Submission to Inquiry into plastic pollution in Australia's oceans and waterways

Yarra Riverkeeper Association

9 December 2022

About the Yarra Riverkeeper Association

Founded in 2005, the Yarra Riverkeeper Association (YRKA) is a values-driven community-based organisation that works with communities, Traditional Owners, governments (local, state, and federal), statutory authorities, and businesses to advocate for the health of the whole river. We are a not-for-profit organisation with a paid staff and volunteer Board. We are independent of the government and transparent in our decision-making.

Our vision is a healthy, protected and loved Yarra, Birrarung River and all her tributaries. We seek to understand and partner with Traditional Owners to re-energise the river ecologically and culturally, bringing back biodiversity and health. Every day we work to make this possible, through vibrant advocacy, education, community engagement, on-the-ground litter and regeneration programs, and fundraising.

As Melbourne's population grows and the climate crisis worsens, the Yarra, Birrarung is coming under increasing environmental pressure, pollution, and habitat fragmentation affecting biodiversity and health. Riverkeepers are vital to keeping the Yarra, Birrarung healthy.

The Yarra Riverkeeper Association has been researching plastics pollution for the past four years. Recently, we embarked on a third phase of research (funded by the Victorian Department of Environment, Land, Water and Planning) to engage industry stakeholders in the prevention of polystyrene pollution in Melbourne's urban rivers, including the Yarra,Birrarung and Maribyrnong, Mirrangbamurn. The first phase of the project researched and documented where and how expanded polystyrene (EPS) pollution occurs in the Yarra, Birrarung River and the second phase quantified the amount of EPS in the Yarra, Birrarung River and relative contribution from five top industry sources. Findings from Phase 1 and Phase 2 are available on the YRKA's website.

The Yarra Riverkeeper Association welcomes the opportunity to share information from our research of the impacts of plastics in inland waterways. The submission contains:

1. Evidence and recommendations on the environmental impacts of plastic pollution particularly in oceans and waterways (ToR of the Inquiry) with an emphasis on polystyrene;
2. Evidence and recommendations on the effectiveness of Australia's plastics management framework under the National Plastics Plan and related policies to reduce plastic pollution particularly in oceans and waterways (ToR of the Inquiry) with an emphasis on polystyrene. This evidence is accompanied by recommendations to improve the effectiveness of plastic waste management.

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1. THE ENVIRONMENTAL IMPACTS OF PLASTIC POLLUTION PARTICULARLY IN OCEANS AND WATERWAYS

Waterways, such as rivers, act as a major transport pathway for all sizes and types of litter. High plastic litter loads in rivers, including both macro and microplastics, are due to high levels of mismanaged plastic waste in population-rich river catchments.

1.1. Scale and nature of plastic pollution: Examples: Port Phillip Bay, Victoria

The 2021 State of Marine and Coastal Environment Report for Victoria estimates the number of litter items and microplastics flowing into Port Phillip Bay from the Yarra and Maribyrnong Rivers annually at more than 2.5 billion. The report documents an increasing trend in the amount of litter on both the Maribyrnong and the Yarra.[1] The State of the Yarra 2019 report had already identified litter as a key threat to our waterways and highlights an increasing trend in litter volumes along the river corridor. Through YRKA's Litter and Flows and the Yarra River Blitz projects, it was identified that polystyrene, especially expanded polystyrene (EPS), is the most prevalent and pervasive litter item in the Yarra River. Since April 2018 and following seven Blitz events approximately 38,000 kg of polystyrene contaminated soil and general waste have been removed from the Yarra's riverbanks and reedbeds. [2]

1.2. Organism injury and plastic ingestion

Based on the evidence of the widespread presence of plastics, it is highly likely that organisms in freshwater ecosystems will encounter macro and microplastic particles. Depending on the particle size and the physiological and behavioural traits of the organism, there is an opportunity for injury and/or ingestion of these items by invertebrates and vertebrates.

Plastic related injuries are widely documented with fishnet entanglement the most common form of injury in marine wildlife. In freshwater systems, wildlife entanglement has been observed in abandoned fishing gear such as nets and lines, plastic bags, packing straps, ropes, clothing gear, and six-pack rings. During surveys on the Yarra River over the course of the Litter and Flows project, staff came across a number of plastic related injuries. These included a flying fox trapped entangled in fishing line adjacent to the river, a pacific black duck with a hair tie wrapped around its beak and a seagull chick trapped in a bandalong litter trap. Entanglement can cause restricted mobility, scoliosis, starvation, smothering and wounding, which in turns leads to infections, amputation of limbs, and death. Entanglement can also reduce the ability to avoid predators.

