Department of Environment, Land, Water and Planning

Regulatory impact statement – Single-use plastic ban 2022

April 2022

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Glossary

Acronym	Full Name
BCR	Benefit Cost Ratio
BRV	Better Regulation Victoria
CPI	Consumer Price Index
CDS	Container Deposit Scheme
DELWP	Department of Environment, Land, Water and Planning
EPA	Environment Protection Authority Victoria
EPS	Expanded polystyrene
FOGO	Food organics and garden organics
FSC	Forest Stewardship Council
HDPE	High Density Polyethylene
NPV	Net Present Value
PET	Polyethylene terephthalate
PV	Present Value
RIS	Regulatory Impact Statement
SUP	Single-use plastics
SV	Sustainability Victoria

Executive summary

Context

The Victorian Government is implementing its once-in-a generation plan to transform Victoria's waste and recycling system and build the state's circular economy, as outlined in *Recycling Victoria: A new economy*. As part of this plan, the government[1] is seeking to further tackle plastic pollution in Victoria.

Following the ban of problematic lightweight plastic bags which came into effect on 1 November 2019, the government has proposed a ban on certain single-use plastic items (specifically drinking straws, cutlery, plates, drink stirrers, expanded polystyrene (EPS) food and drink containers, and cotton bud sticks).

Problem Analysis

The number of single-use plastics used by Victorians is growing every year. Due to the inherent nature of single-use plastics being used only once, often for a short period of time, these items lead to greater volumes of plastic waste, either as pollution in the environment or in landfill. As usage of single-use plastics continues to grow, the adverse impact on the environment is expected to increase, particularly in Victoria's waterways. Such pollution gives rise to potential health risks for the local community, environment and wildlife, particularly where microplastics and plastic debris persist in the environment.

In addition to the environmental impacts of plastic pollution, there is a significant cost associated with cleaning up plastic pollution to mitigate the impacts on amenity, the environment and tourism. As the challenges posed by single-use plastics accumulate over time, a timely response is required to mitigate the continuing impacts in Victoria.

As Victoria moves towards a circular economy, the short lifespan and limited recovery options of single-use plastic items make them a relatively poor use of resources, particularly where they end up as litter or in landfill. The recyclability of such items is limited through kerbside collection systems as they are often an unsuitable shape or are too lightweight to be sorted correctly by recycling machines.

In addition to conventional plastic items, single-use plastics made out of degradable and compostable materials (including bioplastics) are problematic. These items are also prone to becoming litter, breaking up in the environment and being ingested by birds and other marine animals. Their similar appearance to conventional single-use plastic items means individuals are generally not able to differentiate between these types of plastics in order to dispose of them correctly. This further contributes to the contamination of kerbside recycling and food organics and garden organics (FOGO) bins.

The shift away from single-use plastics is generally supported by the public. A ban on single-use plastic items has been implemented in South Australia, the Australian Capital Territory, Queensland and Western Australia, consistent with the National Waste Policy Action Plan to phase out all problematic and unnecessary plastic product types by industry by 2025.

Objectives

The overarching objectives of the proposed Environment Protection Amendment (Banning Single-Use Plastic Items) Regulations 2022 (proposed regulations) are to:

1. Reduce plastic littering and pollution
2. Reduce the amount of plastic waste going to landfill
3. Reduce contamination of recycling streams.

Collectively, these objectives are designed to manage the potential environmental and health risks single-use plastic items pose to Victoria, alongside supporting the transition to a circular economy.

[1] Reference through the RIS document to government refers to the Victorian Government at a state level, unless otherwise specified.

Options considered

Two options have been considered in the RIS:

1. **Option 1 - ban of items, with an exemption for 'integrated items' until 31 December 2025:** This option bans the sale and supply of the listed single-use plastic items (drinking straws, cutlery, plates, drink stirrers, expanded polystyrene food and drink containers, and cotton bud sticks) in Victoria.

   Exemptions will apply for:

   a) Single-use plastic straws that are used or intended to be used by a designated person. A designated person means a person who requires a single-use plastic drinking straw due to a disability or for medical reasons.
   b) Single-use plastic cotton bud sticks used or intended to be used for testing carried out for scientific, medical, forensic or law enforcement purposes.
   c) Single-use plastic cutlery that are used or intended to be used by a correctional, mental health, police or youth justice facility for health and safety purposes.
   d) Paper or cardboard plates lined with any plastic.
   e) Before and until 31 December 2025, 'integrated items' that are single-use plastic drinking straws, cutlery or sealed expanded polystyrene cups.

   Integrated items are defined in the proposed regulations as a plastic item that is, as the result of a machine-automated process:

   - an integrated part of packaging material used to seal or contain food or beverages, or
   - included within or attached to packaging material used to seal or contain food or beverages, including pre-packaged portions of food or beverages.

   Examples of integrated items are plastic straws attached to juice boxes or plastic spoons integrated into yogurt lids.

2. **Option 2 - ban of items, with no exemption for 'integrated items':** This option is the same as Option 1, with the exception of how integrated items are treated. Under Option 2, no exemption will be provided for integrated items. These items will be banned from 1 February 2023 when the broader single-use plastic ban commences.

Under these two options, a 'banned single-use plastic item' is defined in the proposed regulations as an item that is either wholly or partly comprised of plastic and is not 'reusable'. Items that are considered reusable plastics will be manufactured to be used for the same purpose on multiple occasions, and with a warranty (or other written representation from the manufacturer as to the length of time the item is designed to last) of at least one year.

Initial consideration was given to existing tools under the *Environment Protection Act 2017*, such as the general environmental duty, however in order to tailor the approach to the problems arising from single-use plastics, a more specific approach was found to be warranted. Consideration was also given to non-regulatory options such as an education and information campaign, litter clean-up programs, improved labelling and installing more litter bins. These options were not analysed further as they would not adequately achieve the reform's objectives or address the underlying problem.

Analysis

A cost-benefit analysis was used to assess the cost and benefit impacts of Option 1, informed by an analysis of the number of single-use plastic items used in Victoria.

Estimated number of single-use plastic items used in Victoria

The annual volume of single-use plastic items used in Victoria has been estimated to be around 1,228 million items in 2020. Table 1 provides a breakdown by type of item.

Table 1: Annual estimate of single-use plastic items used in Victoria in 2020 (millions)

Item	Number Estimate	Range
Straws	403	322 - 483
Cutlery[2]	181	145 - 217
Plates[3]	20	16 - 24
Drink stirrers	70	56 - 84
Expanded polystyrene food containers	10	8 - 12
Expanded polystyrene drink cups	50	40 - 60
Cotton bud sticks	484	387 - 580
Integrated packaging items	11	6 - 17
Total	**1,228**	**979 - 1,478**

Quantified impacts

Table 2 outlines the results of the quantitative analysis for Option 1. Only the costs and benefits relating to Option 1 have been quantified as there is limited information available to quantify the difference between Option 1 and Option 2 in dollar terms. For the purposes of comparing Options 1 and 2, a qualitative assessment of options has been undertaken to determine the preferred option.

As well as the quantitative impacts, there are additional benefits that have not been quantified due to insufficient information. These are outlined in the RIS as qualitative impacts.

Table 2: Benefit Cost Ratio for Option 1 (over 10 years)[4]

Item	$million
Costs	
Cost to industry	(5.40)[5]
Cost to consumers	7.22
Cost to government	0.55
Total Present Value (PV) of costs	2.37
Benefits	
Benefit derived from reduced land and marine litter in terms of avoided clean-up costs	15.08
Avoided operating landfill costs	0.32
Total PV of benefits	15.41
Net Present Value (NPV)	13.04
Benefit Cost Ratio (BCR)	6.51

[2] Reference to cutlery refers to a cutlery set, including a knife, fork and spoon.
[3] Single-use plastic plates include plastic lined paper and cardboard plates.
[4] Where quoted figures don't sum exactly, it is a result of rounding.
[5] For items labelled 'cost', a bracketed figure indicates a negative cost and therefore a net cost saving (or benefit).

The quantitative analysis found that Option 1 would lead to estimated benefits of $15.41 million over 10 years, which would more than offset the estimated costs of $2.37 million over 10 years. This results in estimated net benefits of $13.04 million and an estimated benefit cost ratio of 6.51.

The key quantified costs relate to consumers purchasing single-use alternatives from retailers to replace single-use plastic items. Hospitality businesses may incur modest costs at an individual business level but, overall, are expected to achieve cost savings. This arises as the costs of many single-use alternatives are expected to be lower than the cost of single-use plastic items they are replacing. Victorian Government costs relate to implementing and monitoring the proposed reform, including providing support for business and community transition.

The quantified benefits reflect the benefit of avoided land and marine litter in terms of avoided clean-up costs and avoided landfill operating costs. Using relevant studies which capture these clean-up costs, it is estimated that 1,893 tonnes of single-use plastic litter will be avoided, producing a benefit to the Victorian environment valued at around $15.08 million over 10 years. This includes the benefits associated with reducing single-use plastic litter in the marine environment and avoiding the potential adverse impact on marine life.

Qualitative impacts

In addition to the monetised benefits, a ban on single-use plastic items is expected to deliver a range of benefits that are not easily quantified, and thereby not fully reflected within the NPV outlined in Table 2. These are:

- Benefits of reducing plastic on marine and land environments - with studies finding that microplastics (tiny pieces of plastic) made up almost 80 per cent of rubbish entering the Port Phillip Bay, reducing the amount of single-use plastics available in Victoria is expected to reduce the amount of plastic waste entering our waterways. This would reduce the risks of microplastics enduring within the environment and negatively impacting both land and marine wildlife.
- Impacts on the community - single-use plastic items that are littered have the potential to break up over time into microplastics. In such a form, microplastics may enter into soil and waterways, which humans may then ingest. This is of particular concern given the toxicity of plastic items and their ability to bioaccumulate.[6] With reduced litter, it is anticipated that the potential risk to human health can be better managed. The reduced presence of such items in popular Victorian locations is also expected to ensure Victoria continues to realise the benefits of tourism.
- Reduction in recycling contamination levels - the proposed reform would reduce the level of contamination in kerbside recycling, enabling a greater proportion of waste to be recycled. Single-use plastics are light and difficult to source separate, which creates contamination issues for other waste materials.
- Avoided lost value of single-use plastics - the proposed reform would reduce the quantum of single-use plastic items used, leading to the preservation of plastic and its associated value. While there would be an inherent increase in other materials being used for reusable products, greater value and use is expected from these products through multiple uses.

Conclusion and preferred option

In comparing Option 1 and Option 2, a number of implementation challenges have been identified with banning 'integrated items' from 1 February 2023 (Option 2). This includes complexities associated with system changes that would be required for manufacturers or packaging suppliers to remove banned items currently integrated into packaging. This could create unintended consequences – some products may cease to be supplied in Victoria, at least in the near term, as manufacturers (both national and international) may not prioritise changing their production processes to meet a single jurisdiction's new requirements. To date, Australian jurisdictions with single-use plastic bans in place have provided exemptions for integrated items.

On balance, Option 1 (Ban of items, with an exemption for integrated items until 31 December 2025) is the preferred option because it provides almost all the benefits of Option 2, while avoiding the implementation risks associated with banning integrated items from 1 February 2023. Exempting integrated items until 31 December 2025 will provide affected manufacturers with greater time to make changes to their packaging and manufacturing processes to remove these items or replace them with non-plastic alternatives. Given this, Option 1 will also address the litter associated with these items over the longer-term.

[6] Bioaccumulate refers to a substance becoming concentrated inside the bodies of living things.

Applying a precautionary approach further supports the introduction of a ban on the listed single-use plastic items given the long-term impacts of microplastics in the environment are still not fully known.

Implementation and evaluation

The ban will be enacted by the Victorian Government regulations and enforced by the Environment Protection Authority Victoria (EPA). The proposed ban would be effective from 1 February 2023. Implementation of the ban will be supported by education and engagement with duty holders, delivered in collaboration across the Victorian Government, prior to the ban coming into effect. This will provide businesses and the community with information to understand the requirements and alternative pathways (e.g. non-plastic single-use alternatives and reusables).

The Department of Environment Land Water and Planning (DELWP) will have primary responsibility for the implementation and evaluation of the reform in collaboration with the EPA, which will be responsible for enforcement. The compliance approach for the ban is expected to be risk-based, focusing on those parts of the supply chain where banned items enter the market. EPA will support retailers (sellers) and hospitality businesses (users), to understand their obligations.

An evaluation of the effectiveness of the ban will be undertaken following its implementation.

Feedback on RIS and exposure draft regulations

Public comments and submissions are invited on this RIS and the exposure draft of the Environment Protection Amendment (Banning Single-Use Plastic Items) Regulations 2022.

Feedback on this RIS and the draft Regulations can be provided by:

- completing the survey on the Engage Victoria page https://engage.vic.gov.au/ or
- through individual submissions sent to SUP.policy@delwp.vic.gov.au

All comments and submissions will be treated as public documents unless the comment or submission clearly indicates that the comment or submission is confidential.

Feedback must be received no later than 11.59pm on Sunday 15 May 2022. Your feedback will inform the final Regulations, guidance and support provided to help Victoria prepare for the upcoming single-use plastic ban.

Contents

1 Introduction

Single-use plastics within Victoria

Following the Victorian Government's release of its 10-year circular economy policy and action plan, *Recycling Victoria: a new economy,* the government has taken active steps to transform the state's recycling sector, reduce waste, and set Victoria up for a more sustainable future. As part of this, the use of single-use plastic items within the economy has been considered in a bid to reduce the amount of plastic litter entering the environment and waste that goes into landfill each year. The commitment to ban single-use plastics is part of the Victorian Government's $515 million investment to deliver the biggest transformation and reform of Victoria's waste and recycling industry, alongside its commitment in delivering its circular economy policy, *Recycling Victoria: a new economy*.

As the name suggests, single-use plastic items (such as drinking straws, cutlery, plates, etc.) are typically designed to be used once. Upon use, often for a brief period, many of these items are then thrown away, contributing to Victoria's growing issue of plastic litter,[7] waste and pollution.[8] In the absence of any action, it is expected that the volume of plastic litter entering aquatic systems is estimated to double by 2030 and triple by 2040.[9]

Australia's National Plastics Plan estimates that Australia produces 2.5 million tonnes of plastic waste each year, of which only 13 per cent is recovered and 84 per cent is sent to landfill.[10] It is also estimated that around 130,000 tonnes of plastic waste leaks into the environment annually, which may have lasting impacts where such items break up into microplastics and absorb into plants, animals and the marine environment.

Single-use plastic items (SUPs) are considered to be particularly problematic given their frequency in litter counts and inability to be recycled. This means they have a greater impact on the natural environment than other plastics. Many single-use plastic items are used away from home and given their lightweight nature, they can be easily blown or washed into waterways and the ocean causing adverse impact on marine life and the broader environment. Plastic pollution harms our health, wildlife and the environment, and attracts significant clean-up costs. Many single-use plastic items are difficult and not commercially viable to recycle, and often end up contaminating other recycling streams. These problems are discussed in more detail in the problem chapter (Chapter 2).

It is estimated that single-use plastic items make up a third of the volume of Victoria's litter stream.[11] With continued use, it is expected that this problem will only continue to grow. This growth trend is demonstrated by the tenfold increase in litter in the Yarra River across a four-year period (2017 to 2020).[12]

In tackling the issue of plastic pollution, the Victorian Government introduced a ban on lightweight plastic bags that came into effect on 1 November 2019.

Addressing single-use plastics in Victoria

Through consultation relating to the development of *Recycling Victoria: a new economy*, Victoria's circular economy policy and action plan, Victorians expressed the need for the Victorian Government to set a clear policy direction and a long-term plan to achieve a circular economy that prioritises more sustainable and innovative use of materials and creates less waste and pollution. This subsequently shaped the ambitious targets set out in *Recycling Victoria: a new economy* by the Victorian Government.

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[7] Charko, F., Blake, N., Seymore A., Johnstone C., Barnett E., Kowalczyk N & Pattison M. (October 2020). Clean Bay Blueprint – Microplastics in Melbourne. Port Phillip EcoCentre.

[8] Sustainability Victoria (2019) Waste projection model. Available at https://www.sustainability.vic.gov.au/Government/Victorian-Waste-dataportal/Interactive-waste-data-mapping/Wasteprojection-model#

[9] United Nations Environment Programme (2021). From Pollution to Solution: A global assessment of marine litter and plastic pollution. Nairobi.

[10] DAWE 2021, National Plastics Plan 2021, Department of Agriculture, Water and the Environment, Canberra, December. CC BY 4.0.

[11] Single-use plastics ban | Victorian Government. (n.d.). Retrieved March 27, 2021, from https://www.vic.gov.au/single-use-plastics www.vic.gov.au

[12] Charko, F., Blake, N., Seymore A., Johnstone C., Barnett E., Kowalczyk N & Pattison M. (October 2020). Clean Bay Blueprint – Microplastics in Melbourne. Port Phillip EcoCentre.

The commitment in *Recycling Victoria: a new economy* to address plastic pollution builds on Victoria's ban on lightweight plastic bags that came into effect on 1 November 2019. The ban applies to all lightweight shopping bags having a thickness of 35 microns or less, including degradable, biodegradable and compostable bags.[13] Since the ban, over 75 per cent of Victorians have reported to be using their reusable bags when shopping.[14]

A number of Australian jurisdictions have also reviewed their current use of single-use plastics and have introduced policies to shift their economy away from single-use plastics to readily available alternatives made from Forest Stewardship Council (FSC) certified paper, bamboo or wood to name a few, as well as moving to reusable alternative products.

On 27 February 2021, the Victorian Government announced a proposed ban on a range of common single-use plastic items - single-use plastic drinking straws, cutlery, plates, drink-stirrers, expanded polystyrene food and drink containers, and cotton bud sticks. These items are proposed to be banned from sale or supply across Victoria from 1 February 2023.

