Sewage treatment at 4 ^{o}C in anaerobic upflow reactors with and without a membrane – performance, function and microbial diversity

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Supplementary material

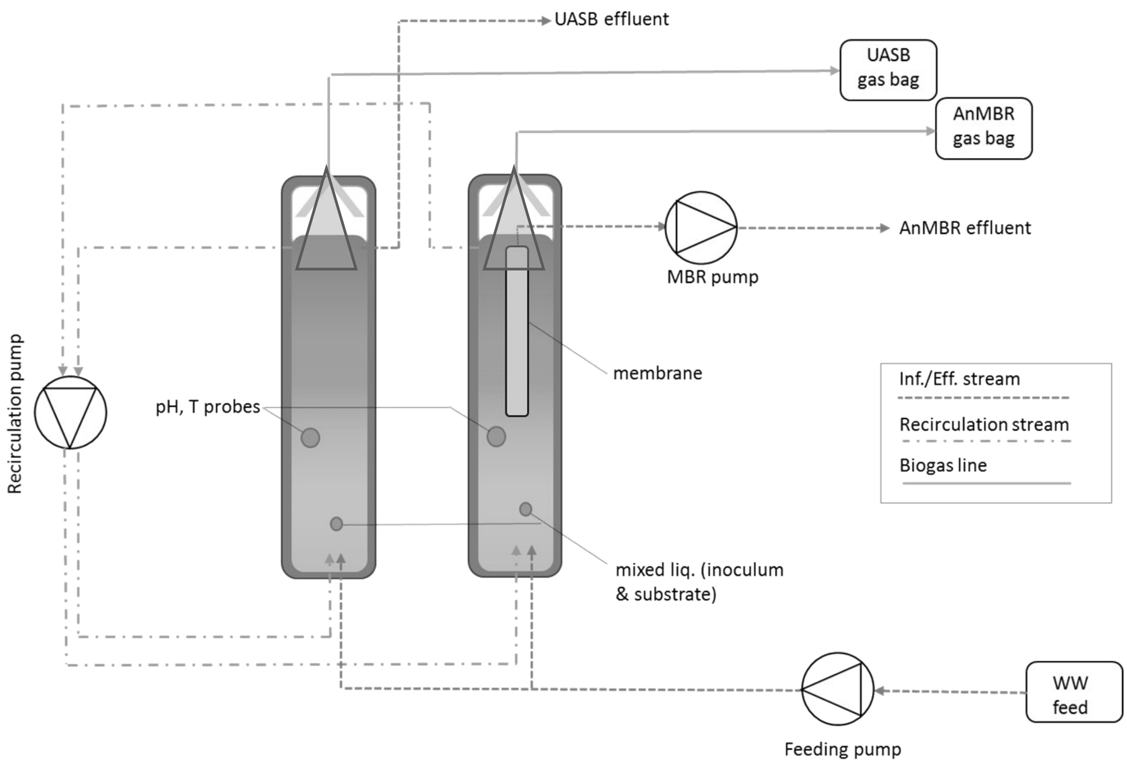

Figure S1 – Process scheme, as described by Petropoulos et al. (2019).