Plastic ingestion has been widely documented in many marine species. Worldwide, at least 690 marine species have encountered plastic pollution, many of which are listed as threatened species (Gall and Thompson, 2015).[3] Although plastic is largely excreted following ingestion, there is evidence to suggest that microplastics can be retained in the gut over

1 Commissioner for Environmental Sustainability Victoria, State of the Marine and Coastal Environment 2021 Report

2 Yarra Riverkeeper Association, Polystyrene Pollution in the Yarra River: Sources and Solutions, Feb 2020
https://yarrariver.org.au/wp-content/uploads/2020/08/42-Polystyrene-Pollution-in-the-Yarra-River-single-lowres.pdf

3 For details of bracketed references in sections 1.2 - 1.4 , please refer to bibliography of report in Footnote 4.

timescales beyond those expected for other ingested matter (Browne et al., 2008). Further, there is evidence that particles can even cross the gut wall and be translocated to other body tissues, with unknown consequences (Browne et al., 2008; Horton et al., 2017). Given the similarity of some phyla that are commonly found in freshwater and marine ecosystems (e.g. nematodes, annelids, molluscs, arthropods), similar findings of ingestion in species in riverine ecosystems are almost inevitable.

Since many of these species, likely to take up microplastics, are important to ecosystems, ecosystem processes such as decomposition and nutrient cycling may be affected by microplastic exposure (Horton et al., 2017). Further, there is the potential for food web effects either through effects on keystone species or possibly through the trophic transfer of microplastics themselves (Horton et al., 2017).[4]

1.3. Observed toxicological effects of microplastics

Ingestion of microplastic particles by marine invertebrates has been linked with a wide range of sub-lethal effects including reduced reproduction, reduced growth of individuals and reduced fitness. These are generally the result of the physical effects of ingested microplastics including internal damage such as lacerations, inflammatory responses and plastic particles replacing digestible food, causing individuals to reduce feeding hence resulting in lower energy intake, although effects vary between species and plastic types (Moore, 2008; Wright et al., 2013). While there are fewer studies conducted to date with freshwater species, the studies that have been conducted generally confirm the potential for microplastics to have detrimental effects on the physiology of species across many ecological niches (Eerkes- Medrano et al., 2015, Horton et al., 2017). Furthermore, plastics adsorb (attract as an exterior film) organic micro-pollutants or persistent organic pollutants (POPs), which include polychlorinated biphenyls (PCBs), Dichlorodiphenyldichloroethylene (DDE) and nonylphenol (Teuten et al., 2009). This may be especially significant in freshwater environments, where concentrations of these chemicals are expected to be higher than in marine systems, due to proximity to the use of these chemicals (Dris et al., 2015).

Mato et al. (2001) documented 100,000 to one million times higher concentrations of polychlorinated biphenyls (PCBs) and dichlorodiphenyldichloroethylene (DDE), both classified as toxic chemicals, in polypropylene pieces from the sea than in the surrounding water. The ingestion of these toxic chemicals is known to affect the physiology and behaviour of organisms, which ultimately affects population stability, as shown by reproductive dysfunctions caused by PCBs in orca and dolphin populations in Europe (Jepson, 2016). Furthermore, these chemicals bioaccumulate and biomagnify up the food chain. This increasing concentration of toxic chemicals in the tissues of organisms at successively higher levels in a food chain has been linked to disease and death in several top predators (Gall and Thompson, 2015). [5]

1.4. Microplastics as a chemical hazard

4 Yarra Riverkeeper Association, Litter and Flows Report, Jan 2020

https://yarrariver.org.au/wp-content/uploads/2020/09/litter-and-flows-Final-single-lowres.pdf

5 Ibid.

Plastic materials often contain a wide range of plasticiser chemicals to give them specific physical properties such as elasticity, rigidity, UV stability, flame retardants and colourings. Many of the chemicals associated with plastics have been identified as either toxic or endocrine disruptors, including bisphenol-A, phthalates such as di-n-butyl phthalate and di-(2-ethylhexyl) phthalate, polybrominated diphenyl ethers (PBDEs) and metals used as colourings (Lithner et al., 2009; Teuten et al., 2009). Additive chemicals like these are weakly bound, or not bound at all to the polymer molecule and as such these chemicals will leach out of the plastic over time. Such releases can be facilitated in environments where particle dispersal is limited and where plastics will experience UV degradation and high temperatures (Horton et al 2017).