Victoria will also introduce a container deposit scheme (CDS) in 2023. In 2018-19 alone, beverage containers made up 47 per cent of the litter stream (by volume) in Victoria. It is expected that the CDS will significantly reduce beverage container litter. The single-use plastic ban will complement the CDS in Victoria by addressing a range of other commonly littered items that are causing environmental harm.

Public institutions such as Melbourne Museum, the National Gallery of Victoria, TAFEs and Zoos Victoria have already started to phase out some of these products and replace them with alternative materials. Many businesses, including Australia's major supermarkets, IKEA and McDonalds have also started to transition away from single-use plastic items in order to reduce plastic use, and the associated litter, waste and pollution.

While these voluntary steps are already being taken by a number of leading organisations and businesses, the Victorian Government recognises that more needs to be done to build on actions taken by first-movers and ensure these actions to reduce the use of single-use plastics are undertaken consistently across the Victorian economy.

While single-use plastic items have useful characteristics, many are only used once and for only a few minutes before being discarded.[15] Importantly, many of these single-use plastic items can be easily avoided or replaced with reusable alternatives. Recent single-use plastic bans introduced in other Australian jurisdictions (including South Australia, Queensland, Australian Capital Territory and Western Australia) indicate that businesses and individuals are able to move away from single-use plastic items and adapt to more environmentally friendly alternatives.

Outline of the Regulatory Impact Statement

The purpose of this Regulatory Impact Statement (RIS) is to consider the costs and benefits of various options to reduce uses and subsequent litter of single-use plastic items, to inform relevant stakeholders - including the Victorian community and decision-makers - on a preferred option. This RIS provides the nature and extent of the problem being considered, identifies feasible options, examines and compares their impacts, and identifies a preferred option to deliver on the Victorian Government's objectives.

Specifically, the RIS is structured as follows:

- Section 2: explores the key problems associated with single-use plastics within Victoria
- Section 3: outlines the reform's objectives
- Section 4: provides details on the options considered
- Section 5: assesses the cost and benefits of the considered options against the base case
- Section 6: provides a comparison between the options
- Section 7: outlines the preferred option
- Section 8: sets out the implementation plan and evaluation strategy for the preferred option

[13] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 8).
[14] Better Bag Habits Campaign Evaluation, Sustainability Victoria.
[15] Bergmann, M., Gutow, L., & Klages, M. (2015). Marine anthropogenic litter. Springer Nature.

The RIS is published to provide stakeholders with an opportunity to provide feedback on the assessment of the options and preferred option.

2 Underlying problem being addressed

This section outlines the overarching problems that have given rise to the need for the reform proposed in this RIS.

These problems largely centre around the impact of plastic pollution being caused by single-use plastics, in conjunction with the barriers it creates to increasing recycling rates and moving Victoria to a more circular economy. These are discussed in further detail below.

2.1 Single-use plastics creates plastic pollution

The number of single-use plastics used by Victorians is growing every year.[16] These items can be released into the environment during collection or disposal or, if not disposed of correctly, in public places. Single-use plastics are easily moved by wind or stormwater into the natural environment, becoming litter[17] on Australian streets, public parks and open spaces, and in our waterways, having a direct impact on the environment and human health.[18] In 2018-2019, over 217,700 foodware items were collected in litter clean-ups – 55 per cent of these items were plastic straws.[19] As there are very limited recycling options for single-use plastics, those items that are not littered are often then sent to landfill. As a result, there is an inherent urgency to move away from such items to address the ongoing and long-term impacts they are having on Victoria.

Plastic pollution harms our environment

Globally, it is estimated 8 to 12.7 million tonnes of plastic enter oceans each year - the equivalent of dumping a garbage truck of plastic into the ocean every minute.[20] Of that plastic, SUP straws, stirrers, cutlery, cups and cotton bud sticks are globally amongst the top ten most prevalent litter items in freshwater systems and oceans.[21] Without action, the quantity of plastic litter entering aquatic ecosystems is projected to double by 2030, and triple by 2040.[22]

Comparatively, Australians consume 3.5 million tonnes of plastic annually, of which 130,000 tonnes leaks into the marine environment as litter.[23] This represents five kilograms of plastic entering our oceans per person each year – more than three times the global average.[24] As this level of usage continues to grow, particularly with respect to single-use plastics by Victorians, such items are considered one of the key contributing factors driving plastic pollution in our waterways, including the Yarra and Maribyrnong rivers. Once introduced into rivers, litter sinks, is deposited on riverbanks, or is transported to the marine environment.[25]

[16] Blue Environment. (2021). Victorian Report – Single-use plastics usage data
[17] Boomerang Alliance (2016) Threat Abatement Plan: Marine plastic pollution. Retrieved from: https://d3n8a8pro7vhmx.cloudfront.net/boomerangalliance/pages/494/attachments/original/1480367461/TAP_Final_28112016.pdf?1480367461
[18] Senate, A. (2016). Toxic tide: the threat of marine plastic pollution in Australia. Environment and Communications References Committee. Parliament House, Canberra: Commonwealth of Australia.
[19] WWF Australia. (2020). Plastic Revolution to Reality: A roadmap to halve Australia's single-use plastic litter.
[20] Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., ... & Law, K. L. (2015). Plastic waste inputs from land into the ocean. Science, 347(6223), 768-771.
[21] Winton, D. J., Anderson, L. G., Rocliffe, S., & Loiselle, S. (2020). Macroplastic pollution in freshwater environments: Focusing public and policy action. Science of the Total Environment, 704, 135242.
[22] United Nations Environment Programme (2021). From Pollution to Solution: A global assessment of marine litter and plastic pollution. Nairobi.
[23] O'Farrell, K., (2020). 2018–19 Australian Plastics Recycling Survey National report. Envisage Works, Melbourne: Australian Government Department of Agriculture, Water and the Environment.
[24] Charko, F., Blake, N., Seymore A., Johnstone C., Barnett E., Kowalczyk N & Pattison M. (October 2020). Clean Bay Blueprint – Microplastics in Melbourne. Port Phillip EcoCentre
[25] Kowalcyk, N. & Kelly A. (2021). Litter and Flows - Connecting the Yarra and the Bay. The Yarra Riverkeeper Association

Given the quantum of plastic pollution entering our waterways, there is a clear health risk imposed on local communities, environment and wildlife, considering the lengthy lifespan of such products.[26]

Over time, plastics fragment into smaller pieces known as microplastics. These tiny plastic fragments do not break down but persist in the environment. Plastic debris is considered to be one of the most serious problems affecting the marine environment.[27] Marine animals including turtles, seabirds and dolphins can mistake plastic debris for food, including soft, white or transparent plastics,[28] leading to intestinal blockages, starvation and death.[29] Plastic entanglement has been identified as a key factor threatening the survival of some marine species.[30] Plastic litter is a key threat to the Burrunan dolphin, a critically endangered species which has just two known populations in Victoria – totalling around 183 individuals.[31] Plastic debris is also becoming a vector for the spread of invasive species and pathogens which can pose a major threat to biodiversity and ecosystem services.[32] Across Australia and the Pacific, plastic pollution is contributing to significant declines in albatross and petrel populations.[33] Ninety nine per cent of all seabird species are predicted to ingest marine debris by 2050.[34]

In Victoria, litter is increasing in many significant waterways including both the Yarra and Maribyrnong rivers, as well as the popular tourist destination of Port Phillip Bay. Between June 2018 and February 2020, over 30 tonnes of litter was collected from the Yarra River.[35] The most common litter item identified is polystyrene, both in terms of quantity and volume.[36]

Victoria's marine life is unique – around 80 per cent of the plants and animals found in the southern Australian waters are found nowhere else in the world. Notwithstanding that single-use plastics remain a subset of Victoria's plastic problem, without change to Victoria's plastic use practices, the impacts caused by such items will continue to negatively affect the marine environment.

Plastic pollution may harm human health

Several studies have also shown that humans are now ingesting plastics via the food that we eat, the water we drink and even the air we breathe.

Current research is estimating that humans are ingesting several milligrams of plastics daily. These plastic particles, and associated chemicals, can pose significant risks to human health including cytotoxicity, acute reactions and immune responses.[37] The long-term health impacts that ingested plastics are having on human populations are currently being investigated,[38] however it may take some time to fully understand these impacts. Since there is some evidence of toxicity (but long-term toxicity may not become evident for some time), taking a precautionary approach now, and addressing plastics pollution, will reduce any potential negative impacts on human health.

[26] Chen, Y., Awasthi, A. K., Wei, F., Tan, Q., & Li, J. (2021). Single-use plastics: Production, usage, disposal, and adverse impacts. Science of the total environment, 752, 141772.
[27] Masó, M., Garcés, E., Pagès, F., & Camp, J. (2003). Drifting plastic debris as a potential vector for dispersing Harmful Algal Bloom (HAB) species. Scientia Marina, 67(1), 107-111.
[28] Poli, C., Mesquita, D. O., Saska, C., & Mascarenhas, R. (2015). Plastic ingestion by sea turtles in Paraíba State, Northeast Brazil. Iheringia. Série Zoologia, 105, 265-270.
[29] Roman, L., Schuyler, Q., Wilcox, C., & Hardesty, B. D. (2021). Plastic pollution is killing marine megafauna, but how do we prioritize policies to reduce mortality?. Conservation Letters, 14(2), e12781.
[30] Vegter, A. C., Barletta, M., Beck, C., Borrero, J., Burton, H., Campbell, M. L., ... & Hamann, M. (2014). Global research priorities to mitigate plastic pollution impacts on marine wildlife. Endangered Species Research, 25(3), 225-247.
[31] Victorian Government. (2021). Conserving threatened species – Burrunan dolphin. Available at: https://www.environment.vic.gov.au/conserving-threatened-species/threatened-species/burrunan-dolphin.
[32] Audrézet, F., Zaiko, A., Lear, G., Wood, S. A., Tremblay, L. A., & Pochon, X. (2021). Biosecurity implications of drifting marine plastic debris: current knowledge and future research. Marine Pollution Bulletin, 162, 111835.
[33] Gilmour, M., Lavers, J. (2021). Latex balloons do not degrade uniformly in freshwater, marine and composting environments. Journal of Hazardous Materials, 403. Balloon report – UTAS.
[34] Wilcox, C., Van Sebille, E., & Hardesty, B. D. (2015). Threat of plastic pollution to seabirds is global, pervasive, and increasing. Proceedings of the national academy of sciences, 112(38), 11899-11904.
[35] Kowalcyk, N. & Kelly A. (2021). Litter and Flows - Connecting the Yarra and the Bay. The Yarra Riverkeeper Association.
[36] Kowalcyk, N. & Kelly A. (2021). Litter and Flows - Connecting the Yarra and the Bay. The Yarra Riverkeeper Association.
[37] Kannan, K. & Vimalkumar, K. (2021) Microplastics and insights into microplastics as obesogens. Frontiers in Endocrinology.
[38] Charko, F., Blake, N., Seymore A., Johnstone C., Barnett E., Kowalczyk N & Pattison M. (October 2020). Clean Bay Blueprint – Microplastics in Melbourne. Port Phillip EcoCentre.

Plastic pollution impacts on amenity, tourism, and is costly to clean up

There are also significant economic consequences of litter and plastic pollution. Clean-up activities can be expensive, resource intensive and rely on volunteers – and the presence of litter in popular locations impacts amenity and tourism economies.

Marine debris negatively impacts public amenity, tourism and fisheries, and is costly to clean up. As highlighted earlier in this chapter, litter is increasing on many of Victoria's most iconic waterways, including the Yarra River and Port Phillip Bay. Marine debris costs economies in the Asia-Pacific region at least US $10.8 billion per year, with the projected total cost reaching US $216 billion by 2050.[39]

It is costly to remove litter, including single-use plastic items from parks and waterways and oceans.[40] In 2019-20, Victoria's local governments spent more than $100 million on litter clean up services, including street sweeping.[41] Clean Up Australia Day costs the Australian economy $35 million annually – including volunteer time, management and administration. In many cases, particularly in marine environments, litter clean-up is not practically achievable. Evidence suggests that cleaning up litter in marine environments could be roughly 5 to 60 times the cost of cleaning up land based litter.[42]

2.2 Single-use plastics are a poor use of resources and delay a shift to a circular economy

On average, Australians use 270 single-use plastic items each year (not including cotton bud sticks)[43]. The high frequency of their use, short lifespan and limited recovery options makes these items a relatively poor use of resources as they ultimately end up as litter or in landfill.

Use of problematic and avoidable single-use plastic items is at odds with the Victorian Government's policy, as outlined in *Recycling Victoria: a new economy*, that seeks to reduce waste and transform the way our production and consumption systems use materials.

A circular economy continually seeks to reduce the environmental impacts of production and consumption, while enabling economic growth through more productive use of natural resources. In a circular economy, greater value is generated from products by prolonging their life through repair and reuse.

Single-use plastics are not an efficient use of scarce resources

The inefficiencies generated by single-use plastic items are due to unpriced externalities relating to extraction of virgin resources, pollution generated in their creation, along with management of their disposal. Disposal practices of single-use plastics have been estimated to cost the world economy in the region of US $80-120 billion every year.[44]

In many cases single-use items can be avoided or replaced with reusable alternatives. Unless required by a designated person, single-use plastic straws can be avoided, or replaced with reusable stainless steel or silicone alternatives; drink stirrers or 'swizzle' sticks can be avoided or replaced with metal teaspoons; single-use plates and cutlery can be replaced with alternative reusable ones and plastic cotton bud sticks can be replaced with reusable ones or reusable cotton pads.

Avoidance or replacement with reusable alternatives represent a more efficient use of resources. Due to their availability and much longer lifespan than single-use items, reusable alternatives result in a more efficient use of the scarce resources in our economy.

[39] McIlgorm, A., Raubenheimer, K., & McIlgorm, D. E. (2020). Update of 2009 apec report on economic costs of marine debris to apec economies. A report to the APEC Ocean and Fisheries Working Group by the Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong, Australia, December.
[40] CSIRO, Circular economy roadmap for plastics, glass, paper and tyres.
[41] Sustainability Victoria (2021). Waste and recycling in Victoria - Local government waste services report 2019-20. Available at: https://assets.sustainability.vic.gov.au/susvic/Report-Waste-Local-Government-Waste-Services-Report-2019-20.pdf.
[42] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning, (p. 12).
[43] Blue Environment. (2021). Victorian Report – Single-use plastics usage data.
[44] Morgan Stanley. (2020). The Circular Economy of Plastics. Retrieved from https://www.morganstanley.com.au/ideas/the-circular-economy-of-plastics#:~:text=Between%20US%2480%20to%20US,indicates%20a%20significant%20financial%20opportunity.

Poor recovery and recyclability of single-use plastics

Single-use plastic drinking straws, plates, cutlery, drink stirrers, EPS food and drink containers, and cotton bud sticks have limited recovery options (caused by their inability to be easily recycled) resulting in the need for these and other items to be landfilled after use.[45]

There are limited recovery options for single-use plastic items as most are made from plastics which cannot be recycled through kerbside collection systems or public bins. For example, kerbside recycling systems are not designed to process expanded polystyrene food containers and there is little end-market demand for this material. Kerbside recycling focuses on sorting and processing the higher value plastics like PET (e.g. beverage bottles) and HDPE (e.g. milk containers).

There is complexity and high cost involved in recovering and processing many types of plastics, including those that many single-use plastics are made from. Further to this, there is limited demand for these types of materials to be made into new products if they are recovered. These factors contribute to plastics having a low recovery rate of approximately 11.5 per cent, or 393 800 tonnes, as of 2020.[46] While single-use plastics remain a subset of all plastics produced, it is considered that these items contribute to the complexity and cost associated with dealing with such waste.

Recycling contamination

Further, single-use plastic items are often too small, an unsuitable shape or too lightweight to be sorted correctly by recycling machines, which are typically designed to separate larger items like bottles and containers. They also may be soiled with food which further contaminates recycling.

The incorrect placement of some single-use plastic items in recycling bins also requires recycling facilities to separate these items to prevent contamination of other recyclable material and then pay for their disposal at a landfill. This ultimately increases the costs, risks, and jeopardises the operations of these facilities.[47]

Expanded polystyrene items break up during collection and processing, and are lightweight, contaminating other targeted lightweight material such as paper and cardboard. In addition, cutlery, drink stirrers and straws are too small to be captured by processing equipment, resulting in disposal to landfill and increased processing costs for recycling facilities.

Single-use bioplastic items are problematic

In addition to conventional single-use plastic items, there is a growing prevalence and use of single-use plastic items made from degradable or compostable materials – including bioplastics which are commonly made from plant-based materials such as corn starch. Bioplastics have similar characteristics to conventional plastics and can cause similar environmental issues; they are light, used only once - representing a poor use of resources - are often littered, and do not break down in land and marine environments. When littered, they create comparable environmental problems as conventional plastics.

Bioplastics cannot be recycled and are not always able to be composted - in home or commercial systems - and are not consistently accepted in food and garden organics (FOGO) collections. The similar appearance of non-compostable bioplastics to both compostable bioplastics and conventional plastics means it is challenging for individuals to make correct disposal decisions for these products, which creates:

- **Problems for the recycling system:** when placed in mixed recyclables bins, single-use bioplastics/ compostable plastics contaminate and reduce the value of other materials (including paper, cardboard and other plastics). For example, bioplastic containers resemble PET containers and cause recycled PET to appear cloudy, reducing its value.
- **Problems for commercial composting systems:** single-use bioplastics/compostable plastics placed in the FOGO bin create problems for commercial composting systems and disrupt the sorting and processing undertaken by the composting industry, leading to additional costs of up to 60 per cent.[48] Few Victorian composters are able to process bioplastics, and there is currently no appropriate life-cycle management of these items. This can contribute to contamination in FOGO bins and products going into landfill.[49] The timeframes required for certified

[45] Australian Packaging Covenant Organisation (APCO). (2020). Action Plan for Problematic and Unnecessary Single Use Plastics. APCO.
[46] O'Farrell, K., (2020). 2018–19 Australian Plastics Recycling Survey National report. Envisage Works, Melbourne: Australian Government Department of Agriculture, Water and the Environment.
[47] Australian Packaging Covenant Organisation (APCO). (2020). Action Plan for Problematic and Unnecessary Single Use Plastics. APCO.
[48] Australian Packaging Covenant Organisation (APCO). (2020). Action Plan for Problematic and Unnecessary Single Use Plastics. APCO.
[49] Australian Packaging Covenant Organisation (APCO). (2020). Action Plan for Problematic and Unnecessary Single Use Plastics. APCO.

compostable plastics to break down exceed the processing timeframes of some organics processing facilities, meaning that fragmented compostable plastics are likely to appear in compost products. Markets for compost fragmented material of any kind (including compostable plastics) are extremely limited.