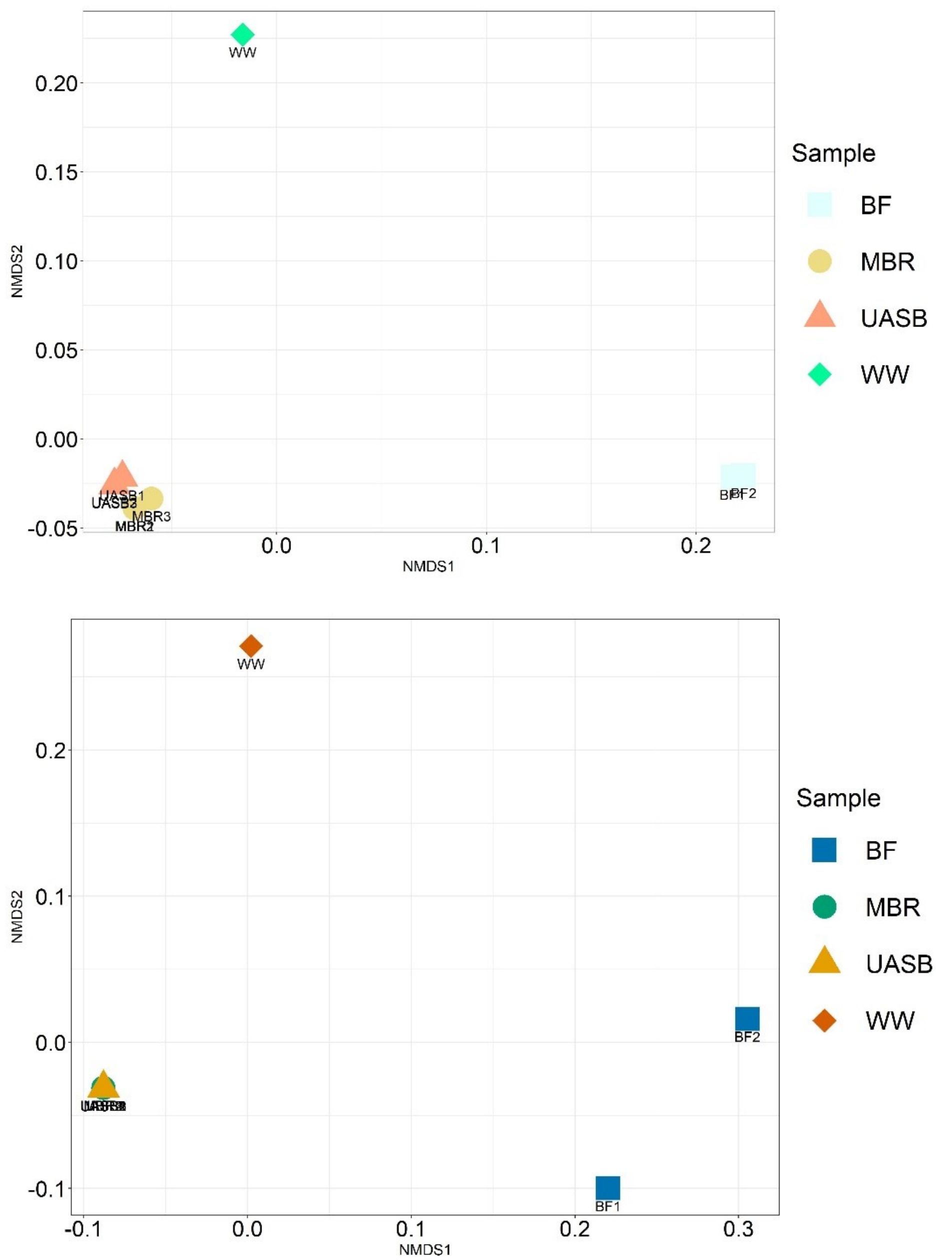

Figure S2 – NMDS plots for total bacteria (up) and archaea (bottom)

