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River corridors as global hotspots of microplastic pollution

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The total production of plastics is estimated to be~ 10 billion metric tons, half of which is thought to have ended up as waste in the environment. However, the total mass of plastic found in the world's ocean garbage patches has been calculated as less than 1 million metric tons, a paradox that leaves the whereabouts of the majority (>99.9%) of plastic waste produced so far unexplained.

Recent research suggests that the accumulation of plastic (in particular microplastic < 5mm in size) in river corridors may be even greater than that in the world's oceans. Our model-based quantifications reveal that rivers do not solely function as pure conduits for plastics travelling to the oceans, but also represent long-term sinks, with in particular microplastics being buried in streambeds and floodplain sediments. This includes the development of pronounced hotspots of long-term plastic accumulation, evidencing that these emerging pollutants have already developed a pollution legacy that will affect generations to come.

The principles that govern the spatially and temporally dynamic inputs of plastics into river corridors as well as the fate and transport mechanisms that explain how plastics are transported and where they accumulate are still poorly understood. Experimental evidence of microplastic pollution in river corridors is hampered by the absence of unified sampling, extraction and analysis approaches, inhibiting a comprehensive investigation of global source distributions and fate pathways. We have therefore initiated the 100 Plastic Rivers programme to provide a global baseline of microplastic pollution in rivers, their drivers and controls in order to develop mechanistic understanding of their fate and transport dynamics and create predictive capacity by informing the parameterisation of global plastic transport models. Preliminary results evidence the suitability of the 100 Plastic Rivers approach and help validate our predictions of global plastic storage in river corridors.