2.3 Public support for single-use plastic bans

Through consultation on the development of *Recycling Victoria*, Victorians expressed the need for the Victorian Government to set a clear policy direction and a long-term plan to achieve a circular economy that prioritises efficient use of materials and less pollution. This subsequently shaped the ambitious targets set out in *Recycling Victoria* by the Victorian Government.

In a circular economy, resources are preserved, and value is created by using and reusing products and materials over a longer period of time. In achieving this systemic approach, a number of Australian jurisdictions - including Victoria - have reviewed their current use of single-use plastics and have taken active steps to shift their economy away from single-use plastics to readily available alternatives made from FSC certified paper, bamboo or wood to name a few, as well as moving to reusable alternative products. Alongside other jurisdictions, Victoria looks to build on the success of the ban on lightweight plastic bags that came into effect on 1 November 2019 and remove more single-use plastic items that waste resources and cause pollution.

Furthermore, this shift away from single-use, represents an opportunity for new, innovative business models that encourage sharing, renting 'product as a service' arrangements, as well as grow Victoria's 'reuse economy' – a key underlying principle of a more circular economy.

Such a shift is generally supported by the public, confirmed by research commissioned by DELWP in August 2020 to determine public attitudes towards waste and recycling, including single-use plastics, during the COVID-19 pandemic. This research found that more than three in five Victorians agree single-use plastics should be banned because they increase the amount of waste generated and are bad for the environment.[50]

In a recent study commissioned by DELWP, most Victorians were supportive of government action on litter with 73 per cent of respondents supporting the phasing out of single-use plastic items.[51]

[50] COVID-19 and Waste: Recycling Victoria Research Report, Prepared for the Department of Environment, Land, Water and Planning by JWS Research, August 2020.
[51] Victorian Department of Environment, Land, Water and Planning. (2019). Container Deposit Scheme Willingness to pay for reduced litter in Victoria Report.

3 Objectives of reform

This chapter presents the objectives that the proposed reforms are designed to achieve. These objectives have been designed in response to the problems articulated in chapter 2.

The impact of plastic pollution within Victoria, - arising from the use of single-use plastics - causes harms to human health and the environment (both land and marine) and reduces amenity. These impacts have been used to form the basis of Objective 1.

The impact of plastic waste going to landfill, driven by the poor recoverability and short life of single-use plastics, results in inefficient use of resources. This impact has been used to form the basis of Objective 2.

Similarly, the impact of plastic recycling contamination, resulting from the incorrect disposal of single-use plastic items, results in inefficient use of resources. This impact has been used to form the basis of Objective 3.

3.1 Objective 1: Reduce plastic littering and pollution

This objective is to reduce the level of plastic litter and pollution which is currently being experienced in Victoria (on both land and in marine environments).

3.2 Objective 2: Reduce the amount of plastic waste going to landfill

This objective is to reduce the quantity of single-use plastics which end up in landfill, given the limited recovery options currently available for such items in Victoria.

3.3 Objective 3: Reduce contamination of recycling streams

This objective is to reduce the level of contamination in kerbside and commercial recycling collections, supporting Objective 2. Reduced contamination by single-use plastic items will enable processing facilities to receive cleaner material, reducing processing costs and volume of waste sent to landfill.

Collectively, these objectives will manage the use of single-use items in Victoria and will support the transition to a circular economy, particularly from a resource utilisation and recycling perspective.

The objectives will be used to inform the analysis and identification of the preferred option.

4 Options

Two regulatory options have been identified to achieve the underlying policy objectives of reducing plastic pollution and supporting Victoria's transition to a circular economy.

In developing the options, DELWP has adopted an approach which is broadly consistent with other Australian jurisdictions that have introduced single-use plastic bans. DELWP has also taken learnings from these Australian jurisdictions, which have informed the general approach to reduce plastic pollution, including the regulatory options analysed in this document, items to regulate and the proposed definition of the term 'single-use plastics'.

The distinctions between the two options to reduce plastic pollution are summarised in Table 3 and detailed in the sections below. These options have been assessed against a base case (i.e. 'status quo'), which assumes no regulatory reform in this area.

For the purposes of Table 3, listed items are those proposed to be banned from 2023, that is, single-use plastic drinking straws, cutlery, plates, drink stirrers, EPS food and drink containers, and cotton bud sticks.

Table 3: Summary of proposed options

	Base Case	Option 1	Option 2
Ban of listed items	X	✓	✓
Ban of integrated items	X	Exempt until 31 December 2025	✓

4.1 Development of options

In developing the proposed options considered above, the below measures were also considered but not included in the formal options analysis. The below measures were rejected as standalone options as it was considered they do not adequately address the problem and objectives within the RIS. While such measures may form part of a suite of government actions to address the problem, they have not been analysed in this RIS as standalone options.

Use existing tools under the *Environment Protection Act 2017*

The *Environment Protection Act 2017* took effect on 1 July 2021. This new legislation is the culmination of comprehensive reform that applies a preventative approach to pollution and waste. The cornerstone of the new framework is the general environmental duty which requires any person engaging in an activity that gives rise to risks of harm to human health and the environment from pollution and waste to take reasonably practical measures to minimise those risks. This reflects the principle of shared responsibility – that all Victorians have a role to play in protecting human health and the environment from the impacts of pollution and waste. Part 4.1 of the new Environment Protection Regulations 2021 also apply to some types of litter.

The new framework would go some way to achieving objectives 1 and 2, however given the complexity of single-use plastics, and the significant extent to which they are used across communities and businesses, an alternative approach is necessary that can be tailored to apply to, and allow exemptions for, specific plastic items.

Information and education campaign

An information and education campaign has not been considered as a standalone option in this RIS as it would not sufficiently address the underlying problems. Compared with a ban on single-use plastics, an information and education campaign would be less effective at removing plastic pollution from the environment, notwithstanding that levels may be lower where businesses and consumers are voluntarily making a shift to sustainable alternatives.

This type of alternative was similarly considered within the economic analysis undertaken for Victoria's plastic bag ban. In that analysis, it was recognised that litter reduction education programs could help to mitigate the impacts of plastic bag litter, but that such programs are often expensive, require ongoing work, and would be difficult to target plastic bag litter specifically. While it was noted that an education campaign could complement other policies by informing the public of new rules and influencing behaviour change, relying on education alone would either be ineffective or prohibitively expensive in achieving the objectives. This observation has been evidenced through education programs undertaken on recycling over the past few decades. While a number of programs have been dedicated to educating Victorians about recycling and best practice, contamination at material recycling facilities is still 13.3 per cent in Victoria.[52]

Additionally, information and education campaigns assume consumers find it easy to identify the 'right thing' to do. This however is not always the case, given not all consumers will have the same access to information, or ability to interpret the information available.[53] As there already exists a great deal of information around the management of single-use plastic items across the state, it is expected that an information and education campaign would not allow for the objectives within Chapter 3 to be met in a timeframe that is commensurate with the risk single-use plastic poses to environmental and human health, particularly when compared to the base case.

Separate to the success of education programs, it's important to note that such an approach would remain inconsistent with the broad approaches adopted by other Australian jurisdictions, given several jurisdictions have already introduced single-use plastic ban (either in stages or encompassing the list of items within Option 1).

Litter clean-up programs

Likewise, litter clean-up programs tend to be resource intensive and have not practically been able to capture litter created across Victoria to adequately address the issue.[54] The Litter Hotspots program has been running in Victoria since 2013 to support a catchment wide partnership building approach to reducing litter in waterways entering Port Phillip Bay. The program was provided with a budget of $2.15 million from the Victorian Sustainability Fund, leading to the following achievements and outcomes:

- 35 funded projects resulting in 267 new organisational partnerships
- significant litter reduction (up to 96.8 per cent) at 436 hotspot sites
- over $2 million in cash and in-kind contributions from funded organisations and project partners
- over 179 tonnes of litter collected (including over 1.29 million cigarette butts).

Whilst the program has seen many successes (as referenced above), litter – specifically plastic pollution – continues to increase.[55]

Litter programs do not address the underlying objective of shifting towards a circular economy, and focus on cleaning up the problem, rather than addressing the underlying problem itself.

The provision of more public litter bins

The provision of more public place waste bins across Victoria has also not been formally analysed given this option would not address all the components outlined within the problem statement, including landfilling of plastics and poor use of resources. More public bins may help to reduce littering but would not support Victoria's objective to transition to a circular economy, address contamination within kerbside recycling and reduce the state's current level of plastic consumption.

[52] 2019-20 Victorian waste data report. (2021, November). https://www.sustainability.vic.gov.au/research-data-and-insights/waste-data/annual-waste-data-reports.

[53] Kaufman, S., Meis-Harris, J., Spanno, M., & Downes, J. (2020). *Reducing contamination of household recycling: A rapid evidence and practice review for behavioural public policy*. Available at: https://uploads-ssl.webflow.com/619ab5836de9f00d9c722d98/61df702ae0198ac4b45af0e3_Recycling-contamination_Rapid-review_FULL-REPORT.pdf.

[54] Monroe, L. (2013). Waste in Our Waterways: Unveiling the Hidden Costs to Californians of Litter Clean-Up. National Resources Defense Council, New York City.

[55] Charko, F., Blake, N., Seymore A., Johnstone C., Barnett E., Kowalczyk N & Pattison M. (October 2020). Clean Bay Blueprint – Microplastics in Melbourne. Port Phillip EcoCentre.

Improved consumer labelling

Improved consumer labelling of items to mitigate the impacts of incorrect disposal has not been considered as a standalone option in this RIS, as this option would be expensive to implement and would centre on addressing Objective 3 to a greater extent when compared to other objectives noted within the RIS.

An example of this includes the Australasian Recycling Label Program.[56] This program is an on-pack labelling scheme that aims to help consumers to recycle correctly and supporting brand owners to design packaging that is recyclable at end-of-life. However, as labelling tends to revolve around the recyclability of packaging (i.e. packaging which single-use plastic items are contained in) rather than the recyclability of the items themselves (i.e. the actual single-use plastic items in question), the benefit of such labelling is considered to be limited.

Subject to the type of consumer labelling considered, it is expected that there may be significant costs to:

- industry, if labelling involves changes to item packaging; or
- government, should such labelling need to be reflected on bins in the community.

While improved consumer labelling may mitigate the level of contamination resulting from single-use plastics being disposed of in kerbside recycling, the option will not directly reduce the amount of litter and landfill caused by single-use plastic items. For this to occur, improved labelling would need to align with consumer convenience when such items are being disposed of. It is anticipated that consumer labelling will also have minimal impact on single-use plastic items going to landfill as improved labelling will not impact consumption of such items, nor promote the use of alternatives or reusables.

4.2 Approach adopted in developing options

Why bans are needed

As reflected within the problem statement of this RIS, the current use of single-use plastic items within Victoria have been found to:

- have a direct harm to the environment and human health;
- be an inefficient use of resources; and
- impact on public amenity.

Increases in population and reliance on single-use plastics for convenience make the problem posed by single-use plastics urgent, yet viable to address as alternatives to single-use plastics are readily available. To date, voluntary steps have already been taken by a number of leading organisations and businesses, however, more needs to be done to build on actions taken by first-movers, due to the urgency of this problem.

Regulatory action has been an effective mechanism in preventing the generation of specific single-use plastics in Victoria. Victoria's ban on lightweight plastic bags came into effect on 1 November 2019. Prior to the ban, Victorians used over one billion lightweight plastic bags each year.[57] Since the ban, over 75 per cent of Victorians have reported that they are using their reusable bags when shopping.[58]

A targeted survey on the lightweight plastic shopping bag ban, conducted for the Victorian Government by the National Retail Association in March 2020 found that, of the 232 retailers surveyed, 88 per cent had seen a decrease in bag consumption since the ban was introduced. Fifty-seven per cent of retailers also said that most customers were bringing their own bags or were not requiring a bag. In addition, retailers supported further action on single-use plastic items, with government support and where appropriate, cost effective alternatives exist.

Banning the supply and sale of single-use plastic items prevents the use of commonly littered items in the first place, removing the need to change how people dispose of them, and reducing the need to manage them in the environment,

[56] https://apco.org.au/the-australasian-recycling-label.
[57] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 8).
[58] Sustainability Victoria (2019). Better Bag Habits Campaign Evaluation Report.

where they may already be causing harm.[59] While it is recognised that non-plastic single-use items may still be littered, it is expected that many will be biodegradable in nature and thereby will have less of an impact on the environment over time.

As single-use plastics are low cost and readily available, businesses and the community have ingrained habits for using them. Behavioural interventions (i.e., education campaigns) seeking to change these habits will take time to have an impact on the use of these items. Meanwhile the negative impact of single-use plastics outlined above will continue to occur.

The South Australian, Australian Capital Territory, Queensland and Western Australian governments all implemented bans on single-use plastic items in 2021, and New South Wales is in the process of implementing a single-use plastic ban. The Victorian single-use plastic ban is designed to broadly harmonise Victoria with bans in other jurisdictions to provide industry with greater certainty and to achieve broad consistency across Australia.

Banning certain single-use plastics is also consistent with the National Waste Policy Action Plan, where it was agreed by all states and territories that problematic and unnecessary plastic product types would be phased out by industry by 2025 (or sooner).

A regulatory approach is therefore considered to be the most effective way to address the problems outlined in this RIS.

4.3 Option 1: Ban of items, with an exemption for integrated items until 31 December 2025

This option would introduce a legislated ban on the sale or supply of single-use plastic items in Victoria from 1 February 2023, with an exemption for integrated items until 31 December 2025. It would apply to anyone who currently sells, supplies, distributes or provides banned items in Victoria.

The banned items would include single-use plastic:

- drinking straws
- cutlery (knives, forks, spoons, etc.)
- plates
- drink stirrers or sticks
- expanded polystyrene food service items and drink containers
- cotton bud sticks.

These items were chosen as they are commonly used for just a few minutes and may be avoided or replaced with reusables. They are often littered and pose a contamination risk to recycling.

The proposed definition of a single-use plastic item for the purposes of the Victorian ban is:

> *A single-use plastic item is an item that is either wholly or partly comprised of plastic, whether or not that plastic is biodegradable, degradable or compostable; and is not reusable. Reusable means a plastic item that is manufactured to be used for the same purpose on multiple occasions and with a warranty (or other written representation from the manufacturer as to the length of time the item is designed to last) of at least one year.*

This will place an onus on manufacturers and suppliers to prove that items deemed not to be a 'single-use plastic' will in fact last for at least a year under normal circumstances.

Treatment of bioplastics and compostable plastics

In addition to conventional plastics, other plastics which are currently available for use include bioplastic and compostable plastic items. Bioplastics refer to plastics that are typically made from plant material, such as corn starch, rather than fossil fuels. Compostable plastics are types of bioplastics that are engineered to fully decompose (as opposed to breaking into

[59] Xanthos, D., & Walker, T. R. (2017). International policies to reduce plastic marine pollution from single-use plastics (plastic bags and microbeads): a review. Marine pollution bulletin, 118(1-2), 17-26.

smaller and smaller fragments the way conventional plastics do over time) under certain conditions that can typically only be met in an industrial composting facility.[60]

Given bioplastic and compostable plastics generally look identical to conventional plastic items, this often leads to them being disposed of in the same sort of waste streams, as it presents a challenge for individuals to differentiate between the two items. This consequently creates contamination issues in collection systems, and thus greater levels of landfill where such contamination cannot be addressed. While bioplastics and compostable plastics can be broken down in a shorter period of time compared to conventional plastics, this only happens under the right conditions - that is, conditions which are rarely met for most waste streams.[61] Where these conditions do not exist, bioplastics can have similar characteristics to conventional plastics considering they are light, used only once (representing a poor use of resources) and when littered, create comparable environmental problems as conventional plastics. For these reasons, these two plastic categories are included within the proposed ban.

Treatment of integrated items under Option 1

Under Option 1, integrated items would be exempt from the ban until 31 December 2025. For example, plastic straws attached to juice boxes or plastic spoons integrated into yogurt lids can continue to be sold in this manner until 31 December 2025.

The proposed definition of an integrated item is:

a) a plastic item that is, as a result of a machine-automated process—

i) an integrated part of packaging material used to seal or contain food or beverages, or

ii) included within or attached to packaging material used to seal or contain food or beverages, including pre-packaged portions of food or beverages.

Examples of integrated packaging include:

- a sealed expanded polystyrene cup containing dry noodles with flavouring or soup powder by a machine-automated process
- a spoon sealed within the packaging of a yoghurt cup by a machine-automated process
- a straw attached to a juice box by a machine-automated process.

Other exemptions from the ban

Under Option 1 (and 2), a number of additional exemptions would exist to enable the use of specific banned single-use items, where their continued use is necessary for particular sectors and individuals. Specifically, these exemptions would allow:

- Single-use plastic straws that are used or intended to be used by a designated person. A designated person means a person who requires a single-use plastic drinking straw due to a disability or for medical reasons.
- Single-use plastic cotton bud sticks used or intended to be used for testing carried out for scientific, medical, forensic or law enforcement purposes.
- Single-use plastic cutlery that are used or intended to be used by a correctional, mental health, police or youth justice facility for health and safety purposes.
- Paper or cardboard plates lined with any plastic due to no alternatives being readily available in the market.

