ANNEXURE

Annexure 1

Estimation of OFMSW and bio-flocculated sludge from SST generation rate in India, based on population size is shown below:

Estimation of OFMSW	Estimation of bio-flocculated sludge from SST (post-UASB)
Population: 1lakh	Population: 1lakh
MSW generation rate 0.119 kg/capita/day (MSW Annual Report, CPCB 2020- 2021)	140lpcd sewage generation rate
Approximate 12000kg/d MSW generation for 1 lakh population	Approcimate14MLD sewage generate from 1 lakh population
50% of MSW is collected and treated, approximately 6000 kg/d	1 MLD sewage treated with UASB, generate 12.5kg/d bio-flocculated sludge from SST
Considering 42-51% of collected MSW is organic waste treated with composting, vermicomposting, anaerobic digestion etc.	40-50% of bio-flocculated sludge is used for recirculation in STP.
The presence of organic waste is 3000kg/d from which considering 20% of organic waste is available for anaerobic digestion	Available bio-flocculated sludge from SST is 7.5kg/d/MLD
Available **OFMSW** is approximately **600kg/d per 1 lakh population**.	Available **bio-flocculated sludge** from SST (post-UASB) is approximately **104 kg/d per 1lakh population.**

Annexure 2

R, MAE, MAPE, MSE value for Output **%VS$_{removal}$** at different training algorithms for different numbers of hidden neurons with the feedforward neural network using the fitting application

Hidden Layer Neuron	LM				BR				SCG			
	MSE	MAE	MAPE	R	MSE	MAE	MAPE	R	MSE	MAE	MAPE	R
2	10.996	2.036	0.028	0.802	5.569	1.279	0.018	0.904	7.95	1.633	0.023	0.861
3	7.102	1.496	0.020	0.878	5.288	1.276	0.018	0.908	13.92	2.217	0.031	0.752
4	4.318	1.150	0.016	0.927	3.977	1.116	0.015	0.931	9.60	1.873	0.026	0.830
5	5.421	1.404	0.019	0.907	3.967	1.120	0.016	0.931	10.47	1.897	0.026	0.814
6	3.204	1.022	0.014	0.944	2.336	0.860	0.012	0.959	7.99	1.714	0.024	0.861
7	2.481	0.822	0.011	0.956	2.340	0.877	0.012	0.959	6.39	1.490	0.020	0.890
8	3.436	1.010	0.014	0.941	1.755	0.758	0.010	0.968	6.91	1.478	0.021	0.881
9	3.124	0.968	0.013	0.946	1.793	0.745	0.010	0.968	5.66	1.404	0.019	0.905
10	2.122	0.809	0.011	0.964	1.694	0.762	0.011	0.969	7.08	1.522	0.021	0.878
11	1.604	0.688	0.010	0.971	1.168	0.635	0.009	0.978	5.08	1.323	0.018	0.914
12	2.242	0.758	0.010	0.961	1.363	0.640	0.009	0.975	4.15	1.160	0.016	0.929
13	3.262	0.926	0.013	0.948	1.261	0.591	0.008	0.977	8.75	1.736	0.024	0.847
14	3.004	0.822	0.012	0.950	1.432	0.575	0.008	0.975	5.48	1.324	0.018	0.913
15	2.119	0.857	0.012	0.963	1.261	0.604	0.008	0.977	3.74	1.091	0.015	0.936
16	4.580	1.215	0.017	0.924	1.960	0.663	0.009	0.966	4.88	1.266	0.018	0.918
17	3.378	1.071	0.015	0.943	**0.697**	**0.419**	**0.006**	**0.986**	**3.84**	**1.107**	**0.015**	**0.936**
18	**1.947**	**0.747**	**0.010**	**0.968**	0.747	0.441	0.006	0.985	4.19	1.145	0.016	0.930
19	3.494	1.118	0.015	0.946	1.188	0.522	0.007	0.979	5.15	1.330	0.018	0.912
20	2.892	0.883	0.012	0.951	1.522	0.461	0.006	0.974	3.60	1.126	0.015	0.941

Annexure 3

R, MAE, MAPE, MSE value for Output **Methane yield(L/kgVS$_{removed}$)** at different training algorithms for different numbers of hidden neurons with the feed-forward neural network using the fitting application