The locations where microplastics may accumulate in soil and surface waters are therefore likely to be subject to the possible release of these chemicals from plastics and their subsequent transfer to water, sediment and organisms. Lithner et al. (2009) showed that different plastic items can leach toxic chemicals into water that can cause varying effects on *Daphnia magna*. Different items made of the same polymer may have varying toxicity effects following leaching, based on the type and quantity of plasticisers added during the manufacture process. This demonstrates that plastic materials can act as a source of complex leachate mixtures to the environment. The relationship between environmental concentrations and those used in toxicity studies is not fully established. It is possible that the concentrations used in laboratory tests either over or under-represent levels of environmental contamination. However, it is still valuable to understand the potential ecological implications of microplastic pollution at these low/high concentrations as a means to understand potential hazards and to assist in developing risk assessments. Given that environmental concentrations of microplastics are likely to increase with input and fragmentation of plastics already present in the environment, future higher concentrations can be expected. [6]

1.5. Environmental impacts s of expanded polystyrene

Worldwide, EPS is commonly reported as one of the top items of debris recovered from riverbanks, shorelines and beaches (Thaysen et al., 2018).[7] Its widespread distribution and persistence have resulted in EPS being found in the gut contents of freshwater invertebrate and vertebrate wildlife (Jianann et al., 2018). In addition to physical EPS material, styrenes, the building blocks of the polymer, are found in marine and freshwaters and sediments globally (Kwon et al., 2015, 2017). Because polystyrene plastic is thought to be one of the only sources of styrenes in the environment, the styrene contamination is likely a result of polystyrene weathering and leaching in marine and freshwater systems (Kwon et al., 2017). Furthermore, in some parts of the world EPS has been cited as a source of other chemicals to the environment (Rani et al., 2015; Jang et al., 2017) and wildlife (Jang et al., 2016).

In Asia, hexabromocyclododecanes (HBCDs) have been detected in EPS buoys and other consumer products (Rani et al., 2014). This contamination originates from recycled EPS materials containing flame retardants. The same research group found that sediments near

6 Ibid.

7 For details of bracketed references in section 1.5. please refer to bibliography of report in Footnote 2.

aquaculture farms using recycled EPS buoys have relatively higher concentrations of HBCD compared to other sites (Al-Odaini et al., 2015). Further, mussels living on EPS buoys have EPS EPS fragments and greater concentrations of HBCD in their tissues than mussels that live on other materials (Jang et al., 2016). These studies confirm that HBCD from EPS leach into the environment and surrounding organisms. In 2015, the European Union banned HBCD (hexabromocyclododecane), the brominated flame retardant used in polystyrene building insulation, arguing that the health and environmental hazards associated with HBCD were significant. HBCD is not manufactured in Australia but is imported in EPS resin, as liquid dispersions and as a component of the EPS in finished articles.

Polystyrene is more harmful than other types of plastic because it is composed of relatively hazardous chemicals (Lithner et al., 2011). Under certain conditions, EPS leaches styrene and benzene, chemicals that have known toxic properties (Gibbs and Mulligan, 1997; Niaz et al., 2017). Laboratory toxicity studies suggest polystyrene microspheres can impact feeding behaviour (Besseling et al., 2012; Cole et al., 2015), cause weight loss (Besseling et al., 2012), and affect reproduction (Cole et al., 2015; Sussarellu et al., 2016) in invertebrate species. [8]

2.6. Impacts of plastics pollution on human health

With increasing documentation of macro and micro plastics being ingested by marine and aquatic life, concern is rising about the impacts of plastics on human health. Many studies have been done on marine and fresh-water ecotoxicology. The research into the effects on microplastics is still in early stages. Publications have confirmed widespread contamination of our food with micro-plastics including in water and salt, thereby providing the basis for chronic exposure. [9] The abundance of microplastics in the environment means that humans are exposed not only through consumption, but also through inhalation and skin contact. Potential health impacts may include oxidative stress, neurotoxicity, immune system disruption and transfer to microplastics to other tissues after exposure. [10] Almost all studies conclude that understanding the health impacts of exposure of humans to microplastics is very limited and that more research is needed.

Recommendation 1

Fund research into the effects of microplastic pollution on human health.