[60] Fox, E. (2021, November 4). *Bad News - Bioplastics Are NOT A Solution To Plastic Pollution*. Beyond Plastics - Working To End Single-Use Plastic Pollution. https://www.beyondplastics.org/fact-sheets/bad-news-about-bioplastics
[61] Why Bioplastics Will Not Solve the World's Plastics Problem. (2020, August). Yale E360. https://e360.yale.edu/features/why-bioplastics-will-not-solve-the-worlds-plastics-problem

4.4 Option 2: Ban of listed items, with no exemption for ‘integrated items’

Under Option 2, no exemption is provided for integrated items. In this option, integrated items are treated the same way as other single-use plastic items. As these items meet the definition of banned single-use plastic items, they will be banned from 1 February 2023 when the broader single-use plastic ban commences.

5 Impact analysis of options

This section considers the costs and benefits for business, individuals and government of the options assessed against the base case (i.e. the current situation that exists in Victoria) for the purposes of determining the preferred option to achieve the Victorian Government's objectives.

This chapter covers the:

- high-level methodology for the RIS impact analysis
- estimates of the quantity of single-use plastic items in Victoria
- base case for the impact analysis
- costs of the options
- benefits of the options
- sensitivity analysis
- determination of the preferred option.

For the purposes of assessing the costs and benefits associated with the proposed options, the options are assessed against a base case. The base case is the situation that would have otherwise occurred in the absence of the proposed reform.

5.1.1 Identification of costs and benefits

The costs and benefits proposed under this RIS have been identified considering the potential impact of the options on different stakeholders across the supply chain of single-use plastics. These include consumers, business (suppliers, retailers, hospitality, etc), and government.

5.1.2 Assumptions

Where there is insufficient publicly available information, assumptions have been made to address any identified data gaps. These assumptions have been identified to be reasonable based on available evidence. Where such information is not available, or it has been considered inappropriate to make such assumptions, the relevant cost or benefit is discussed qualitatively.

The assumptions adopted are discussed in detail in the relevant sections below.

5.1.3 Decision Tool

Where sufficient data is available, the cost and benefit impacts can be quantified over a 10-year period, which aligns with the life of the proposed regulations. The costs and benefits are then compared by applying a net present value (NPV) to determine the preferred option.

The analysis is conducted in two steps. The first step provides both a quantitative and qualitative assessment of the costs and benefits for Option 1 (which is substantially similar to Option 2). The second step involves a comparison of Option 1 and 2 qualitatively, due to limited information on the specific the impact of Option 2.

5.2 Quantity of single-use plastic items

The annual quantity of single-use plastic items used in Victoria has been estimated, as provided in Table 4, for the purposes of understanding the current use of single-use plastic items in Victoria.

Table 4: Summary of annual quantity of single-use plastic items in Victoria for FY2020 - millions

			Split of estimate per industry (central estimate)		
Item	**Total number of items (central estimate)**	**Estimate Range**	**Retail**	**Hospitality**	**Medical, Correctional & Other Institutional**
Straws	403	322 - 483	48	274	81
Cutlery[62]	181	145 - 217	58	103	19
Plates	20	16 - 24	4	15	1
Drink stirrers	70	56 - 84	15	52	3
EPS food containers	10	8 - 12	2	7	0.5
EPS cups	50	40 - 60	11	37	2
Cotton bud sticks	484	387 - 580	213	34	237
Integrated packaging items	11	6 - 17			
Total	**1,228**	**979 - 1,478**	**350**	**523**	**344**

It is estimated that a total of 1,228 million single-use plastic items, included in ban under both Option 1 and 2, were used in Victoria in the financial year ending 30 June 2020 (FY2020). These estimates have been accompanied with an indicative range to reflect the uncertainty around the number estimates. A breakdown of number estimates across three specific industries - retail, hospitality and medical[63] - are also provided, except for integrated packaging items. Integrated packaging items have not been split per sector due to limited available information. Further detail on the calculation of single-use plastic numbers and the industry split can be found in Appendix A.

For the purposes of quantifying the estimated number of single-use plastics used in Victoria under the base case (i.e. no ban on single-use plastic items), it has been assumed that the above values (for FY2020) also apply to the 2021 financial year. Since the 2020 estimates only partially overlap with the onset of the COVID-19 pandemic, they are likely to generally reflect pre-COVID rates of SUP use. In reality, the use of single-use plastic items in 2021 may have significantly increased due to COVID-19, supported by increased takeaway sales across Victoria. It is unclear whether the COVID-19 pandemic has had permanent or temporary effects on the consumption of the SUP items proposed to be included in the policy. Therefore, in the absence of further evidence, this assumption has been adopted in an effort to smooth out any potential short-term impact that COVID-19 may have on the use of single-use plastics.

The estimates have been increased at a rate of 1.5 per cent per annum over the appraisal period in line with population forecasts for Victoria.[64] While it is expected that the use of single-use plastics will fall over time as businesses and consumers shift away from using single-use plastic items, there is limited visibility as to the rate of this shift. As consumption levels increase, along with Victoria's population, this assumption has been considered reasonable.

[62] Reference to cutlery refers to a cutlery set, including a single fork, knife and spoon.
[63] 'Medical' is used to refer to medical, correctional and other institutional contexts unless otherwise specified.
[64] Department of Environment, Land, Water and Planning. (2019). Victoria in Future. Retrieved at https://www.planning.vic.gov.au/land-use-and-population-research/victoria-in-future.

For further detail on how each item estimate has been quantified, please refer to Appendix A.

5.3 Base Case

The options are analysed against a base case. The base case maintains the 'status quo', whereby the preventative approach underpinning the *Environment Protection Act 2017* remains unchanged, and no new regulations or other actions are introduced to reduce the supply or distribution of single-use plastics in Victoria.

The base case assumes that a portion of the market has already shifted to either using single-use alternatives, reusables or avoiding the use of an item altogether. This assumption has been factored into the single-use plastic volumes estimates detailed in section 5.2.

While continued focus on sustainability and building a more circular economy in Victoria is expected to play a part in how single-use plastic items are consumed in the future, the base case assumes the continued consumption of single-use plastic items in Victoria (which grows at a rate of 1.5 per cent per annum in line with population growth).[65] However, even under the base case, consumers and businesses have tended to make more sustainable choices (particularly around the use of single-use items), which would have impacts to both the costs and benefits of the reform over time (as a result of reduced use of single-use plastics under the base case). This moderate shift has not been modelled and is not expected to materially impact the analysis.

5.4 Costs

5.4.1 Overview

There are two types of costs considered across the options. The first includes monetised costs, while the second captures those costs which have not been able to be quantified. The monetised costs quantify the estimated cost to industry, cost to consumers and cost to government.

Non-monetised costs considered include the expected impacts on manufacturers and the implementation costs to industry. Further non-monetised costs are considered in Section 5.16, for the purposes of undertaking an overall assessment of Option 1 and Option 2.

Where values have been labelled as costs throughout Section 5.4-5.7, a positive number indicates an absolute cost. Conversely, a negative value indicates a 'negative cost' which is a cost saving or reduction.

5.4.2 Cost variables

The monetised costs are presented as a Net Present Value (NPV) over 10 years using a 4 per cent real discount rate and the 2021/22 financial year serves as the base year (year 0). The costs are valued in real terms as at 2021/22.[66] The modelling assumes there would be full compliance on day one of the new requirements coming into effect, which is proposed to be 1 February 2023.

Table 5 provides a summary of the estimated costs over the 10-year period, split across industry, consumers and government. The costs provided relate to Option 1. The additional components contained under Option 2 (i.e. no exemption for integrated items) have not been monetised as there is limited information available. The differences between the two options have been assessed qualitatively in section 5.16 - Overall assessment of options.

[65] Department of Environment, Land, Water and Planning. (2019). *Victoria in Future 2019*. https://www.planning.vic.gov.au/__data/assets/pdf_file/0032/332996/Victoria_in_Future_2019.pdf

[66] The Victorian Guide to Regulation recommends a real discount rate of four per cent for regulatory and legislative proposals.

Table 5: Summary of estimated costs under Option 1(PV over 10 years) - $ millions

Cost	Option 1[67]
Cost to industry[68]	(5.40)
Cost to consumers	7.22
Cost to government[69] - Implementation	0.38
Cost to government[70] - Enforcement and compliance	0.17
Total costs	2.37

The estimated costs in Table 5 reflect the total cost of implementing the core ban under Option 1, with an estimated net total cost of $2.37 million over 10 years. Consumers are expected to incur costs of $7.22 million over 10 years, relating to the additional costs associated with purchasing alternatives to single-use plastics in a retail context. Industry is estimated to recognise a cost saving of $5.40 million over 10 years, due to cheaper single-use alternatives already existing within the wholesale market. The costs to government relate to implementing and monitoring compliance with the single-use plastic ban, with an estimated cost of $0.55 million over 10 years.

The costs to industry are largely driven by the cost differential between single-use plastics and alternatives across the hospitality and medical sectors. Anecdotally, these cost differentials are expected to be absorbed by businesses, noting that single-use items tend to be offered free of charge to consumers. Given this current behaviour, it is assumed that businesses would not pass on any additional costs (or savings) to consumers.

Similarly, it is assumed that there is a cost difference between single-use alternatives and single-use plastic items within a retail setting. As this cost differential is expected to be fully borne by consumers, these costs are considered to be a cost to consumers.

Across both retail and industry, some alternatives are cheaper than single-use plastic items already (e.g. plates). Despite being cheaper, the fact that uptake of non-plastics alternatives has not been greater strengthens the argument that price alone will not drive changes in behaviour, and that a ban is likely the only effective way to make the shift away from such items in the economy.

For each item, the costs associated with the ban have considered:

- **The likely response to the ban** - in response to the ban, businesses can make a number of changes to their operations, and consumers can make several behavioural changes. The three most likely responses to the ban are considered to be:
    1. Switch to alternative non-plastic single-use items (i.e. FSC certified paper, wood, bamboo etc.) - this would involve a one-for-one switch to the alternative single-use item.
    2. Switch to reusable items (i.e. metal straws, metal cutlery etc.) - this would involve a capital investment into reusable items. Each reusable item is expected to replace a significant number of single-use plastic items (based on the lifespan of reusable items).
    3. Removal from the market - businesses may choose not to offer or may reduce the volume of single-use items supplied to customers (e.g. by not offering straws or by having them behind the counter on request only). Equally, consumers may choose not to use these items.
- **The cost differential between plastic items and the alternatives** - for single-use alternative items, this is a simple comparison, however for reusable items the cost comparison considers the number of single-use plastic items that each reusable item would replace, over the reusable item's lifespan.

[67] Costs which will result in an outlay have been captured as a positive number. Cost savings have been captured in brackets.
[68] Cost to industry refers to the costs which would be incurred by businesses under Option 1. Cost to industry specifically considers the cost to hospitality and medical sectors, based on the volume estimates split adopted within Table 4.
[69] Cost to government relates to the cost which would be incurred by the Victorian state government under Option 1.
[70] Cost to government relates to the cost which would be incurred by the Victorian state government under Option 1.

Subject to individual circumstances, costs to industry and consumers may increase or decrease depending on the individual response adopted to the ban. Notwithstanding these unique circumstances, the costs above inform the impact of the proposed reform on these participants within the market.

Specific details behind each of the above considerations can be found in the sections below.

5.5 Cost to Industry

5.5.1 Impact on manufacturers

Stakeholder discussions with plastic producers have indicated that while much of the single-use plastic items used in Victoria is produced outside the state, there remains a number of Victorians manufacturers who produce such items locally.

Assuming that these Victorian manufacturers do not only supply to businesses within Victoria, it is expected that these businesses can continue to operate after the ban to service non-Victorian customers, where local laws allow. This would equally apply to any importers or distributors who supply single-use plastic items in Victoria. This demand, however, is more likely than not to diminish over time, particularly as states continue to regulate the sale and supply of items made out of plastic.

Alternatively, where such manufacturers produce alternative and reusable items, their ability to pivot away from single-use plastics or increase their level of production of alternatives may offset any impact of the proposed ban.

It is recognised that where manufacturers solely produce and provide items included in the proposed ban, the reform could have a significant impact on these manufacturers. To understand the extent of this impact and whether there are any Victorian manufacturers in this category, further consultation with industry is required.

For the purposes of the impact analysis, it is assumed that any cost impacts on manufacturers are passed downstream to industry and consumers in the form of higher or lower prices for the single-use alternatives. This is assumed as manufacturers will want to be relatively competitive as the reform comes into effort. This assumption has been adopted as it is unclear exactly many of these businesses currently:

- operate in Victoria
- supply only to Victoria
- manufacture or supply only the items which are proposed to be banned.

This forms the basis for the cost differentials discussed in the following sections.

5.5.2 Implementation costs for industry

Implementation costs to industry consider those costs that businesses (for example, hospitality venues) may incur under the proposed reform. The Victorian Government will provide clear communications regarding new obligations on Victorian businesses as part of the ban, prior to it coming into effect in February 2023. Lead time between the ban being announced (February 2021) to when the regulations are proposed to be made (mid-late 2022), and to when the proposed regulations come into operation in February 2023, allows industry time to plan for how they reduce or remove their stocks of banned items.

Further, options will be explored to provide advice to any business or organisation that has excess stock when the ban takes effect, to find uses for this stock, such as for exempt users. National businesses may also have the opportunity to direct stock to other jurisdictions if they are not yet banned. To ensure any remaining stock is not wasted, initiatives like Queensland's Great Plastic Rescue[71] that salvaged any items which may have been destined for landfill will be considered, if needed.

For these reasons, it is expected that any costs associated with excess stock will be minimal.

[71] The Great Plastic Rescue - https://www.thegreatplasticrescue.com.au/ https://www.thegreatplasticrescue.com.au/.

5.5.3 Industry operational costs

Operational costs are the ongoing costs to businesses and largely relate to any cost differentials associated with alternative single-use and reusable products (compared with the existing single-use plastic items).

Table 6: Cost by item under Option 1 (PV per year) - $ million[72]

Items	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
Straws	1.61	1.42	1.24	1.07	0.91	0.77	0.63	0.50	0.38	0.27	8.80
Cutlery	(1.72)	(1.68)	(1.64)	(1.60)	(1.56)	(1.53)	(1.49)	(1.45)	(1.42)	(1.38)	(15.48)
Plates	(0.21)	(0.20)	(0.20)	(0.19)	(0.19)	(0.18)	(0.18)	(0.17)	(0.17)	(0.17)	(1.86)
Drink stirrers	(0.57)	(0.55)	(0.54)	(0.53)	(0.51)	(0.50)	(0.49)	(0.48)	(0.47)	(0.45)	(5.08)
EPS food containers	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.41)
EPS drink containers	1.12	1.01	0.91	0.82	0.73	0.64	0.56	0.49	0.42	0.36	7.06
Cotton bud sticks	0.27	0.24	0.21	0.19	0.16	0.14	0.12	0.10	0.08	0.06	1.56
Total	**0.46**	**0.19**	**(0.06)**	**(0.29)**	**(0.50)**	**(0.70)**	**(0.88)**	**(1.05)**	**(1.21)**	**(1.35)**	**(5.40)**

The costs of switching away from single-use plastics for industry are provided in Table 6. The total costs to industry reflect that there will be a net cost saving of $5.40 million PV over 10 years where industry moves away from single-use plastics to single-use alternatives. The cost saving is largely driven by cutlery and drink stirrers, attributed to the cost of a single-use alternative item being lower than the single-use plastic counterpart. Specifically, the cost saving arising from cutlery is driven by the cost differential between single-use plastic items and alternatives, alongside the expected removal of some of these items from the market. This calculation considers the cost of comparable non-plastic alternative products, rather than more expensive premium alternatives. The costs per year suggest that the reform will provide a net positive by the end of year 3.

These costs have been estimated based on the consumption level assumed within Table 18, in conjunction with the costs differentials per item detailed in Table 21 and Graph 1 within Appendix A.

Generally, it has been assumed that where single-use plastic items are currently used across the hospitality and medical sectors, the majority of this use will be replaced with non-plastic single-use alternatives. Subject to the item in question, a small shift towards reusables, along with avoidance of the item altogether has also been factored for, based on current trends. For further detail on how each item has been treated, please refer to Appendix A.

The cost per item, with respect to single-use plastics and single-use alternatives, has been calculated by considering multiple sources to quantify an average cost. The cost per use of a reusable item (to determine the cost differential of replacing a reusable item for a single-use plastic), has been calculated by determining the average cost of the reusable item and proportioning this cost by the assumed lifespan of the product and how many single-use plastic items it will replace.

In terms of the costs sourced for industry, it has been assumed that industry may buy items in bulk or may have access to wholesale pricing compared to the general public. This will result in a lower cost attributed to each item than compared to those considered for 'retail purposes'. For further details on how each item has been costed, please refer to Appendix A.

[72] Where quoted figures don't sum exactly, it is a result of rounding.

Based on these assumptions, the cost to industry has been quantified in line with the volumes of single-use plastics detailed within Section 5.2.

5.6 Cost to consumers

5.6.1 Cost to consumers shifting from single-use plastics

Consumer costs relate to the cost differential consumers will incur from switching away from single-use plastic items under the proposed reform in retail settings (i.e. in a supermarket or party supply store), which may include switching to a single-use alternative, a reusable item, or avoiding the item altogether. It is assumed in this instance that any additional costs or cost savings borne by retailers will be passed on to consumers in full, and therefore has been treated as a cost to consumers.

