



Australia's National
Science Agency

Marine Debris FAQs



What does the CSIRO marine debris team do to study and help solve the plastic pollution crisis?

Our team is involved in collecting and understanding information about the sources, sinks and hotspots of plastic around the world, by:

- Identifying trends in plastic pollution through time and space.
- Writing reports and articles in peer-reviewed scientific journals to communicate our findings.
- Developing new technologies to address key problems that we identify.
- Presenting at meetings and conferences around the world to share our experience on science-based solutions to plastic pollution issues.



Members of the CSIRO Marine Debris Team conducting a beach transect survey

Our team works with partnering organizations across numerous projects, identifying problem items and collaborating for potential solutions.

How does plastic enter the ocean?

Plastic in the ocean comes from a lot of different sources, stemming from land or marine based activities:

Land-based activities:

- These are responsible for most of the plastic entering our ocean.
- Plastic waste from cities and towns often enters storm-water systems and is flushed into creeks and rivers by the wind and rain, eventually ending up in the ocean.
- No single country, city or region is responsible for this plastic issue – however, areas with high population densities and lower socio-economic backgrounds are typically the greatest sources.

Waste Collection

Does someone come on a regular basis to collect your household waste for managed disposal? Some places have services such as rubbish bins and waste collectors that are maintained by their city, while other places do not have this option. In places without these services, it is difficult for people to properly dispose of plastic (and other waste), and there tend to be higher rates of mismanaged waste.

Not all types of rubbish are transported from land to the ocean:

- Items that sink tend to stay close to where they were lost and will sink to the bottom if deposited directly into a water.
- Items that are light and that tend to float, can be blown by the wind and they are consequently more likely to be washed into rivers and finally reach the sea. To find out about which plastic items sink or swim in rivers and the ocean, click [here](#).

Most of the plastic that enters the ocean this way is estimated to be transported by 1000 major rivers worldwide.



Scientists estimate that for every three pieces of floating plastic that enter the ocean from land, two pieces wash back onto the coast, while one gets washed far out to sea.

To discover more about what CSIRO is doing to understand how plastic is transported by rivers, and what we can do to reduce plastic, click [here](#).

Marine-based activities:

