



Policy Brief on Marine Litter

The Marine Litter and Climate Change Nexus

An argument for an integrated approach

A healthy global ocean for mitigating climate change

There is growing awareness of the effects of climate change on the ocean and of the ocean's role in mitigating climate change. The ocean produces half of the world's oxygen, absorbs a quarter of global carbon emissions and captures 90% of excess heat generated by **greenhouse gas (GHG) emissions** (UN 2023). **Marine ecosystem health is, therefore, pivotal to achieving the climate goals set in the Paris Agreement.** However, the ocean is adversely affected by marine pollution and the climate crisis, and plastic is a major contributor to both.

This policy brief presents the links between the climate crisis and marine plastic litter, and solutions and recommendations for an integrated nexus approach.

Plastic is a major driver of climate change

Plastic entails greenhouse gas emissions during all stages of its life cycle (Zheng and Suh 2019). This includes extraction and transport of fossil fuels, refining, manufacturing, distribution, use, disposal, waste management and plastic in the environment (Hamilton et al. 2019). Research suggests that **plastic could account for up to 20% of the global annual GHG budget in 2050** (Hamilton et al. 2019). Plastic production is on the rise and plastic pollution is a result: The OECD predicts that plastic waste in aquatic environments will **"more than triple from 140 million tons in 2019 to reach 493 million tons in 2060"** (OECD 2022).

"Although they are often thought of separately, climate change and plastic pollution are directly and indirectly linked, and both are amongst the biggest ecological challenges faced today globally, not least they share the same fossil origin, oil and gas (Bergmann et al. 2022)."

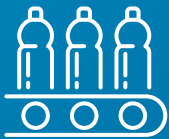
Key facts on plastic



'Plastic' refers to fossil or bio-based materials. Currently almost all **plastic is fossil-based** (Hamilton et al. 2019).



The **packaging industry** accounts for the largest share (42 %) of plastic production (Geyer et al. 2017).



About **9.2 billion tons** of plastic were generated from 1950 – 2017 (Geyer et al. 2017).



The **majority of marine debris** is plastic (Jambeck et al. 2015).

End-of-life treatment options for plastic in practice are limited and eventually lead to down-cycling (Garcia et al. 2017). This often leaves **incineration as the only treatment option** (Vollmer et al. 2020).



'**Bioplastic**' (from renewable feedstocks) is often unsustainable and has the same harmful effects when entering the environment (Hamilton et al. 2019).



'**Biodegradable**' or '**compostable**' plastic, either from fossil or renewables sources, can often only be treated in industrial waste plants – but does not decompose in the environment (Hamilton et al. 2019).



The climate crisis exacerbates marine plastic pollution

The increase and intensification of extreme weather events are direct effects of the climate crisis. They include floods, storms and marine heatwaves – causing continued ocean warming, rising sea levels and permafrost degradation (Ford et al. 2022, IPCC report 2023). Studies show that these weather events can **release accumulated plastic waste from terrestrial sinks**, such as riverbanks and coastlines, into the marine environment (van Emmerik et al. 2023, Meijer et al. 2021).

Marine plastic pollution contributes to global warming

Marine plastic pollution is **evident in all ocean basins** (Geyer et al. 2017), and diminishes the ocean's function as the **world's largest carbon sink** (Stoett and Vince 2019). Microplastics hinder carbon absorption by phytoplankton and zooplankton (Shen et al. 2020; Kvale et al. 2021).

Other evidence suggests that light-reflecting microplastic accelerates the melting of Arctic glaciers (Stefánsson et al. 2021). Research has also shown that **the degradation process of (marine) plastic litter releases methane**, with emissions of yet unknown proportions (Royer et al. 2018).

Ecosystems and marine species are threatened by the combined effect of climate crisis and plastic pollution resulting in a loss of biodiversity

Both marine litter and the climate crisis are stressors for marine ecosystems and species (Ford et al. 2022). **Continued ocean warming also increases marine biodiversity loss**, with Arctic sea-ice ecosystems, coral reefs, kelp, mangrove, and seagrass ecosystems particularly at risk (IPCC 2023). Similarly, climate-sensitive ecosystems are particularly vulnerable to plastic pollution (Rowlands et al. 2021), exacerbating the third planetary crisis, biodiversity loss.

Overconsumption, the linear plastic economy and unsound waste management are main causes of marine plastic pollution

Plastic waste is often predominantly land-based (Jambeck et al. 2015): Waste is dumped on riverbanks, coasts, and beaches or reaches the ocean from landfills near the shoreline. It enters the environment during waste collection, transport, or through public littering (Pew Charitable Trusts and SYSTEMIQ 2020). At the same time, overconsumption and the linear plastic economy are the main drivers of plastic pollution (Lau et al. 2020). Inadequate implementation of circular economy strategies and lack of financing systems are only some of the economic key issues (UNEP 2021).

Implications and solutions need to apply to the entire plastic pathway

A broad and profound set of solutions is already available along the economic pathway of plastic. With the technological, political, economic, and behavioural solutions known

today, ongoing plastic pollution could be drastically reduced in the short-term by up to 80% (UNEP 2023), while at the same time, GHG emissions would be reduced (OECD 2023). This would make a major contribution to the ultimate goal to end plastic pollution by 2040, as declared by the G7 and also committed to by the High Ambitions Coalition to End Plastic Pollution (G7 2023).

