

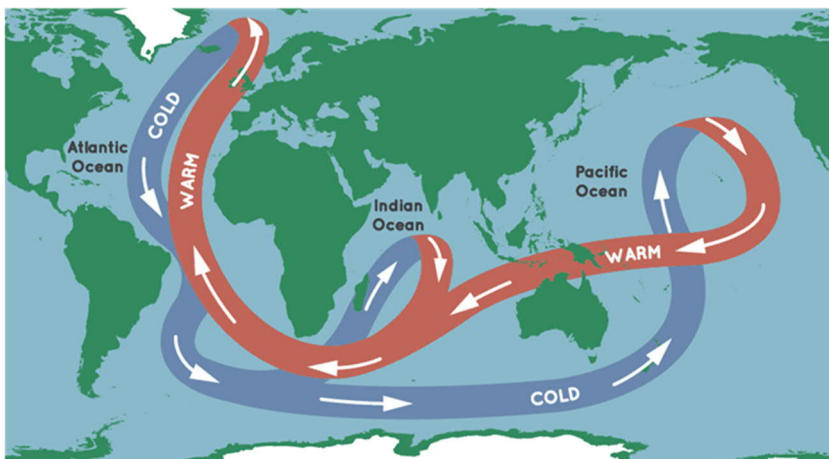
## Plastics as a Menace in Marine Environments

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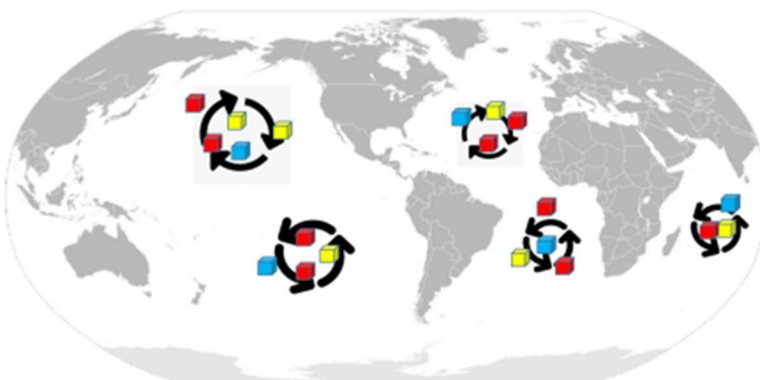
When addressing the issue of marine litter, plastics emerge as the predominant culprit. In the context of the Adriatic Sea, natural forces, including currents and winds, play a pivotal role [1].

Examining the origin of average plastic sea litter (constituting 54.9%) at the depopulated, uninhabited, and remote Adriatic islands, it becomes evident that plastics constitute the most prevalent form of marine debris. This growing prevalence raises a red flag, urging the world to recognize it as a global pollution concern. A staggering three-quarters of floating plastic litter originates from fishing activities, and its persistence in the environment leads to gradual degradation into smaller particles known as microplastics (MP) [2].

The world hosts five ocean gyres, natural systems where plastic accumulates due to ocean currents (refer to Figures 1 and 2). These gyres harbor millions of plastic pieces, occasionally providing unintentional 'food' for marine life in those areas (refer to Figure 2). Addressing this issue requires a concerted effort to reduce plastic pollution and other environmental stressors. This multifaceted approach is essential not only for preserving marine life but also for enhancing the resilience of our oceans in the face of climate changes [3].