8 Yarra Riverkeeper Association, Polystyrene Pollution in the Yarra River: Sources and Solutions, Feb 2020 https://yarrariver.org.au/wp-content/uploads/2020/08/42-Polystyrene-Pollution-in-the-Yarra-River-single-lowres.pdf

9 Udovicki, B., Andjelkovic, M., Cirkovic-Velickovic, T. *et al.* Microplastics in food: scoping review on health effects, occurrence, and human exposure. *Food Contamination* 9, 7, 2022. https://doi.org/10.1186/s40550-022-00093-6

10 Simul Bhuyan, M. Effects of microplastics on fish and human health. *Frontier Environmental Science* , March 2022. https://doi.org/10.3389/fenvs.2022.827289

2. EFFECTIVENESS OF AUSTRALIA'S PLASTICS MANAGEMENT UNDER THE NATIONAL PLASTICS PLAN AND RELATED POLICIES TO REDUCE PLASTIC POLLUTIONS PARTICULARLY IN OCEANS AND WATERWAYS

2.1. Lack of progress

The National Packaging Targets set by the Australian Government to be reached by 2025 are welcome, however, progress has been very slow and limited. The 2021 Collective Impact Report by the Australian Packaging Covenant Organisation (APCO) paints a disappointing picture.

TARGET	Result 2017-18	Result 2018-19	Result 2019-20
100% reusable, recyclable or compostable packaging.	88%	89%	86%
70% of plastic packaging being recycled or composted.	16%	18%	16%
50% average recycled content included in packaging^ (revised from 30% in 2020).	35%	38%	39%
The phase-out of problematic and unnecessary single-use plastic packaging.	Foundation phase	Foundation phase	Development phase

Figure E1: Progress towards the 2025 Targets, 2019-20

^Data shown excludes wood packaging due to insufficient data

Source: APCO Collective Impact Report 2022[11]

The figures speak for themselves and demonstrate that the Australian Government must take much more urgent and effective action if it is to reach the 2025 targets. There is some progress against the fourth target. All states and territories have now banned lightweight plastic bags as of 1 June 2022. ACT, QLD, SA, WA and NSW have a single-use ban of plastics in place, and a ban will come into place in VIC in early 2023. However, most of these bans have wide-ranging exceptions that still allow for wide-spread use of plastic packaging, such as light-weight produce bags, plastic bottles, and business to business packaging.

Recommendation 2

Expand national plastics ban to cover business to business packaging. After a phase out period of a maximum of two years, include single use plastic bottles in the plastics ban.

[11] APCO Collective Impact Report 2021
https://documents.packagingcovenant.org.au/public-documents/APCO%20Collective%20Impact%20Report

Phase out single use plastic bottles with plastic bottles of harder plastic that can be washed and re-used. Collect these bottles through deposit schemes at supermarkets and support recycling businesses in the set-up of equipment to process used hard plastic bottles for re-use and redistribution to beverage businesses. Refer to Germany for case study. [12]

2.2. Lack of genuine "recyclability"

Many manufacturers claim that their plastic packaging or product is recyclable. Australia has no standardised labelling to identify recyclable plastic. While many plastic products and packaging materials can be recycled, many fail to meet the Sustainability Packaging Guidelines.[13] This means that plastic products or packaging may be technically feasible to recycle, but the mechanisms and/or infrastructure for this to happen are not yet in place or not functioning. The experience of the Red-Cycle program is one such example, where consumers believed that soft plastics were being recycled, while they were in fact being stock-piled in warehouses. [14]

Manufacturers of expanded polystyrene are keen to emphasise that they offer to pick up polystyrene waste from construction companies. However, there is no incentive for construction companies to do so, and anecdotal evidence suggests that returning polystyrene waste to the manufacturer is not a priority on building sites. Some polystyrene manufacturers also provide recycling bins for polystyrene at their manufacturing plants. However, these plants are often located away from major city centres and therefore the distance provides a disincentive for many consumers to drop off polystyrene waste.

Confusing labelling also deceives consumers into thinking that products are compostable when they are not. An example would be the claim of biodegradable bin bags. Almost all bin bags in super-markets are now labelled biodegradable. Many of these are oxodegradable. Oxodegradable bags break down primarily through the reaction of a chemical additive to oxygen, light or heat . They are not suited to composting, and they break down into fragments of small plastic which pose threats to animals who may mistake them as pieces of food. [15]

Recommendation 3

Require and monitor adherence to principles of Sustainable Packaging Guidelines

12 Plastic Smart Cities, Deposit Refund Scheme, https://plasticsmartcities.org/products/deposit-return-program

13 APCO Sustainability Packaging Guidelines, https://apco.org.au/sustainable-packaging-guidelines

14 Sydney Morning Herald, *The fire that sparked the end of Coles and Woolies* (sic) *plastic recycling program.* 9/11/22

15 Clean Up Australia, Plastic Bags - Frequently Asked Questions. Accessed 09/12/22 https://www.cleanup.org.au/plastic-bags-faq#:~:text=Biodegradable%20bags%20are%20not%20suited%20to%20recycling

(adapted for size and turn-around of businesses)[16]

To ensure that recycling does not become a substitute for reducing problematic packaging, it is essential for the Federal and State governments to require manufacturers and business to adhere to the principles of the Sustainable Packaging Guidelines as follows.

