Climate impacts of plastic consumption in Australia

Summary Report

Australian Marine Conservation Society

WWF AUSTRALIA

Summary of findings and policy briefing.

Based on the report *Carbon emissions assessment of Australian plastics consumption*, prepared for AMCS and WWF-Australia by Blue Environment.

About the Australian Marine Conservation Society (AMCS)

The Australian Marine Conservation Society (AMCS) is Australia's peak ocean conservation organisation. We are an independent charity staffed by a committed group of scientists, educators and passionate advocates, who have defended Australia's oceans since 1965. Our paid and volunteer staff work every day to advance evidence based solutions for threats to our marine wildlife, protecting critical ocean ecosystems such as Ningaloo and the Great Barrier Reef, and preventing destructive practices such as whaling and supertrawlers from harming our endangered species.

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About the Worldwide Fund for Nature – Australia (WWF-Australia)

WWF-Australia is one of Australia's largest and most trusted environment organisations. We work with more than two million financial and non-financial supporters to save species and protect the places we love. WWF-Australia is part of the WWF International Network, the world's largest independent conservation organisation, operating in more than 100 countries worldwide. Our global mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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About Blue Environment

Founded in 2006 and specialising in strategic environmental consulting, Blue Environment is one of Australia's most experienced teams of specialists in materials impacts analysis, waste management, resource efficiency, strategy and policy. Our clients include Sustainability Victoria, DELWP, EPA Victoria, Infrastructure Victoria, the Department of Agriculture, Water and the Environment, various waste and resource recovery groups, private industries and many others.

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Published: July 2023

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Skyrocketing levels of plastic consumption are not just polluting our oceans, but also contributing to global warming, posing a significant threat to ecosystems and wildlife.

While the extent and impact of plastic pollution in Australia is relatively well documented, the potential climate impacts of plastic production, consumption and waste management have barely been explored.

To investigate the link between plastics and climate change, the AMCS and WWF-Australia commissioned Blue Environment to model the greenhouse gas emissions resulting from plastics consumption in Australia, and the impact of different policy approaches to reduce plastic emissions.

This is the first research into the hidden climate cost of Australia's plastics addiction.

Our modelling found that in 2020:

- **Australia's plastics use produced more than 16 million metric tonnes of greenhouse gas emissions (GHG) in 2020**, taking into account emissions from production and waste management such as recycling or landfill.
- This is equal to the emissions from around 5.7 million cars on the road every year.
- If we continue on our current path, Australia's plastic consumption and **plastic-related emissions are expected to more than double by 2050.**

The good news is that by transitioning to a truly circular economy, Australia can reduce waste, pollution and plastic-related greenhouse gas emissions at the same time.

The solutions are clear.

We need to:

- cut total plastic consumption by at least 10%
- rapidly increase plastic recovery and recycling,
- fully power recycling and transportation with renewable energy, and
- move away from virgin fossil-fuel based plastic entirely.

These actions would reduce the total emissions of Australia's plastic consumption by more than 70% by 2050, compared with a business-as-usual scenario. AMCS and WWF-Australia advocate a more ambitious, evidence-based target for consumption reduction.[1]

This study aims to support evidence-based decision making to reduce plastic consumption, waste and pollution in Australia. It comes at a pivotal time, as UN member states negotiate a treaty to end plastic pollution; and as Australia's state, territory and federal governments make critical decisions about plastic regulation, waste management investment and the elimination of problematic plastics.

Rising plastic use is a threat to climate and wildlife

Plastic pollution presents a major threat to our ecosystems and wildlife. Often used once and thrown away, plastic can last for hundreds of years without completely degrading,[2] posing serious entanglement and ingestion risks to wildlife. Globally, more than 2,000 species have encountered plastic pollution in their natural environment.[3] Research suggests more than half of all sea turtles have ingested plastic,[4] and by 2050, 95% of seabird species will likely be affected.[5]

However, the climate impacts of Australia's plastic addiction have not been known – until now.

Most of the plastic used in Australia is derived from fossil fuels (oil and gas).

The extraction and conversion of fuels to turn them into plastic result in significant greenhouse gas emissions. Globally, around half of the plastic we consume is designed to be used once then thrown away,[6] with further GHG emissions resulting from disposal methods.

