

EcoCentre advice on waterways, on plastic pollution and on Waste to Energy

This paper outlines Port Phillip EcoCentre perspectives on two significant environmental issues of relevance to the Australian Government.

1. Protect waterways, particularly from plastic pollution.
2. Waste to Energy:
 - a. Waste to Energy should not be used for mixed municipal solid waste.
 - b. The Clean Energy Finance Corporation should only invest in zero emissions technology.
 - c. Government must drive overall waste reduction and creating a circular economy.

Port Phillip EcoCentre ('the EcoCentre')

The Port Phillip EcoCentre is a leading community-managed organisation with a dedicated team of scientists, educators and volunteers who design and implement innovative environmental programs. Our expertise includes Port Phillip Bay health and the urban ecology of Greater Melbourne, within the traditional lands and waters of the Kulin Nation. We connect communities to their ecosystems in over 160 Melbourne suburbs.

We bring together people of all ages and backgrounds to spark solutions and inspire environmental leadership. Each year the EcoCentre collaborates with over 25 Affiliate organisations, 120 schools and 250 partners from business, government, philanthropy, education and research institutions. Our collective impact since 1999 has transformed the way Melbourne understands wildlife, waterways and wellbeing in the age of climate change.

1. Protect waterways, particularly from plastic pollution.

Clean water is a human right, and it underpins our economy, human health and a balanced climate. Protecting water ecosystems requires a range of interventions including eliminating threats to stormwater quality; ensuring Environmental and Cultural flows in rivers; expanding (and protecting) native forests; resourcing the enforcement of environmental laws; and investing in strategic co-design and practical programs with community groups, who possess local expertise and provide on-ground presence for outreach, citizen science, and reporting pollution events.

Plastics are a proven threat to waterways. The potential for plastic pollution to harm aquatic life is recognised by scientists as a global problem. Microplastics are classified as pieces of plastic smaller than 5 mm in diameter, which are mostly parts of broken up larger plastic products. Plastics (at macro, micro and nano scales) have been proven to damage air¹, soil², water and cause brain damage in fish³. As a vector both for toxins into food chains and for invasive species between ecosystems, plastic in waterways is also a significant risk for human health, tourism, and fisheries.

Given the consequences of microplastics on marine ecosystems and human health, an Australia Senate *Inquiry into the threats of marine plastic* was conducted in 2015-2016. It recommended active support for research into the threats posed by microplastic pollution, including research to identify the extent of microplastic pollution.

¹ Gasperi et al, *Microplastics in air: Are we breathing it in?* (2018)

² Forschungsverbund Berlin, [An underestimated threat: Land-based pollution with microplastics](#) (2018)

³ Mattsson et al, [Brain damage and behavioural disorders in fish induced by plastic nanoparticles delivered through the food chain](#) (2017)

Subsequently, the Australian Government's *Threat Abatement Plan (TAP) for the impacts of marine debris on Australia's coasts and oceans* was released in April 2018⁴. EcoCentre programs cover all five objectives of the TAP: (1) contribute to long-term prevention of marine debris; (2) understand the scale of impacts of plastics and microplastics on key species and ecosystems; (3) remove existing pollution; (4) monitor the quantities, origins, types and chemical contaminants of marine debris, and assess the effectiveness of management arrangements for removing it; and (5) increase public understanding of the causes and impacts, to inspire behaviour change.

The EcoCentre established monthly trawls in Melbourne's urban rivers to categorise and quantify riverine litter as part of our 'Turn off the Tap' project (2014-2017) and ongoing 'Clean Bay Blueprint' project (2017-2020). These were Australia's first studies to monitor and map microplastic litter holistically across a city's streets, rivers and coast, to inform localised source reduction plans.

85% of marine pollution comes from sources on land, and rivers are the main ways plastic pollution makes it to Port Phillip Bay from land based sources. Most litter in the bay comes from the suburbs; litter on the street washes into the stormwater drains, which empty into the creeks, which empty into the larger rivers, which empty into the bay. The Maribyrnong and Yarra Rivers are the largest rivers that connect to the bay and run through highly populated areas. As trawls are conducted near the river mouth, the results are representative volumes generated by each catchment.

Primary microplastics are resin pellets ('nurdles') lost during the industrial process of molding larger products. Most microplastic pollution is *secondary*, and once started out as larger plastic user products, like plastic drink bottles, straws or take away containers, but have broken up in the environment by UV radiation (from sunlight), getting bounced around (e.g. by wind and waves), crushed by vehicle traffic on roads and shredded by mowers slashing grass verges and nature strips.

