

Oceans struggle to absorb Earth's carbon dioxide as microplastics invade their waters

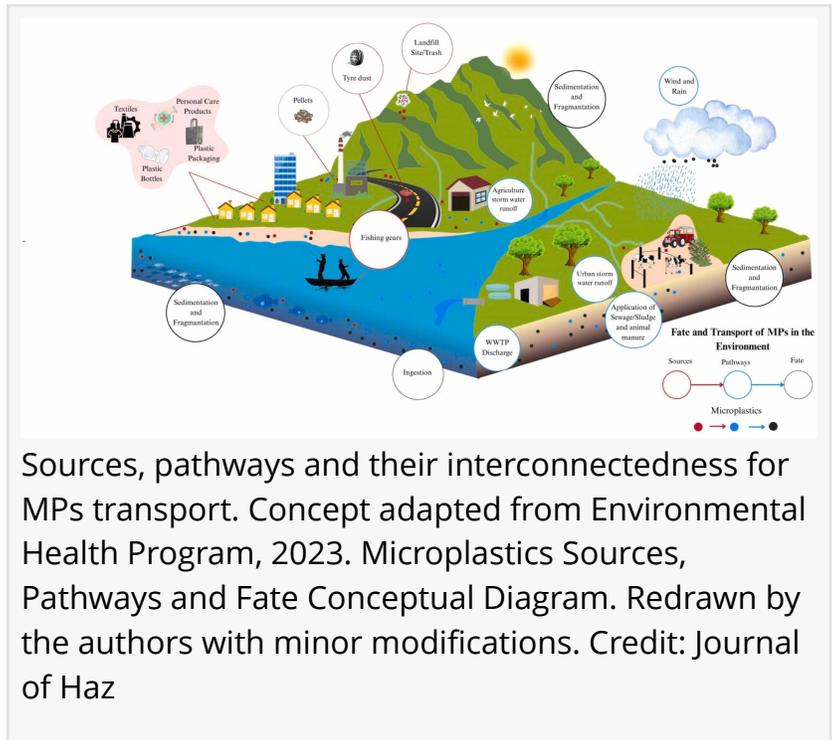
Research shows microplastics are flooding the oceans, lessening their ability to absorb carbon dioxide, a process critical to regulating Earth's temperature.

SHARJAH, EMIRATE OF SHARJAH, UNITED ARAB EMIRATES, January 5, 2026 /EINPresswire.com/ -- A new study reveals that microplastics are impairing the oceans' ability to absorb carbon dioxide, a process scientists find crucial for regulating Earth's temperature.

Defined as tiny plastic fragments smaller than five millimeters in size, microplastics have become ubiquitous. They are found almost everywhere, from deep ocean waters, freshwater sources, air, soil, Arctic ice, and even human bodies. Their pervasiveness poses serious risks to the environment. They carry toxins that living creatures, including humans, ingest, triggering a host of diseases, disrupting the ecosystem, harming aquatic life, and reducing soil fertility.

Now researchers have found that despite the global urgency of climate change, the role of microplastics in this crisis, particularly their presence in marine environments, has received limited attention. "Climate disruption and plastic pollution are two major environmental challenges that intersect in complex ways. MPs (microplastics) influence biogeochemical processes, disrupt oceanic carbon pumps, and contribute directly to greenhouse gas (GHG) emissions," they write in a study published in the *Journal of Hazardous Materials: Plastics*. (<https://doi.org/10.1016/j.hazmp.2025.100032>)

"In marine ecosystems, MPs alter the natural carbon sequestration by affecting phytoplankton and zooplankton, which are key agents of carbon cycling. Additionally, the plastisphere, a microbial community colonizing MPs, plays a significant role in GHG (greenhouse gas production)



due to its diverse microbial networks.”

While widely recognized as pollutants, “our study shows they also interfere with the ocean’s ability to absorb carbon dioxide, a process critical for regulating Earth’s temperature,” said Dr. Ihsanullah Obaidullah, Associate Professor of Integrated Water Processing Technologies at the University of Sharjah and the study’s corresponding author.

Dr. Obaidullah added, “Microplastics disrupt marine life, weaken the ‘biological carbon pump,’ and even release greenhouse gases as they degrade. Over time, these changes could lead to ocean warming, acidification, and biodiversity loss, threatening food security and coastal communities worldwide.”

A hidden climate threat

Dr. Obaidullah describes the study as a “collaborative perspective” involving scientists from China, Hong Kong, Pakistan, and the United Arab Emirates. “We have highlighted an overlooked link between microplastics and climate change. We call for urgent global action to address this emerging threat.”

The authors, who published their research under the title “Microplastics and Global Warming: A Hidden Climate Threat Uncovered in a New Perspective,” present a scoping review that maps the nature, range, and extent of existing research on the topic. By identifying gaps in the literature, they uncover a hidden greenhouse effect rarely highlighted before.

“Oceans are Earth’s largest carbon sink,” explained Dr. Ihsanullah. “Microplastics are undermining this natural shield against climate change. Tackling plastic pollution is now part of the fight against global warming.”

The study emphasizes that “biological carbon pumping”—the ocean’s natural process that transfers carbon from the atmosphere into the deep sea layers—is the primary mechanism linking microplastics to global warming and climate change. “MPs interfere with this process by reducing phytoplankton photosynthesis and impairing zooplankton metabolism,” the authors note.