Table 7: Total cost per item under Option 1 (PV per year) - $ million[73]

Items	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
Straws	0.39	0.32	0.26	0.21	0.15	0.11	0.06	0.02	(0.02)	(0.06)	**1.44**
Cutlery[74]	1.80	1.30	0.84	0.41	0.01	(0.36)	(0.68)	(0.66)	(0.65)	(0.63)	**1.38**
Plates	(0.36)	(0.35)	(0.34)	(0.33)	(0.32)	(0.32)	(0.31)	(0.30)	(0.29)	(0.29)	**(3.21)**
Drink stirrers	(0.15)	(0.15)	(0.14)	(0.14)	(0.14)	(0.13)	(0.13)	(0.13)	(0.12)	(0.12)	**(1.36)**
EPS food containers	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	**(0.11)**
EPS drink containers	(0.08)	(0.08)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	**(0.72)**
Cotton bud sticks	1.69	1.50	1.33	1.17	1.01	0.87	0.74	0.61	0.50	0.39	**9.80**
Total	**3.28**	**2.54**	**1.86**	**1.22**	**0.63**	**0.08**	**(0.40)**	**(0.54)**	**(0.67)**	**(0.78)**	**7.22**

The costs of switching away from single-use plastics for consumers are provided in Table 7. The total costs to consumers indicate that a net cost of $7.22 million PV over 10 years will be realised where consumers move away from single-use plastics to single-use alternatives. The cost is largely driven by cotton bud sticks, given the high volume of items consumed within a retail context[75]. This cost is mitigated across the other items, particularly plates, given the lower cost of single-use alternatives within a retail setting. Across the review period, it is expected that the net impact will become positive within the seventh year of the reform. While other items will have a smaller cost impact per year or may have a net cost saving across the review period (i.e. plates, drink stirrers, and EPS food and drink containers), these cost savings will not offset the cost arising from cotton bud sticks.

The consumer costs have been estimated based on the consumption level estimated in Table 18, in conjunction with the costs per item detailed in Table 22 and Graph 2 in Appendix A.

[73] Where quoted figures don't sum exactly, it is a result of rounding.

[74] The reversal in trend direction of cutlery item costs observable from 2030 is a result of the falling item cost of single-use alternative cutlery reaching parity with the SUP equivalent under the modelling assumption of a 2.5% annual decrease in price driven by efficiencies derived from a growing rate of production.

[75] The cost per item has considered multiple sources across a number of alternatives (for example, paper, etc.) to quantify an average cost. The values then decrease in magnitude in subsequent years due to discounting of future values.

Similar to the approach adopted for industry, it has been assumed that where single-use plastic items are currently used across the retail sector, the majority of this use will be replaced with non-banned single-use alternatives. Subject to the item in question, a small shift towards reusables, along with avoidance of the item altogether has also been factored for, based on current trends. For further detail on how each item has been treated, please refer to Appendix A.

The cost per item, with respect to single-use plastics and single-use alternatives, has been calculated by considering multiple sources to quantify an average cost. The cost per use of a reusable item (to determine the cost differential of replacing a reusable item for a single-use plastic), has been calculated by determining the average cost of the reusable item and proportioning this cost by the assumed lifespan of the product and how many single-use plastics items it will replace. For further details on how each item has been costed, please refer to Appendix A.

5.6.2 Exemption cost

Under the options, there will be an exemption available to consumers who require straws due to a disability or for medical reasons. As it is expected that there will be no formal process by which these consumers will need to obtain a single-use plastics exemption, no costs have been attributed to this exemption.

5.7 Cost to government

The costs to government are outlined in Table 8, split across year 1 implementation costs and ongoing enforcement and compliance costs. Enforcement and compliance activities for the single-use plastic ban will be the responsibility of the EPA. The costs to government for the ban are based on EPA's estimates of the costs involved in enforcement and compliance of the proposed single-use plastic ban.

Table 8: Cost to government (PV over 10 years) - $ millions

Costs	Options 1 & 2
Year 1 implementation costs	0.38
Ongoing enforcement and compliance costs (after year 1)	0.17
Total cost	**0.55**

Further details on the costs to government are provided below.

5.7.1 Year 1 implementation costs

The costs to government in year 1 include costs associated with industry engagement and providing information to businesses to support the commencement of the ban, along with the costs of setting up the compliance approach for the ban. It is estimated that these implementation costs will total $0.38 million.

Implementation costs will include resources for the following:

- communication and engagement with duty holders
- development of guidance material
- administrative costs: website, IT etc
- authorised officer training
- initial compliance activities.

5.7.2 Ongoing enforcement and compliance costs

Ongoing enforcement and compliance activities for the ban, post year 1, are estimated to cost around $0.17 million PV over 10 years. This enforcement and compliance cost will cater for:

- contact centre processing

- dispatch assessment and triage (of reported incidents)
- inspections
- compliance action
- internal review, updates and changes as needed.

5.8 Benefits

5.8.1 Benefits overview

There are two types of benefits considered across the options. The first type captures monetised benefits, while the second captures those benefits which have not been able to be quantified. The monetised benefits relate to the benefit derived from reduced land and marine litter in terms of avoided clean-up costs and avoided operating landfill costs.

Non-monetised benefits considered later within the chapter include reduction in contamination levels, environmental health benefits and human health benefits.

5.8.2 Benefit variables

Table 9 provides a summary of the estimated monetised benefits over the 10-year period. The benefits quantified relate to the items banned under Option 1. Only the costs and benefits relating to Option 1 have been quantified as there is limited information available on integrated items to be able to quantify the difference between Option 1 and Option 2 in dollar terms. The differences between the two options have been assessed qualitatively in section 5.16 - Overall assessment of options.

Table 9: Summary of estimated benefits of Option 1 (PV over 10 years) - $ millions[76]

Benefit	Option 1
Avoided operating landfill cost	0.32
Benefit derived from reduced land and marine litter in terms of avoided clean-up costs	15.08
Total benefits	**15.41**

Table 9 provides that the estimated benefits across Option 1 total to $15.41 million over 10 years. The community is estimated to recognise a benefit of $15.08 million over 10 years, based on avoiding land and marine litter (derived in terms of avoided clean-up costs). In addition to avoided litter, it is estimated that a benefit of $0.32 million over 10 years will be realised due to avoided operating landfill costs, arising from less single-use plastic items entering landfill.

The sections below provide further details on the monetised benefits.

5.8.3 Methodology - benefit of avoided litter and avoided landfill cost

Quantification of single-use plastics avoided

To calculate the expected litter and landfill expected be avoided under Option 1, single-use plastic volume estimates have been converted to metric totals (i.e. tonnes). These metric values have been sourced from the analysis commissioned by Sustainability Victoria. For further details on this calculation, please refer to Appendix A.

The use of single-use plastic items which have been treated as exempt (i.e. straws for individuals who require them for disability or medical reasons, cutlery sets for correctional and mental health facilities, etc.) have been treated as unavoidable plastics. This volume of single-use plastics is assumed not to be avoided.

Avoidable plastics capture two different scenarios:

[76] Please note, quoted figure may not sum exactly due to rounding.

- The first scenario considered the transition away from single-use plastic use, leading to avoided litter of such items. This volume directly relates to the benefit of avoided litter.

- The second centres on avoided landfill, due to the use of reusables and single-use alternatives, in conjunction with a shift away from using such items altogether. Given the breadth of materials that single-use alternatives could be made of (i.e. bamboo, sugarcane, FSC certified paper, etc.) and general consumer behaviours, an assumed compostable rate of 50 per cent has been attributed to single-use alternatives to appropriately cater for the fact that not all items will avoid landfill.[77]

Based on this approach, the total tonnes of single-use plastics avoided from landfill and litter has been quantified. It is estimated that approximately 17,213 tonnes of single-use plastics would be avoided over 10 years. This quantum is significantly lower than other values of single-use plastics quantified (i.e. quantum of single-use plastics flowing to litter per the WWF report, etc.) due to the single-use plastics included within the ban only forming a small portion of the total single-use plastic items available within the market (including items such as drink bottles, food packaging, etc.). For further details on this calculation, please refer to Appendix A.

Attributing a monetary value to avoided litter and landfill under Option 1 has been detailed below.

Benefit of avoided land and marine litter

The benefit of avoided litter captures the benefit of avoided single-use plastic litter within the community to the Victorian public. In doing so, avoided litter clean-up cost estimates have been used. While it is recognised that the effectiveness of capturing the benefits of avoided litter may be limited due to the nature of clean-up costs, the value does provide a relative base to quantify the potential level of the benefit.

The avoided clean-up costs for reduced land and marine based litter represent a way of estimating damage costs of litter, including:

- increased visual amenity due to less litter in public spaces and in the natural environment
- benefits from reduced harm to the environment and wildlife being caused by litter, and the potential flow on effects of this for human health and well-being.

In terms of reaching an avoided clean-up cost[78], a blended cost for avoided land and marine litter (per tonne) has been quantified in an effort to capture the benefit of avoided litter entering both land and marine environments.[79] The cost used for avoided land litter, per tonne, is $2,103 (adjusted for Consumer Price Index (CPI) from $1,876).[80] The cost for avoided marine litter, per tonne, is $40,929.95 (adjusted for CPI from $36,512).[81] In blending these two costs together, it has been assumed that single-use litter within oceans only equates to approximately 20 per cent of the total litter experienced within Victoria, of which the remaining 80 per cent would be associated with land litter. This results in a blended cost for avoided land and marine litter of $9,868 per tonne.

The Marsden Jacob study has been used to quantify the benefit of avoided land and marine litter. This value has been used over more recent studies, as Marsden Jacobs, for the purposes of undertaking the CBA for the single-use plastics bag ban, estimated a per tonne cost that is applicable to plastic litter in Victoria. A per tonne cost allows for the avoided landfill and litter totals to be quantified as a cost per the weight of each unit.

[77] Due to limited data existing around the compostability of alternative single-use items and the different materials which are available in the market, an assumption that an average of 50 per cent compostability across ten years has been adopted in quantifying the number of alternative single-use plastic items which avoid landfill, to appropriately cater for the possibility that a portion may still end up in such an environment despite their intended nature. It is expected that options for processing compostable single-use alternatives will increase over time.
[78] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).
[79] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).
[80] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).
[81] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).

Notwithstanding the uncertainty which may be associated with clean-up costs, a breakeven analysis has been conducted in Appendix B to investigate the effects of variations in this cost estimate and the value required in order for the reform to break even – that is, the level of benefits needed to fully offset the costs of the reform.

A drawback of using avoided clean-up costs to estimate the value of the benefits of avoided litter is that it is an indirect estimate of avoided harms. It does not necessarily directly reflect damage to the environment, human health or amenity, since the cost to clean-up a certain amount of litter may not be the same as the value of the harms associated with that litter. Instead, clean-up costs illustrate the cost of reversing damage after it has occurred or as it is occurring. Marsden Jacob estimated clean-up costs for land and marine environments using various sources, including by estimating the value of volunteer time for voluntary litter clean-up programs. Marsden Jacob note that this represents a conservative approach to estimating the benefits of avoided litter, as it may not fully capture the associated harms or the value that society places on reducing the amount that is littered.

WWF Australia's Plastic Revolution to Reality Report estimates that Australia's annual single-use plastic consumption equates to 1,000,000 tonnes.[82] Of that estimation, 71 per cent is sent to landfill, and 11 per cent leaks directly into the environment (with approximately the remaining 18 per cent being recovered through recycling).[83] The landfill and litter components of this estimate are found to be reasonable, given single-use plastic items are generally used on a demand-basis, often in a food court or home environment, where they may be more often than not disposed of, ending up in landfill. Alternatively, a portion may still enter the environment as litter, which is factored for within the 11 per cent estimate.

For further details on how the blended clean-up cost per tonne has been calculated, please refer to Appendix A.

5.8.4 Benefit derived from reduced land and marine litter in terms of avoided clean-up costs

Table 10: Benefit derived from reduced land and marine litter (PV over 10 years) - $ millions

Benefit	Option 1
Benefit derived from reduced land and marine litter in terms of avoided clean-up costs ($m)	15.08

Table 10 provides that the benefit derived from reduced land and marine litter across Option 1 over 10 years will total $15.08 million. Based on this benefit, Option 1 is expected to result in a benefit to the community from less single-use plastics being littered across Victoria. The ban on single-use plastic items (apart from a small number of exemptions) is expected to almost entirely eliminate the litter pollution of these items. It is estimated that 1,893 tonnes of single-use plastics will be avoided from becoming litter[84]. These estimates align with the percentages included within the WWF Australia's Plastic Revolution to Reality Report around the quantum of single-use plastics which are sent to landfill (71 per cent), leak into the environment (11 per cent), or are recovered via recycling (18 per cent).

This benefit is based on the nature of plastic pollution. Over time, plastics can break up in the environment, or resemble food eaten by animals. When plastics do eventually break up, the risks of toxicity contaminating the environment (i.e. water, soil and the food chain) may be realised, having undesired consequences for the environment and community.

Litter from alternative single-use items is expected to have fewer negative impacts, as many of these replacement items are made of natural materials, meaning they are both less visible in the environment and their presence will reduce over time through biodegradation. This suggests that there will be a direct benefit of reduced litter arising under the proposed ban (Option 1) compared with the base case, even where this benefit is partially offset by littering from alternative single-use items such as bamboo cutlery and paper straws. Of the 1,893 tonnes of single-use plastics which will be avoided from becoming litter, 1,769 tonnes is estimated to be replaced with single-use alternatives.[85]

[82] WWF Australia. (2020). Plastic Revolution to Reality Report.
[83] Across the six most problematic categories of consumer single-use plastic (including disposable foodware which a number of proposed banned items would fall in), these six categories account for 70% of the annual single-use plastics consumption in Australia and contribute to 75,000 tonnes of the 130,000 tonnes leaked into the environment each year. Based on this estimation, the WWF report provides that 11 per cent leaks directly into the environment.
[84] Of the 17,213 tonnes of single-use plastics estimated to be avoided from this ban, 12,221 tonnes will be avoided from going to landfill and 1,893 tonnes becoming litter. The remaining 3,098 tonnes relates to recycled single-use plastic.
[85] This value is quantified assuming that single-use plastic items weigh the same as single-use alternatives. This assumption has been considered reasonable for the purposes of quantifying at a high level the impact alternatives may have on the economy. It remains unclear the type of alternatives industry and consumers will switch to, to inform the litter tonne estimation.

Given the nature of clean-up cost estimates, a breakeven analysis has been performed to understand what cost would be required for the proposed reform to break even. This sensitivity analysis, detailed in Appendix B, shows that if the value was reduced as low as $1,145 per tonne, it would still result in a net positive outcome. In other words, the net avoided litter value could be reduced by as much as 88 per cent and the proposed ban would still break even over 10 years. This being noted, evidence suggests that plastic packaging persists in the environment and may have a higher associated clean-up cost.

Plastic litter is also the type of litter that the public is most concerned about[86], particularly when compared to non-plastic alternatives, meaning that it may be considered more valuable to clean-up relative to non-plastic litter. Please refer to Appendix B for further detail relating to this breakeven analysis.

5.8.5 Avoided operating landfill costs

Avoided landfill operating costs[87] have been estimated to equate to $61.32 per tonne (adjusted for CPI from $54.70 per tonne in 2016).[88] Based on this price, it is estimated that, per tonne of single-use plastic avoided, $43.54 in landfill operating costs are avoided (given 71% of litter sent to landfill).

Table 11: Avoided landfill costs (PV over 10 years) - $ millions

Benefit	Option 1
Avoided landfill operating costs ($m)	0.32

Table 11 provides that the avoided landfill operating costs across Option 1 over 10 years will total $0.32 million. A proportion of the banned single-use items will be exempt and will therefore not result in any landfill cost savings. Of those that are expected to be exchanged for single-use alternatives, a moderate rate of 50 per cent of composting, in line with systemic changes likely to occur as a result of the ban, has been assumed.[89] This will contribute to avoided landfill and therefore lead to cost savings.

A small number of reusable items have been assumed not to be recyclable with this proportion of materials expected to end up in landfill, albeit in significantly lower numbers owing to the inherent reusability of these items. Finally, those items removed from the market entirely (e.g. a portion of straws consumed in Victoria) will also directly lead to reduced littering and landfill quantities.

Externalities associated with landfill have not been considered for the purposes of quantifying this benefit, given the low volume of landfill expected to be avoided under the proposed reform, approximately 12,221 tonnes over ten years.

5.9 Non-monetised benefits

5.9.1 Benefits of reducing plastic on marine and land environment

While it is recognised that the benefit of reduced litter on the marine and land environment are implicitly addressed under the benefit of avoided land and marine litter quantified above (as less litter reduces the amount which eventually ends up in the environment), the full benefits to Victoria's environment (particularly marine) may not be captured, because the value is an indirect estimate of avoided harms. The ultimate environmental and social costs may exceed the avoided clean-up costs utilised, and therefore have been discussed qualitatively below.

[86] Victorian Department of Environment, Land, Water and Planning. (2019). Container Deposit Scheme Willingness to pay for reduced litter in Victoria Report. Pg. 22.
[87] This cost refers to raw landfill operating costs, excluding any inclusion of landfill levies. This cost also excludes costs relating to greenhouse gas emissions or other environmental impacts of landfills, on the basis that limited data exists to substantiate the respective costs associated with such matters.
[88] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).
[89] The composting rate of 50 per cent

Specific to Victoria, the direct impact of litter on marine environments, particularly Melbourne's Port Phillip Bay, have been previously identified to be associated with the pieces of rubbish flowing into the Bay annually from the Yarra and Maribyrnong rivers.[90]

Monthly trawls of rubbish within the two rivers, between January 2015 and 2019, conducted by the Port Phillip EcoCentre, demonstrated that microplastics made up almost 80 per cent of rubbish entering the bay, of which straws were identified to equate to 0.63 per cent and polystyrene 10.46 per cent.

Given the nature of the Bay, containing a fairly enclosed marine ecosystem which does not receive additional plastic pollution from Asia or anywhere else in the world, the litter collected and which continues to impact the Bay has been deemed to be a direct result of Victorian litter.

