Supplementary Material

Long-Term Occurrence and Fate of Microplastics in WWTPs: A Case Study in Southwest Europe:

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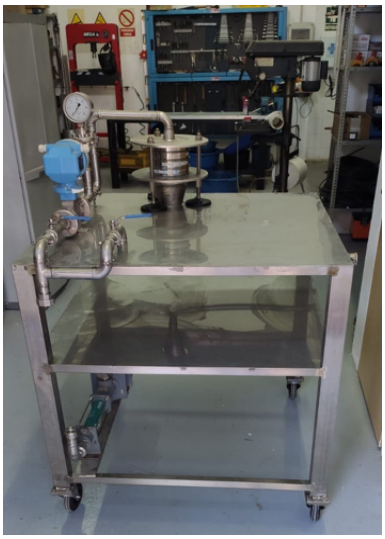
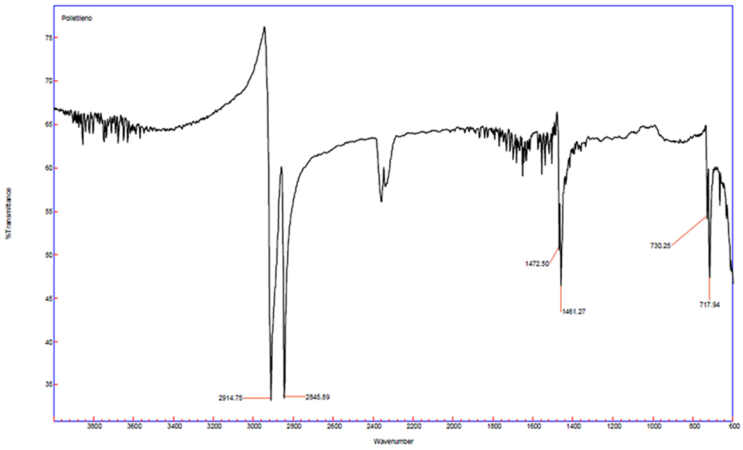
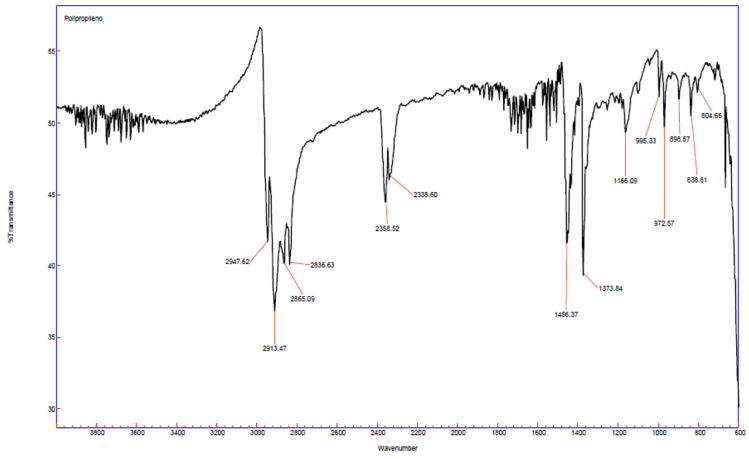


Figure S1. Device employed for wastewater sampling. The photograph shows the filtration module, pressure indicator and flow meter as part of the device.



