Electronic Supplementary Material (ESI) for Environmental Science: Processes & Impacts.

Supplementary information to

A theoretical assessment of microplastic transport in river catchments and their retention by soils and river sediments.

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Table S1. Summary of MP properties, and sources (data extracted from ref [1-3])

Polymer type	Density (kg m^{-3})	Common uses	On-land sources of MP	Pathway to streams	MP Size range (mm)
Polystyrene (expanded) (EPS)	16-640	Bait boxes, floats, cups , expanded packaging	Households and laundry dust	municipal wastewater effluents	0.01-0.1
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.5-5
Polypropylene (PP)	900-920	Rope, bottle caps, gear, strapping, personal care products	Discharge of primary MP containing personal care products	municipal wastewater effluents	0.005-0.8
			Unintentional spill of pellets during production and transport	Industrial wastewater effluents, Surface run-off	1-3
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-5
Polyethylene (PE)	910-940	Plastic bags, bottles, six-pack rings, gear, personal care products	Discharge of primary MP containing personal care products	municipal wastewater effluents	0.005-0.8
			Unintentional spill of pellets during production and transport	Industrial wastewater effluents, Surface run-off	1-3
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-1
Styrene Butadiene Rubber (SBR)	940	Roofing felt and car tyres	City dust, Car tyre abrasion	surface run-off, municipal wastewater effluents, canalization, Wind/precipitations	0.06-0.1
			Releases from MP containing sewage sludge applied to soil	Surface run-off	0.005-1
Acrylonitrile Butadiene Styrene (ABS)	1030-1110	Electronics and electrics, car interior, toys	Unintentional spill of pellets during production and transport	Industrial wastewater effluents, Surface run-off	1-3
			Abrasion and breaking down during processing or product usage	Industrial wastewater effluents, Surface run-off	0.005-0.5
Polystyrene (PS)	1040-1090	Utensils, containers, packaging	Households and laundry dust	municipal wastewater effluents	0.01-0.1
			Unintentional spill of pellets during production and transport	Industrial wastewater effluents, Surface run-off	0.15-3
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-5
			Abrasion and breaking down during processing or product usage/releases of beads during industrial processes	Industrial wastewater effluents, Surface run-off	0.005-0.9
			Releases from MP containing sewage sludge applied to soil	Surface run-off	0.01-0.1
			Households and laundry dust	municipal wastewater effluents	0.01-0.1

			City dust	surface run-off, municipal wastewater effluents, canalization, Wind/precipitations	0.06-0.1
			Surface weathering	surface run-off, municipal wastewater effluents, canalization	0.05-1
			Surface abrasion/deflashing processes	Industrial wastewater effluents, Surface run-off	0.005-1
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-1
			Releases from MP containing sewage sludge applied to soil	Surface run-off	0.01-0.1
Polyamide or nylon (PA)	1130-1150	Gear, rope, textiles	Households and laundry dust	municipal wastewater effluents	0.01-0.1
			City dust	surface run-off, municipal wastewater effluents, canalization, Wind/precipitations	0.06-0.1
			Abrasion and breaking down during processing or product usage/releases of beads during industrial processes	Industrial wastewater effluents, Surface run-off	0.005-0.9
			Releases from MP containing sewage sludge applied to soil	Surface run-off	0.05-5
Polyvinyl chloride (PVC)	1160-1300	Film, pipe, containers, carpentry	Unintentional spill of pellets during production and transport	Industrial wastewater effluents, Surface run-off	1-3
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-5
			Surface abrasion/deflashing/industrial processing	Industrial wastewater effluents, Surface run-off	0.005-1
			Weathering of PVC containing products during use	surface run-off from urban areas, municipal wastewater effluents, canalization,	0.06-0.1
Polyurethane (PUR)	1200	Insulation, filling materials	Coating erosion and abrasive blasting activities	Industrial wastewater effluents, Surface run-off, canalization	0.1-5
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off, canalization	0.005-5
			Releases from MP containing sewage sludge applied to soil	Surface run-off	0.05-5
Poly(lactic acid) (PLA)	1210-1430	Packaging, cups, mulch fim	Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-5
			Surface abrasion/deflashing/industrial processing	Industrial wastewater effluents, Surface run-off	0.005-1
			Weathering of PVC containing products	surface run-off from urban areas,	

