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Sustainable Water Integrated Management

(SWIM) - Support Mechanism

SUB-REGIONAL WORKSHOP 9-12 July 2012 Israel

Wastewater Treatment Technology

What is the Best Available Technology for biological wastewater treatment in Rural Area?

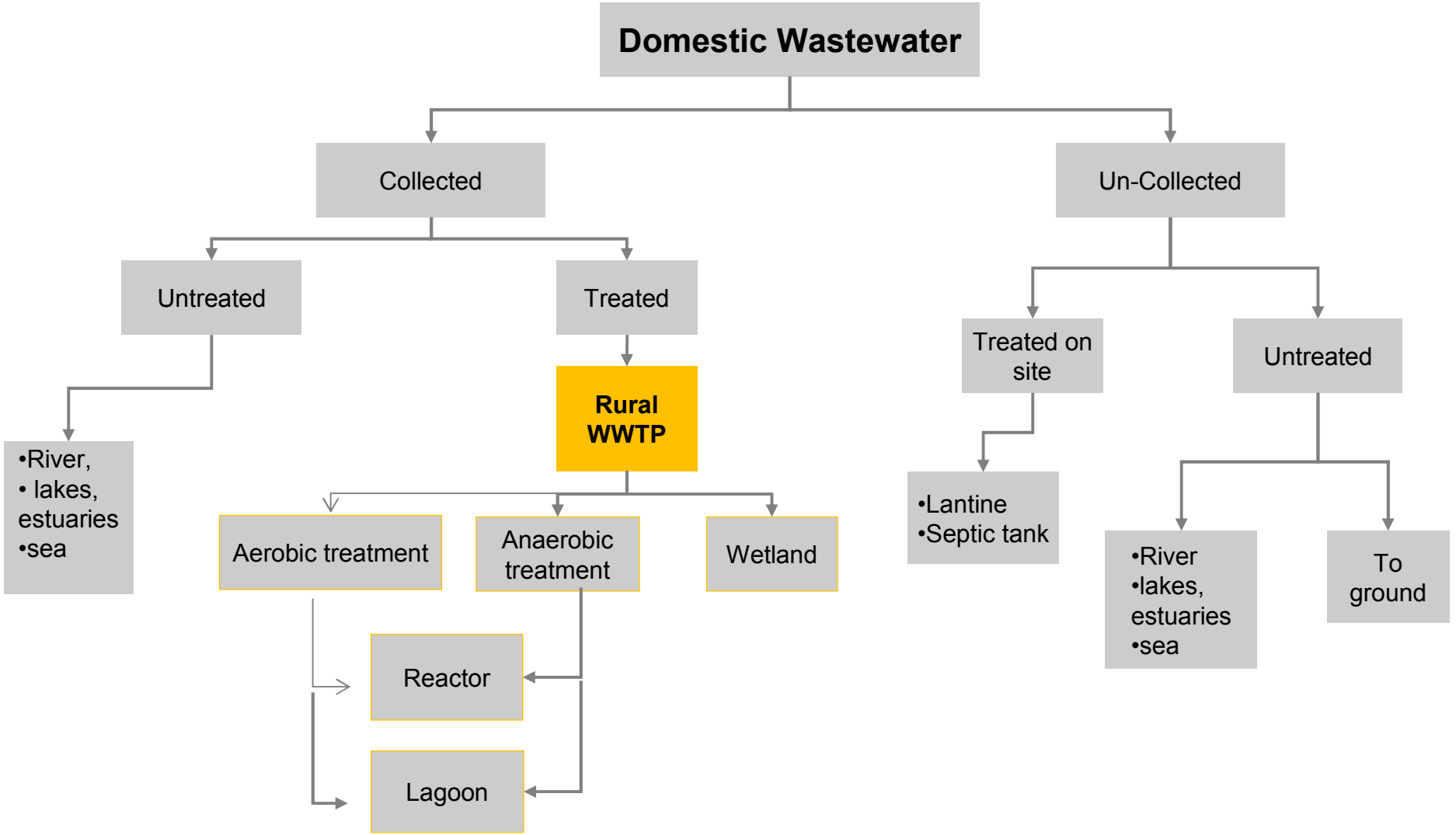
E.ling

July 2012

Agenda

- Overview of the Biological Wastewater Treatment Processes
- Review of new generation of Biological Treatment Technologies
- Consideration for choosing BAT for biological treatment technology in Rural WWTP's applications

Domestic Wastewater Path



Biological Treatment Types

- Aerobic Processes
- Anoxic Processes
- Anaerobic Processes
- Combined Aerobic-Anoxic-Anaerobic Processes

