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# The Sink is Leaking! – Enabling Citizen Science for Global Mapping of Microplastic Leakage from Coastal Soils

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## Abstract

The growing amount of marine plastic pollution calls for the need to better understand the mechanisms of its dispersal, geophysical processes involved, and quantitative distribution throughout different environmental compartments. Transported by winds, waves and currents, plastic washes up on coastal, lake- and fluvial shores. Here, it can sediment within the local soil horizon, where further macroplastic decomposition driven by both abiotic and biotic factors contributes to an ever-increasing amount of secondary microplastic (MP). While soil has been theorized to act as a sink, its permanence remains yet to be questioned. Much data on a global scale is needed. To achieve this, whilst also ensuring adequate geographical coverage, it is vital to enable contributions from research in developing countries as well as from citizen scientists (CS). Unfortunately, many of the commonly used analytical methods for MP-quantification in environmental samples are both complex and costly.

Here we used CS-friendly methods to document and quantify the so far little researched phenomenon of MP-leakage from coastal soil through a case study on Smøla island in Mid-Norway. Precipitation was simulated over 9 locally collected soil core samples in a laboratory experiment, and leachate analyzed for MPs in the size range 100 $\mu$ m-1mm. The methodological approach involved filtration for size-separation and H<sub>2</sub>O<sub>2</sub>(30%)-digestion for organic matter removal, followed by Nile-red staining for MP-visualization under UV-light and stereomicroscopy for optical identification and counting. MPs were detected in all samples (contamination-control through method blanks) and a positive trend between MP-leakage and soil macroplastic concentration was observed.

The method's potential for global follow-up studies was demonstrated. We further discuss methodological challenges and make recommendations for improved data quality in a CS-context. A simple and efficient recipe using widely accessible materials that can be used by anyone wanting to contribute to our global knowledge of MP-leakage from coastal soil is presented.

**Keywords:** Microplastic leakage, Coastal soil, Citizen Science, Quantification method, Nile red staining

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