



Estimation of global plastic loads delivered by rivers into the sea

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A considerable fraction of marine plastic debris likely originates from land-based sources. Transport of plastics by rivers is a potential mechanism that connects plastic debris generated on land with the marine environment.

We analyze existing and experimental data of plastic loads in rivers and relate these to the amount of mismanaged plastic waste (MMPW) generated in the river catchments. We find a positive relationship between the plastic load in rivers and the amount of MMPW. Using our empirical MMPW-plastic river load-relationship we estimated the annual plastic load for 1494 rivers, ranging from small first order streams to large rivers, which have an outlet to the sea.

We estimate that the global load of plastic debris delivered by rivers to the sea is 39000 tons per year with a large 95% prediction interval between 247 tons per year and 16.7 million tons per year, respectively. Our best estimate is considerably lower than the estimated total land-based inputs which range between 4.8-12.7 million tons annually (Jambeck et al. 2015). Approximately 75% of the total load is transported by the 10 top-ranked rivers which are predominantly located in Asia. These river catchments encompass countries with a large population and high economic growth but an insufficient waste infrastructure. Reducing the plastic loads in these rivers by 50% would reduce the global inputs by 37%.

Of the total MMPW generated within river catchments, only a small fraction of about 0.05 % has been found to be mobile in rivers. Thus, either only a small fraction of MMPW enters the river systems, or a substantial fraction of plastic debris accumulates in river systems world wide.

References:

Jambeck, J. R., R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, and K. L. Law (2015), Plastic waste inputs from land into the ocean, *Science*, 347(6223), 768–771, doi:10.1126/science.1260352.