The Center for International Environmental Law estimates plastics could account for up to 15% of the world's carbon budget by 2050 if decisive action is not taken.[7] The Minderoo Foundation puts global emissions from single-use plastics at around ~450 million metric tons in 2021 – equivalent to the total annual GHG emissions of the United Kingdom.[8]

While Australia doesn't make a lot of plastic - 87% of the plastic we use is imported[9] - we generate more single-use plastic waste per person than any other country except Singapore.[10] Once used, we send most plastic to landfill, with around 13% recovered for recycling (2020-21).[11] Our analysis shows that the policy decisions made about the amount, type and disposal of plastic have far reaching consequences for climate, human health and our wildlife.

Global Warming Potential 20 vs 100 years

While emissions studies have historically been modelled on the basis of global warming potential (GWP) over 100 years, this does not account for the acute short-term impacts of methane which persists for a relatively short timeframe in the atmosphere (around 12 years, compared with 100 years for carbon dioxide). In this study we have used a 20 year GWP to show the true global warming impact of plastics.

Emissions from Australia's plastics consumption

In this study, we modelled the emissions caused by the production and end-of-life waste management of plastics consumed in Australia in the 2019-20 financial year.

To do this, we examined the five most commonly used polymers (types of plastics). These were then used to estimate the total carbon footprint of all plastic consumption in Australia.

Plastic emissions higher than previously estimated

Historically, plastics have been promoted as less greenhouse gas intensive than other materials. But there is growing evidence that emissions associated with plastic are likely to be much higher than previously estimated, due to increased use of gas in production and disposal of plastic.[12]

Recent research indicates that methane emissions from gas extraction is 25-40% higher than estimates commonly used in life cycle assessments and comparisons.[13]

As a greenhouse gas, methane is up to 83 times more potent than carbon dioxide over 20 years.[14] With fossil gas increasingly used to make plastics this has significant implications for emissions impacts of plastics consumption.

Polymers included in the study

Polymers are the substances used to make plastic products and components. The study modelled emissions for the following polymers:

Polyethylene terephthalate (PET)
commonly used to make single-use beverage bottles.

High density polyethylene (HDPE)
commonly used to make bottles for cleaning products, milk bottles, etc.

Polyvinyl chloride (PVC)
commonly used in construction and in clothing.

Polypropylene (PP)
commonly used in packaging.

Polylactic acid (PLA)
commonly used in packaging as an alternative to fossil plastics.

Emissions factors for other polymers (i.e. Low-density polyethylene (LDPE), Polystyrene (PS) & Expanded Polystyrene (EPS)) have been estimated based on the closest modelled polymer type.

Emissions from plastic production

This research modelled and compared the emissions intensity of different methods for producing plastic, including the emissions associated with the extraction of the fossil fuels used to make most virgin plastics.

Based on this data, future policy approaches to plastic emissions reduction should have a significant focus on reducing or avoiding virgin fossil fuel derived plastics.

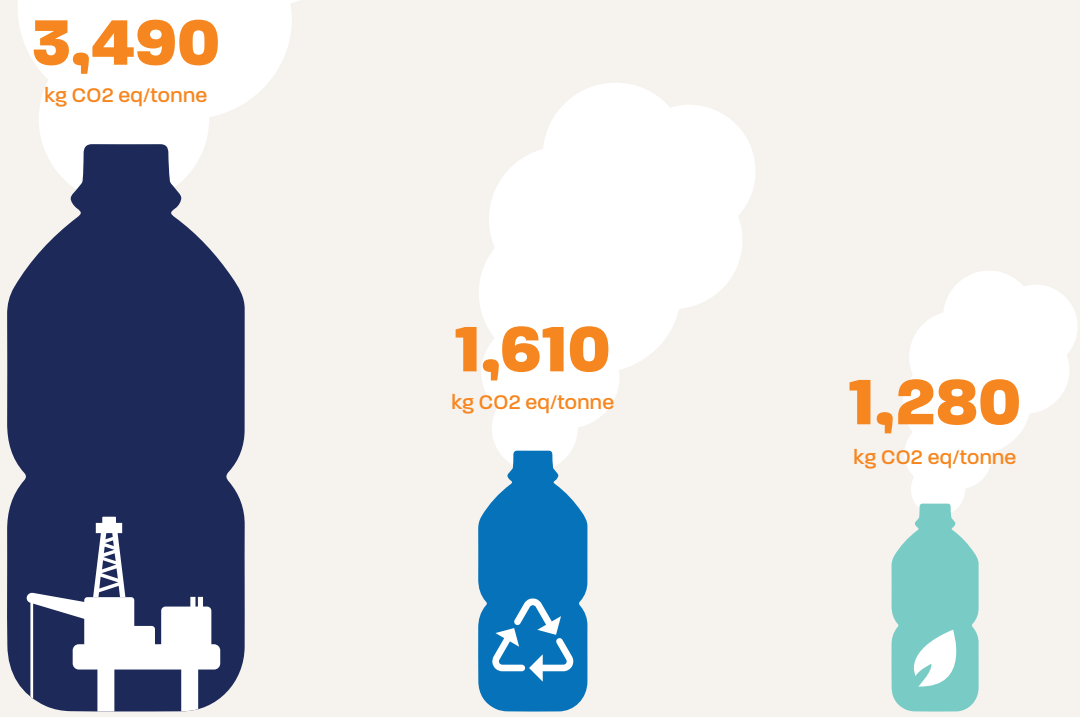
Based on our modelling, over a 20 year time frame:

