Supporting information

Table S1 Qualities of the overlying seawater# samples

Site	Depth* (m)	Temp* (℃)	Salinity* (ppt)	w.pH*	w.DO (mg/L)	w.COD* (mg/L)	w.NH_3-N* (mg/L)	w.NO_2^--N* (mg/L)	w.NO_3^--N (mg/L)	w.PO_4^{3-}* (mg/L)
JX1	15.8	17.8	1.34	7.76	6.71	1.42	0.0063	0.0078	4.74	0.051
JX2	17.5	17.7	1.30	7.80	9.12	1.664	0.0654	0.0057	4.40	0.08
JX3	17.8	17.5	1.35	7.74	8.31	1.412	0.0070	0.0061	4.57	0.05
JX4	15.8	18	1.22	7.94	9.44	1.516	0.0050	0.0069	4.43	0.194
JX5	13.5	18.6	1.37	7.91	9.81	1.068	0.0067	0.0075	4.38	0.085
JX6	13.5	17.7	1.36	7.95	8.88	1.348	0.0098	0.0073	4.27	0.072
JX7	16.8	18	1.33	7.95	11.96	1.308	0.0304	0.0074	4.76	0.073
JX8	14.2	17.9	1.31	7.93	10.45	1.344	0.0200	0.0040	4.50	0.06
JX9	13.4	17.8	1.30	7.88	10.86	1.572	0.0015	0.0071	4.83	0.064
SY1	4	20.7	3.16	6.49	8.92	3.616	0.398	0.079	4.89	0.100
SY2	2.5	20.4	3.16	6.50	8.85	3.916	0.418	0.102	4.22	0.105
SY3	2	20.3	3.16	6.50	8.86	**4.016**	0.375	0.103	4.30	0.082
SY4	4	20.7	3.16	6.53	8.92	3.456	0.638	0.083	4.75	**0.1271**
SY5	5	20.8	3.16	6.50	9.00	3.056	0.064	0.061	5.20	0.085
SY6	5	20.2	3.16	6.93	9.16	2.256	0.157	0.076	4.58	0.116

Notes: #, "w." is added before a water quality item to tell apart from a sediment quality item. *, means significantly deviates ($p < 0.01$) according to Wilcoxon rank-sum test

Table S2 Qualities of the surface sediment[#] samples

Site	s.pH	s.Moisture content (%)	s.NH_3-N (mg/kg)	s.NO_2^--N* (mg/kg)	s.NO_3^--N (mg/kg)	s.AP (mg/kg)
JX1	7.74	21.94	5.94	0.033	0.47	12.3
JX2	7.68	35.16	9.34	0.104	2.8	12.8
JX3	8.2	35.11	4.65	0	1.5	8.1
JX4	8.37	39.12	7.93	0	2.7	14.7
JX5	8.71	23.13	1.93	0	4.7	5.8
JX6	8.54	19.6	0.4	0	12.5	4.2
JX7	7.7	32.32	**10.69**	0.033	1.07	13.4
JX8	8.08	27.14	5.91	0.033	0.87	9.6
JX9	8.43	19.9	1.4	0	4.5	4.6
SY1	8.62	25.58	3.32	0.174	2.93	3.6
SY2	8.44	31.43	6.03	0.421	6.28	8.8
SY3	8.12	25.07	3.04	0.068	1.43	9.2
SY4	7.95	32.72	2.93	0	3.3	10.1
SY5	8.07	31.75	4.99	0.104	4	5.9
SY6	7.95	25.5	1.07	0.068	**13.63**	4

Notes: #, "s." is added before a sediment quality item to tell apart from a water quality item. *, means significantly deviates ($p < 0.01$) according to Wilcoxon rank-sum test

Table S3 The alpha-diversity indexes of the microbial communities

Sample ID	Triplicate sample	Diversity index					
		PD whole tree	Chao1	Dominance	Observed species	Shannon	Simpson
JX1	JX1a	421	8189.163	0.010685	5236	9.385214	0.989315
	JX1b	360	7090.246	0.015655	4498	8.775145	0.984345
	JX1c	375	7243.834	0.016267	4664	8.917463	0.983733
JX2	JX2a	457	8245.258	0.008454	5577	9.727348	0.991546
	JX2b	423	8062.908	0.008925	5382	9.669223	0.991075
	JX2c	403	7624.826	0.013283	5022	9.291591	0.986717
JX3	JX3a	584	12289.44	0.007578	7581	10.47494	0.992422
	JX3b	549	11546.47	0.008172	7228	10.20566	0.991828
	JX3c	535	10769.05	0.011451	6942	9.950004	0.988549
JX4	JX4a	516	10910.84	0.003193	6532	10.37189	0.996807
	JX4b	510	10284.88	0.003727	6420	10.30583	0.996273
	JX4c	501	9876.558	0.003753	6199	10.27597	0.996247
JX5	JX5a	280	4745.245	0.044089	3265	7.369827	0.955911
	JX5b	298	5144.684	0.037163	3592	7.725668	0.962837
	JX5c	321	5974.75	0.030297	3908	7.974608	0.969703