Our study found **more than 828 million pieces of litter make their way from the Yarra and Maribyrnong rivers into Port Phillip Bay, annually**. This is most likely an underestimation, because we only trawl the top 20 cm of the water column with a manta net and many plastic items do not float on top of the water, but pass under the net or are transported close to the bottom. **74% of these litter items are classified as microplastics**. In both rivers, most of the litter caught consisted of hard plastic remnants, secondary microplastics from broken up plastic items. Of the other analysed litter items, polystyrene, nurdles, plastic bottle caps, straws and soft plastics were prevalent.

It was found the Yarra River carries significantly more litter than the Maribyrnong and **that its litter loads are increasing, with recent spikes in polystyrene and hard plastic remnants**. Data revealed seasonal and plastic type variations, for which reasons are currently unclear but will be investigated. The EcoCentre's *Clean Bay Blueprint* project will continue its riverine trawls and combine findings with street, beach and Port Phillip Bay heads data to compile Greater Melbourne's first whole-of-catchment litter baseline and pollution reduction recommendations by July 2020.

Every piece of litter was once in human hands. Protection of waterways starts on land catchments. Considering both local and global research and best practice, several initial recommendations have been formulated by the EcoCentre:

- a. Improve on the current linear, single-use and 'throw away' models of plastic life cycle by legislating responsible manufacturing, handling and recycling via circular economy principles. (see points i, ii and iii below)

⁴ <http://www.environment.gov.au/system/files/resources/e3318495-2389-4ffc-b734-164cdd67fe19/files/tap-marine-debris-2018.pdf>

- b. Rather than implementing a product-by-product ban, potentially leaving bans open to exploitation, concentrate on designing an overarching framework that uses sustainable designs and materials and recovery plans as a criterion for all products.
- c. Actively fund and subsidise industry and start-up initiatives that move away from manufacturing plastics or try to replace them with truly sustainable alternatives. (see iv)
- d. Because plastic pollution is everybody's problem, the government, industry and community need to forge working partnerships that result in effective collaboration.
- e. A multi-pronged approach in plastic awareness education is needed in the community to achieve necessary behaviour change.
- f. Install and maintain kerbside stormwater pit filters.⁵

Plastic management, waterway health and climate change are inextricably linked. Healthy waterways are a carbon sink, but warming temperatures induced by climate change continue to damage aquatic ecosystems and trigger droughts. Plastic has an emissions footprint: plastic production generates more emissions than steel⁷, and littered plastic emits greenhouse gases⁶. Waterways will therefore benefit (via emissions reduction and reduced pollution) by adopting Beyond Zero Emissions⁷ four key actions for zero emissions Australian plastic industry:

- i. prioritise reduction
- ii. reuse what is durable (possible for around 20% of products)
- iii. increase our plastic recycling rate to 55% of products (~5x increase)
- iv. replace the source for products needing virgin plastics (25% of products) by using plant plastics with a carbon-negative design.

Humans are made 60% of fresh water, and everything we love depends on freshwater in some way – in Melbourne 90% of our freshwater use is *embodied* in the footprint of our food and goods.^{8, 9, 10} (Growing ingredients for one burger take 2500 litres of water; the materials for one shirt take 2700 litres.¹¹) Despite being a 'blue planet' our freshwater is a tiny percentage of Earth's water (2%), to which we have limited access. We rely on recycling the same small amount for all time, and keeping it drinkable, fishable and swimmable. We must not compromise this critical and limited resource by allowing contamination by plastic pollutants. Investing in healthy waterways will ultimately protect Australian communities, climate and economy.

2. Waste to Energy

- a. **Waste to Energy should never be used for mixed municipal solid waste.**
- b. **The Clean Energy Finance Corporation should only invest in zero-emissions technology.**
- c. **Government must drive overall waste reduction and creating a circular economy.**

Like many environmental groups worldwide, we harbour extreme concerns about Waste to Energy (WTE) schemes that use thermal processes to convert various 'feedstocks' into heat or electricity. Waste to Energy technology has an overall low potential calorific (energy production) value for Australia's needs, triggers problematic tradeoffs and diverts funding from more productive, zero-emission technologies and waste reduction investments. It has benefits primarily for niche distributed scenarios. These do not relate to thermal processing of municipal mixed solid waste, where

⁵ Point f was not published in the EcoCentre's 2018 study, but is an emerging recommendation as of 2019.

⁶ Royer, et al. [Production of methane and ethylene from plastic in the environment](#) (2018)

⁷ Beyond Zero Emissions, [Electrifying Plastic Brief](#) (2018)

⁸ Victorian Eco Innovation Lab, Melbourne University, [Foodprint: What does it take to feed a city?](#) (2016)

⁹ Rutherford, Tsang, Tan, [City people eat rivers: estimating the virtual water consumed by people in a large Australian city](#) (2007)

¹⁰ Crawford, Pullen, [Life cycle water analysis of a residential building and its occupants](#) (2011)

¹¹ Waterfootprint.org

government 'diversion from landfill' targets and reduced ability to offshore recyclables have currently raised risky temptation to invest in WTE.

