



The Ocean and Us: A Broader Perspective

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Winning article: [Advancing plastic pollution hotspotting at the subnational level: Brazil as a case study in the Global South](#) (Marine Pollution Bulletin, 2023)

"Ocean health is a symptom of the entropy of the socioecological system that demands a holistic social and environmental justice approach."

The ocean has been achieving recent relevant advances in the international agenda, with important multilateral agreements dedicated to its protection. After the turn of the Millennium, the attention to the ocean was deepened in the [United Nations 2030 Agenda for Sustainable Development](#) through the Sustainable Development Goal 14 (Life below water), whose thematic transversality to the other SDGs was highlighted. The understanding of the importance of the ocean and its potential as an agent for transforming society and facing planetary crisis emerged internationally and guided multilateral movements such as the [UN Ocean Conferences](#) and the [UN Decade of Ocean Science for Sustainable Development](#) (2021-2030).

Today there is a global consensus about the "ocean we want" based on the expected objectives of the [Ocean Decade](#), a strategic process to implement SDG 14 engaging all the society to promote a clean, healthy, and resilient ocean that is productive, predictable, and safe, with open access to information and which inspires and engages us. To achieve each of these objectives and build "[the ocean we need for the future we want](#)", different actions are necessary. One is to have the sources of pollution identified and reduced or eliminated. However, in reality the ocean is unequivocally and increasingly degraded since sewage, solid waste, chemicals, fertilizers, heavy metals, and medicines keep ending up in the sea.

Among these threats, marine litter is an emerging global problem that has been causing environmental, economic, social, and human health impacts of different types and magnitudes. Considering that human activities carried out in terrestrial environments correspond to [80% of the sources of marine litter](#), this contaminant represents more than a problem, but also a symptom of the unsustainable way we have been living, especially in the Global South.

Fernando Pessoa, a Portuguese poet, well expressed such a source-to-sea concept with his typical antagonistic statements, as in this passage about the biggest Portuguese river called the Tejo: “The Tejo is more beautiful than the river that flows through my village / But the Tejo isn’t more beautiful than the river that flows through my village / Because the Tejo isn’t the river that flows through my village”. In fact, the Tejo confounds itself with the ocean where it opens to. Conversely, he wrote, “But not many people know the river of my village / And where it comes from / And where it’s going / And so, because it belongs to less people / The river of my village is freer and greater”. In fact, it was freer and greater in the beginning of the 20th Century, when these sentences were written.

But sadly, the river that is flowing through our village is dying nowadays, as demonstrated in our study by the large amount of solid waste navigating our watersheds (Photo 1). We estimated the amount of mismanaged plastic waste for all 5,570 Brazilian municipalities, pinpointing the hotspots where litter leaks to the environment, rivers and the ocean. We applied innovative approaches to deal with a data-poor reality typical of Global South countries and incorporated new socioeconomic criteria, plastic consumption parameters, and environmental particularities (presence of river dams and dimension of rivers). We improved previous estimates both in spatial and temporal granularity, increasing the degree of certainty of the existing estimates regarding the location and relative dimension of hotspots.



Photo 1. The mouth of the Amazon River is one of the most relevant leakage points of plastic waste to the ocean in Brazil. In the municipality of Belém, a large amount of litter that is generated both locally and along the huge watershed that drains to the Atlantic Ocean engulfs the fishermen’s boats at the low tides (Source: Alexander Turra).

The study made great progress in understanding sources and pathways of land-based sources of marine litter, providing a ranking of the most critical locations in Brazil and generating an open access database for the general public. The results will help decision-makers define appropriate instruments to address the litter problem and monitor the progress of implemented actions. We expect that the outcomes of our study will be replicated along the Global South countries based on the efforts of NGOs, universities, private sector and/or national and subnational governments to support the implementation of the [Plastic Treaty](#) that is being elaborated by the United Nations Environmental Assembly. However, although the advances our study provides can be widely spread and scaled up, the analyzed scenario reveals that technical solutions alone are not sufficient to solve the marine litter issue and the complex conjuncture it represents.

Importantly, societal causes are at the root of the generation of marine litter, and addressing them should be a guiding lighthouse to decision makers for changing upstream reality. As demonstrated in our study, the amount of marine litter is a direct consequence of poverty, especially the number of people living marginalized and in subnormal agglomerations, such as slums, without coverage of services of waste collection and final disposal. This reality correlates with the major theme of sanitation, such as the access to drinking water, sewage collection, and treatment systems, which amplifies waterborne diseases. Furthermore, before reaching the ocean, mismanaged solid waste contributes to a wide suit of ailments, such as breeding grounds for the mosquito *Aedes aegypti* that is causing an epidemic of dengue fever in Brazil, and the clogging of rainwater drainages that is amplifying floods caused by the increasing magnitude and frequency of extreme weather events.

In other words, the ocean is unhealthy because society is unhealthy and the river that flows through our village reveals the entropy of the socio-ecological system. The sea [or the Tejo], sometimes far beyond the river of our village, reflects what happens at the village through which that river flows. And this is the reality we need to change. This is, in essence, the message of marine litter and ocean pollution research in the context of planetary boundaries science. Besides dialoguing directly and indirectly with different planetary boundaries, such as biosphere integrity, climate change, freshwater use, and land system change, our study reinforces the need of a holistic view to understand and face the reasons that are causing the planetary crisis. For example, one shouldn't disregard the causes that might lead to a tipping point in 2050 where there will be more plastic than fish in the ocean - according to the [Ellen MacArthur Foundation](#).

Our study addresses a wicked and complex problem that requires a transdisciplinary approach to be tackled. We need to identify and objectively face the sources of environmental contamination. But according to the current trend in the field of marine pollution, researchers are seeking for technical solutions without addressing the ultimate causes of this problem. And this brings us to the basal issue of governance of the socioecological system, which is a severe drawback in the Global South. More than creating tools to face marine pollution, the planetary boundaries science will greatly benefit from the science behind social control and citizen empowerment to subvert top-down and hegemonic processes that cultivate misery and ignorance. Quoting Bertolt Brecht, a German writer, "The worst illiterate is the political illiterate, he doesn't hear, doesn't speak, nor participates in the political events". The science

behind planetary boundaries still depends on advancing in political literacy, and why not include environmental and ocean literacy, whose lack is the root of the planetary crisis.

As a final remark recalling Fernando Pessoa, “Nobody ever thinks about what’s beyond / The river of my village / The river of my village doesn’t make you think about anything / When you’re at its bank you’re only at its bank”. Now onwards, at the bank of the river of the global village, we need to look around and beyond to empower people and promote social and environmental justice! Then, the boundaries will be further and further away from us...



Photo 2. The faces of the multidisciplinary team behind our study in Brazil.