- Design-for-recovery principle: identify any opportunities for improvement. Establish a robust process to review any new packaging and record the outcomes.
- Use recycled materials, Use renewable materials. Eliminate hazardous materials. Optimise material efficiency. Design to minimise litter and design to reduce product waste.
- Design for transport efficiency. Work with businesses in different sectors to determine viable solutions to store and prepare/compact packaging materials for transport. Support transport and recycling businesses in developing methods for collection of polystyrene from retailers and markets.
- Design for accessibility. Work with businesses to ensure that drop-off centres are located in accessible, central locations for consumers.
- Provide consumer information. Identify any opportunities for improvement and record the outcomes.
- Ensure that packaging has been reviewed against all 10 Principles and has been optimised. Keep records of all packaging reviews including evidence that packaging has been optimised.

2.3. Lack of coordination between agencies and lack of resourcing of oversight

While the federal government is driving action on the Nationals Plastics Plan, regulation and oversight of plastic pollution happens at state agencies and council level. State agencies, such as EPAs, who are tasked with monitoring and enforcement, tend to focus their efforts on large-scale or dangerous incidents of pollution. They are not equipped to monitor the manifold sites and sources of plastic pollution. Councils operate at local levels, but are frequently under-resourced and only act when incidents of pollution are reported. Yet, the nature of plastic pollution is that it comes from small sources, medium-scale and large sources at multitudinous locations all over the state from households, to retail, to hospitality and industry. State EPAS and local councils are under-resourced to monitor and enforce waste management of plastics from the different sources and at different sites.

Recommendation 4

Work with state governments to **identify appropriate agencies for oversight, monitoring and compliance** at local level and work with state governments to **determine shared federal-state funding model to provide state agencies and councils with adequate**

16 See APCO Sustainability Packaging Guidelines (8) for details on implementation for different sizes of businesses.

resourcing for local on-ground monitoring and enforcement of plastic pollution waste management.

2.4. Exemptions of polystyrene in several settings from National Plastics Ban

Given how far Australia is lagging behind its targets under the National Plan, it is important to address gaps in plastics waste management. A blanket business-business exemption of use of polystyrene is likely to further undermine the implementation of the targets and prevent progress towards substitution with viable sustainable alternatives.

As the Yarra Riverkeeper Association's research has documented, the highest percentage of macro-plastic pollution in Melbourne's waterways is made up of polystyrene[17], with the construction industry being the biggest contributor. For the time being, much of the construction industry relies on polystyrene for cladding and, in the form of waffle pods, for foundations, and for this reason was granted an exemption under the National Plastics Ban. Unfortunately, while there are some manufacturers and construction companies who may be well intentioned in their handling and use of polystyrene, far too much of the product still ends up in Australia's waterways.

Recommendation 5

Put in place regulations to **require construction companies to avail themselves of the free-pick up services for polystyrene waste** provided by polystyrene manufacturers. Require all polystyrene manufacturers to provide pick up services.

Additional Recommendations:

Recommendation 6

Put in place guidelines to prevent polystyrene waste leakages and identify appropriate measures for different sizes of businesses in different sectors, such as drain nets, physical barriers, and bins with netting.

Recommendation 7

Support industry in transition to design and produce alternatives for plastic packaging at scale. Provide seed funding for pilot projects of alternative plastic packaging, pollution management measures, such as transport and storage of polystyrene waste.

17 Barmand, S., Goodsell, K., Yardley, D., Kowalczyk, N. (2020). Polystyrene Pollution in the Yarra River: Sources and Solutions. YRKA

https://yarrariver.org.au/wp-content/uploads/2020/08/42-Polystyrene-Pollution-in-the-Yarra-River-single-lowres.pdf

Recommendation 8

Prior to the plastics ban taking effect at state level, **support state agencies to work with businesses and ramp up monitoring to prevent potential dumping and/or stock-piling of materials that will be banned.**