→ Reactor

- ✓Attached Growth
- ✓Suspended Growth
- ✓Combined Systems

- Pond Processes

→ Lagoon

- ✓Aerobic
- ✓Maturation
- ✓Facultative
- ✓Anaerobic

Reminder

- ✓ Overview of the Biological Wastewater Treatment Processes
- Review of new generation of Biological Treatment Technologies
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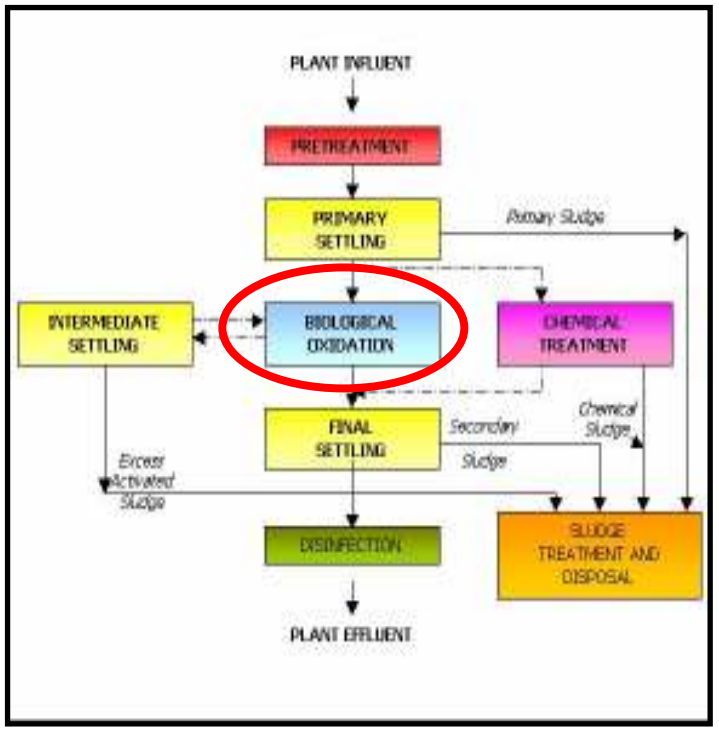
New Generation

New Generation- Integration of Technologies



- The biological treatment is the heart of the wastewater treatment plant.
- Defining a BAT for biological treatment will effect the entire plant's technology choices.
- *Question: What are the consequences of choosing one technology over another?*

Reminder

- ✓ Overview of the Biological Wastewater Treatment Processes
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The four Parameters to consider

Source Characters

Product Quality

Sustainably

Overall Cost

TABLE 3-16
Typical composition of untreated domestic wastewater

Contaminants	Unit	Concentration		
		Weak	Medium	Strong
Solids, total (TS)	mg/L	350	720	1200
Dissolved, total (TDS)	mg/L	250	500	850
Fixed	mg/L	145	300	525
Volatile	mg/L	105	200	325
Suspended solids (SS)	mg/L	100	220	350
Fixed	mg/L	20	55	75
Volatile	mg/L	80	165	275
Settleable solids	mL/L	5	10	20
Biochemical oxygen demand, mg/L: 5-day, 20°C (BOD_5, 20°C)	mg/L	110	220	400
Total organic carbon (TOC)	mg/L	80	160	290
Chemical oxygen demand (COD)	mg/L	250	500	1000
Nitrogen (total as N)	mg/L	20	40	85
Organic	mg/L	8	15	35
Free ammonia	mg/L	12	25	50
Nitrites	mg/L	0	0	0
Nitrates	mg/L	0	0	0
Phosphorus (total as P)	mg/L	4	8	15
Organic	mg/L	1	3	5
Inorganic	mg/L	3	5	10
Chlorides[a]	mg/L	30	50	100
Sulfate[a]	mg/L	20	30	50
Alkalinity (as $CaCO_3$)	mg/L	50	100	200
Grease	mg/L	50	100	150
Total coliform[b]	no/100 mL	10^6–10^7	10^7–10^8	10^8–10^9
Volatile organic compounds (VOCs)	μg/L	<100	100–400	>400

[a] Values should be increased by amount present in domestic water supply.

[b] See Table 3-18 for typical values for other microorganisms.

Note: 1.8(°C) + 32 = °F.

Product Quality

- The product (effluent) quality depends on the target of the usage

- Different countries have different standards…

- There are exceptions rural WWTP's, which gets temporary or permanent discounts in the emission criteria

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Sustainability of the technology



Foot -Print

low



High

Energy Consumption Efficiency



Operation & Maintenance

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Overall Costs

Treatment Process	Achievable Effluent Quality (mg/L)		Construction Costs of Treatment Processes by Design Flow (GPD) [b]				
	TN	P [a]	4K GPD	10K GPD	25K GPD	50K GPD	100K GPD
Construction Costs							
1. MLE Process	10	2	$261,000	$311,000	$422,000	$601,000	$874,000
2. Four-Stage	6	2	$336,000	$368,000	$475,000	$666,000	$968,000
3. Three-Stage	6	2	$291,000	$333,000	$441,000	$627,000	$913,000
4. SBR	8	2	$336,000	$381,000	$482,000	$697,000	$966,000
5. Intermittent Cycle	8	2	$229,000	$374,000	$584,000	$861,000	$1,026,000
6. MLE + Deep Bed Filtration	6	1	$308,000	$368,000	$486,000	$664,000	$958,000
7. Submerged Biofilters	12	2	$247,000	$296,000	$450,000	$847,000	(c)
8. RBCs	12	2	$263,000	$342,000	$527,000	$868,000	$1,092,000
O&M Costs ($/year)							
1. MLE Process	10	2	$30,400	$35,500	$49,400	$66,600	$100,100
2. Four-Stage	6	2	$52,500	$57,600	$73,800	$95,900	$132,300
3. Three-Stage	6	2	$35,900	$41,900	$56,400	$76,200	$115,900
4. SBR	8	2	$28,000	$34,100	$49,100	$67,600	$100,000
5. Intermittent Cycle	8	2	$28000	$34100	$49100	$67600	$100,000
6. MLE + Deep Bed Filtration	6	1	$36,900	$42,700	$58,100	$75,900	$111,400
7. Submerged Biofilters	12	2	$19,500	$24,400	$41,100	$60,400	(c)
8. RBCs	12	2	$22,000	$26,500	$39,200	$52,100	$78,000

Source: Foess et al. (1998)

The four Parameters to consider

Source Characters

Product Quality

Sustainably

Overall Cost

Looking Forward

As time goes by, the technologies get more intensive & compact, the demands from the "microbial workers" gets higher,
as well as regulatory demands.

We should expect that the requirements for using BAT will follow a similar path and therefore be prepared to properly asses our needs when choosing the right one.