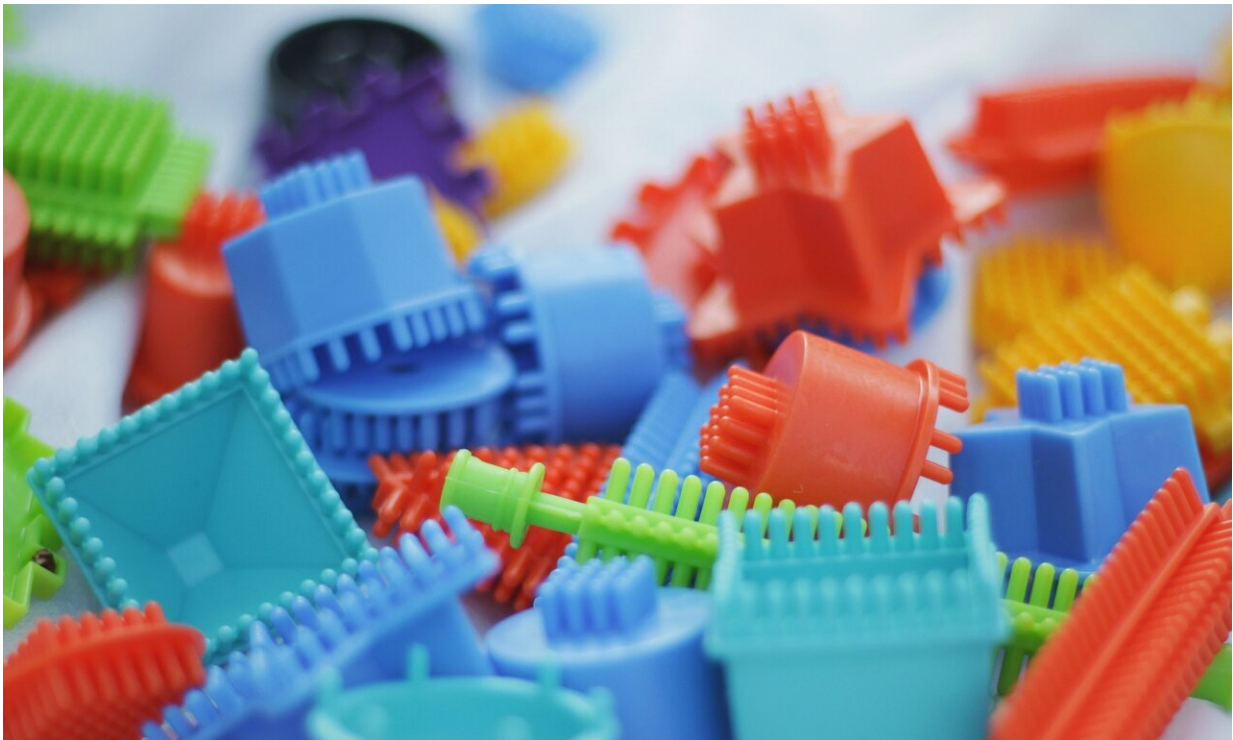


# More than half of plastics in Mediterranean marine protected areas originated elsewhere

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Researchers have, for the first time, simulated both micro- and macroplastics accumulation in Mediterranean Marine Protected Areas (MPAs). They found that the majority of Mediterranean countries included in the study had at least one MPA where more than half of macroplastics originated elsewhere. The study, published in *Frontiers in*

*Marine Science*, highlights the need for international collaboration on plastic pollution management in marine protected areas.

Marine plastic [pollution](#) is one of the biggest environmental issues of our time, along with the climate crisis and overfishing. Depending on characteristics such as buoyancy and size, plastics can travel long distances, sometimes ending up far away from their source.

A team of researchers led by Dr. Yannis Hatzonikolakis, of the Hellenic Centre for Marine Research, found that transboundary plastic pollution is significant in most Mediterranean MPAs. Transboundary pollution happens when pollution that originates in one country causes damage in another country's environment. More than 55% of macroplastics in several studied MPAs originated from a different country or region.

"Our study shows that specific sites, important for the conservation of biodiversity, concentrate high amounts of plastics," said Hatzonikolakis.

"Although marine protected areas are protected by restrictions from other threats, for example fishing and tourism, plastic acts like an 'invisible' enemy, potentially threatening the native marine organisms."

## **Where do plastics accumulate?**

To predict plastic accumulation zones in Mediterranean marine conservation areas, the researchers conducted a three-year simulation (between 2016 and 2018) of the distribution of plastic particles in the Mediterranean Sea using a so-called basin-scale particle drift model. The model considers the most important dispersion processes, such as currents, sinking, and winds. The researchers considered three land-based sources of plastic particles: rivers, cities, and wastewater discharge.

They found that coastal zones (inshore waters) were the most impacted by both micro- and macroplastics. The average microplastics concentration in inshore waters was more than 1.5m particles per km<sup>2</sup>, while offshore waters had 0.5m particles per km<sup>2</sup>. The average macroplastics concentration in inshore waters was more than 5kg per km<sup>2</sup>, and offshore waters had more than 1.5kg per km<sup>2</sup>.

As national MPAs and Natura 2000 sites are close to coastal zones (inshore waters), these sites accumulated more plastic pollution than sites which lay in offshore waters, such as sites of conservation interest for whales and dolphins.

## **Potential solutions**

The majority of the micro- and macroplastic concentrations can be traced back to land-based sources, showing that reducing plastic waste at the source (such as treating wastewater) are needed steps. But just local efforts to reduce plastic pollution in protected areas would be insufficient.

The researchers found that the size of floating particles is an important factor in determining the distance that plastics travel from their sources. Macroplastic concentrations in inshore waters were 3.4 times higher compared to offshore waters, while microplastic concentrations are found to be 5.3 times higher in inshore waters. This implies that macroplastics travel further from their sources than microplastics.

This finding has implications for plastic management in MPAs: "Most of the studied Mediterranean countries (13 out of 15) had at least one national marine protected area with over 55% of macroplastics originating from sources beyond their borders," explained Hatzonikolakis.

The research highlights the importance of [international collaboration](#) for the management of plastic pollution in Mediterranean MPAs.

"Our study provides results based on which stakeholders can move forward to international collaborations to deal with [plastic](#) pollution. This is a challenging task for the Mediterranean Sea, which is shared by numerous countries with great differences in socioeconomic status, political regimes, languages, governance, and cultures."

**More information:** Yannis Hatzonikolakis et al, Quantifying Transboundary Plastic Pollution in Marine Protected Areas Across the Mediterranean Sea, *Frontiers in Marine Science* (2022). [DOI: 10.3389/fmars.2021.762235](#)

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