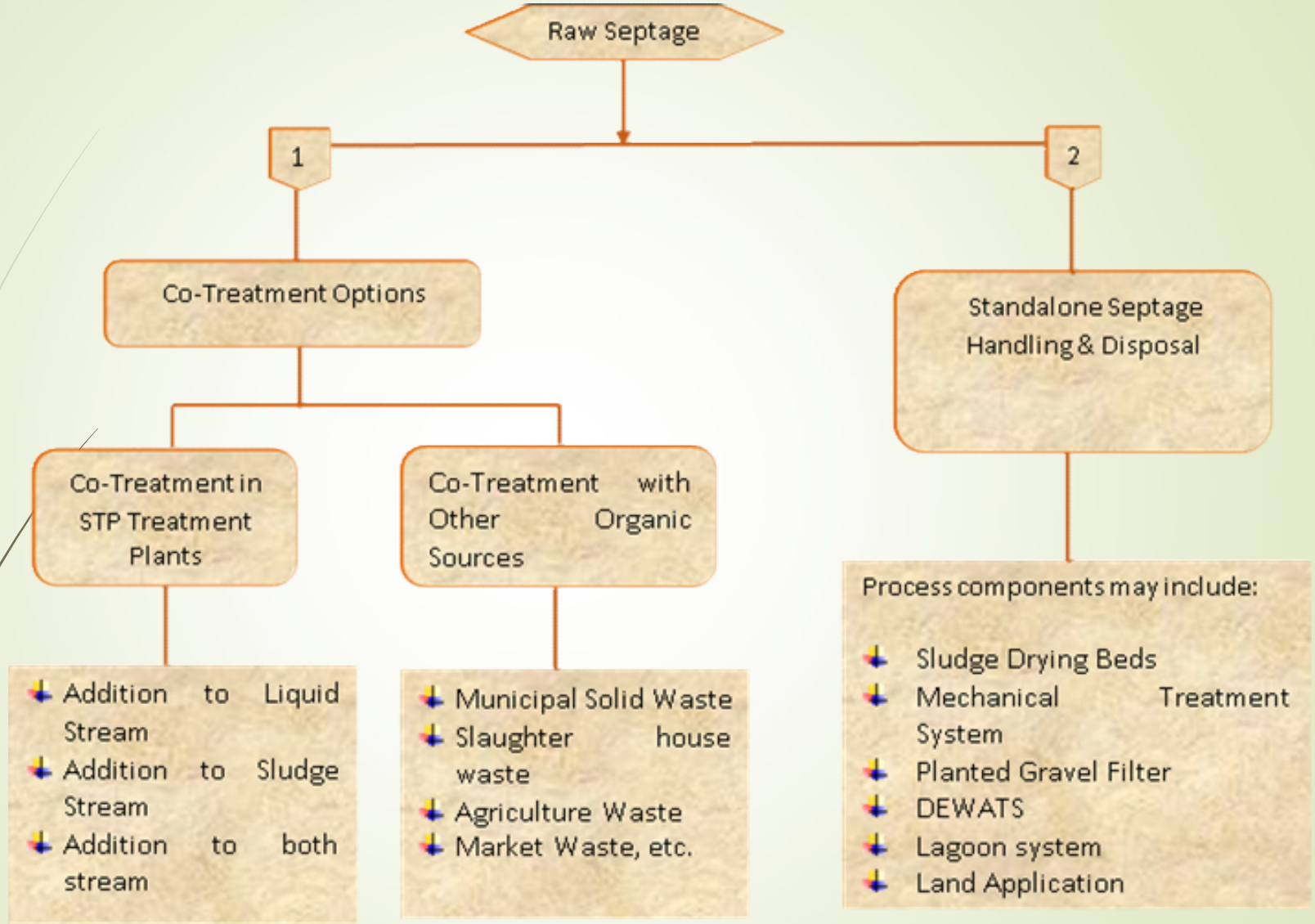
Outcome Comparative Chart contd…

Parameter	Units	Range	TT/IWMI	NUSP	NIUA	Philipines	CBCL, Canada	CPHEEO
TSS	mg/L	500-20083	33825	12862	NA	NA	15000	1059
BOD	mg/L	611-115001	16322	6480	21250	NA	6500	520
TSS (vol.or org.)	mg/L	3020-71925	16741	9027	29481	NA	9000	NA
N (Ammoniacal)	mg/L	78.4-800	224	97	NA	NA	NA	NA
KJN as N	mg/L	BDL(DL:0.5)-968	307	588	NA	23100	600	NA
MLVSS	mg/L	400-23097	10774	NA	NA	NA	NA	NA
Helminth eggs	Nos./L	2-45	12	NA	NA	NA	NA	NA



