Submitted Abstract

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Abstract

Data on spatial distribution of mismanaged plastic waste along the river course is crucial to assessment the plastic input to the river system. Moreover, it is important for evaluation of related risks to biota, human health and aesthetic value of riverine landscape. So far, mountain rivers, not directly connected with the oceans, have not been investigated on a on plastic pollution, which make an evaluation of the above risk in these high biodiversity ecosystems difficult.

Here, we employ spatial analysis utilizing publicly available databases of vector-based hydrography and raster dataset of modelled mismanaged plastic waste (MPW)) to provide first ever estimation on spatial distribution of MPW along all rivers and streams (in total 175669 kilometers) draining the Carpathians Mountains (Central-East Europe). To calculate MPW distribution along studied rivers we intersected pixel values of MPW layer with vector layer of watercourses and other datasets (e.g., DEM). The highest MPW was found along the watercourses of 5th and 6th order (Strahler) (872 and 680 t/yr. respectively). The highest proportion of MPW hot-spots (MPW>5000 t/yr.) along watercourses occur in Romania (3392 km) and Poland (2309 km). Watercourses within Baltic Sea basin (11.1 % of all studied watercourses) flow through the Carpathian regions with higher MPW (620 t/yr.) than these from the Black Sea basin (88.3 % of all studied watercourses) (60 t/yr.). MPW varied between the analyzed catchments of main Carpathian rivers, reaching the highest values in the west-north part of the region (e.g., Oder River (0.7% of studied watercourses) (908.8 t/yr.) and Vistula River catchments (2.6% of studied watercourses) (605 t/yr.). MPW also varied among the watercourses flowing through the areas of different nature protection types (national, regional, international), reaching the highest value in areas protected on national level (29.5 % of all studied watercourses).

We suggest that mountainous rivers may considerably contribute to the plastic pollution of rivers. Though these areas are not densely inhabited, the waste management in these areas is difficult due the terrain conditions, besides it is not profitable to collect the waste in these areas, therefore the waste is often illegally or improperly deposited. Our results can be used as an applying material to decision makers on a rapid need to minimize MPW in local and regional scale of Carpathian region. Such a requirement should comprise actions towards increasing public eco-awareness as well as withdrawing appropriate legal restrictions.