Solutions should be regulatory as well as market-driven – addressing the producer as well as the consumer – and be prioritised at the first stages of the supply chain to establish an extended producer responsibility (EPR). They should be holistic in order to have a positive effect at several points of the market system. To be considered a real solution or improvement, a product's net carbon emission, environmental and health impacts have to be analysed throughout the entire life cycle (OECD 2022).

Solutions need to make sure that they do not just shift the problem, but take into consideration the interactions with other planetary crises, such as the loss of biodiversity (which is accelerated by plastic pollution) and the release of microplastics and chemicals of concern during the plastic degradation process (Passarelli et al. 2021).

Need for action: How to reduce GHG emissions along the plastic pathway

- ✔ Set up regulatory framework and market mechanisms that restrain plastic production and consumption, particularly reduce the production of virgin plastics and single-use plastic.
- ✔ Establish a waste hierarchy: Prevention needs to be prioritised over reuse and recycling. Recycling needs to be prioritised over incineration and dumping.
- ✔ Waste management must be improved and expanded. Leverages into the environment need to be ended.
- ✔ Unsustainable production chains need to be regulated to support structural changes. This includes raising taxes for fossil fuels, the reduction of negative substitutions and the economical internalisation of environmental damage costs.
- ✔ A shift from linear to more circular economies and plastic life cycles needs to be implemented.
- ✔ Renewable energy must be used throughout the entire product cycle.

Reduction of GHG emissions during the plastic production process

PROPOSED INTERVENTIONS	POLICY OPTIONS
reduce primary plastic polymers and restrain overall production	regulate supply and trade, introduce fiscal instrument, bans, phase-outs and phase-downs of specific polymers and products of concern
foster sustainable consumption patterns	precautionary approach, product approval, ban single-use plastic, avoid regrettable substitutions, capacity building, education, awareness raising

Reduction of GHG emissions during plastic use and reuse

PROPOSED INTERVENTIONS	POLICY OPTIONS
prolong the life of materials and products, reuse approach in all possible pathways	quota, design standards for obsolescence, repairability and reuse, incentives, deposit and return schemes, take-back and product-as-a-service schemes, extended producer responsibility (EPR), B2B-product passport (business-to-business) / B2C-labels (business-to-consumer)
facilitate recycling, limit use of single plastic materials	design standards for composition and compounds, quota, extended producer responsibility (EPR) capacity building, education, awareness raising

Reduction of GHG emissions through improved recycling

PROPOSED INTERVENTIONS	POLICY OPTIONS
ban on export/import of plastic waste	ban
improve collection and sorting at source	incentives, automated collection and sorting systems at source
avoid incineration of plastic incl. energy production	prohibition, penalty, strict regulations for exceptions

Reduction of GHG emissions by reducing marine pollution

PROPOSED INTERVENTIONS	POLICY OPTIONS
reduce plastic inputs and leakages, also with focus on the increase of extreme weather events	taxes, private public investment in waste collection, financing, standards for landfills, remediation landfills (urban mining), emissions standards for sectors and uses and safety regulations for transport
avoid landfilling and dumping of plastic waste and public littering	private and public investment in waste collection, treatment infrastructure, behavioural change, penalties

Recommendations for mitigating the climate crisis by tackling plastic pollution

The following policy recommendations focus on those aspects that address the mutual causes of climate change and plastic pollution, and combat the loss of (marine) biodiversity to pool resources and mitigate conflicts between different objectives:

- 1. Overcome the disconnection between climate change and plastic pollution policies** through joint strategic efforts. The issue of plastic pollution needs to be integrated into climate (adaptation) frameworks and strategies.
- 2. Prioritise countries, regions, and topics politically** to support those countries and regions that face the marine plastic pollution and climate change crises the most, i.e. Small Island Developing States (SIDS).
- 3. Adopt and enforce ambitious targets for reducing greenhouse gas emissions** from both fossil energy and industrial sources, including the entire plastic lifecycle.
- 4. Financially support the transition to a more sustainable path in the plastic value chain** to generate systemic changes. Bridging of the finance gap through public and private financial flows (i.e. via funds).
- 5. In line with the IPCC report 2023: Set human and ecosystem health and marine protection as a major climate goal** as the human impact on the ocean, including plastic pollution, directly affects its capacity for climate mitigation, blue carbon storage and resilience.

The Triple Planetary Crisis and Germany's contribution to overcome it

Germany actively supports international agreements to combat plastic pollution, including in the marine environment, address climate change, and safeguard marine biodiversity at the

United Nations level, G20 and G7. It is also taking a leading role in the negotiations of the international treaty to end global plastic pollution (UNEA-5/2 2023). An ambitious agreement will lay the foundation for one of the most important environmental protection measures since the Paris Climate Agreement in 2015 and the Global Biodiversity Framework in 2022.

The Grant Programme against Marine Litter

The German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) has been supporting the engagement against marine litter with a Grant Programme since 2019:

→ www.z-u-g.org/en/marine-litter/info .

Further information and contact

Grant Programme against Marine Litter

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