Standalone Treatment Options for Septage Handling & Disposal

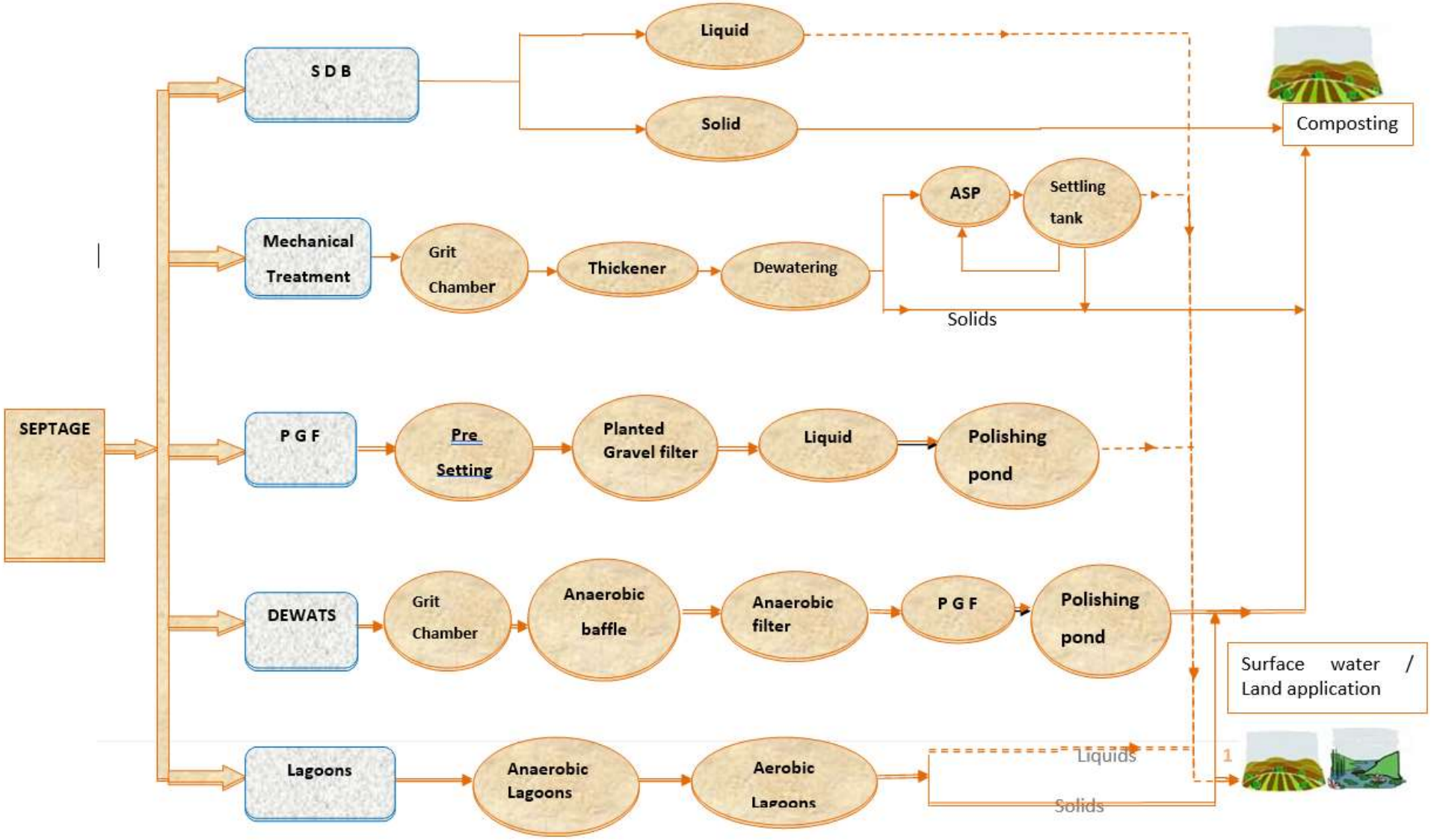
Approaches for Septage Handling & Disposal



Implications of Characteristics on Design of Treatment Facilities

- **Importance:** To suggest a sustainable treatment methodology
- Land Application – Coliforms, Helminth eggs have a higher potential risk; hence stabilizing or decreasing pathogenic content critical
- Anaerobic biodegradation rate and extent
- Organic content - feasible treatment options primarily for biological treatment approaches

Components of a Standalone Septage Treatment Options



Comparative Analysis of Septage treatment technologies

Technology	Land Area	Capital Cost excluding land cost	O & M	Labour Requirement	Labour Skill
Land Application	Very High	Low	Low	Nil	High skill in planning.
Planted Gravel Filter with Settling tank and Polishing Pond	Medium	Medium	Medium	Low	Semi-skilled
Lagoons (Anaerobic & Anaerobic)	Medium	Medium	Low	Low	Semi-skilled
Septage Sludge Drying Beds with anaerobic aerobic lagoon	High	Medium	Medium	Low	Semi skilled
DEWATS	Medium	High	Medium	Low	Semi-skilled
Mechanical Treatment	Very Low	High	High	Low	Highly Skilled

Technology Suitability Matrix

Technology	Volume of Septage		
	upto10,000Litre/day	10,000 - 50,000 Litre/day	> 50,000 Litre/day
Sludge Drying Beds with lagoons	*	✓	✓
Mechanical Treatment	*	*	✓
Planted Gravel Filter with poilishing pond	✓	✓	*
Lagoons	✓	✓	*
DEWATS	*	✓	✓
Land Application	✓	*	*

•- Viable; * Economically Non-viable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