Despite the impact reflected via EcoCentre's review, the figures demonstrated a reduction in the number of straws in the Yarra River, which at the time of analysis, was the only litter category to decline. This reduction was attributed to community and business efforts embracing alternatives to plastic straws (i.e. glass, metal and paper).

While this voluntary shift demonstrates the benefits of less plastic pollution to the marine environment, it is expected that the proposed reform, applying state-wide, will realise a reduction in the impact that plastic pollution has on the marine environment at a greater capacity, limiting the potential harm such items may have on the respective wildlife and ecosystems.

In light of this study and the positive insights demonstrated around the quantum of single-use plastics straws found within the Yarra River, it is expected that reduced marine litter would occur under the proposed reform. While the extent to which marine litter will decrease is unclear, a preventative approach which limits the possibility of single-use plastics entering into marine environments is seen to be more cost effective than managing the issue once it already exists. This preventative approach would extend equally to land litter and would be expected to result in a higher NPV for both options.

5.9.2 Impacts on the community

The impacts of plastic polluting on the community have implicitly been addressed under the benefits from reduced land and marine litter quantified above, as the community benefits from action being taken to reduce litter, leading to avoided clean-up costs. However, the avoided clean-up costs do not directly reflect the damage of plastic polluting on the community. This benefit is also discussed qualitatively below to fully recognise the potential benefits of the proposed reform.

As addressed within the problem statement of this RIS, the littering of single-use plastic items has the potential to break down over time into microplastics (i.e. tiny pieces of plastics). In such a form, microplastics may enter into soil and waterways, which humans may then ingest. For example, where microplastics remain in the marine environment, there is a risk that such items are mistaken for food and consumed by fish. This risk is then passed on to the public where the fish is consumed. This is of special concern given the toxicity of plastic items.

While the implications of ingesting plastics via our food systems remains unclear, both in Victoria and globally, initial studies suggest that on average, people could be ingesting approximately 5 grams of plastic every week, either through air, food and water consumed by humans.[91]

It is expected that a direct benefit will arise where such items are removed from use for the community, eliminating the possibility of single-use plastics harming the environment, including wildlife and contaminating food and water the community digests. This may indirectly result in a loss of convenience to consumers where the properties of plastics are more desirable than alternatives. However, it is expected that this loss of convenience will not be significant, particularly as alternatives become more available and mainstream.

The presence of plastic pollution and litter in popular locations also can have a negative impact on tourism economies. While the benefit of avoided land and marine litter can be assumed to capture the amenity benefits the community receives from reduced litter, the economic impacts of litter on tourism have not been quantified specifically in the cost-benefit analysis due to limited data on the direct impact single-use plastic items have on this economy. Nevertheless, it is expected that the

[90] Charko, F., Blake, N., Seymore A., Johnstone C., Barnett E., Kowalczyk N & Pattison M. (October 2020). Clean Bay Blueprint – Microplastics in Melbourne. Port Phillip EcoCentre.
[91] Plastic ingestion by humans could equate to eating a credit card a week. (2019). WWF. https://wwf.panda.org/wwf_news/?348375/Plastic-ingestion-by-humans-could-equate-to-eating-a-credit-card-a-week.

proposed reform would support the continued benefits of tourism, particularly around Victoria's population attractions, including Port Phillip Bay and the Great Ocean Road.

Due to the expected impact on the community, it is anticipated that this benefit would increase the NPV for both options.

5.9.3 Reduced contamination of recycling streams

Under the proposed reform, a reduction in contamination of Victoria's waste systems, due to a reduction in use of single-use plastics, is expected to reduce the level of complexity and cost involved in recovering and processing plastics, improving the recovery rate and quality of recyclables which are collected via kerbside bins. This reduction in contamination of recycling by single-use plastic items will also improve the circularity of such materials, aligning with Victorian government's plan of shifting to a more circular economy.[92]

To what extent contamination will reduce, however, remains unclear. Notwithstanding this limitation, where there is a reduction in single-use plastic items which contribute to the level of contamination experienced within kerbside waste, the benefits associated with the options and therefore NPV would be higher than has been calculated in this analysis.

5.9.4 Avoided lost value of single-use plastics

Inherent in the use of single-use plastics is their near-immediate disposal. Disposal of single-use plastics has been estimated to cost the world economy in the region of US $80-$120 billion every year. By disposing of single-use plastic items, their value is effectively lost to the economy. Recognising that, under a single-use plastic ban, some of these items would likely be exchanged for reusable alternatives, some of this value would no longer be lost.

While it is predicted that only a relatively small proportion of single-use plastics would be replaced with reusable alternatives (approximately 5 - 12 per cent, depending on the item, as reflected in Appendix A), the preservation of value would nevertheless represent a benefit to the Victorian economy.

This benefit will inherently lead to a small increase in other materials being utilised (i.e. metal, bamboo, paper, etc.) for reusable products. As it remains unclear the extent to which these other materials will be utilised, this benefit has not been quantified, however, it is expected that the use of such materials will be smaller and lead to greater recovery of such materials, given the reusable and recyclability of materials used in reusable products. An example of this is metal straws. The continued use of a metal straw results in less material (in this case metal) being used over the lifespan of the item, alongside the fact that the item can then be recycled and its value can be reused for another purpose.

5.10 Sensitivity analysis

A sensitivity analysis was conducted to understand the impacts of varying key cost assumptions on the overall costs of each option. The sensitivity analysis has considered the following assumptions:

- single-use plastic item numbers
- the cost differential of key single-use alternative items
- the calculated proportion of the retail price of single-use plastic items that relates to plastic raw material value
- the value of avoided clean-up costs as a breakeven analysis
- the proportion of plates plastic-coated.

Each of the assumptions has been varied from its central assumption to provide a low-cost and high-cost scenario. Table 12 provides an overview of the different scenarios for each assumption:

[92] Sustainability Victoria Waste Projection Model. Accessed: http://www.sustainability.vic.gov.au/services-and-advice/business/investment-facilitation-service/waste-data-portal/waste-projection-model.

Table 12: Low/central/high-cost scenarios for each assumption

Assumption	Low-cost scenario	Central cost scenario	High-cost scenario
Single-use plastic item numbers	20% decrease	As quantified	20% increase
Cost differential of key single-use alternative items	10% decrease	As quantified	10% increase
The proportion of SUP retail price being material value	5 p.p.[93] decrease[94]	As quantified	5 p.p. increase
The value of avoided clean-up costs	Breakeven analysis and comparative study considered		
The proportion of plates that are plastic-lined paper and cardboard	10 p.p. decrease	As quantified	10 p.p. increase

Table 13 below reflects the percentage change in the NPV under each of these sensitivities.

Table 13: Percentage change in NPV

Assumption	Item	Low-cost scenario	Central cost scenario	High-cost scenario
Single-use plastic item numbers	N/A	-20%	-	20%
Cost differential of key single-use alternative items	Hospitality-sector straws	13%	-	-13%
	Retail-sector cotton buds	10%	-	-10%
	Hospitality-sector drink containers	6%	-	-6%
The proportion of plates that are plastic-lined paper and cardboard	N/A	6%	-	-6%

Across the scenarios considered, the cost differential of key single-use alternative items was identified to be the most sensitive to the overall costs of each option, specifically straws. The cost differential between a single-use plastic drinking straw and its alternative equivalent is $0.01. A 10 per cent increase in this differential results in a 13 per cent decrease in NPV across the model. The same is true in the opposite direction, with signs inverted. This level of sensitivity is expected as the cost differential per item is a significant driver of the costs considered within this RIS.

The sensitivity of the avoided clean-up costs utilised has been considered under a breakeven analysis. This shows that, from the initial cost of $9,868 used in the analysis, any reduction of that value down to $1,145 would still result in a net positive outcome. In other words, the net cost could be reduced by as much as 88 per cent and the proposed ban would still break even over 10 years. More recent clean-up cost estimates indicate that clean-up costs could be higher than estimated in this RIS. Therefore, a more recent estimated value for avoided clean-up costs for container litter of $29,110 per tonne has been used to indicate a high-end potential NPV of $42.7 million.

[93] "p.p" refers to percentage point.
[94] Given that the utilised calculated estimate is 6%, a smaller bracket has been used for this test to avoid negative percentages.

All sensitivity tests demonstrated a positive NPV, or in the case of the breakeven analysis, demonstrated Option 1 would breakeven even at significantly lower values.

Further detail across each of the scenarios has been included within Appendix B below.

5.11 Overall assessment of Option 1

Based on the costs and benefits quantified above, the benefit-cost ratio for Option 1 is 6.51, as provided in Table 14.

Table 14: Benefit Cost Ratio for Option 1

Item	Option 1 ($m)
Total PV of costs	(2.37)
Total PV of benefits	15.41
Net Present Value (NPV)	13.04
Benefit Cost Ratio (BCR)	6.51

The NPV of $13.04 million indicates that Option 1 provides greater quantified benefits when compared to the relevant costs (and when compared to the base case). Additional non-quantified benefits, associated with the expected reduction in contamination of recyclables, along with reduced impacts on the environment and the community, would likely increase the NPV further, if these benefits were able to be quantified. Therefore, Option 1 is preferred to the base case.

Further, given that the long-term impacts of plastic particles in the environment are still not fully known, the precautionary principle would indicate there is potential additional benefit in implementing the proposed reform to ban certain single-use plastic items.

6 Comparison between Option 1 and Option 2

In comparing Option 1 against Option 2, we have undertaken a qualitative comparison given there is limited information available to quantify the difference between Option 1 and Option 2 in dollar terms.

Option 2 may have marginally higher benefits as a result of banning integrated items from 1 February 2023 (earlier than Option 2). This additional benefit is less than 1 per cent of the benefits over three years, given that integrated items represent around 0.95 per cent of the in-scope single-use plastic items.

In terms of additional costs, Option 2 is expected to create several implementation challenges compared to Option 1. These challenges include:

- **Complexities associated with producers moving to viable alternatives in the short-term**: Removing integrated items from packaging or changing integrated items to be made from alternative materials requires testing and changes to packaging design, manufacturing equipment and processes, all which impose costs and require time. While these types of costs are imposed under both Option 1 and 2, they are more onerous under Option 2 as the changes would need to occur quickly to meet the 1 February 2023 ban date and could not be incorporated into existing packaging re-design to update processes and timeframes.
- **Inadvertent removal of integrated items from the Victorian market in the short-term**: There is a high risk that products that contain integrated packaging may no longer be made available for the Victorian market, particularly where these products are imported or produced in Australia for a national market. This would lead to a loss of producer and consumer welfare. This is because the integrated item is part of the overall production/manufacturing process and some producers may be reluctant or unable to change their production processes in the short term, particularly where Victorian sales are a small proportion of their overall sales.

Given the risks and unintended consequences discussed above, it is expected that the potential level of disruption from banning integrated items from 1 February 2023, would exceed the benefits and have a negative impact on the NPV for Option 2. Therefore, Option 1 is preferred to Option 2.

6.1 Conclusion

The analysis assessed Option 1 to be an improvement on the base case (i.e. Option 1 has a positive NPV, based on the quantifiable benefits and costs). Applying the precautionary principle would further support the introduction of a ban on the listed single-use plastic items given that the long-term adverse impacts of microplastics in the environment are still not fully known.

Option 1 (Ban of items, with an exemption for integrated items exempt until 31 December 2025) is the preferred option because it provides almost all the benefits of Option 2, while avoiding the implementation risks associated with banning integrated items when the broader ban commences on 1 February 2023, and not allowing sufficient time for manufacturers to phase out single-use plastics integrated items.

Option 1 also aligns with the approach to integrated items taken in those other Australian jurisdictions that have introduced single-use plastic bans.

7 Preferred option

Option 1 (Ban of items, with an exemption for integrated items until 31 December 2025) is the preferred option as it is expected to provide greater net benefits to the community than Option 2 and delivers on the Victorian Government's objectives for the reform.

Option 1 involves:

- A ban on the following single-use plastic (conventional, degradable and compostable plastics) items:
    - drinking straws
    - cutlery, including knives, forks, spoons, chopsticks, splades, food picks and sporks
    - plates
    - drink stirrers or sticks
    - EPS food service containers
    - EPS drink containers
    - cotton bud sticks.
- 'Banned single-use plastic item' is defined in the proposed regulations as an item that is not 'reusable'. Items that are considered reusable and not a single-use plastic will be manufactured to be used for the same purpose on multiple occasions, and come with a warranty (or other written representation from the manufacture as to the length of time the item is designed to last) of at least one year.
- The ban would provide an exemption for single-use plastic items that are integrated into the packaging of products by a machine-automated process, until 31 December 2025. For example, plastic straws attached to juice boxes or plastic spoons integrated into yogurt lids can continue to be supplied until 31 December 2025, after which these items will be banned for sale and supply in Victoria.
- The ban would also provide the following exemptions:
    - single-use plastic straws for disability or medical reasons
    - single-use plastic cotton bud sticks for scientific, medical, forensic or law enforcement testing purposes
    - single-use plastic cutlery for use by a facility, place or premise for correctional, mental health, police or youth justice, for health and safety reasons
    - single-use plastic lined paper and cardboard plates.
- Penalties in the proposed regulations for businesses and organisations who provide banned items are up to:
    - 60 penalty units for an individual
    - 300 penalty unties for a business, organisation, council
- The Victorian Government sets the penalty units each year. For the 2021-2022 financial year, the value of a penalty unit is $181.74.

As part of the compliance approach undertaken under Option 1, penalties and infringements will be imposed where Option 1 is not adhered to. The extent of these penalties and infringements, and the approach to ensuring compliance, will be confirmed upon finalisation of the regulations.

Option 1 scored higher than Option 2 because while both options would achieve similar benefits on a per item basis, banning integrated packaging items from 1 February 2023 (Option 2) would be expected to have larger implementation cost impacts which would have a negative effect on the expected NPV. Whilst limiting disruption, Option 1 is expected to:

- reduce plastic littering and pollution (aligning with Objective 1 of the RIS), and
- reduce consumption of single-use plastic, and therefore reduced onflow of items entering landfill waste (aligning with Objective 2 and 3 of the RIS).

Impact on small business

It is good practice for a RIS to consider the likely impacts of the preferred option on small business. This reflects a concern that, generally, small businesses may experience disproportionate impacts from new regulations, for reasons such as having limited resources to interpret and comply with new requirements, alongside the potential for greater cost impacts due to smaller scaled operations.

The impact of the single-use plastic ban on small businesses has the potential to be disproportionate to other businesses operating within Victoria. This may arise where limited information or resources are available for a small business to make a shift to replace any existing single-use plastic items with items that are not subject to the ban, including sourcing warranties from suppliers. Notwithstanding this potential impact, it is anticipated that by government providing sufficient lead time to businesses, from announcing the proposed ban, to introducing the proposed regulations and it coming into effect, small businesses will have sufficient opportunities to raise concerns and ask any questions they may have around the process, allowing for a transition away from single-use plastic items proposed to be banned. The Victorian Government will undertake a business engagement program that will assist small to medium businesses with the transition from banned single-use plastics, with a focus on investigating reusable solutions.

Impact on hospitality/retail businesses

The impacts of the single-use plastic ban are expected to be broadly proportionate to the quantity of single-use plastic items that the business consumes and are therefore expected to impact all retail and hospitality businesses proportionately. That is, large businesses that consume a greater number of items included in the ban are expected to experience greater relative costs and benefits, and small businesses with lower volumes are expected to be affected to a lesser extent. Overall, the impacts of Option 1 are expected to be relatively modest for most businesses, given the similar costs between single-use plastic items and their single-use non-plastic alternatives (such as FSC certified paper, wood and bamboo). This expectation is based on the fact that there will be a majority shift to single-use alternatives, alongside some removal of items from the market or shift to reusables (as reflected within Table 19 and 20).

It is expected that greater emphasis may be placed on targeting information and resources on the ban towards smaller businesses. This is attributed to the greater administrative burden that will arise for smaller businesses that do not have the required controls in place to manage such changes. It is more likely that smaller businesses may not be aware of the ban and the alternatives available. However, it is expected that many of the changes will be implemented at a supplier level (i.e. suppliers will need to stop stocking banned items in Victoria). This is also aided by the fact that these suppliers have already responded to similar bans in other Australian jurisdictions.

Impact on manufacturers

Manufacturing of single-use plastics generally occurs outside of Victoria, in conjunction with a number of small Victorian players. Based on this market structure, a significant impact on Victorian manufacturing businesses is not expected, where manufacturers have sufficiently diversified their operations. However, a disproportionate impact may be felt by any small Victorian plastic manufacturers where the majority or entirety of their business relates to manufacturing of items included in the ban. The precise number of Victorian businesses that exclusively manufacture single-use plastic items, proposed to be banned is not fully known.

In these cases, pivoting manufacturing to other plastic items would involve costs. However, for any such businesses operating in Victoria, they would continue to be able to export their single-use plastics products to other jurisdictions in Australia or overseas.

Impact on competition

It is also good practice for a RIS to assess the potential impact of the preferred option on competition. New regulations can sometimes affect competition by preventing or limiting the ability of businesses and individuals to enter and compete within particular markets.

There are some manufacturers in Victoria that provide single-use products to businesses and other organisations. Industry engagement with manufacturers indicated that while a number of manufacturers are already making alternative items to single-use plastics, any manufacturer that predominantly makes single-use plastic items would be affected by the ban.

From a competition perspective, as the ban applies equally to all manufacturers that produce the listed single-use plastic items, it is not expected that there would be a significant impact on competition. These manufacturers can seek to diversify their offerings by producing alternatives to single-use plastics; produce single-use plastics that are not banned items and/or sell their single-use plastics into other markets where they are not banned or where exempt circumstances apply pursuant to the proposed regulations.

Table 15 considers the questions used to assess whether a proposal is likely to affect competition as outlined in the Victorian Guide to Regulation. The responses indicate how the proposed reform may affect retailers, hospitality and manufacturers.