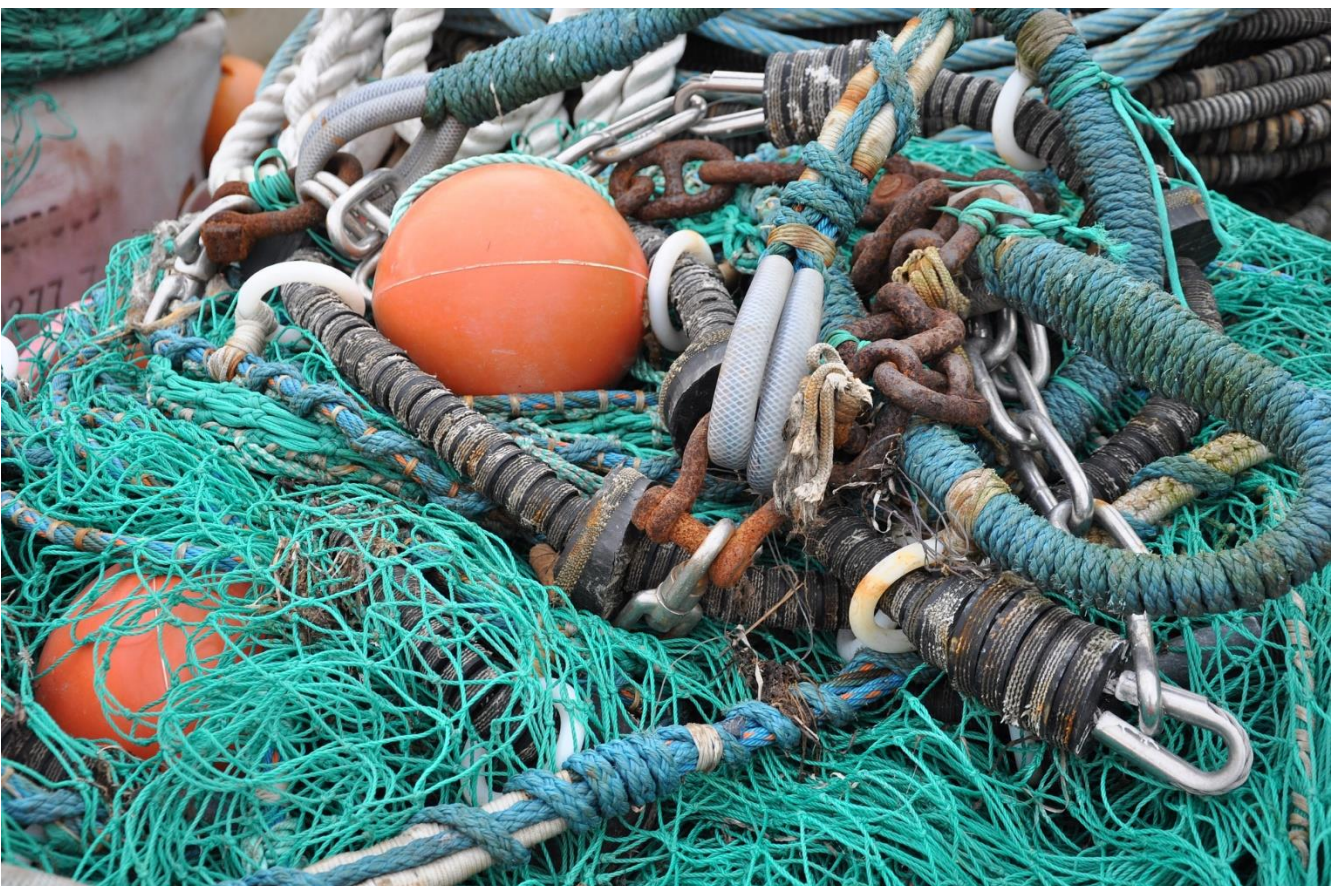
- Another major plastic source originates from people disposing of or losing plastic at sea.
- Fishing-related waste such as floats, nets, ropes, traps, and ship-board disposables (i.e., glow sticks and PPE) are commonly discovered marine plastics.
- Plastic can also come from ships disposing their waste at sea, and the loss of containers during shipping.

Ghost Nets as Marine Debris

These lost and abandoned fishing nets are often called '*ghost nets*,' because they can continue fishing for and killing marine animals for many years after they are lost. Ghost fishing nets are particularly a problem in Northern Australia, where ghost nets kill an estimated 136,000 sea mammals per year.

For more information about how much fishing gear is lost at sea, click [here](#).

Interested about ghost fishing in Northern Australia? Click [here](#).



Picture of a Ghost Nest as a Marine Debris

How much plastic is in the ocean?

Given how large the ocean is, this is something difficult to count, and no one knows exactly how much plastic is in the ocean- but we do know that it is spread from the sea surface, through the water column, to the seafloor. In order to estimate how much plastic is in the oceans, scientists will often count how much plastic is in small areas of ocean, and then use this information to model how much plastic there is likely to be in other areas with similar characteristics.

- Scientists estimate that there are more than 5 trillion plastic pieces weighing over 250,000 tonnes floating at sea, and about 14 million tonnes of plastic on the seafloor.
- Lots of plastic is floating in the water column (between the surface and the sea-floor), but we do not know exactly how much! It is very difficult to measure due to the size of the ocean.
- More rubbish enters daily now than ever; scientists estimate that 19 to 23 million tons (11%) of plastic waste generated globally in 2016 entered aquatic ecosystems.



Photo of rubbish collected during a clean up

See [here](#) for more information about plastic near the coast and in the ocean.

For more information about plastic in the water column, see [here](#).

To read more about plastic on the seafloor, see [here](#).

What types of plastic are in the ocean and where do they come from?

It depends on where you look! Different types of plastic accumulate in different parts of the ocean.