Virgin fossil plastic is
2.2x
more emissions intensive than mechanically recycled plastic

Virgin fossil plastic is
2.7x
more emissions intensive than plant based plastic

Figure 1: Average emissions of plastic production methods

(GWP 20 year basis)



Emissions from waste management and recycling

The method of producing plastic matters, but what happens to it afterwards is also critical. To accurately estimate emissions produced over the plastic 'lifecycle', the study also modelled impacts of different waste management methods, including recycling, landfill and incineration.

Based on our modelling, over a 20 year time frame:

- **Chemical recycling** is 67% more emissions intensive than mechanical recycling
- **Incineration and waste-to-energy** are the most emissions intensive disposal methods for plastic

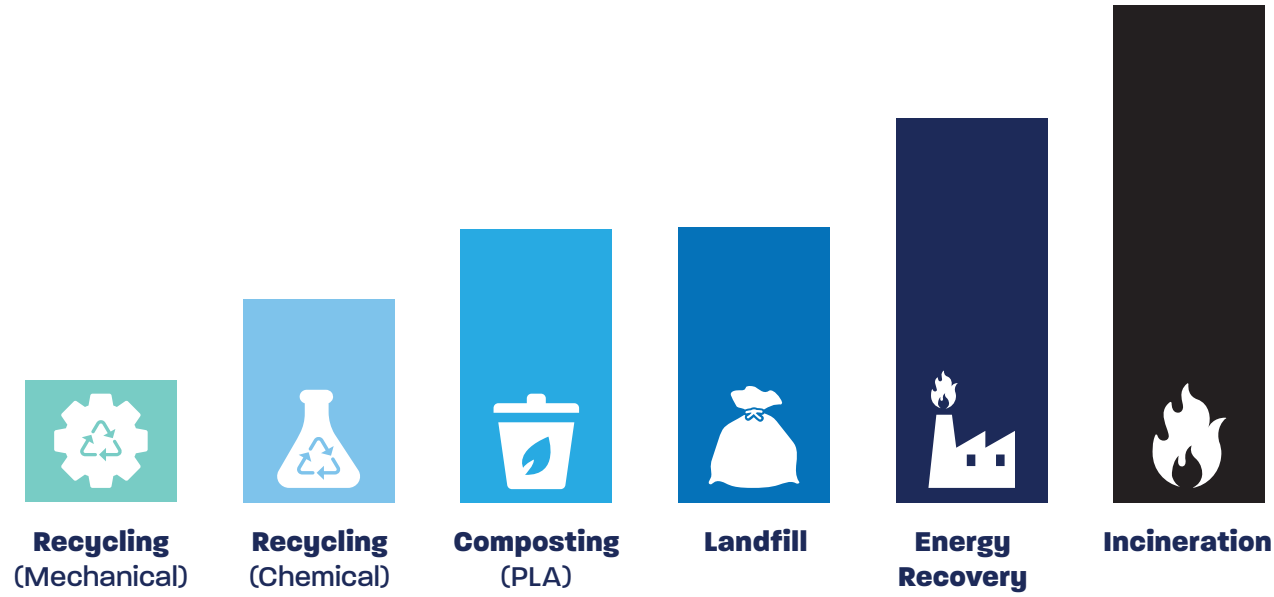
The study shows there is danger in rushing to adopt technological 'solutions' such as waste-to-energy conversion or chemical recycling. While many are keen to adopt chemical recycling as a 'silver bullet' for hard-to-recycle plastics such as soft plastics, its high emissions profile is not consistent with global decarbonisation efforts.