			during use	municipal wastewater effluents, canalization,	
Polyethylene terephthalate (PET)	1340-1390	Bottles, strapping, gear, textile	Unintentional spill of pellets during production and transport	Industrial wastewater effluents, Surface run-off	1-3
			Households and laundry dust	municipal wastewater effluents	0.01-0.1
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-5
			Weathering of PVC containing products during use	surface run-off from urban areas, municipal wastewater effluents, canalization,	0.06-0.1
Polyester resin + glass fibers	1350	Textiles, leisure boats, furnitures	Surface abrasion/deflashing/industrial processing	Industrial wastewater effluents, Surface run-off	0.005-1
			Households and laundry dust	municipal wastewater effluents	0.01-0.1
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-5
			Weathering of PVC containing products during use	surface run-off from urban areas, municipal wastewater effluents, canalization,	0.06-0.1
Polyethersulfone (PES)	1370	Personal care products, lighting fixtures, Electrics and electronics, Surgical and medical devices, Automotive components, Food service components	Discharge of primary MP containing personal care products	municipal wastewater effluents	0.005-0.8
			Unintentional spill of pellets during production and transport	Industrial wastewater effluents, Surface run-off	1-2
			Breaking down of larger items in landfills/recycling facilities/littering	Industrial wastewater effluents, Surface run-off	0.005-1
			Releases from MP containing sewage sludge applied to soil	Surface run-off	0.005-1
Polytetrafluorethylene PTFE (aka Teflon)	2200	Personal care products, sealing, mechanical and industrial components	Discharge of primary MP containing personal care products	municipal wastewater effluents	0.005-0.8
			Abrasion and breaking down during processing or product usage	Industrial wastewater effluents, Surface run-off	0.005-0.5
			Releases from MP containing sewage sludge applied to soil	Surface run-off	0.05-5

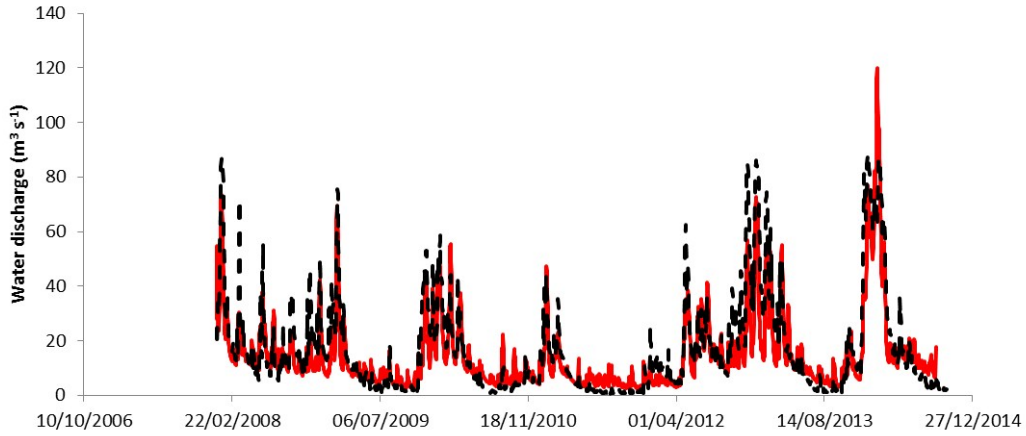
Table S2. The subcatchment information of the Thames system

No.	Reach Name	Length (m)	Area (m^2)	Land use %			
				Arable	Pasture	Forest	Urban
1	Crickdale Castle to Pinkhill	54100	1609	74.4	16.5	2.8	6.3
2	Pinkhill to Osney	12420	526	60.3	16.3	5.0	18.5
3	Osney to Culham	18960	1288	72.5	15.3	2.2	10.0
4	Days Weir	9320	58	78.9	0.0	2.8	18.3
5	Days Weir to Caversham	35150	1154	72.9	10.3	8.2	8.6
6	Caversham to Shepperton	70410	3632	44.0	12.2	15.1	28.7
7	Mosley	9540	1102	38.9	13.1	25.3	22.7
8	Teddington	7740	589	30.6	15.4	17.7	36.3