(a)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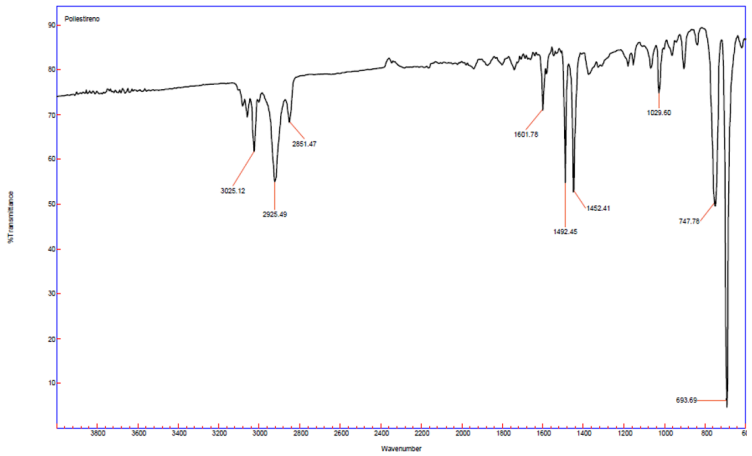
(b)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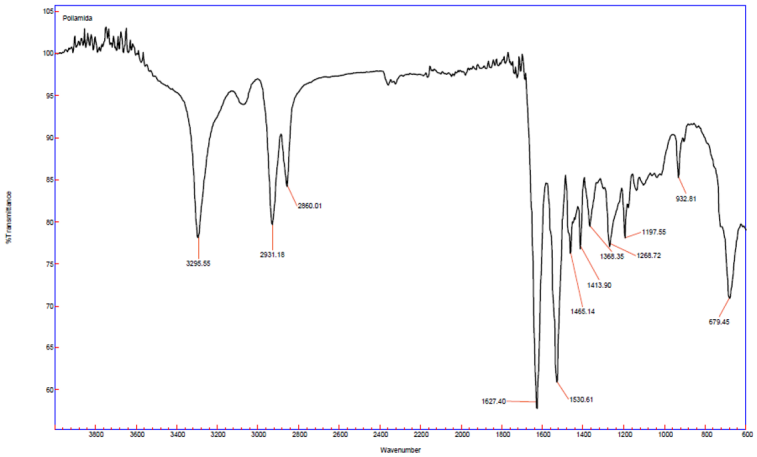
(c)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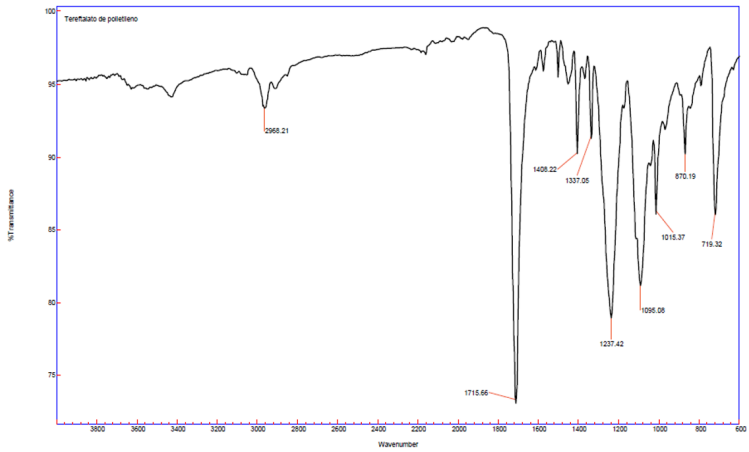
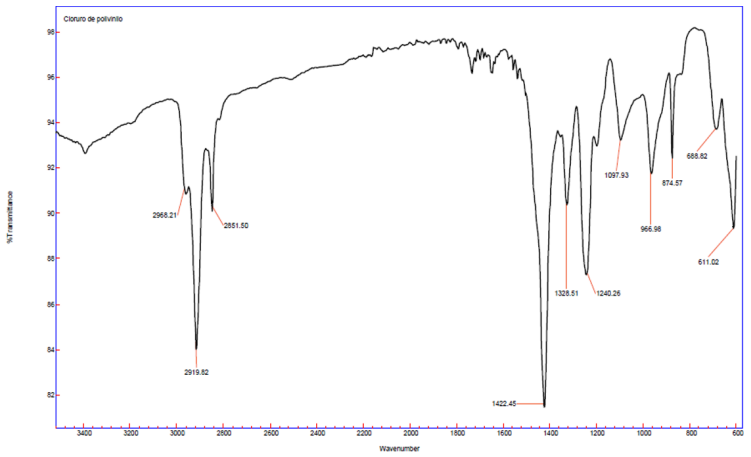
(d)



(e)



(f)

Figure S2. (a) Example of FTIR spectra registered for polyethylene (PE) obtained from the analysis of a black fibre recovered from the secondary effluent sample of July. **(b)** Example of FTIR spectra registered for polypropylene (PP) obtained from the analysis of a white fragment recovered from influent sample of August. **(c)** Example of FTIR spectra registered for polystyrene (PS) obtained from the analysis of a red fibre recovered from the influent sample of September. **(d)** Example of FTIR spectra registered for polyamide (PA) obtained from the analysis of a white foam recovered from the secondary effluent sample of October. **(e)** Example of FTIR spectra registered for polyethylene terephthalate (PET) obtained from the analysis of a white fragment recovered from the final effluent sample of March. **(f)** Example of FTIR spectra registered for polyvinyl chloride (PVC) obtained from the analysis of a black fragment recovered from the sludge sample of October.

