

Alkylphenols and Chlorophenols Remediation in Vertical Flow Constructed Wetlands: Removal Efficiency and Microbial Community Response

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Table S1. Concentration of ammonia (NH_4^+), nitrite (NO_2^-), nitrate (NO_3^-) and phosphate (PO_4^{3-}) ions in influent and effluent of CWs (mean and standard deviation, $n = 3$), irrigated along eight weeks with *Ribeira de Joane* water not doped (control) or doped with NP and OP.

NH_4^+ ($\mu\text{mol L}^{-1}$)			
Weeks	Influent	Effluent	
		Control	Doped
1	108 $\pm$ 14	3.9 $\pm$ 0.9	5 $\pm$ 3
2	90 $\pm$ 6	10 $\pm$ 1	9 $\pm$ 2
3	118 $\pm$ 9	7 $\pm$ 3	5.6 $\pm$ 0.9
4	95 $\pm$ 16	8 $\pm$ 2	6.3 $\pm$ 0.2
5	163 $\pm$ 23	8 $\pm$ 2	8 $\pm$ 1
6	34 $\pm$ 2	9 $\pm$ 1	8 $\pm$ 1
7	135 $\pm$ 2	12 $\pm$ 4	11 $\pm$ 2
8	63 $\pm$ 4	7.1 $\pm$ 0.5	9 $\pm$ 1

NO_2^- ($\mu\text{mol L}^{-1}$)			
Weeks	Influent	Effluent	
		Control	Doped
1	43 $\pm$ 6	1.6 $\pm$ 0.2	1.7 $\pm$ 0.1
2	29.0 $\pm$ 0.7	< 0.25*	< 0.25*
3	6.3 $\pm$ 0.2	< 0.25*	< 0.25*
4	23 $\pm$ 2	< 0.25*	< 0.25*
5	53 $\pm$ 4	0.3 $\pm$ 0.1	0.3 $\pm$ 0.1
6	45 $\pm$ 2	< 0.25*	< 0.25*
7	51 $\pm$ 3	0.3 $\pm$ 0.1	0.3 $\pm$ 0.1
8	20.9 $\pm$ 0.9	< 0.25*	0.3 $\pm$ 0.1

NO_3^- ($\mu\text{mol L}^{-1}$)			
Weeks	Influent	Effluent	
		Control	Doped
1	490 $\pm$ 113	20 $\pm$ 25	3.9 $\pm$ 0.7
2	655 $\pm$ 60	10 $\pm$ 5	24 $\pm$ 5
3	211 $\pm$ 39	3 $\pm$ 1	< 2.5*
4	634 $\pm$ 127	39 $\pm$ 51	4 $\pm$ 2
5	303 $\pm$ 163	4 $\pm$ 2	9 $\pm$ 6
6	213 $\pm$ 9	25 $\pm$ 34	9 $\pm$ 2
7	382 $\pm$ 21	5 $\pm$ 1	5 $\pm$ 4
8	253 $\pm$ 26	4 $\pm$ 2	6 $\pm$ 5

PO_4^{3-} ($\mu\text{mol L}^{-1}$)			
Weeks	Influent	Effluent	
		Control	Doped
1	20 $\pm$ 2	2.1 $\pm$ 1	< 1.0*
2	5.2 $\pm$ 0.4	1.5 $\pm$ 0.9	< 1.0*
3	4.0 $\pm$ 0.4	1.9 $\pm$ 0.9	< 1.0*
4	2.0 $\pm$ 0.1	3 $\pm$ 2	1.6 $\pm$ 0.7

5	14.0 ± 0.4	5 ± 2	1 ± 1
6	15.0 ± 0.7	4 ± 2	2.1 ± 0.3
7	8.7 ± 0.3	9 ± 4	6 ± 1
8	9.0 ± 0.4	6 ± 3	5 ± 1

Table S2. Concentration of ammonia (NH₄⁺), nitrite (NO₂⁻), nitrate (NO₃⁻) and phosphate (PO₄³⁻) ions in influent and effluent of CWs (mean and standard deviation, n = 3), irrigated along eight weeks with *Ribeira de Joane* water not doped (control) or doped with PCP.

NH ₄ ⁺ (μmol L ⁻¹)			
Weeks	Influent	Effluent	
		Control	Doped
1	18 ± 2	6 ± 7	2.3 ± 8
2	18 ± 2	2 ± 2	< 1.4*
3	52 ± 4	< 1.4*	< 1.4*
4	84 ± 2	< 1.4*	1.5 ± 0.2
5	48 ± 2	2.2 ± 0.9	< 1.4*
6	38 ± 2	2.1 ± 0.6	1.6 ± 0.3
7	22.6 ± 0.3	<1.4*	2.6 ± 0.6
8	21 ± 1	1.5 ± 0.1	3 ± 2

