

PLASTICS AND SHALLOW WATER CORAL REEFS

Synthesis of the science for policy-makers



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About

The overall purpose of this brief is to provide policy and management recommendations for addressing and reducing the impacts of plastics on shallow water coral reefs, based on current scientific knowledge. In doing so, the brief will contribute to achieving the related global, national and regional goals and targets, including the Sustainable Development Goals (SDGs).

The brief promotes integrated planning and management, awareness-raising, and other efforts to improve and standardise the monitoring of plastics on reefs.

It is primarily aimed at national and state policy-makers. The supporting scientific evidence provides rationale for recommendations and more detailed information for government officials with technical roles, as well as regional environmental organisations and conservation organizations.

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EXECUTIVE SUMMARY

Hundreds of millions of people and industries worth billions of dollars depend on healthy shallow water reef ecosystems (UN Environment, 2018). Yet, anthropogenic stressors, including climate change and pollution, are threatening these fragile ecosystems. As a result, we are now seeing unprecedented levels of decline in reef health and coral cover across the globe.

Plastic, which makes up a sizable proportion of marine pollution, can now be found in all the world's oceans, but it is thought to be in highest concentration in coastal areas and reef environments where the vast majority of this litter originates from land-based sources.

Marine plastic litter pollution is already affecting more than 800 marine and coastal species through ingestion, entanglement and habitat change. With the additional impacts of climate change on coral reef ecosystems, the threat of plastics must be taken seriously.

However, there remains a significant lack of knowledge on the true impacts of plastics on the reef environment. This research identifies a number of knowledge gaps that are necessary to address in order to strengthen the scientific evidence base for action on marine plastics that impact coral reefs, and towards achievement of targets set by the global community.

WHAT WE KNOW

The issue of plastics in the marine environment has been recognised by scientists, governmental organisations, non-governmental organisations, private institutions and charities alike. It is recognized as a global priority, including in the 2030 Sustainable Development Agenda, under Sustainability Development Goal (SDG) 14 on conserving and using the oceans, seas and marine resources for sustainable development. Specifically, Target 14.1 is to prevent and significantly reduce marine pollution of all kinds by 2025, with indicator 14.1.1 including an index on floating plastic debris density.

THE SCALE

A landmark study by Jambeck et al. (2015a) calculated that approximately 275 million metric tonnes (MT) of plastic waste was generated by coastal countries, with 4.8 to 12.7 million MT entering the ocean. In the Asia-Pacific region alone, approximately 11.1 billion items of plastic are thought to be present in the shallow water reef environments and this is predicted to rise to more than 15.7 billion by 2025. In addition to the influx of plastics found around coastal areas, five major gyres (or aggregations of floating plastics) have now been identified across the world's oceans. However, a significant proportion of marine litter is unaccountable as estimates on the total amount of litter entering the marine ecosystem are one to three times the magnitude of that reported (Jambeck et al., 2015b).

THE SOURCE

Marine litter, due to its transboundary nature, is found in all the world's oceans and seas, threatening ecosystem health and causing substantial economic costs through its impacts on public health, tourism, shipping, fishing and aquaculture. The majority of marine litter is plastics (60-80%), predominantly from land-based sources through rivers and run-off. Tourism can be among the most significant sources of marine litter and unsurprisingly the most commonly encountered macroplastics in many reef environments are food and drink packages (Lamb et al., 2018). Other sources include direct dumping of solid waste into the ocean; abandoned, lost or discarded fishing gear, referred to as 'ghost gear'; and micro- or nano-plastics, which can include tyre dust, industrial pellets, paint chips, textile particles and cosmetic microbeads.

THE IMPACT

More than 800 species have had some form of encounter with marine litter, of which the majority is plastic. For example, every species of sea turtle has been documented to have been impacted, as well as 66% of marine mammals and 50% of seabirds. Trends over the past two decades have shown that instances of ingestion and entanglement of plastic debris has increased by 49% (Gall & Thompson, 2015). Recently, Lamb et al. (2018) demonstrated a link between macroplastic pollution and increased likelihood of coral disease, with the likelihood of disease rising from 4% to 89% when corals were in contact with plastics. However, across the current breadth of research globally, there remains major knowledge gaps as to the true scale and impact of plastic on reef organisms and the ecosystem as a whole.

WHAT WE NEED TO KNOW

Summary of knowledge gaps associated with reef ecosystems:

1. Understanding of the scale of mismanaged waste in relation to coral reef environments.
2. Understanding of the patterns of plastic pollution in and around coral reef environments.
3. Understanding of the impacts of leaching chemicals from plastics in coral reef environments.
4. Understanding of how, on a wider, more ecologically relevant scale plastics impact coral reef environments.
5. Understanding how macroplastics interact with and affect benthic invertebrates such as sponges and corals.
6. Quantification of the impact of ghost gear and its impact on coral reef communities.
7. Exploring the role of macro- and micro-plastics in transporting invasive epibionts and possible pathogenic agents on a global scale.
8. Measuring concentrations of microplastics across coral reef ecoregions to understand the scale of the issue in a standardised manner.
9. Exploring the level of risk microplastics have on reef organisms.
10. Exploring issues with the detection of microplastics in organisms and the surrounding environment
11. Assessing the quality of current assays used to assess microplastics and validate models for assessing the chance of false negatives and positives in plastic counts.

WHAT WE NEED TO DO

Closing the knowledge gaps highlighted above will allow us to understand the impacts of plastics on reef organisms and the ecosystem as a whole. However, even without this knowledge it remains clear that plastics are a major concern but one which can be addressed. Namely the restriction or elimination of single use plastics on a global scale would have a considerable and measurable impact on the amount of plastics which reach reefs.

This report identifies detrimental impacts of marine plastic litter on shallow water coral reef ecosystems and organisms. In response to these threats, the following recommendations are made in order to advance action on marine litter and SDG Target 14.1, especially in relation to the sustainable management of coral reef ecosystems:

1. *Strengthen partnerships to eliminate marine litter and plastic pollution*

Governments, civil society and private sector actors are encouraged to join the Global Partnership on Marine Litter and engage with the partnership to develop plans and targets for reduction of waste that may enter coral reef areas.

2. *Strengthen national planning to address land-based sources of plastic litter on coral reefs*

Countries with coral reefs should develop or revise national action plans and local mitigation measures, based on strategic assessments that identify key sources, pathways and impacts of plastics on reefs; identify and manage major local sources of plastic pollution; apply bans on harmful single-use plastics on beaches close to coral reefs; work with key plastic-producing industries to implement liability and compensation schemes based on polluter-pays mechanisms; and address consumer demand to ensure lasting impact.

3. Reduce the impact of marine litter from aquaculture, lost and abandoned fishing gear on coral reefs

Develop and apply regional regulations and guidelines on eliminating or reducing lost and abandoned fishing gear from entering the ocean on or around coral reefs, through relevant regional organizations such as Regional Fisheries Management Organizations and Regional Seas Conventions and Action Plans, in close consultation with fishing industries and communities.

4. Invest in monitoring and research

Financial investment by governments and other entities, and efforts by academic and research institutions is required, in particular, to:

- i. Understand the status and magnitude of marine litter on coral reef ecosystems;
- ii. Understand the impact of plastics on coral reef species and ecosystems;
- iii. Understand the potential societal and economic impacts of plastics on coral reefs;
- iv. And improve data collection and information to address these knowledge gaps.



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