Table 15: Competition Assessment questions

Question	Response - Retailers and hospitality	Response - Manufacturers
Is the proposed measure likely to affect the market structure of the affected sector(s)?	The market structure of the retail/hospitality sector is not expected to be affected, given the availability of similarly priced alternatives to single-use plastic items in the market.	Stakeholders have indicated that manufacturers/wholesalers have already taken active steps to diversify their operations (or are in the process of doing so) in response to similar single-use plastic bans implemented in other Australian jurisdictions. The market structure for manufacturers/wholesalers would be affected if manufacturers chose to exit the sector directly as a result of the Victorian ban.
Will it be more difficult for new firms or individuals to enter the industry after the imposition of the proposed measure?	The availability of alternatives to the banned single-use plastic items means there is no additional barrier for new retailers to enter the market.	It is not expected to be more difficult for new businesses or individuals to enter the industry, however, entry to the industry would be expected to focus on producing: • alternative products to the banned single-use plastic items; • single-use plastic products not banned; • single-use plastic products supplied under the exemptions; or • single-use plastic items that are banned and intended for export.
Will the costs/benefits associated with the proposed measure affect some firms or individuals substantially more than others?	The similar price of alternatives to the banned single-use plastic items means that the cost impacts on business are expected to be relatively minor. Some businesses may not experience a cost increase where their alternative items are similarly priced to their current single-use plastic items or where they choose to no longer provide single-use plastic items (with no alternative provided to their customers).	Victorian manufacturers and wholesalers who currently make single-use plastic items included in the ban, are expected to be affected to a greater extent than manufacturers that produce a more diverse range of plastic and other products. Notwithstanding this impact, the intended effect of the reform is to remove single-use plastic items from the Victorian economy (subject to any exemptions in place), to meet the proposed objectives. It is expected that with sufficient notice, Victorian businesses will have an opportunity to transition prior to the ban coming into effect, if they have not done so already (in the midst of other state bans). The cost of transitioning will depend on the manufacturer / wholesaler in question.

Question	Response - Retailers and hospitality	Response - Manufacturers
Will the proposed measure restrict the ability of businesses to choose the price, quality, range or location of their services?	Price is not expected to restrict businesses from continued operations, however there could be an impact on an individual business where an alternative item is considered by consumers to be inferior to the single-use plastic item it is replacing. For example, some consumers have raised issues with some paper straws and plates for certain applications.	The preferred option does not restrict businesses to choose the price and quality of the products. However, it could narrow the range as it provides a limitation on what single-use plastic items can be sold or supplied in Victoria. However, manufacturers could continue to produce and supply these items to other jurisdictions where the items are not banned, or to businesses who would fall under one of the exemptions.
Will the proposed measure lead to high ongoing costs for new entrants that existing firms do not have to meet?	The similar price of alternatives to single-use plastic items means that the cost impacts on businesses across retail and hospitality are expected to be relatively small. However, this cost differential may increase where businesses within these industries opt to use reusable items, which could then require additional capital costs.	The preferred option will apply equally to current and new entrants, subject to the single-use alternative they opt to manufacture. The on-going costs a business incurred, whether a new entrant or existing business, will depend on the initial investment needing to be outlaid and recognised within the initial years. Subject to further information, it is anticipated that this process would remain relatively similar to what has historically been incurred for single-use plastics.
Is the ability or incentive to innovate or develop new products or services likely to be affected by the proposed measure?	The ban on single-use plastic items is not expected to impact innovation or new service development within the industry. It may lead to greater innovation and development of sustainable alternatives to single-use plastic items.	The ban on single-use plastic items may contribute to innovation and development of alternative products in the industry.

To the extent that there are any modest impacts on competition in Victoria, these impacts are necessary to achieve the Government's objectives and are expected to be significantly outweighed by the benefits provided by the ban on single-use plastic items.

8 Implementation and evaluation

8.1 Implementation plan

As set out in the Victorian Guide to Regulation,[95] the implementation plan should set out a clear, practical strategy for implementing the preferred option by outlining:

- what needs to be done
- who will be doing it
- when it will be done
- who will monitor implementation (including identification and management of implementation risks).

8.1.1 Path for implementation

The analysis has shown that Option 1 is the preferred option. As such, new regulations will be required to implement a ban on single-use plastic items (as outlined in the Preferred Option chapter).

8.1.2 Implementation tasks

Table 16 outlines the key activities to support the implementation of the proposed reform:

Table 16: Implementation Tasks

Theme	Responsibility	Timing
Stage 1 - RIS published for stakeholder feedback	DELWP	April 2022
Stage 2 - RIS consultation process	DELWP	April / May 2022
Stage 3 - Review of stakeholder submissions	DELWP	June / July 2022
Stage 4 - Regulations finalised	DELWP	August / September 2022
Stage 5 - Regulations published	DELWP	September / October 2022
Stage 6 - Develop and roll out education and engagement program	DELWP and Sustainability Victoria	August 2022 - January 2023
Stage 7 - Regulations come into effect	DELWP / EPA	1 February 2023

Stage 1 - RIS published

Upon the RIS being completed and receiving a letter of adequacy from BRV, the RIS will be published for public consultation for a minimum of 28 days.

Stage 2 - RIS consultation process

DELWP will seek to engage with the suppliers, manufacturers, wholesalers, community, business, corrections, health and disability sectors and other key stakeholders to obtain feedback on the proposed reforms.

[95] Victorian Guide to Regulation, p. 43.

Stage 3 - Review of submissions

Following the consultation process, DELWP will review any written submissions provided by stakeholders to inform the final version of the proposed regulations.

Stage 4 - Regulations finalised

Regulations will be finalised to enact the proposed reform, including specifying the relevant items to be subject to the ban, along with any exemptions and exclusions.

Stage 5 - Regulations published

Once finalised, the regulations will be published, detailing to businesses and the broader community on how the reform will operate, along with any exclusions or exemptions and when the reform will come into effect.

Stage 6 - Education and engagement program

The Victorian Government will undertake an education and engagement program prior to the ban coming into effect. This program will provide retailers, manufacturers and suppliers with the relevant information to understand the requirements and alternative pathways, such as using non-plastic single-use alternatives and reusables. It is anticipated that education materials will be available for businesses and communities on Victorian Government websites.

Information and education material will be provided to businesses and the community confirming the banned items and highlighting examples of suitable alternative products. Engagement will be targeted across the supply chain from manufacturers to suppliers, wholesalers, and retailers. Consideration will be given on how best to engage with small medium enterprises (SME's) and culturally and linguistically diverse (CALD) businesses that may require a more targeted approach.

Stage 7 - Regulations come into effect

The proposed regulations are expected to come into effect on 1 February 2023. The proposed regulations will ban the sale, supply, distribution or provision of the prescribed single-use plastic items.

8.1.3 Who will be responsible?

DELWP will be responsible for managing the overall implementation of the proposed reform, coordinating activities with other relevant organisations, such as the EPA, in terms of accomplishing each stage addressed above in accordance with the expected timeline. These activities include managing the stakeholder consultation process on the RIS and finalising the regulations. DELWP, in collaboration with other parts of the Victorian Government, will develop and implement an education and engagement program to support businesses and other organisations to prepare for the ban on certain single-use plastic items.

8.1.4 Who will monitor implementation?

DELWP will have primary responsibility for monitoring and overseeing the implementation of the proposed ban of single-use plastic items and managing associated implementation risks. DELWP will be responsible for monitoring the effectiveness of the ban in meeting its objectives, primarily reducing single-use plastics litter.

Once the regulations are in place, EPA will have responsibility for compliance and enforcement of the ban. The compliance approach for the ban is expected to be risk-based, focusing on the supply chain where banned items could enter the market, and the provision of information and support for retailers and hospitality businesses to understand their obligations. Compliance activity may result in actions such inspections of businesses, on-the-spot fines if non-compliance is verified and potential escalation to investigation.

8.2 Evaluation strategy

The evaluation strategy is designed to assess the effectiveness of the reform following its implementation and operation for a period of time. The Victorian Guide to Regulation[96] notes that the evaluation strategy should include:

- what will be evaluated
- how it will be done
- who will do it
- when it will be done.

8.2.1 What will be evaluated

This RIS has determined that the preferred option is Option 1. As such, Option 1 will be evaluated to understand the extent it has actually met the objectives of the reform, including:

- reducing marine and land-based plastic pollution from the banned items
- reducing the amount of plastic waste which goes to landfill
- reducing the use of resources from avoiding using items or switching to reusable alternatives
- reducing the level of contamination of recycling
- supporting Victoria's transition to a circular economy.

8.2.2 How will it be done?

The following indicative evaluation measures are proposed for the evaluation of the proposed ban. The evaluation measures will be settled ahead of the implementation of the proposed ban. This will enable DELWP to gather the appropriate data to establish performance baselines prior to the ban's introduction. The post-implementation evaluation will then assess the impact the ban has had by comparing performance against the baseline levels of performance. Table 17 outlines the types of evaluation measures that may be used.

Table 17: Proposed evaluation measures

Evaluation measure and purpose	How will it be done?	Who will do it?	When will it be done?	Alignment to RIS objectives
Stage 1 - Litter audit	Regular counts using the Australian Litter Measure (AusLM)	DELWP	Twice-yearly, commencing mid-2022	Used to establish baseline information and trends on the effectiveness of the ban at reducing the level of single-use plastics found in the environment as litter.

[96] Victorian Guide to Regulation, p. 47.

Evaluation measure and purpose	How will it be done?	Who will do it?	When will it be done?	Alignment to RIS objectives
Stage 2 - Assessment of single-use plastics use in Victoria and alternative items used	Business Surveys, industry data	Sustainability Victoria	Annual consumption data collected from 2018-19 onwards.	Used to establish baseline information and trends on the effectiveness of the ban by tracking the consumption of banned single-use plastic items and uptake of their alternatives in Victoria
Stage 3 - Regulation evaluation	Business surveys, complaints data, regulator audits and litter reduction data delivered via litter audits conducted	DELWP	Regulation review - February 2026	Used to evaluate the effectiveness of the ban across a number of sources, with respect to the objectives (plastic pollution, landfill, contamination).

8.2.3 Who will do it?

DELWP will be responsible for the evaluation process. DELWP will also work closely with EPA in conducting the evaluation. External support may also be utilised, for example, in conducting business surveys and conducting engagement with industry.

8.2.4 When will it be done?

Data collection for the evaluation is expected to commence within 18 months after the commencement of the regulatory ban. The evaluation will be completed by February 2026.

Six monthly litter audits and annual consumption data on single-use items will be used to establish baseline information and trends over time to assess the efficacy and compliance associated with the ban and progress with respect to reducing the plastic pollution for the listed items.

9 Appendix A

The following Appendix provides further detail around the methodology adopted for certain costs and benefits captured within the impact analysis chapter.

9.1 Single-use plastics quantity methodology

In estimating the total quantity of single-use plastic items used in Victoria, the following information sources were used:

- data from other jurisdictions (where available) and adjusted for Victorian population relativities
- stakeholder and market participant information on the estimated usage in Victoria
- research studies and reports from other jurisdictions regarding SUP quantity usage.

The analysis also used existing Victorian estimates of single-use plastic items commissioned by Sustainability Victoria. These provide national and Victorian single-use plastic packaging and products consumption data across the financial year ended 30 June 2020 (excluding the use of cotton bud sticks) (commissioned estimates).[97] The commissioned estimates have been compared against other information sources to develop central estimates, where relevant, that have been applied in this analysis. Quantity estimates have also been separated and disaggregated into relevant sectors, namely retail, hospitality and medical industries to consider the different behavioural responses and cost implications in these sectors.

The commissioned estimates per item have been summarised within Table 18.

Table 18: Summary of annual quantity of single-use plastic items in Victoria for 2020 - millions

			Split of estimate per industry		
Item	**Number Estimate**	**Range**	**Retail**	**Hospitality**	**Medical, Correctional & Other Institutional**
Straws	403	322 - 483	48	274	81
Cutlery[98]	181	145 - 217	58	103	19
Plates	20	16 - 24	4	15	1
Drink stirrers	70	56 - 84	15	52	3
EPS food containers	10	8 - 12	2	7	0
EPS cups	50	40 - 60	11	37	2
Cotton bud sticks	484	387 - 580	213	34	237

[97] Australian plastics flows and fates study 2020–21 – Victorian report – Historical SUPPPs data' Blue Environment.
[98] Reference to cutlery refers to a cutlery set, including a single fork, knife and spoon.

			Split of estimate per industry		
Item	**Number Estimate**	**Range**	**Retail**	**Hospitality**	**Medical, Correctional & Other Institutional**
Integrated packaging items	11	6 - 17			
Total	**1,228**	**979 - 1,478**	**289**	**469**	**367**

The sections below provide the volume estimates for each single-use plastic item type and a description of the methodology applied.

Straws

It is estimated that around 403 million single-use plastic drinking straws were used in Victoria in FY2020.[99] The analysis below attributes 48 million to retail, 274 million to hospitality and 81 million to medical use.

Percentage wise, the proportion of straws per industry equates to 12 per cent for retail, 68 per cent to hospitality, and 20 per cent to medical.

Medical

To estimate the use of drinking straws used within the medical sector, data from Wesley Hospital was used, detailing that 480,000 single-use plastic straws are prevented from going to landfill each year by switching to paper straws and reducing the overall usage across their capacity of 538 beds (equating to 892 straws per bed).[100] It was estimated that the average number of hospital beds within an Australian hospital is 70.85.[101] This suggests that an average of 63,212 straws were used per Australian hospital in FY2020.

On the understanding that Victoria has approximately 300 hospitals (and therefore around 21,255 beds), it was estimated that around 19 million single-use plastic straws were consumed in the medical industry in Victoria in FY2020.

Straws used by persons with a disability

As the options propose to have an exemption for single-use plastic drinking straws used for individuals who require them due to a disability or for medical reasons (referred to as a 'designated persons' in the draft Regulations), each sector estimate split has been adjusted to exclude any use by individuals with a disability. This adjustment has been undertaken as it is expected that straws used for disability reasons would also be provided within a retail (purchased for at-home use) and hospitality (used for takeaway or dine-in) context.

To determine the level of plastic straws used by persons with a disability, it was identified that 18 per cent of Australia's population have a disability,[102] of which 32 per cent have a severe disability. Where these proportions are then applied to Victoria's population, it is estimated that a total of 0.385 million Victorians have a severe disability.[103]

Based on a survey conducted by the Disability Organisation Network, 44 per cent of people with a severe disability indicated reliance on drinking straws.[104] Applying this level of reliance, it is estimated that 0.169 million of Victorians were

[99] Australian plastics flows and fates study 2020–21 – Victorian report – Historical SUPPPs data' Blue Environment.
[100] Diviv Group. (2021). *Environmental sustainability | The Wesley Hospital Brisbane*. Wesley Hospital. https://wesley.com.au/community/environmental-sustainability. *About Us*. (2021). Wesley Hospital. http://wesley.com.au/careers/about-us#:~:text=With%20538%20beds%2C%20The%20Wesley,part%2Dtime%20and%20casual%20staff
[101] Australian Institute of Health and Welfare. (2020). *Australia's health snapshots 2020*. https://www.aihw.gov.au/getmedia/128856d0-19a0-4841-b5ce-f708fcd62c8c/aihw-aus-234-Australias-health-snapshots-2020.pdf.aspx.
[102] Australian Institute of Health and Welfare. (2020b). *People with disability in Australia*. https://www.aihw.gov.au/reports/disability/people-with-disability-in-australia/contents/people-with-disability/prevalence-of-disability
[103] Ibid.
[104] Disability Organising Network. (2018, December). *Discovering alternative straw use for people with disabilities*.

relying on straws in Victoria in FY2020. Assuming each individual uses 1 straw per day, this would equate to an annual amount of 62 million.

Combining the estimates arising from hospital use and for disability thereby results in a medical estimate for single-use plastic straws of 81 million in FY2020 (20%).

Importantly, as the 62 million estimate above captures use of drinking straws for people with a disability across all sectors, the drinking straw estimates across retail and hospitality need to be reduced by the same amount to ensure units are not being double counted. In undertaking this adjustment, the 62 million estimate has been assumed to relate 60 per cent to retail and 40 per cent to hospitality. These proportions, resulting in 37.2 million for retail and 24.8 million for hospitality, have then been subtracted from the estimates detailed below to reach a total of 403 million.

Further detail on how the retail and hospitality estimates have been reached have been addressed below.

Retail

To estimate the use of single-use plastic drinking straws within the retail sector, data relating to the number of plastic straws sold annually by Woolworths, prior to their removal from stores within 2018, were used, totalling 134 million.[105] Based on retail operators within Victoria and their respective market share[106], a breakdown of straws sold across Woolworths (37.4%), Coles (28.4%), ALDI (10.5%), IGA (7%) and other retailers (16.7%) was quantified. As Woolworths, Coles, and ALDI have already ceased selling single-use plastic straws within Victoria, the estimate of straws used within Victoria has solely factored for the possible quantity arising from sales in IGA and other retailers. This results in an estimate of approximately 85 million units in FY2020 which relate to the retail sector.

The 37.2 million single-use plastic straws purchased for reasons by individuals with a valid exemption (i.e. designated persons), are then removed from this estimate, leading to an estimate of 48 million in FY2020 (12%).

Hospitality

To estimate the use of single-use plastic drinking straws within the hospitality sector, insights gathered from industry surveyed data have been used. This data estimated that approximately 480 million plastic straws were consumed across Australia annually by large hospitality operators. Apportioning this estimate for Victoria's population suggests that the Victorian straw annual consumption is around 125 million per annum.

This estimate has been adjusted to determine the consumption attributable per consumer.[107], which is estimated to equal 5 straws annually per customer in Victoria.

Applying this customer straw usage estimate across the Victorian fast-food sector, it is estimated that around 194.27 million single-use plastic straws are used annually in the fast food industry in Victoria. Assuming that fast food equates to around 65 per cent of the use of straws in the hospitality industry, based on market concentration levels, the use of single-use plastic straws in Victorian hospitality in FY2020 equates to around 274.16 million (68%) (after removing 24.8 million single-use plastic straws used for designated persons).