NO ₂ ⁻ (μmol L ⁻¹)			
Weeks	Influent	Effluent	
		Control	Doped
1	5.5 ± 0.1	< 0.26*	< 0.26*
2	8.7 ± 0.3	0.3 ± 0.1	< 0.26*
3	18.9 ± 0.4	< 0.26*	< 0.26*
4	18.6 ± 0.1	< 0.26*	< 0.26*
5	26.8 ± 0.4	< 0.26*	< 0.26*
6	2.3 ± 0.1	< 0.26*	< 0.26*
7	2.2 ± 0.2	< 0.26*	< 0.26*
8	4.2 ± 0.1	< 0.26*	< 0.26*

NH ₃ ⁻ (μmol L ⁻¹)			
Weeks	Influent	Effluent	
		Control	Doped
1	394 ± 3	239 ± 44	56 ± 34
2	938 ± 1	371 ± 98	76 ± 36
3	118 ± 4	187 ± 62	49 ± 44
4	92 ± 5	62 ± 27	30 ± 10
5	573 ± 35	189 ± 98	32 ± 22
6	78 ± 1	35 ± 45	26 ± 23
7	32 ± 3	12 ± 9	23 ± 18
8	119 ± 1	9 ± 3	15 ± 10

PO ₄ ³⁻ (μmol L ⁻¹)			
Weeks	Influent	Effluent	
		Control	Doped
1	2.8 ± 0.1	15 ± 2	12 ± 2
2	3.1 ± 0.1	26 ± 20	12 ± 3
3	5.6 ± 0.1	13.1 ± 0.7	10 ± 3
4	8.2 ± 0.4	12 ± 4	10 ± 3
5	8.4 ± 0.2	11 ± 3	9 ± 3
6	4.5 ± 0.1	14 ± 2	11 ± 3
7	2.7 ± 0.1	13 ± 4	12 ± 3
8	4.6 ± 0.2	11 ± 2	11 ± 2

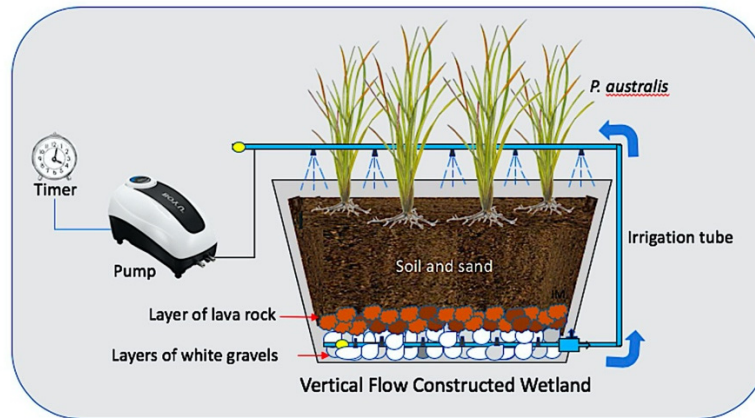


Figure S1. Schematic graphical assembly of a CW with a flow recirculation and a modified bed used in both experimental works.

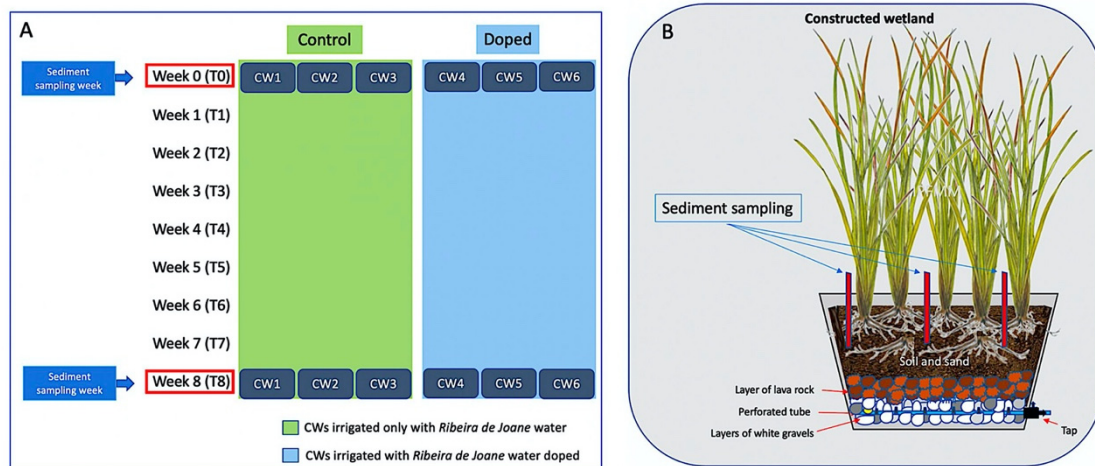


Figure S2. The experimental design (A) and sediment sampling in each CW (B).

