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Waste water treatment as a source of microplastic pollution

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Plastic pollution has now been found across the Earth's active zone, with recent studies finding plastics in remote parts of the Pacific Ocean, in deep ocean trenches, and in the high Arctic. Of particular concern are microplastics (<5mm diameter), these can be ingested by organisms where they have been shown to cause both chronic and acute health problems. In order to address plastic pollution there is a need to understand how plastic in the oceans is linked to terrestrial sources. Recent conceptual models have illustrated that plastic pollution is a complex interlinked problem with myriad sources and pathways introducing and redistributing plastic around the environment. Terrestrial and freshwater sources are likely to be significant contributors to overall plastic pollution; however, to date they remain poorly understood or quantified. There is a need to both identify and quantify sources of microplastic pollution in terrestrial and freshwater environments, as well as vectors which lead to the redistribution and storage of microplastics in hotspots of accumulation.

In this study we present pilot data attempting to characterise the influence of Waste Water Treatment (WWT) processes on environmental plastic pollution. Using the concept of the "Plastic Cycle" we identify various pathways for plastics present in domestic waste water to enter the environment after treatment. Using two study areas in the UK, we quantify the microplastic loading to the environment from WWT effluent, which is discharged to freshwaters, and from WWT sludge, which is spread on agricultural land as fertiliser. Our results show that both effluent and sludge are important sources of microplastics to the environment. However, these can be of the same order of magnitude as other sources indicating that addressing environmental microplastic pollution is likely to need an integrated approach. Our results also show these sources have lower loadings at some of our sites than reported in other studies, this indicates both treatment processes in WWT and management practices in sludge spreading are likely to be important in determining environmental loading of microplastics at specific sites. The influence of waste water treatment as a source of microplastic pollution needs to be further constrained, but our pilot data indicates a complex picture which needs to be better understood in order to inform environmental governance.