Table S1. Volumes of wastewater (L) and amount of sludge (g) sampled during the period of the study.

		Influent (after Screening) (L)				**Secondary Effluent (L)**				**Final Effluent (L)**				**Sludge (g)**
		20 µm	**100 µm**	**250 µm**	**500 µm**	**20 µm**	**100 µm**	**250 µm**	500 µm	20 µm	100 µm	250 µm	500 µm	
2020	May	3	10	25	25	180	270	270	270	290	290	290	290	5.8330
	June	6	18	88	172	79	287	287	287	244	244	244	244	5.2907
	July	12	28	46	63	187	265	265	265	198	272	272	272	5.0503
	August	74	119	188	222	135	319	319	319	274	274	274	274	5.1268
	September	24	24	62	62	121	258	258	258	280	280	280	280	5.4851
	October	85	85	85	85	210	210	210	210	266	266	266	266	5.6021

	November	24	32	54	54	202	202	202	202	258	258	258	258	5.1426
	December	27	42	59	80	276	276	276	276	310	310	310	310	4.9943
2021	January	22	43	58	71	308	308	308	308	320	320	320	320	5.3346
	February	29	42	65	83	221	221	221	221	257	257	257	257	5.0148
	March	61	84	125	166	124	254	254	254	280	280	280	280	5.4236
	April	35	47	79	98	267	267	267	267	283	283	283	283	5.1160

Table S2. Size and shape evolution of microplastics after each treatment (influent, secondary effluent and final effluent) and the overall removal efficiency of each type of microplastic.

		Influent		**Secondary Treatment**			**Final Effluent**			**Overall**
		Number of MPs	Abundance (%)	Number of MPs	Abundance (%)	Removal efficiency (%)	Number of MPs	Abundance (%)	Removal efficiency (%)	removal efficiency (%)
Size	20-100 µm	656	19.57	403	23.44	38.56	289	23.05	28.28	55.95
	100-250 µm	832	24.82	468	27.23	43.75	325	25.92	30.55	60.94
	250-500 µm	858	25.60	412	23.97	51.98	338	26.95	17.96	60.61
	>500 µm	1006	30.01	436	25.36	56.66	302	24.08	30.73	69.98
Shape	Fibres	1161	34.20	667	36.19	42.54	508	40.32	23.83	56.24
	Fragments	2163	64.88	1157	63.32	46.50	712	57.28	38.46	67.08

Table S3. Relationship between the colours and chemical composition found for each sampling point expressed in percentage.

		White	**Black**	**Red**	**Blue**	**Green**	**Yellow**	**Purple**
Influent	PS	11.36	21.17	24.92	27.34	12.92	2.29	0
	PA	15.36	11.45	11.33	7.9	32.56	21.4	0
	PE	23.45	17.67	16.5	9.58	17.17	5.8	9.83
	PP	24.18	25.25	9.42	10.34	12.25	18.56	0
	PET	8.45	7.41	24.67	27.69	7.08	24.7	0
	PVC	5.65	0	1.33	0	0.58	2.27	90.17
Secondary effluent	PS	18.97	9.94	20.61	10.1	13.37	27.01	0
	PA	25.33	3.69	15.65	18	27	10.33	0
	PE	5.1	32.17	6.78	23.48	4.46	24.98	3.03