While this study models the emissions associated with using chemical recycling to create new plastics, in Australia it is likely to be used for the production of liquid fossil fuels for the foreseeable future. As such, emissions associated would be even higher than those modelled in this research.

Similarly, while energy recovery (using waste to generate energy) has been promoted by some as a sustainable waste management method, it is not compatible with either an emissions reduction or waste hierarchy-informed approach.

Figure 2: Average emissions of plastic waste management approaches

(GWP 20 year basis)



kg C02 equivalent per tonne of plastic

Policies to reduce plastic-related emissions

If we continue on our current path, plastic consumption and related emissions will more than double by 2050.

Even if we achieved a 50% recycling rate, emissions reduction resulting from increased recycling will be outpaced by growth in plastic consumption.

This study shows that the most impactful action to simultaneously address plastic waste and greenhouse emissions is to reduce plastic consumption, while also increasing recycling and powering it with renewable energy.

Reducing the use of plastic is vital.
Other policy interventions will have limited or no effect on plastic-related greenhouse gas emissions, if plastic consumption continues to rise linked with population growth.

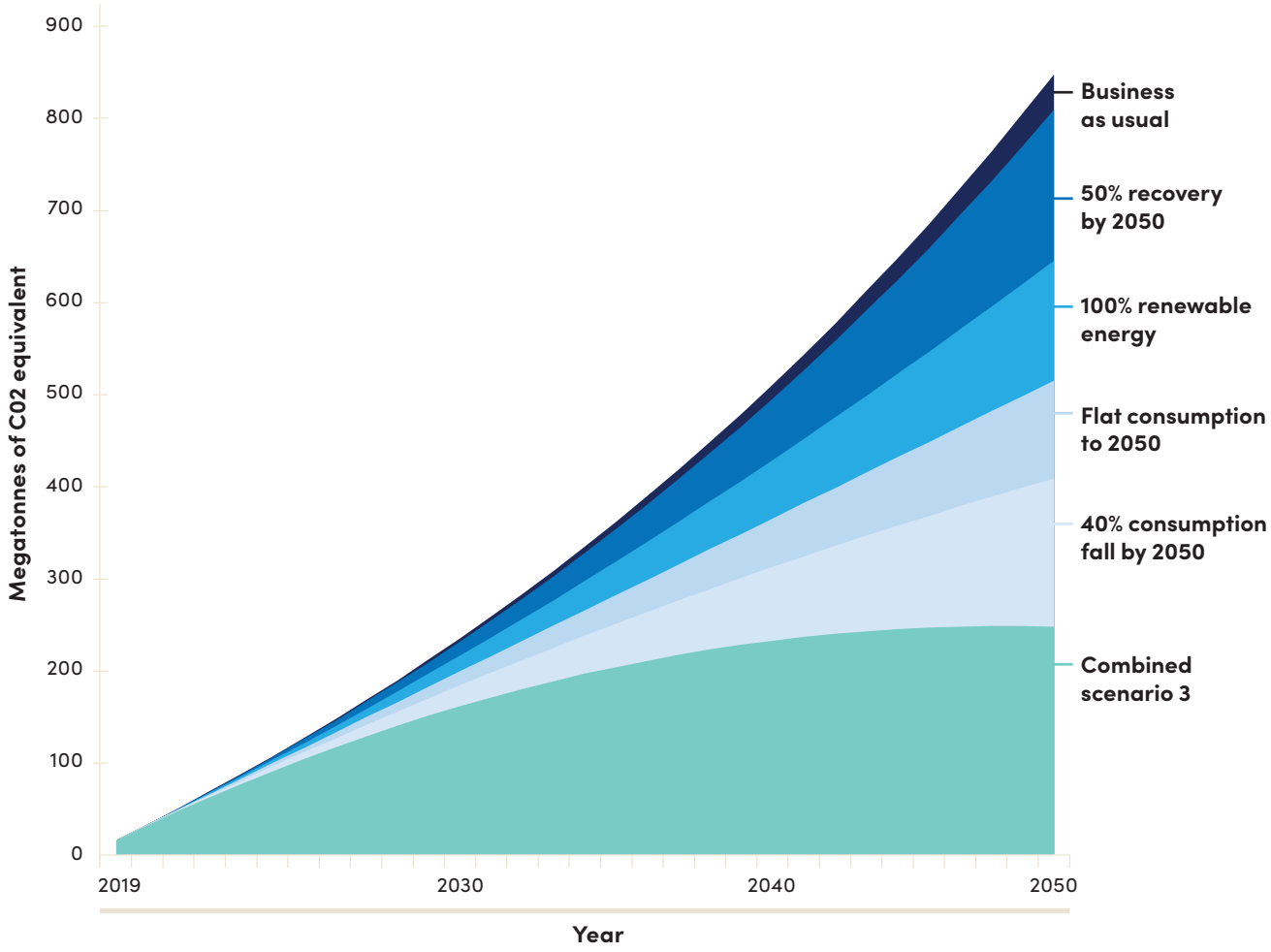
Our research modelled 10%, 40% and 60% consumption reductions of polymers studied by 2050. For context, recent research states 'it is socially, technically, and economically feasible to reduce plastic consumption by 30 per cent by 2040 compared to BAU … before considering switching to single-use substitute materials'. Emissions from other materials were not modelled in this study.