In Australia, waste biomass is expected to continue to be utilised for heat and electricity production in niche, localised applications generally in single-site configurations such as biogas from landfills or sewage treatment plants. In 2018, the Clean Energy Finance Corporation (CEFC) announced WTE investment funds, including debt financing for the Australian-first \$668m Western Australia facility. One year earlier the CSIRO had concluded, "Large-scale new build/retrofit combustion and gasification plants that run on 100% biomass are unlikely to be required or cost competitive."¹² The Victorian Government acknowledges WTE that includes plastic waste, such as municipal waste, is "the same as using fossil fuel."¹³

WTE proposals typically claim landfill and energy production benefits – but what is the cost-to-benefit ratio? The Victorian Government's *Turning Waste into Energy* discussion paper (2017) states "The CEFC contends that energy from waste could meet up to 2 per cent of Australia's electricity demands" up from a current level of 0.9% (~800 MW).

This is a small potential impact, given the following concerns:

- **Zero gain.** WTE for mixed waste is no better than landfill (European Union Circular Economy Plan, 2018)
- **Toxic emissions.** Thermal technologies have a greenhouse emissions profile equivalent to burning coal (US Environment Protection Agency, 2014). New York State compared emissions profiles and found that WTE produced 14x the amount of mercury as an equivalent coal plant, and more lead and cadmium.
- **WTE is a significant net energy loss compared to recycling.** Not only do many items have low calorific value, but once burned it is likely that replacement products will need to be made. For example, recycling a tonne of plastic saves 8,397 kWh compared to generating new plastics; burning that same plastic will only generate 2,403 kWh and making a new tonne (to replace what was burned) will use 9,619 kWh.
- **Cannibalising material.** Thermal processes rely on 'reliable waste volumes over long periods to justify investment, consequently locking up (and using only once) resources that could be repeatedly recycled in the circular economy' (Boomerang Alliance, 2017)
- **Perverse disincentive for more sustainable waste reduction.** WTE locks in ongoing dependence upon generating a certain level of waste material, therefore undercutting preferred *reduce, reuse* and *recycle* actions on the waste management hierarchy. Gayle Sloan from the Waste Management Association of Australia (WMAA) says that if the technology detracts from a focus on reusing and recycling resources, then it is doing us a disservice. "It's one of the lowest options on the hierarchy, as in it's the last resort before landfill. Once you've burnt it, it's gone. You don't get that resource back."
- **Mixed waste WTE loses money.** Europe is often heralded for its WTE, however a 2019 McKinsey study concluded that "Almost 60% of Denmark's plastic waste ends up at incineration plants. If the nation were to recycle the material instead, it would benefit the economy as much as 1.5 billion Danish Krone (or US\$ 152 million) each year."¹⁴ Because a 15-to-20 year contract is typically needed to make WTE facilities bankable, investors (including governments providing waste material) become locked in to this net loss.

¹² CSIRO, [Low Emissions Technology Roadmap](#) (2017) p90

¹³ Victorian Government, *Turning waste into energy* (2017) p17

¹⁴ <https://recyclinginternational.com/research/mckinsey-study-says-denmark-is-wasting-money-by-burning-plastics/>

Waste to Energy for municipal waste is risky and must not divert priority investment from zero emissions electrification, overall waste reduction and creating a circular economy.

Australia's challenging volume of *waste* is driven by *wastefulness* at all stages of a product life cycle. The eco-footprint of the average Australian is 3.8x the planet's bioregenerative capacity¹⁵. Our wastefulness is growing faster than our population or economy.¹⁶ This dangerous misalignment will eventually cost Australian Government in numerous ways, unless we use various mechanisms to advance a circular economy inherently built around regenerative/renewable reuse and recycling. Waste to Energy is not sufficiently regenerative.

We note even WTE proposals for non-municipal waste ('bioenergy') are complex and problematic environmentally and economically. Most available bioenergy is from very disparate agricultural wastes. Collecting and transporting such wastes add significant costs. Energy crops are inefficient; and burning native forests is unsustainable and unjustifiable. In their 2018 *Electrifying Industry* report, Beyond Zero Emissions wrote, "Solar panels convert sunshine into energy far more efficiently than any plant, producing 3-5 times more energy per hectare than sugar cane. Electricity is also a far more useful and transportable form of energy than biomass."

Port Phillip EcoCentre supports 100% renewables by 2030 and net zero emissions by 2035, which has been demonstrated possible with current technology, within a growing economy. **Government investments, especially by the Clean Energy Finance Corporation, must be in zero-emissions renewable technologies.**

*Prepared by April Seymore
March 2019*

¹⁵ WorldAtlas.com

¹⁶ https://www.environment.gov.au/system/files/resources/0a517ed7-74cb-418b-9319-7624491e4921/files/factsheet-australian-context_0.pdf