	PP	38.25	10.47	9.13	1.63	10.01	30.51	0
	PET	5	21.98	27.67	20.03	19.67	5.65	0
	PVC	14.06	9.99	2.56	0	6.72	55.78	10.89
Final effluent	PS	8.96	13.66	22.99	28.06	10.33	16	0
	PA	5.27	35.56	15.43	26.09	17.65	0	0
	PE	0.02	22.15	0.67	3.48	37.88	28.76	7.04
	PP	76.04	9.11	0	0	0	14.85	0
	PET	0	17	45.03	15.01	20.43	0	2.53
	PVC	0	0	0.56	0	0	35.67	63.77
Sludge	PS	8.96	13.66	22.99	28.06	10.33	16	0
	PA	5.27	35.56	15.43	26.09	17.65	0	0
	PE	7.02	2.52	0.78	15.69	35.03	38.96	0
	PP	26.07	9.03	21.23	10.01	8.76	24.9	0
	PET	6.78	35.97	35.44	5.04	16.77	0	0
	PVC	56.02	11.73	4.55	2.03	0	25.67	0

PA, Polyamide; PE, Polyethylene; PET, Polyethylene terephthalate; PP, Polypropylene; PS, Polystyrene; PVC, Polyvinyl chloride.

Table S4. Relationship between the shapes and chemical composition found for each sampling point expressed in percentage.

		PE	**PP**	**PS**	**PA**	**PET**	**PVC**
Influent	Fragments	67.53	77.40	52.58	9.64	73.96	97.50
	Films	0	0	0	0	1.10	2.50
	Pellets	0	0	0	0	0.24	0
	Fibres	32.47	22.60	44.84	90.36	24.33	0
	Foams	0	0	2.58	0	0.37	0
Secondary effluent	Fragments	63.10	78.76	41.14	1.45	80.19	90.00
	Films	0	0	0	0	1.38	5.00
	Pellets	0	0.14	0	0	0.92	5.00
	Fibres	36.90	21.10	50.29	97.83	16.13	0
	Foams	0	0	8.57	0.72	1.38	0
Final effluent	Fragments	54.64	70.54	32.63	2.35	66.35	100
	Films	0	0	0	0	1.92	0
	Pellets	0.28	0.17	1.05	0	2.88	0
	Fibres	40.16	21.30	46.32	97.65	18.27	0
	Foams	4.92	7.99	20	0	10.58	0
Sludge	Fragments	60	83.33	51.85	0	81.58	88.89
	Films	0	0	0	0	2.63	11.11
	Pellets	0	0	0	0	0	0
	Fibres	40	16.67	33.33	90	10.53	0
	Foams	0	0	14.82	10	5.26	0

PA, Polyamide; PE, Polyethylene; PET, Polyethylene terephthalate; PP, Polypropylene; PS, Polystyrene; PVC, Polyvinyl chloride.

Table S5. Summary of the concentrations of microplastics (MPs/L) in the influent, secondary treatment and final effluent during the period of study. Influent and effluent average flow values are also indicated.

Months		Wastewater Line				
		MPs Concentration (MPs/L)			Influent (average flow) (m^3/day)	Effluent (average flow) (m^3/day)
		Influent	Secondary treatment	Final Effluent		
2020	May	23.85	2.36	1.16	5335	4931
	June	18.17	2.44	1.58	4741	4377
	July	18.45	1.76	0.99	4981	4328
	August	16.04	2.26	0.77	4089	3684
	September	17.49	2.39	1.52	4803	4235
	October	14.82	1.89	1.26	4707	4071
	November	14.91	1.67	1.34	4936	4412
	December	15.62	1.48	1.09	4672	4448
2021	January	11.90	1.36	1.31	4374	3934
	February	13.62	1.54	0.71	4584	3913
	March	11.44	1.97	0.59	4510	3865
	April	17.12	1.65	1.26	5770	5159

Table S6. Summary of the concentrations of microplastics (MPs/g) in dehydrated sludge during the period of study. Average mass flow values are also indicated.

Months		Sludge Line	
		MP concentration in dehydrated sludge (MPs/g dry weight)	Average mass flow of sludge (kg dry weight)
2020	May	39.35	3095
	June	29.81	2421
	July	29.57	2452
	August	36.05	2667
	September	28.49	2097
	October	22.26	1764
	November	19.44	3262
	December	22.25	3973
2021	January	11.99	3976
	February	16.54	1994
	March	18.88	3544
	April	13.86	2701