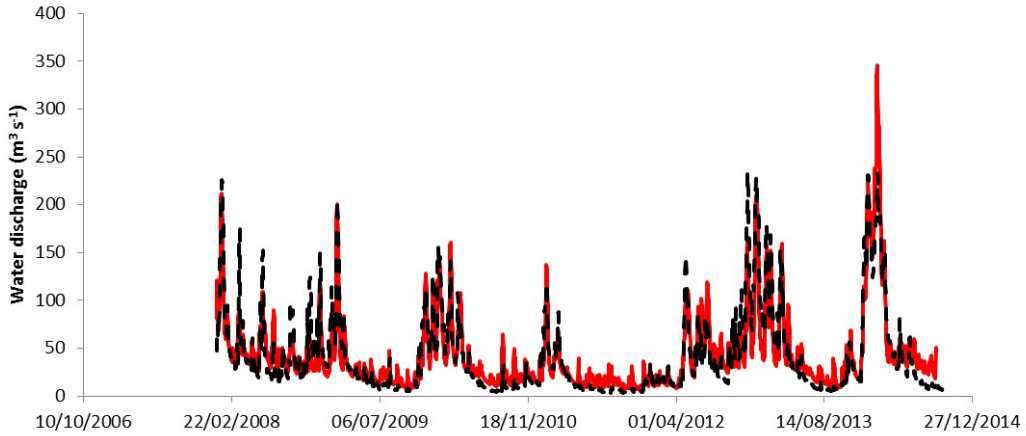
Table S3. Statistic of the relationship between observed and predicted data of water discharge and suspended sediments.

No.	Reach Name	Water discharge N-S coefficient	Water discharge R^2	Suspended sediment R^2	Suspended sediments Percent bias
1	Crickdale Castle to Pinkhill	0.77	0.89	0.27	4.6
2	Pinkhill to Osney	0.63	0.88		
3	Osney to Culham	0.82	0.91		
4	Days Weir	0.82	0.92	0.39	18.7
5	Days Weir to Caversham	0.83	0.91	0.47	-19.6
6	Caversham to Shepperton	0.79	0.93	0.54	16.2
7	Mosley	0.76	0.93		
8	Teddington	0.77	0.93	0.64	6.5

Figure S1. Modelled (red lines) and observed (dotted line) data of water discharge in 3 selected reaches of the Thames