Another connection, the authors indicate, is related to the plastisphere, an assembly of microbes in aquatic settings that form biofilms on surfaces. “The plastisphere is home to a variety of microorganisms, the majority of which are involved in biological processes like the nitrogen and carbon cycles.”

Alarmingly, they maintain, microplastics also emit greenhouse gases during degradation, exacerbating their impact on climate systems.

Unseen connections

The researchers adopted an integrative narrative approach to analyze previous studies, rather than a systematic or scoping review. Their analysis is grounded in desktop research, drawing on peer-reviewed articles, reports from international organizations, and other authoritative sources to critically synthesize knowledge on microplastics, ocean health, climate change, and related socio-environmental issues.

Unlike protocols such as PRISMA, no rigid inclusion or exclusion criteria were applied. Instead, the emphasis was placed on conceptual integration and thematic linkage across disciplines, said Dr. Ihsanullah. A total of 89 studies published mainly after 2015 were reviewed, covering literature from 2010 to 2025. This approach enables a holistic discussion of emerging evidence, knowledge gaps, and policy implications in the context of climate change, the Sustainable Development Goals (SDGs), and human rights.

The study seeks to address knowledge gaps in the literature, which, according to the authors, have largely concentrated on identifying microplastics and developing cleanup strategies. They write, "The extent to which microplastics affect climate change, ocean health, and associated systems is currently unknown. This can be mostly because the issue is novel, intricate, and multifaceted. The significant ecological effects of plastic pollution in the oceans are well recognized, but its exact connections to these extensive environmental processes are not well understood."

To bridge the gaps, the researchers explore the multifaceted effects of microplastics on ocean health and climate change, urging future studies to highlight the internal linkages between microplastics and climate change dynamics. Such dynamics, they argue, could foster a shift in "perspective in research and policymaking."

By considering the ecological and economic dimensions of microplastic ocean impact, the study aims to enhance an understanding of plastic pollution and support the development of more effective mitigation strategies, particularly in addressing microplastics' role in exacerbating environmental challenges such as oxygen depletion and ecosystem destabilization.

Ubiquitous and versatile

Plastics are not only pervasive but also remarkably versatile, affordable, and durable. They are integral to modern life, used in everything from food, medicine, retail packaging, construction of pipes, insulation and windows, plane parts, interiors for fuel, electronics, consumer goods, and healthcare applications.

As a result, the worldwide generation of plastics is massive. A 2025 U.N. report estimates that annual plastic production exceeds 400 million tonnes, half of which is designed for single use, and less than 10 percent of it is recycled. Projections indicate that, without intervention, annual

plastic production could triple by 2060.

To date, the world has produced over 8.3 billion tonnes of plastic, with 80 percent ending up in landfills or the environment. Alarmingly, only nine percent of the massive volume is recycled.

While plastics deliver undeniable benefits to society, the authors warn that “their environmental footprint across the entire life cycle has become a growing concern. These plastics, being highly persistent, have become a pressing global environmental challenge.

“The increasing demand for and excessive consumption of plastic have led to serious challenges for human and ecosystem health, posing threats to environmental sustainability and food safety.”

Integrated action is required to address issues

The researchers urge policymakers not to underestimate the long-term impact of microplastics on ecosystems and human life, even if their current effects appear minimal. They caution that “while their (microplastics) current impacts may seem minor, their growing accumulation suggests future significance. The impact of MPs on ocean health, particularly concerning potential ocean warming and acidification, remains an area of concern.”

The authors call for an integrated approach, stressing that microplastic pollution and climate change cannot be addressed in isolation. “In this way, the effects of climate change could be lessened by taking appropriate action to slow down the production of microplastics,” they note.

Among other recommendations, the authors urge the United Nations to revisit its Sustainable Development Goals, pointing out that “plastics are currently represented by a single indicator, which may not adequately capture the widespread risks posed by microplastics across diverse ecological systems.”

They also advocate for immediate and coordinated efforts to “develop governance frameworks that tackle both MP pollution and climate change, particularly their links to ocean acidification and warming.”

To safeguard the oceans and preserve their ability to absorb carbon dioxide, they outline key priorities, which include reducing single-use plastics, improving waste management, promoting biodegradable alternatives, and advancing research on how microplastics influence ocean temperature and carbon cycles.

Additionally, they recommend leveraging AI-driven monitoring and innovative materials to curb plastic waste.

When asked about future research directions, Dr. Ihsanullah said, “Our next step is to quantify

the climate impact of microplastics and develop integrated solutions. This is not just an environmental issue; it's a global sustainability challenge.”

LEON BARKHO
University Of Sharjah
+971 50 165 4376
[email us here](#)

This press release can be viewed online at: <https://www.einpresswire.com/article/880589053>

EIN Presswire's priority is source transparency. We do not allow opaque clients, and our editors try to be careful about weeding out false and misleading content. As a user, if you see something we have missed, please do bring it to our attention. Your help is welcome. EIN Presswire, Everyone's Internet News Presswire™, tries to define some of the boundaries that are reasonable in today's world. Please see our Editorial Guidelines for more information.

© 1995-2026 Newsmatics Inc. All Right Reserved.