For example, in the Great Pacific Garbage Patch; most of the plastic consists of fishing nets and floating fragments of hard plastic (i.e., floats and fishing basket debris). Fishing nets are much bigger and weigh more than these hard plastics, but they are outnumbered by other pieces of plastic fragments. Fishing debris are collected in remote seas, far from land, because this is where many fisheries are located. However, other floating plastics travel here with wind and water currents. Floating plastic pieces, foamed items such as polystyrene and rubbers, or containers with trapped air, are easily transported by blowing wind. They can float at sea for decades or be deposited on remote islands far from where they were originally deposited.



Photo of litter on the sea floor

Near to the coast, the type of plastic that is most numerous depends on what types of things are common; for example, if there is a lot of restaurants, there tends to be a lot of take-out packaging, or, if lots of people smoke, there tends to be a lot of cigarette butts. For larger items, single-use plastics such as bags, bottles, and food wrappers constitute most of the trash items near the coastlines.

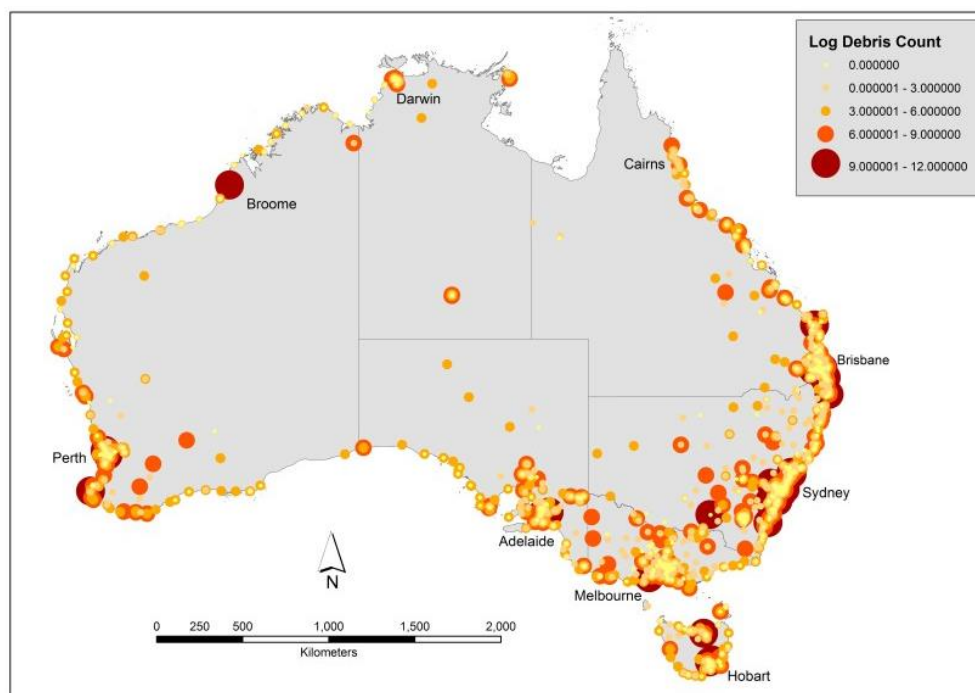
For more information about plastic hotspots across the world, see [here](#).

Where does the plastic on Australian beaches come from?

Plastic on the beach in Australia comes from a few sources, such as:

- people littering on the beach,
- litter blowing from nearby urban areas,
- washing onto the beach from nearby waterways,
- some is transported a long distance through the open ocean.

Some litter is transported more easily than others. For example, glass and metal does not easily travel and is usually found only a short distance from where it was dropped. Plastic bags and wrappers are light and easily transported by wind and water, but also are easily snagged, and often travel only short distances from their origin. Buoyant hard plastic, sealed containers such as plastic bottles, and foams, can travel very long distances. There is a myth that most of the plastic on Australia's beaches come from overseas, however, the data does not support this. Though it can be difficult to determinate the exact origin of plastic found on the beach, larger items often have original labelling or a barcode. Most identifiable debris in our country tends to be local at most Australian sites, however, small fragments are especially difficult to find the origin of.



Map of debris hotspots, note the higher debris loads in urban cities around Australia's coastline. Data are reported as the log base 10 of the total amounts of debris per 1000 m². For the full CSIRO report, see [here](#).