REACH 5



REACH 8

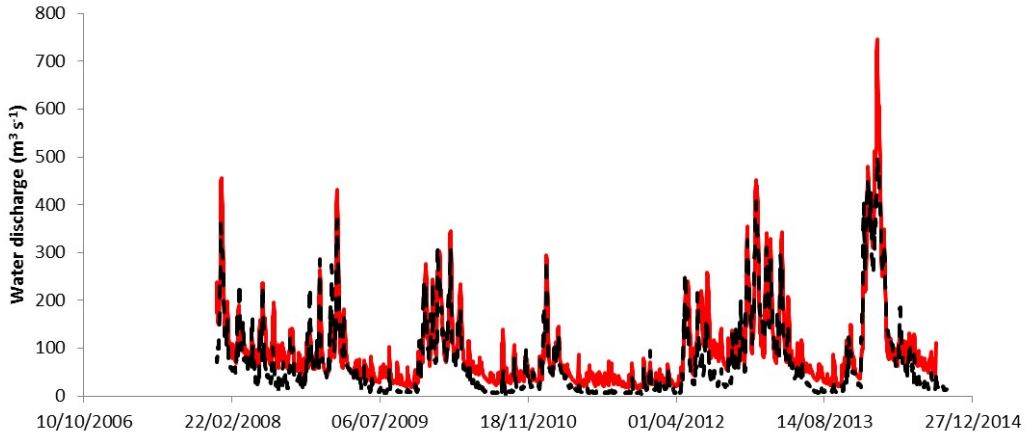
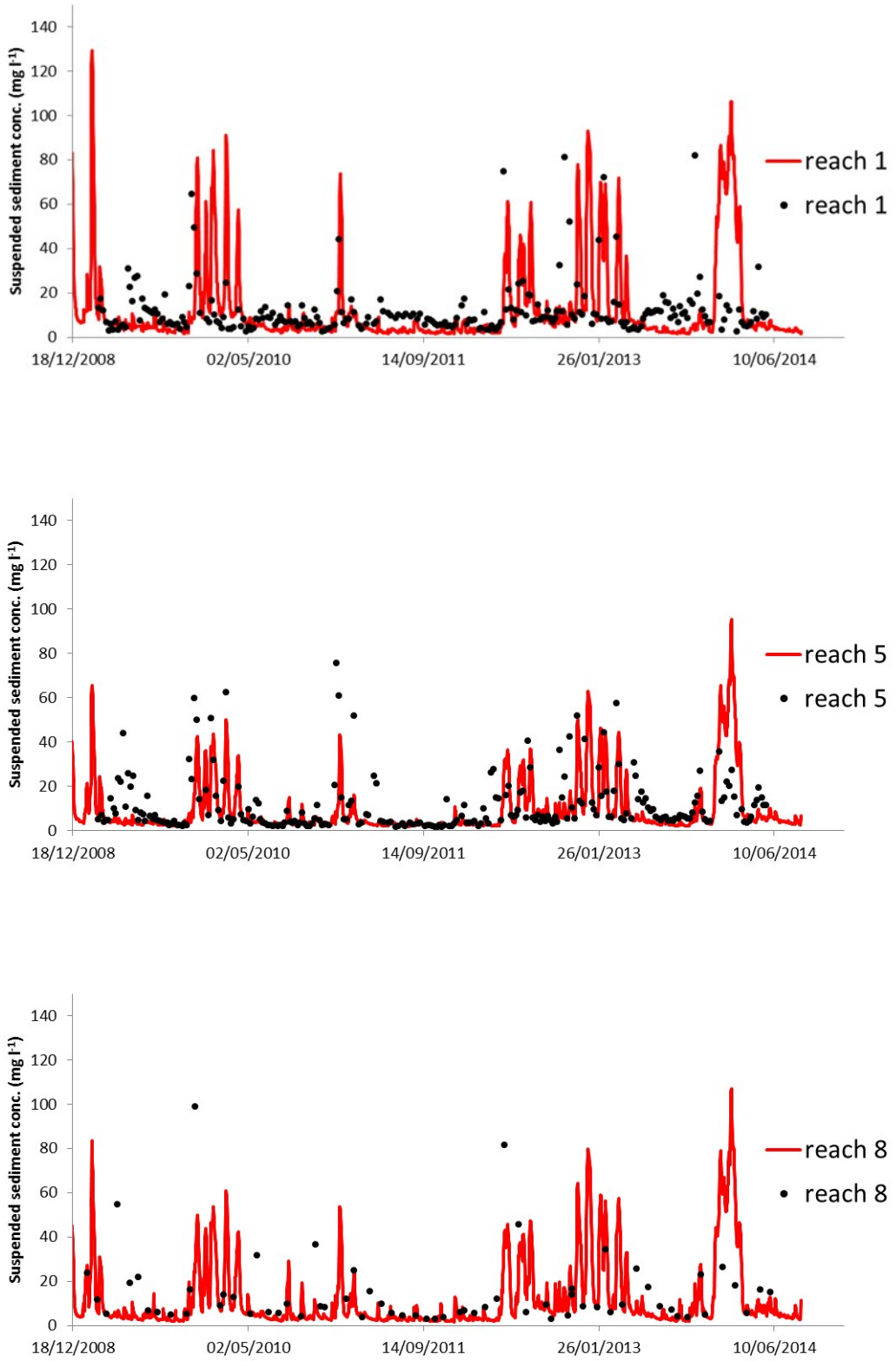


Figure S2. Modelled (red line) and observed (dots) data of suspended sediment concentrations in three selected reaches of the Thames



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1. Lassen C., S. F. Hansen, K. Magnusson, F. Noren, N. I. Bloch Hartmann, P. R. Jensen, T. G. Nielsen and A. Brinch, *Microplastics - Occurrence, effects and sources of releases to the environment in Denmark*, Copenhagen, 2015.
2. P. Sundt, P.-E. Schulze and F. Syversen, *Sources of microplastics-pollution to the marine environmnet*, Report M-321|2015, Mepex, 2014.
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