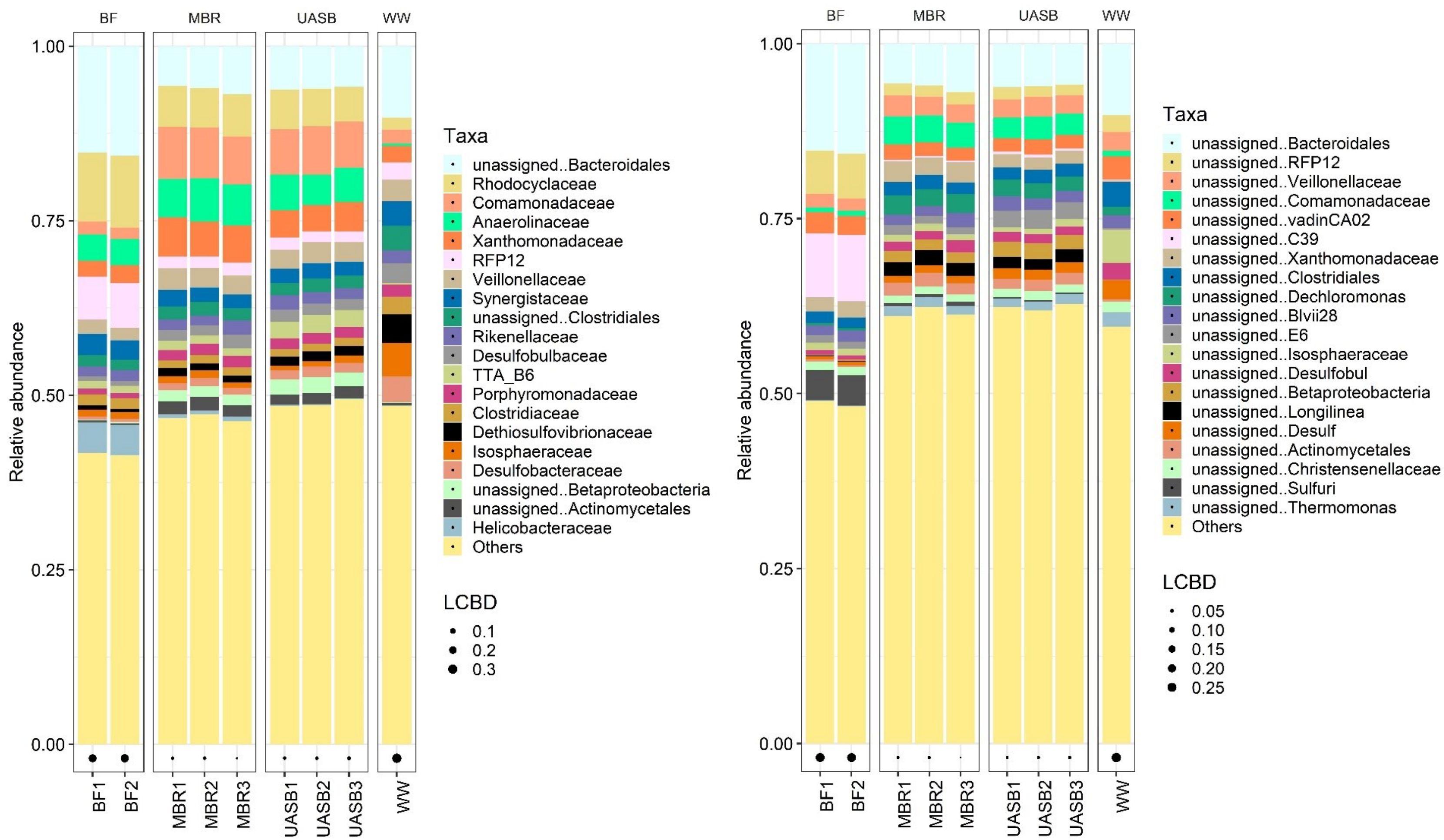

Figure S3 - Bar plot for total bacteria at a family (left) and species level (right); the plot shows the top 20 most abundant taxa whilst the rest are displayed as a group of ‘others’; dots stand for the LCBD rate of the community; (WW stands for wastewater; BF stands for biofilm; UASB stands for the Upflow Anaerobic Sludge Blanket reactor; MBR stands for the Anaerobic Membrane Bio-Reactor).