Hidden Layer Neuron	LM				BR				SCG			
	MSE	MAE	MAPE	R	MSE	MAE	MAPE	R	MSE	MAE	MAPE	R
2	568.188	13.009	2.531	0.725	1027.096	15.261	2.248	0.384	1152.265	15.249	2.325	0.235
3	677.767	13.320	2.077	0.701	635.070	13.149	2.503	0.691	1107.895	16.177	2.826	0.280
4	461.516	11.303	1.710	0.784	448.313	10.900	1.326	0.792	1041.816	17.325	3.444	0.376
5	395.380	9.839	1.246	0.819	390.506	9.902	1.216	0.821	1029.209	14.404	2.215	0.376
6	429.094	9.946	1.167	0.802	350.341	9.155	1.172	0.841	773.812	13.806	2.375	0.612
7	344.614	9.298	1.381	0.846	269.346	8.614	1.284	0.881	734.673	13.370	1.693	0.634
8	300.628	8.093	1.225	0.869	223.961	7.857	1.251	0.902	701.532	12.455	1.651	0.647
9	294.632	9.680	1.636	0.871	194.512	7.221	1.197	0.916	616.299	13.102	2.387	0.715
10	**244.484**	**8.371**	**1.390**	**0.894**	198.977	6.715	1.271	0.915	582.927	12.867	2.133	0.718
11	373.662	7.562	1.241	0.838	126.602	5.299	1.013	0.946	722.063	12.990	1.987	0.632
12	330.975	7.890	1.164	0.851	63.896	3.866	0.664	0.973	687.430	13.547	1.714	0.660
13	363.801	8.498	0.969	0.837	101.487	4.651	0.658	0.957	905.477	13.650	1.938	0.500
14	256.022	6.244	0.790	0.887	152.058	4.740	0.522	0.936	620.549	12.364	2.377	0.699
15	300.583	8.759	1.439	0.870	140.407	4.493	0.582	0.941	529.669	11.976	1.779	0.748
16	391.676	9.634	1.389	0.827	99.133	4.418	0.675	0.958	699.647	12.877	2.063	0.645
17	327.440	10.125	1.897	0.854	77.599	3.524	0.486	0.968	**492.484**	**10.913**	**1.466**	**0.777**
18	348.508	8.101	1.460	0.862	74.568	3.432	0.535	0.969	530.072	10.345	1.315	0.757
19	389.716	8.749	1.196	0.841	**71.638**	**3.602**	**0.540**	**0.970**	664.208	12.493	1.848	0.672
20	290.542	8.918	1.737	0.871	76.677	2.966	0.392	0.968	526.769	11.534	1.782	0.750

Annexure 4

FFBP-NN for **%VS$_{removal}$** and Methane yield (L/kg VS$_{removed}$) using BR training algorithms at tan-sigmoid transfer function
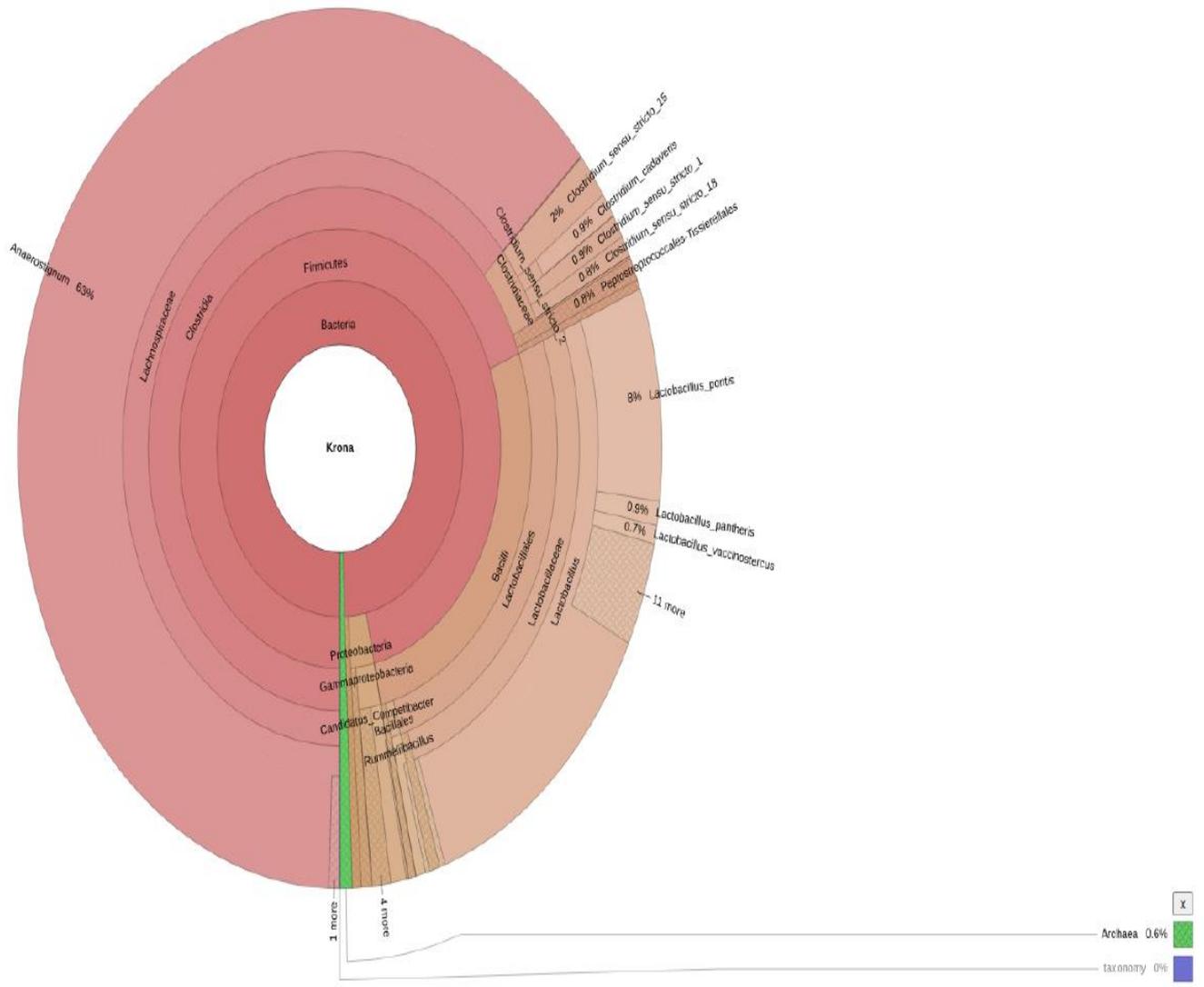
Hidden Neuron	%VS$_{removal}$				Methane yield (L/kg VS$_{removed}$)			
	MSE	MAE	MAPE	R	MSE	MAE	MAPE	R
2	17.737	3.463	0.048	0.827	1980.122	28.238	4.825	0.296
3	3.795	1.309	0.018	0.962	271.679	9.164	1.077	0.936
4	8.736	2.358	0.033	0.917	790.345	18.321	2.726	0.799
5	5.300	1.765	0.024	0.949	610.242	14.864	1.673	0.851
6	5.555	1.701	0.024	0.948	324.946	11.075	1.086	0.923
7	2.161	1.168	0.016	0.977	251.745	10.005	1.052	0.944
8	3.795	1.309	0.018	0.963	271.679	9.164	1.077	0.936
9	2.770	1.369	0.019	0.972	162.019	7.419	0.916	0.962
10	2.066	1.088	0.015	0.978	82.598	5.362	0.706	0.981
11	2.370	1.004	0.014	0.976	314.429	7.263	0.934	0.931
12	3.131	1.024	0.014	0.969	537.344	9.138	1.319	0.878
13	4.297	0.919	0.012	0.960	209.528	5.206	0.565	0.952
14	1.317	0.641	0.009	**0.985**	81.605	4.135	0.573	**0.982**
15	1.452	0.646	0.009	0.985	210.522	5.365	0.576	0.952
16	5.758	0.863	0.012	0.949	237.783	5.136	0.878	0.947
17	4.575	0.792	0.011	0.959	504.407	5.702	0.729	0.891
18	6.132	0.770	0.011	0.946	444.022	4.133	0.717	0.910
19	1.519	0.508	0.007	0.985	115.227	3.288	0.868	0.974
20	4.541	0.658	0.010	0.957	214.961	4.525	0.737	0.950