For more information about how different types of plastic are transported, click [here](#).

To read more information about plastic on Australia's beaches, see [here](#).

Why can't we just clean up the plastic in the ocean?

The problem with cleaning up ocean plastic is that the ocean is so big and so deep that plastics are too numerous (trillions of items) and too widely spread out to effectively clean up. Even in the most plastic-dense areas of the ocean, the items are still very dispersed.

- Though some organisations have clever ideas to clean up ocean rubbish patches with ships, these are very expensive to run relative to the amount of plastic that they manage to collect.
- The rate that new plastic enters the ocean exceeds any viable (physically and financially) methods to remove the plastic that has already accumulated, with our current technology and resources.
- Much of the plastic that enters the environment becomes washed on beaches, and volunteer beach cleaning programs are a way that people can directly help remove plastic from their local area.

However, preventing more plastic entering the ocean in the first place is more likely to have a bigger impact, currently, than removing the plastic at sea.

What is Australia doing to tackle plastic pollution and is it working?

Australia has been taking some big steps in our effort to reduce plastic pollution. We are fortunate enough to have access to the funding and support in this country that not only allows us to design and image solutions, but to share these solutions with other countries. Here are some of the things Australia is doing to tackle plastic pollution:

- Introducing policies that target specific types of waste, such as plastic shopping bags or plastic straws.
- Campaigns that promote people to pick up litter while educating them on proper disposal methods, such as Clean Up Australia Day.
- Introducing container deposit schemes that remove waste by adding a dollar value to items.
- Research is key which is looking at all aspects of plastic pollution; from identifying the most 'at risk' areas to pollute, to creating models that can identify plastic in waterways and track the type of plastics that are commonly entering the ocean.

This cross-disciplinary and collaborative effort does seem to be working. Recent work by CSIRO's own Kathryn Willis, Britta Denise Hardesty and colleagues found that there has been an average reduction in coastal litter of 29% in the last 6 years. Go Australia!

To see more about this reduction in coastal litter, see their paper [here](#).

To learn more about how successful waste campaigns are at reducing waste, see this [paper](#).

For more information about container deposit schemes, see [here](#).

How does plastic harm sea animals such as sea turtles, whales, dolphins, and sea birds?

There are numerous impacts of plastic pollution on wildlife.

- Animals can become entangled in ropes and fishing nets, causing debilitation, death, and drowning.
- They can eat the plastics, which can cause blockages and perforations of the gut, resulting in sickness and death.
- Scientists are only just looking into the complications occurring on a micro- and nanoscopic level when animals eat plastic, as plastic can break down into infinitely smaller pieces within the gut.
- These small pieces, called 'nano plastics', can travel around the body, and have been shown to cross important barriers like the blood-brain barrier and placental wall.
- This presence of plastics within the body is not just restricted to animals either – humans are very much at risk.



Photo of a sea bird surrounded by plastic

More than 900 large marine animal species are recorded interacting with marine litter, and the numbers of fish and smaller animals, such as marine invertebrates, zooplankton and phytoplankton are not well known.

To see more about plastic harms sea turtles when they eat it, click [here](#).

For more in-depth information about what happens when seabirds eat plastic, see this [paper](#).

To learn more about how ghost nets entangle sea turtles and other animals, see [here](#).

How much plastic is in the deeper ocean?

Unfortunately, the distribution of our plastic pollution extends beyond the surface ocean and coastal areas. Plastics can either sink, or be carried away by underwater currents, eventually settling on or becoming caught in sediment or rocks on the seafloor. These plastics can be thousands of metres from the surface and are slowly buried by the multitude of life that occurs above – producing organic matter called ‘marine snow,’ as well as ambient sediment input.

- Surface plastics represents a mere 1% of the total ocean plastic
- It is conservatively estimated that 14 million tonnes of microplastic reside on the ocean floor
- Nowhere is safe – plastic bags have been found at 10,898 metres deep in the Mariana Trench



Marine trash recorded at 10898 metres deep in the Mariana Trench, 1998. Source: JAMSTEC Deep-sea Debris Database

Click [here](#) for JAMSTEC’s image galley of deep-sea plastics.

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