

Sludge treatment by earthworm-enhanced reed beds towards smart-cities



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Sludge treatment reed bed (STRB) is a natural Green Infrastructure (GI) to dewater sewage sludge. Integration of IGs in urban planning for sludge dewatering and reuse is recommended for future smart cities in terms of resource recovery. The application of STRB in Mediterranean region is the study topic.

Objectives

Assessment of earthworm assisted STRB in Mediterranean region and temperate climate

Pilot study in Beirolas WWTP, Lisbon



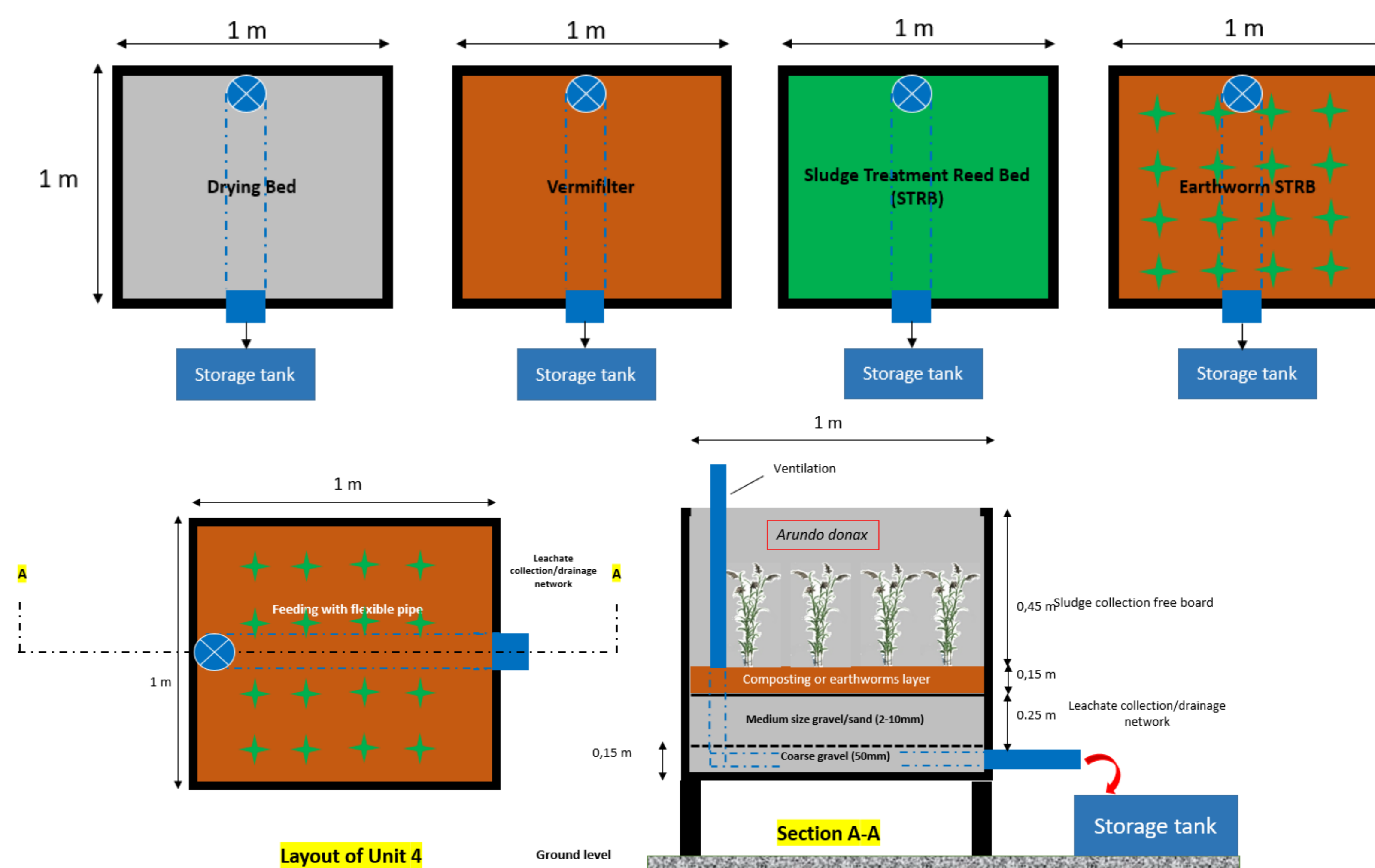
Arundo donax
(5 tufts/m²)



Earthworm
(250 bodies of *Eisenia fetida*)



Natural cobbles



*Four units are duplicated with four identical units; therefore, eight units in total are being assessed.

Operation and raw sludge quality

Mode of feeding: every 15 days

Duration of resting: 15 days

Feeding date	Raw sludge characteristics					
	pH	EC (ms/cm)	Temperature	TS (g/L)	VS (g/L)	SLR (kg.DS/m ² .year)
Friday, May 13, 2022	6.92±1.7	1.92±0.0	25.7±0.5	19.69±0.1	15.32±0.1	17
Friday, May 27, 2022	5.72±0.1	1.92±0.1	26.6±1.9	25.91±0.0	20.88±0.1	22
Tuesday, June 7, 2022	5.39±0.1	1.74±0.0	26.1±0.1	26.27±2.4	20.98±2.4	22
Wednesday, June 22, 2022	5.37±0.1	1.94±0.0	23.8±0.1	36.37±0.2	29.90±0.3	31
Monday, July 4, 2022	5.42±0.0	1.77±0.0	25.4±0.1	31.15±0.6	25.56±0.5	26

Initial results

Date of sampling	Accumulated sludge dryness and organic matter content after 48 hours of feeding															
	Dry Solid content (DS, %)								Volatile Solid content (VS, %)							
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
Monday, May 16, 2022	39	61	32	79	47	90	56	90	81	81	81	81	81	58	82	82
Monday, May 30, 2022	56	34	42	26	36	43	56	19	81	81	81	81	81	58	82	82
Friday, June 24, 2022	9	16	11	22	11	18	10	16	81	83	79	75	83	82	79	81
Wednesday, July 6, 2022	29	17	19	19	21	15	28	31	80	81	82	81	78	80	80	72

Date of sampling	Accumulated sludge dryness and organic matter content after 15 days of feeding															
	Dry Solid content (DS, %)								Volatile Solid content (VS, %)							
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
Friday, May 27, 2022	94	93	94	93	95	95	93	95	80	67	78	74	80	66	81	69
Tuesday, June 21, 2022	87	88	88	89	88	91	90	90	77	76	78	79	77	77	74	79
Monday, July 4, 2022	86	91	89	90	86	91	89	91	78	77	79	75	78	78	81	74

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