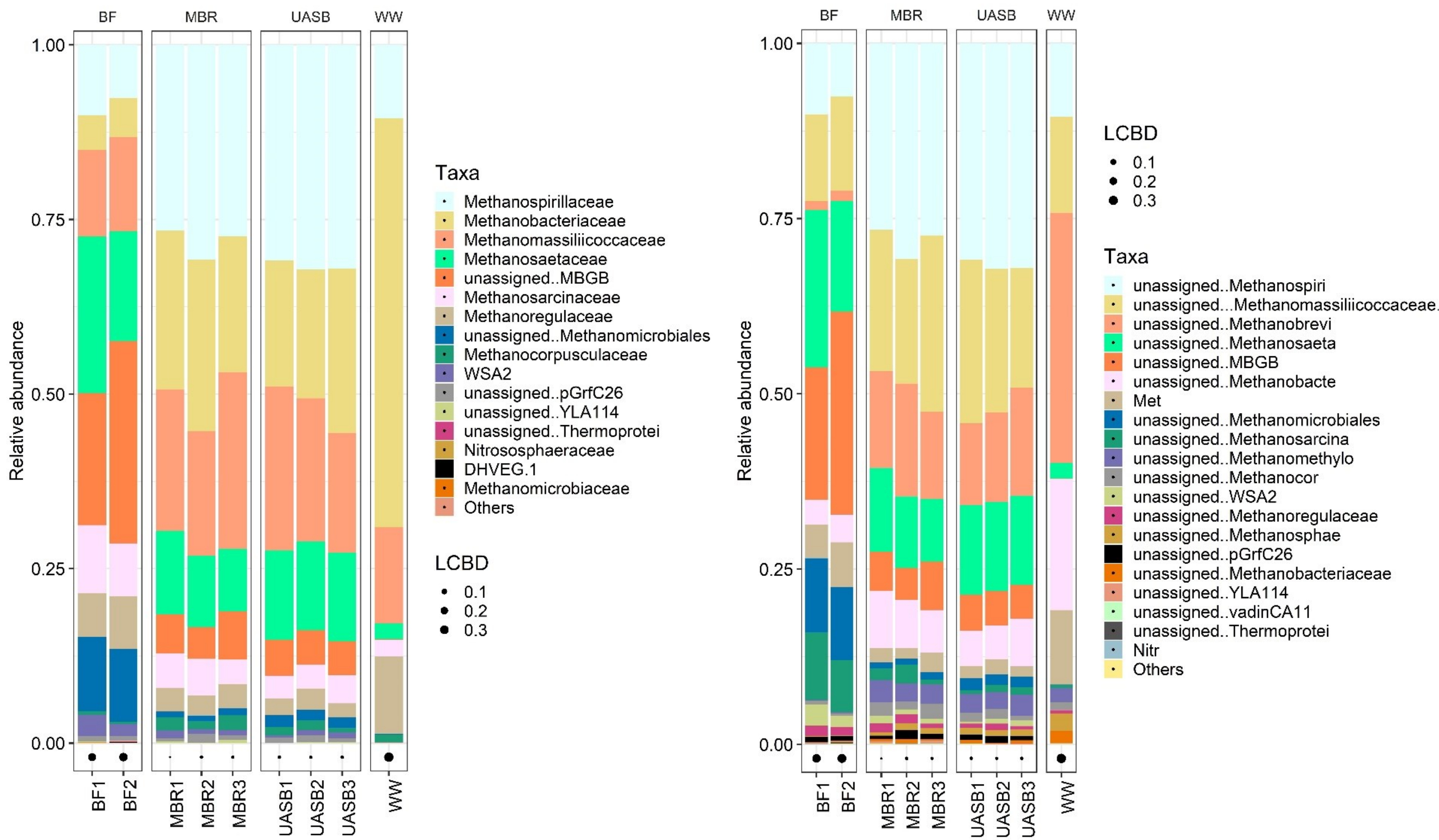

Figure S4 - Bar plot for total Archea at a family (left) and species (right) level; the plot shows the top 20 most abundant taxa whilst the rest are displayed as a group of ‘others’; dots stand for the LCBD rate of the community; (WW stands for wastewater; BF stands for biofilm; UASB stands for the Upflow Anaerobic Sludge Blanket reactor; MBR stands for the Anaerobic Membrane Bio-Reactor).

Table S1 - Net energy consumption and production from the methane produced at the AnMBR and the UASB during the steady methane peak periods (85-181)

General				
	Steady period (days):	85-181		
	Days:	85, 96, 130, 167, 181		
	Observations (n):	5		
Energy production				
	Reactor ID:	MBR	UASB	
	mmol $CH_4.HRT^{-1}$ (or mmol.$L_{wastewater}^{-1}$)	0.66	0.68	
	mmol $CH_4.m_{wastewater}^{-3}$	662.60	680.00	
	mol $CH_4.m_{wastewater}^{-3}$	0.66	0.68	
	$m^3CH_4.m^{-3}$ WW	0.02	0.02	at STP 25^oC
	$KWh.m^{-3}$	0.16	0.16	1.0 m^3 CH_4:10.0 kWh
	Actual $KW.m^{-3}$	0.099	0.101	61.8% CHP efficiency (*Li et al.,2011*)
Energy use				Reference
	Minimum membrane operation ($kWh.m^{-3}$)	0.30	0.00	*Judd, 2010*
	Pumping wastewater ($kWh.m^{-3}$)	0.02	0.02	*Bodik and Kubaska, 2013*
	Mixing via pumping ($kWh.m^{-3}$)	0.02	0.02	*Bodik and Kubaska, 2013*
	Fouling mitigation via effluent pumping ($kWh.m^{-3}$)	0.02	0.00	*Bodik and Kubaska, 2013*
	Dissolved CH_4 strip ($kWh.m^{-3}$)	0.05	0.05	*McCarty et al., 2011*
	Total energy demand ($kWh.m^{-3}$)	0.410	0.090	
Net energy				
	Energy net ($kWh.m^{-3}$)	-0.3113	0.0113	

* Standard error for the gas production at normal operation regime (SO_4 reduction in) of 0.04 and 0.08 mmol $CH_4.HRT^{-1}$ for AnMBR and UASB respectively

** In the absence of SO_4 the methane rate was 0.82±0.16 and 1.06±0.17 mmol $CH_4.HRT^{-1}$ corresponding to -0.288±0.024 and 0.0664±0.025 $kW.m^{-3}$ for the AnMBR and the UASB respectively

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