	JX6a	355	6315.101	0.04297	4320	7.789968	0.95703
JX6	JX6b	355	6207.286	0.04863	4318	7.700216	0.95137
	JX6c	420	7764.359	0.029278	5289	8.595847	0.970722
	JX7a	416	8140.508	0.012849	5230	9.326897	0.987151
JX7	JX7b	360	6328.342	0.01493	4357	8.945284	0.98507
	JX7c	371	7085.563	0.01657	4551	8.826687	0.98343
	JX8a	509	9580.242	0.005385	6443	10.29513	0.994615
JX8	JX8b	515	9599.287	0.003612	6432	10.4353	0.996388
	JX8c	516	9876.657	0.005802	6474	10.25052	0.994198
	JX9a	387	7208.65	0.037676	4843	8.121219	0.962324
JX9	JX9b	388	7269.401	0.036754	4893	8.201705	0.963246
	JX9c	333	6037.866	0.046838	4080	7.615689	0.953162
	SY1a	429	7715.317	0.016601	5317	9.077585	0.983399
SY1	SY1b	446	7910.838	0.020208	5579	9.129699	0.979792
	SY1c	418	7103.483	0.019904	5030	8.858185	0.980096
	SY2a	493	9930.853	0.015296	6131	9.377585	0.984704
SY2	SY2b	447	9183.397	0.041088	5271	8.171397	0.958912
	SY2c	496	8878.012	0.008929	6114	9.8255	0.991071
	SY3a	449	8840.643	0.031158	5350	8.423929	0.968842
SY3	SY3b	459	9041.765	0.028222	5536	8.611608	0.971778
	SY3c	429	8560.282	0.025614	5192	8.487383	0.974386
	SY4a	523	9853.086	0.008097	6539	9.950902	0.991903
SY4	SY4b	519	10340.79	0.007965	6620	9.937576	0.992035
	SY4c	514	10296.7	0.008155	6545	9.861191	0.991845
	SY5a	516	10732.04	0.011062	6647	9.691267	0.988938
SY5	SY5b	481	9189.717	0.013573	6089	9.514687	0.986427
	SY5c	502	10607.97	0.015344	6440	9.467362	0.984656
	SY6a	468	10389.49	0.021204	5921	8.867032	0.978796
SY6	SY6b	427	8487.196	0.026161	5439	8.693611	0.973839
	SY6c	504	10009.72	0.018111	6350	9.303449	0.981889

Table S4 Major pollutants discharged from the wastewater treatment plants

WWTP	Treatment object	Capacity (10^3 t/d)	COD flux (t/d)	NO_3^--N Flux (t/d)	PO_4^{3-} flux (t/d)
JX [a)]	Phase I	300	33.4	5.33	0.12
	Phase II	300			
SY [b)]	Domestic	66	65.4	3.42	0.36
	Industrial	154			

Notes: a) JX WWTP was built in two phases of construction progress, and both phases use similar process of A^2/O as the main technology.

b) SY WWTP receives domestic sewage and industrial wastewater separately, and treats them by A/O and A^2/O technology, respectively.