Annexure 5

FFBP-NN for **%VS$_{removal}$** and Methane yield (L/kg VS$_{removed}$) using LM training algorithms at the tan-sigmoid transfer function

Hidden Neuron	%VS$_{removal}$				Methane yield (L/kg VS$_{removed}$)			
	MSE	MAE	MAPE	R	MSE	MAE	MAPE	R
2	22.501	3.954	0.054	0.775	2152.704	32.708	5.843	0.185
3	16.865	3.200	0.044	0.835	2178.776	32.258	5.838	0.132
4	11.816	2.493	0.035	0.890	2427.739	24.834	4.087	0.204
5	9.094	2.346	0.032	0.913	1677.438	26.291	5.042	0.587
6	10.250	2.416	0.034	0.906	854.692	19.117	3.155	0.779
7	9.934	2.302	0.033	0.905	1532.185	27.260	4.738	0.552
8	7.501	2.084	0.029	0.930	1193.145	22.615	3.256	0.671
9	5.634	1.325	0.019	0.947	918.937	10.343	0.836	0.773
10	8.375	2.205	0.031	0.922	838.794	17.756	1.832	0.786
11	4.839	1.649	0.022	0.955	1088.031	16.987	1.479	0.731
12	14.067	2.547	0.037	0.875	1379.427	23.041	2.698	0.628
13	6.153	1.988	0.028	0.942	930.742	18.317	2.181	0.757
14	14.253	2.967	0.040	0.883	1650.958	23.472	3.315	0.500
15	4.229	1.454	0.020	0.960	1023.750	15.710	1.713	0.733
16	12.071	2.732	0.038	0.897	1433.473	24.809	4.213	0.585
17	25.363	4.013	0.054	0.838	2360.003	22.791	1.344	0.241
18	2.852	1.192	0.016	**0.973**	2474.188	26.298	2.871	0.311
19	6.901	1.970	0.027	0.937	423.777	13.225	1.582	**0.900**
20	9.729	2.469	0.034	0.910	1320.165	22.876	2.898	0.628

Annexure 6

Krona Plot