Modelled policy scenarios

To inform policy development efforts, our research modelled the impact of different policies on plastic-related emissions, compared with business-as-usual. We considered five groups of policy settings:

Business as usual	Plastic consumption continues to rise in line with existing trends and population increases. End-of-life fates (recycling, landfill, pollution) do not change significantly.
Reduced consumption scenario	Australia reduces the total amount of plastic we use by 10%, 40% or 60% compared with 2019/20 levels. This would see Australia return to levels of consumption comparable with 2000-2010.
Increased recycling scenario	Compared with current plastic recovery rate of 14%,[15] Australia increases its plastic recycling rate to 50% or 100%. This scenario assumes 75% mechanical recycling and 25% chemical recycling.
Renewable energy scenario	Energy supply for plastic production, transport and waste management/ recycling is from 100% renewable sources.
Combined scenario	The cumulative effect of reducing plastic consumption, increasing recycling and using 100% renewable energy. This can be considered part of the transition to a circular economy for plastics in Australia.

Figure 3: Annual accumulated emissions under modelled policy scenarios



This figure shows six of the eleven policy scenarios modelled, to illustrate impact across the various scenario categories. The impact of all 11 scenarios modelled can be found in the full report.

Policy recommendations

In striving to cut greenhouse gas emissions and reduce future global warming, Australia has an obligation to consider the greenhouse impacts of all of the plastics we import, consume and dispose of.

Meaningful emissions savings can be achieved by reducing plastic use, adopting reusable systems and products, and switching to alternative materials where necessary.

Building a more circular economy for plastics is not just critical for emissions reduction, but also helps to reduce ocean plastic pollution. By using less plastic and keeping it in the economy for as long as possible, we can reduce the risk of plastic leakage into the environment. Research shows that policies that put a value on plastic, and provide a safe pathway for managing it, help to reduce plastic pollution.[16]

Based on the findings, AMCS and WWF-Australia recommend that Australia's federal, state and territory governments take action to:

1 **Reduce plastic production dramatically within the next 10 years**, through a combination of approaches such as increasing reuse systems, banning single-use plastics, and extended producer responsibility approaches.

2 **Rapidly transition away from the use of virgin fossil fuel based plastic**, using substitutes such as plant-based, recycled or CO2-based plastic. This would require investment in the infrastructure needed to manage these plastics.

3 **Shift to a 100% renewable energy system for both stationary energy and transport**, and electrify plastics production, product manufacture, product use and product end-of-life management.

4 **Maximise recycling when products are no longer reusable or repairable**, with a strong preference for mechanical recycling where feasible.

5 **Avoid management of plastics via incineration (including energy recovery)**, which in a future state with an otherwise fully renewable energy system, will be much more emissions intensive compared with other management options.

6 **Support comprehensive and robust global regulation to reduce plastic consumption** and transition to a safe circular economy for plastics, through a new international agreement to end plastic pollution.

This approach balances the need to reduce emissions with the imperative to rapidly transition to a circular economy that follows waste hierarchy principles, resulting in less plastic in our oceans and a safer climate for future generations.

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Acknowledgements

This research was supported by the James N. Kirby Foundation, the Bunderra Foundation, and Twynam Investments.

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