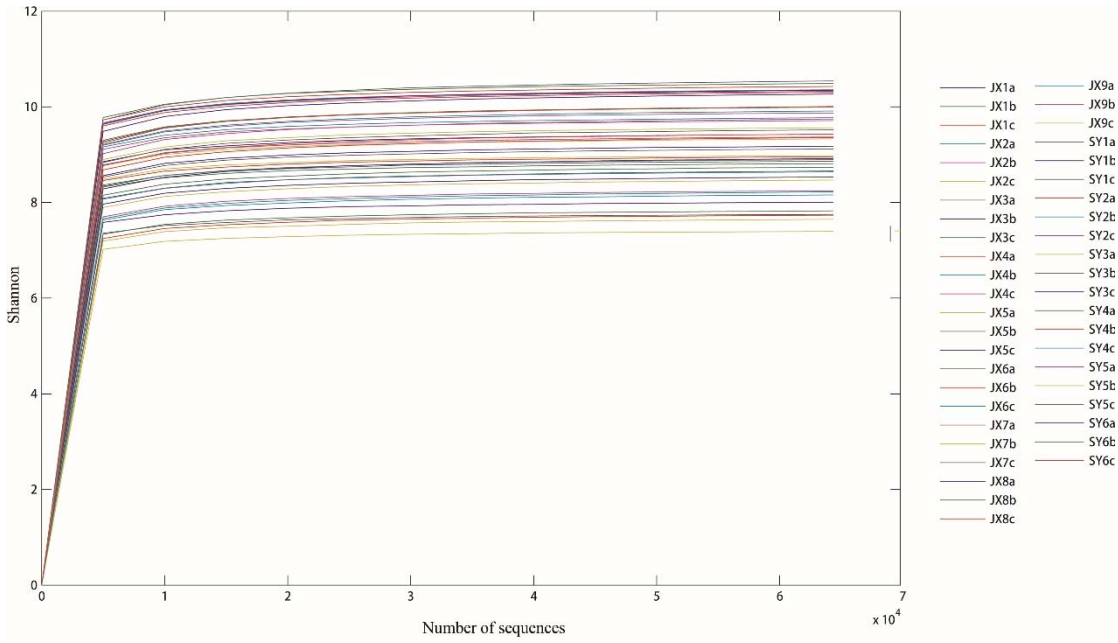

Fig. S1 The Shannon rarefaction curves of the microbial communities

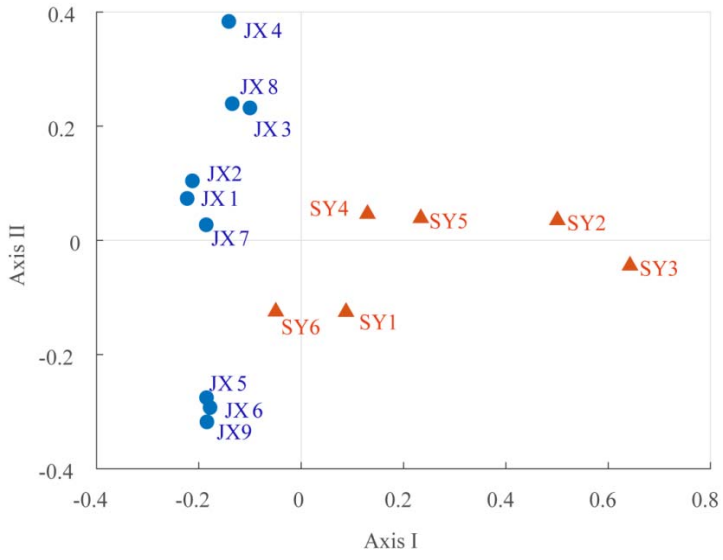

Fig. S2 DCA of the microbial community compositions

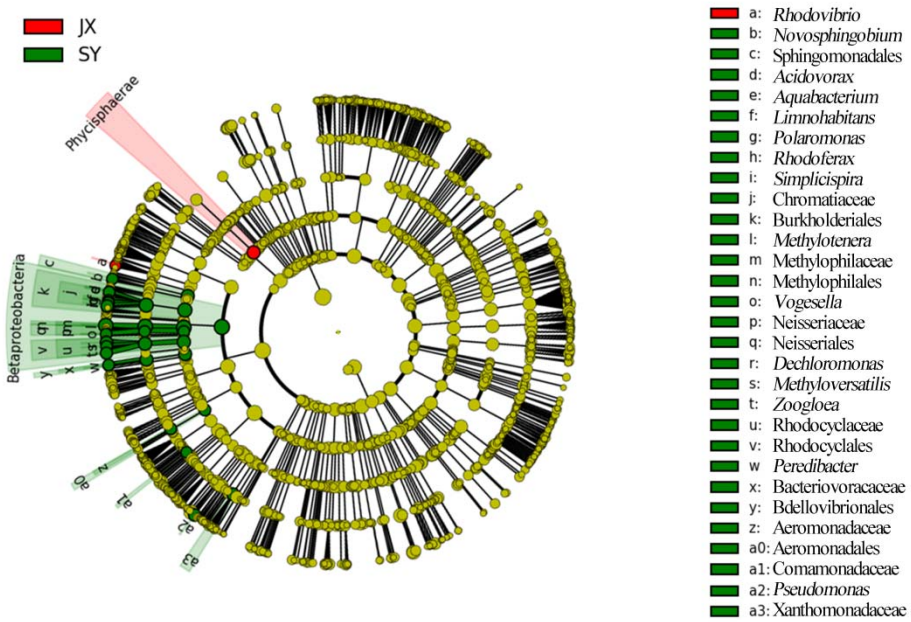

Fig. S3 Cladogram showed the phylogenetic distribution of the microbial communities associated with SY and JX with LDA values of 2.0 or higher as determined by LEfSe. Differences are highlighted by the color of the most abundant class. Red indicates JX and green indicates SY; yellow represents insignificant difference. The diameter of each circle is proportional to a taxon's abundance. Circles from inner region to outer region represent the phylogenetic levels from kingdom to genus