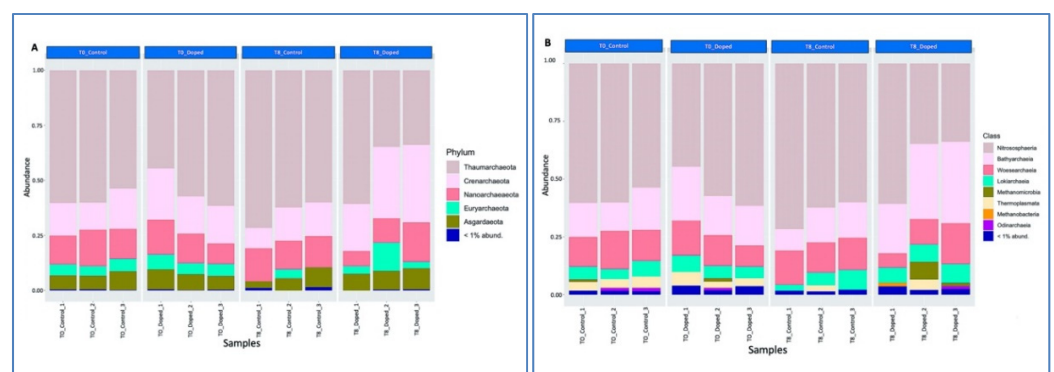


Figure S3. (A) Abundance of the major phyla and (B) classes with abundance > 1% of Archaea across the different CWs systems substrates, irrigated along eight weeks with *Ribeira de Joane* water not doped (control) or doped with NP and OP. Samples collected at the beginning (T0) and at the end of the experiment (T8) (n = 3).

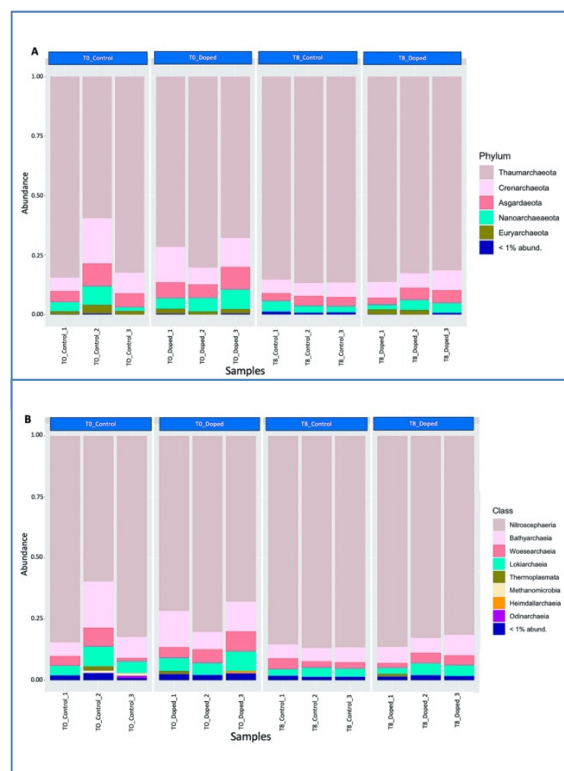


Figure S4. (A) Abundance of the major phyla and (B) classes with abundance > 1% of *Archaea* across the different CWs systems substrates, irrigated along eight weeks with *Ribeira de Joane* water not doped (control) or doped with PCP. Samples collected at the beginning (T0) and at the end of the experiment (T8) (n = 3).

Table S3. Summary statistics of 16S rRNA gene amplicon sequencing for experiment#1.

Sample ID	Number of sequences	OTUs ^a	Classified %	No Relative %	Rejected %
T0_C_1	59369	14182	74.41	2.18	23.41
T0_C_2	62416	14116	76.27	1.94	21.79
T0_C_3	66747	14931	77.68	1.87	20.45
T0_DP_1	92696	21254	74.83	2.10	23.06
T0_DP_2	69956	16244	78.28	2.00	19.72
T0_DP_3	80982	17006	75.26	2.10	22.64
T8_C_1	75430	15043	75.88	2.60	21.52
T8_C_2	28965	7400	77.97	2.79	19.23
T8_C_3	45287	11377	78.49	1.89	19.61
T8_DP_1	55609	13017	78.00	2.32	19.68
T8_DP_2	79581	15830	78.56	2.39	19.03
T8_DP_3	50432	12030	78.98	1.82	19.20
Total	767470	172430	-	-	-
Average ± stdev	63956 ± 17540	14369 ± 3380	-	-	-

Table S4. Summary statistics of 16S rRNA gene amplicon sequencing for experiment#2.

Sample ID	Number of sequences	OTUs ^a	Classified %	No Relative %	Rejected %
T0_C_1	95767	20710	91.92	3.75	4.32
T0_C_2	69693	16520	92.34	3.43	4.23
T0_C_3	56353	13527	92.59	3.58	3.83
T0_DP_1	88032	20212	94.85	2.31	2.84
T0_DP_2	69792	17386	91.05	4.43	4.52
T0_DP_3	68302	15787	92.02	3.49	4.49
T8_C_1	59040	13752	91.03	3.69	5.27
T8_C_2	52216	13789	91.42	3.74	4.84

T8_C_3	62916	15673	90.81	3.84	5.35
T8_DP_1	54021	13434	91.53	3.73	4.74
T8_DP_2	57251	11316	91.39	3.87	3.74
T8_DP_3	56339	13642	91.61	2.90	5.48
Total	789722	185748	-	-	-
Average ± stdev	65810 ± 13681	15479 ± 2847	-	-	-