*Figure 1: Global ocean currents (red color stands for warm surface, and blue for cold depth currents) [4].*



*Figure 2: The five subtropical Ocean Plastic Gyres floating in the center of the North Pacific, South Pacific, North Atlantic, South Atlantic and Indian Oceans. The question is not whether there is plastic pollution, but how we will use science to inform solutions and whether we are willing to do the hard work to solve the problem [5].*

## Slovenian Coast Survey: Unveiling the Persistent Marine Litter Challenge

In a dedicated effort to shed light on the escalating issue of marine litter (ML), a comprehensive field survey was conducted along the Slovenian coast. While the most recent Adriatic Sea inventory primarily focused on the Gulf of Trieste, our extensive survey in 2023 covered the entire Slovenian coastal stretch, from the Lazaret area at the Italian border to Piran. The findings unveiled a disconcerting continuity of similar waste types observed in previous assessments spanning from 2013 to 2017 [6, 7]. The documented presence of marine litter along the shoreline has had a substantial visual impact, adversely affecting the scenic beauty of the landscape. The majority of the identified waste appeared fragmented, deteriorated, and challenging to differentiate. A particularly troubling development is the emergence of sizable stranded pieces, including flatfish.

A closer examination of the detailed data from the Slovenian coast survey highlights cigarette butts and filters as the most prevalent forms of litter, closely followed by straws (including non-plastic variants), individual pieces of Styrofoam, and remnants of shopping bags. Notably, a significant portion (85%) of the materials deposited on the shore comprised natural elements such as driftwood, reed, grass, and foliage. However, the remaining 15% of marine litter had anthropogenic origins, with plastic constituting an alarming 69% of this fraction.

These findings underscore the urgent need for proactive measures and targeted interventions to address the persistence of marine litter along the Slovenian coast, safeguarding both the environment and the aesthetic appeal of this precious coastal ecosystem.



Figure 3: Two flatfishes have been evidenced during the coast zone survey (photo: N. Špeh).

While an observable upward trend in litter concentration is noted along the Slovenian coastline, the overall pollution level can be characterized as moderate. Specific areas, especially within the protected Strunjan Landscape Park, receive regular cleaning efforts, contributing to a proactive approach in managing environmental impact.

### How to continue

Moving forward, with a focus on the plastic pollution issue, there has been a notable increase in the number of published research papers (refer to Figure 4). Furthermore, the implementation of the European Marine Directive (2008) has provided a robust regulatory framework. This directive outlines a comprehensive approach to collecting data on plastic pollution, covering aspects such as sediment in seawater, the state of seawater across different water column levels, and features within the coastal zone. The prescribed parameters include monitoring marine litter amount, density, and categorization based on recycling potential, encompassing materials like paper, metal, glass and ceramics, textiles, and plastics. This regulatory framework establishes a structured foundation for addressing and

mitigating plastic pollution, fostering a more sustainable and environmentally conscious coastal management strategy.

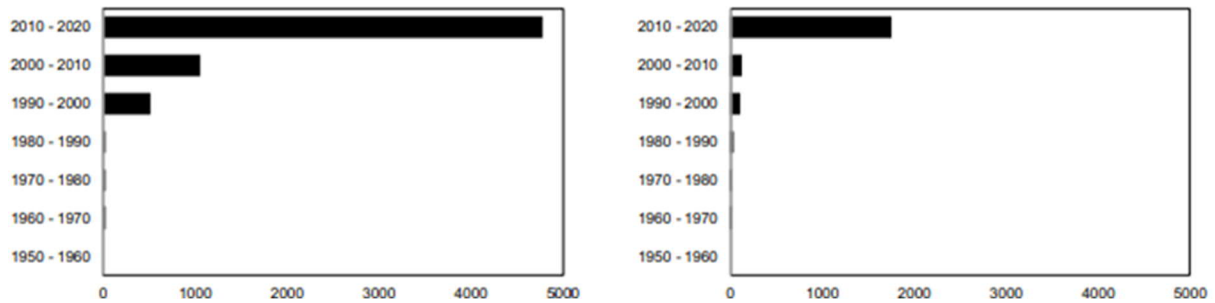


Figure 4: The number of papers that appear in Web of Science Core Collection using search terms Plastic (pollution or debris), left graph, and Microplastics (right graph) [5].



Figure 5: Celebration of 'Throwaway living' after Life Magazine (in the mid-1950s).