Cutlery

It has been estimated that around 181 million single-use plastic cutlery units[108] were used in Victoria in FY2020. The analysis below attributes 58 million to retail, 103 million to hospitality and 19 million to medical, correctional and other facility use.

[105] Woolworths Group (2018, June 4). Woolworths Group reaffirms its commitment to a Greener Future. Available at: https://www.woolworthsgroup.com.au/page/community-and-responsibility/corporate-responsibility-news-updates/planet/woolworths-group-reaffirms-its-commitment-to-a-greener-future

[106] *Supermarket statistics 2021*. (2021, November 28). [Statistic guide]. Finder.Com.Au. https://www.finder.com.au/supermarket-statistics-2021#:%7E:text=least%20(%24148).-%20,What%20is%20Australia%E2%80%99s%20largest%20supermarket%3F,holding%2028%25%20of%20the%20market.

[107] Roy Morgan. (2021, May). *McDonald's, KFC, Hungry Jack's & Domino's Pizza are Australia's favourite restaurants* (No. 8712). http://www.roymorgan.com/findings/8712-australian-eating-habits-eating-in-out-december-2020-202105240437

[108] A cutlery unit refers to a set including a single-use plastic fork, knife and spoon.

Hospitality

To estimate the use of single-use plastic cutlery within the hospitality sector, insights gathered from industry surveyed data have been used. Approximately 120 million cutlery units were consumed across Australia annually by a large hospitality operator, of which approximately 31 million units relates to Victoria (based on Victoria's population).

This estimate has been adjusted to determine the use of cutlery per consumer.[109] The estimated figure of 1.14 cutlery units per customer per annum has then been applied across the Victorian fast-food sector (similar to the approach adopted above for straws). Assuming the fast-food sector use only equates to 65 per cent of Victoria's cutlery use, the overall estimate for cutlery 103 million.

Medical, correctional and other facilities

To estimate the use of cutlery used within the medical sector, a five-year average of the number of medical bed days within Victoria has been utilised (7.764 million), assuming 3 meals per day, which would require one cutlery unit per meal.[110] Assuming that 50 per cent of medical cutlery has already switched to being reusable, it is estimated that a total of 11.65 million cutlery units were used in the medical sector in FY2020.

As the options propose to provide an exemption for cutlery items used within correctional and mental health facilities for safety reasons, an estimate of the number of cutlery units used in these facilities has been quantified.

To estimate the use of single-use plastic cutlery in mental health facilities, the number of psychiatric bed days reported by the Australian Institute of Health and Welfare (893,864) has been used, assuming each bed has 3 meals per day, which would require one cutlery unit per meal. This estimates that 2.68 million cutlery units would be exempt due to their use within mental health facilities.[111] The 2.68 million exempt units are subtracted from the 11.65 million medical total to arrive at 8.74 million for non-exempt medical use.

To estimate the use of single-use plastic cutlery in Victorian correctional facilities[112], it was assumed that individuals would have 3 meals per day, which would require one cutlery unit per meal. Annually, this will lead to 7.83 million units of cutlery being exempt under the proposed reforms. This value has been included within the total estimate related to medical use.

Retail

The same estimated split across industries for straws (prior to the disability adjustment) has been assumed as a starting point for cutlery, and has been applied to triangulate a breakdown, attributing 58 million to retail.

Drink stirrers

The SV commissioned analysis estimated that 70 million single-use plastic drink stirrers were used in Victoria in FY2020. Based on the applicability of the commissioned estimate to Victoria and limited availability of other data sources on this item, the commissioned estimate for drink stirrers has been adopted for the purposes of the impact analysis.

Breakdown across industry

It has been assumed that the estimated split across industries for straws would also apply to drink stirrers. This is because most settings using disposable drink stirrers would also make use of other disposable items including cutlery and straws. This results in a breakdown of approximately 8 million to retail (12%), 48 million to hospitality (68%), and 14 million to medical (20%).

[109] Roy Morgan. (2021, May). *McDonald's, KFC, Hungry Jack's & Domino's Pizza are Australia's favourite restaurants* (No. 8712). http://www.roymorgan.com/findings/8712-australian-eating-habits-eating-in-out-december-2020-202105240437

[110] *Australian Institute of Health and Welfare. (2021). Table 2.6: Patient days for public and private hospitals, states and territories, 2015–16 to 2019–20.* https://www.aihw.gov.au/getmedia/2381c1da-9fdb-492c-b3bf-f86e50020d92/2-admitted-patient-care-2019-20-tables-activity.xlsx.aspx

[111] *Australian Institute of Health and Welfare. (2021). Overnight admitted mental health care tables 2018-2019.*

[112] *Corrections statistics: quick reference | Corrections, Prisons and Parole*. (2020). Corrections Victoria. https://www.corrections.vic.gov.au/prisons/corrections-statistics-quick-reference#:%7E:text=Number%20of%20prisoners%20in%20Victoria,June%202010%20figure%20of%204%2C537.

Plates

The SV commissioned analysis estimated that 20 million single-use plastic plates were used in Victoria in FY2020. Given data limitations around the use of single-use plastic plates, the commissioned SV estimate for plates has been adopted in estimating the quantity of single-use plastic plates for the purposes of the impact analysis.

Breakdown across industry

It has been assumed that the estimated split across industries for straws would also apply to plates (as well as for cutlery and drink stirrers). This is because most settings using disposable plates would also make use of other disposable items including cutlery and straws, leading to the same percentage proportion of units being applied to the industry sectors.

This results in a breakdown of approximately 4 million to retail (21%), 15 million to hospitality (74%), and 1 million to medical (5%).

Expanded polystyrene food containers

The SV commissioned analysis estimated that 10 million single-use expanded polystyrene (EPS) food containers were used in Victoria in FY2020. Given the data limitations around the use of EPS food containers in Victoria, the commissioned SV estimate of 10 million has been applied in this analysis.

Breakdown across industry

It has been assumed that the estimated split across industries for straws would also apply to EPS food containers, as these are often consumed in the same settings. This results in a breakdown of approximately 2 million to retail (21%), 7 million to hospitality (74%), and 1 million to medical (5%).

Expanded polystyrene drink cups

The SV commissioned analysis estimated that 50 million single-use expanded polystyrene drink cups were used in Victoria in FY2020. Based on the applicability of the commissioned estimate SV data to Victoria and limited availability of other data sources on this item, the commissioned estimate for EPS drink cups has been adopted in estimating the volume of single-use EPS drink cups. for the purposes of the impact analysis.

Breakdown across industry

It has been assumed that the estimated split across industries for straws would also apply to EPS drink cups, given the nature of straws and drink cups. This results in a breakdown of approximately 11 million to retail (21%), 37 million to hospitality (74%), and 2 million to medical (5%).

Cotton bud sticks

In estimating the use of cotton bud sticks in Victoria, the Cotton Bud World Industry Report was used, which reflected that the global cotton buds market totalled 543.75 billion units in 2017 and was expected to expand at a compound annual growth rate of 3.4 per cent from 2018 to 2026. This results in a global estimate of 601 billion units in FY2020.[113] Scaling this estimate for Victoria provides an estimated consumption of around 506 million units per annum (assuming Australia is 0.32 per cent of the world's population).[114]

[113] Cotton Buds World Industry Report 2018–2026: Analysis by Material, Application and Geography. (2018). https://www.prnewswire.com/news-releases/cotton-buds-world-industry-report-2018-2026-analysis-by-material-application-and-geography-300675866.html. While the report does not specifically mention what type of cotton buds are included within the estimate, the estimate is similar to Sustainability Victoria's estimate, which refers directly to plastic cotton bud sticks.

[114] The Cotton World Bud Report data has been scaled by population to determine the quantum which would be relevant to Victoria. This approach has been adopted as it results in a similar number of cotton bud sticks used in Victoria when compared to the Sustainability Victoria estimate of 461 million units.

Further, Sustainability Victoria information on daily global cotton bud production (1.50 billion units) has been extrapolated. providing an annual Victorian estimate of 461 million units.[115] Using these two sources, the median of 484 million units has been used as the quantity estimate.

Breakdown across industry

To estimate the use of single-use plastic cotton bud sticks within the retail sector, the UK DEFRA report's annual consumption of cotton buds (1,800 million) has been used to quantify a per capita value (31.83), which when applied to Victoria (6.68 million), provides an estimate of 212.66 million. Based on this estimate, retail captures 44 per cent of Victoria's cotton bud use.

Given data limitations existing around the use of cotton bud sticks across other industries, it has been assumed that 49 per cent has been allocated to the medical sector, with the remaining 7 per cent assumed to be used in hospitality, mainly in a hotel context.

Integrated items

In terms of establishing an estimate for the number of integrated items used within Victoria, primary market research was carried out to determine the types of products likely to come with integrated plastic items. These include instant noodles, yoghurt, ice cream, and other single-use serving packaging transportable goods.

Firstly, the consumption of instant noodle servings (420 million) in Australia was obtained to determine the servings per capita estimate (16.8).[116] With respect to Victoria, 112.2 million servings were calculated. As most packaging appears to have already dispensed of plastic items that would fall under the ban, it has been assumed that 5 per cent of the servings estimated still include integrated plastics, resulting in an estimate of 5.61 million.

A similar approach was adopted for yoghurt, whereby the average yoghurt consumption per capita (7.5kg) was apportioned to the consumption that would be attributed to 150g single-serve units.[117] In this instance, it was assumed 10 per cent were single serve 150g units. Based on this level of consumption (0.75kg) of 150g units, the equivalent number of units per capita (5 units) was applied across Victoria's population (leading to an estimate to 33.405 million). As most packaging appears to have already dispensed of plastic items that would fall under the ban, it has been assumed that 5 per cent of the servings estimated still include integrated plastics, resulting in an estimate of 1.67 million.

Further, the average ice-cream consumption per capita (18 litres) apportioned to 100ml single-serve units (assumed here to equate to 5 per cent), results in the equivalent number of units per capita of 9 units. Across Victoria's population, the total Number of Single-Serve Units consumed in Victoria per annum would equate to 60.129 million, of which 3.01 million units would be assumed to have integrated packaging.

Totalling these items alongside a 10 per cent uplift to factor to account for additional single serve consumer goods not accounted for above, provides the estimate of 11.32 million units for integrated items.

[115] Sustainability Victoria. (2021, December 22). *Wildlife-friendly alternatives to plastic cotton buds*. https://www.sustainability.vic.gov.au/cotton-buds
[116] Buchholz, K. (2020, September 10). *Oodles of Noodles: Instant Noodle Consumption Around the World*. Statista Infographics. https://www.statista.com/chart/22865/instant-noodle-consumption-by-country/
[117] https://www.dairysafe.vic.gov.au/consumers/dairy-foods/yoghurt.

9.2 Assumed behaviour changes

9.2.1 Hospitality and Medical sectors

Table 19: Estimated behaviour changes in response to the core ban - per cent of volume

Item	Single-use plastic item	Non-banned single-use alternative	Reusable	Removed from the market
Straws				
Hospitality	0%	90%	0%	10%
Medical	100%[118]	0%	0%	0%
Cutlery				
Hospitality	0%	90%	0%	10%
Medical, correctional and other facilities	54%[119]	35.5%	11.5%	0%
Drink Stirrers				
Hospitality	0%	90%	0%	10%
Medical	0%	90%	0%	10%
Plates				
Hospitality	20%	80%	0%	0%
Medical	20%	68%	12%	0%
EPS food containers				
Hospitality	0%	100%	0%	0%
Medical	0%	100%	0%	0%
EPS drink containers				
Hospitality	0%	100%	0%	0%
Medical	0%	100%	0%	0%
Cotton bud sticks				
Hospitality	0%	100%	0%	0%
Medical	100%	0%	0%	0%

In establishing the percentage distributions detailed within Table 19, the following assumptions have been applied:

- **Straws:**
    - *Hospitality:* stakeholder consultations indicated a majority of businesses would use single-use alternatives and that a maximum of 10 per cent of straws would be removed from the market, on the basis that they are no longer used where they are not provided.

[118] Straws captured under the medical industry are associated with the exemption which will exist for single-use plastic straws used by designated people. This assumption does not apply sector-wide.
[119] This percentage has been based on the use of single-use plastic cutlery within correctional (7.83) and mental health facilities (2.68) across the total use of single-use plastic cutlery within the medical industry (19 million).

- *Medical*: as the medical sub-category captures only those who would use a single-use plastic straw for exempt reasons (i.e. due to a disability or for medical reasons), it has been assumed that 100 per cent of straws for medical purposes will remain single-use plastic.

- **Cutlery:**
  - *Hospitality:* a 10 per cent removal of cutlery within a hospitality setting assumes consumers would use existing cutlery they have at home, thereby not requiring such items to be provided from business.
  - *Medical, correctional and other facilities*: The cutlery estimate under this industry includes cutlery use within medical, correctional and other facilities. As there will be an exemption for cutlery use within correctional and mental health facilities, this item has been treated differently to straws. Based on the cutlery use within correctional and mental health facilities, 54 per cent of use within the industry is assumed to continue using conventional single-use plastic cutlery. 11.5 per cent is assumed to shift to reusables (on the basis that some medical facilities would have commenced this transition), while the remaining 34.5 per cent is assumed to be replaced by non-banned single-use alternatives.

- **Drink Stirrers:** The same approach has been adopted for drink stirrers as were for straws across both the hospitality and medical sector. It is assumed that 10 per cent of the current estimate will be removed from the market due to existing options being used and substituted (i.e. metal spoons).

- **Plates:**
  - *Hospitality*: it has been assumed that there will be a 100 per cent shift to single-use alternatives (80 per cent after the adjustment for the exemption of plastic lined plates), on the basis that businesses who provide food to consumers will require some sort of plate equivalent in order to transfer it over to consumers.
  - *Medical*: the same assumption has been adopted for plates as was for cutlery and the shift to reusables (12%). As a result, it is expected that 88 per cent of the sector will then shift to single-use alternatives (68 per cent after the adjustment for the exemption of plastic lined plates).
  - *Exemption of plastic lined plates:* 20 per cent of each industry estimate has been assumed to relate to single-use plastic lined paper and cardboard plates, resulting in continued use of single-use plastic items. The 20 per cent assumption has been based on a market scan of single-use plastic plates currently available in the market.

- **EPS food containers:** the same assumption has been adopted for EPS food containers as was for plates (excluding the effect of the plastic lined plates exemption), except that there will be no replacement by reusables.

- **EPS drink cups:** the same assumption has been adopted for EPS drink cups as was for EPS food containers.

- **Cotton bud sticks:**
  - *Hospitality*: has been assumed that there will be a 100 per cent shift to single-use alternatives in hospitality, on the basis that a reusable option is not particularly viable with respect to cotton bud sticks.
  - *Medical*: as the medical sub-category captures anyone who would fall under an exemption, it has been assumed that 100 per cent of cotton buds for medical purposes will remain single-use plastic.

While other states have already introduced single-use plastic item bans on a number of items included within Option 1, it's important to note that these bans are still within the early stages of implementation and enforcement, and thus have no available data indicating how industry has shifted from single-use plastic items upon a ban coming into effect. Thereby, the assumptions above have been adopted in terms of determining how industry will pivot under the proposed reform.

9.2.2 Retail sectors

Table 20: Estimated behaviour changes in response to the core ban - per cent of quantity

Item	Single-use plastic item	Non-banned alternative	Reusable	Removed from the market
Straw	0%	85%	5%	10%
Cutlery	0%	95%	5%	0%
Drink stirrer	0%	90%	0%	10%
Plate	20%	75%	5%	0%
EPS food container	0%	100%	0%	0%
EPS drink cup	0%	90%	10%	0%
Cotton bud sticks	0%	100%	0%	0%

In establishing these percentage distributions, the following assumptions were adopted with respect to consumers:

- **Straws**: stakeholder consultations indicated a majority of consumers would use single-use alternatives and that a maximum of 10 per cent of straws would be removed from the market on the basis that they are no longer used due to behavioural changes. Given the uptake of reusable items within the economy, but also considering their continued unsuitability in a number of settings, it has also been assumed that 5 per cent will shift towards reusable items.
- **Cutlery:** The shift to reusable cutlery within a retail sense has been set on the basis that some consumers would continue purchasing such items (95 per cent), while some would be motivated and enabled to purchase reusable cutlery as a result of the influence of the ban (5 per cent).
- **Drink stirrers:** It is assumed that within a retail sense, 10 per cent of drink stirrers would be avoided, with some consumers simply using items they already own (i.e. spoons). It is also assumed that retail customers specifically purchasing SUP drink stirrers would likely continue to need a similar disposable item for its convenience and amenity, and therefore 90 per cent of this estimate would be exchanged for single-use alternatives.
- **Plates:** 20 per cent of the retail estimate has been assumed to relate to single-use plastic lined paper and cardboard plates, resulting in continued use of these single-use plastic items across the lifespan of the regulations.[120] With respect to retail, it is expected that consumers will take the same approach with cutlery as with plates.
- **EPS food containers:** it has been assumed that there will be a 100 per cent shift to single-use alternatives, on the basis that where consumers are wanting a single-use item, they will opt for the alternative for convenience.
- **EPS drink containers:** it has been assumed that there will be a 90 per cent shift to single-use alternatives, alongside a 10 per cent uptake of reusable items, given the existing uptake of reusable cups.
- **Cotton bud sticks:** it has been assumed that there will be a 100 per cent shift to single-use alternatives in retail, on the basis that a reusable option is not particularly viable with respect to cotton bud sticks. Additionally, no data is currently available to confirm the expected behavioural shift to reusable alternatives should a ban come into effect.

[120] This assumption has been based on a market scan of single-use plastic plates on the market.

9.3 Cost of switching away from single-use plastics

9.3.1 Cost to industry

For the purposes of understanding the incremental costs associated with each of the options, the costs associated with switching from each of the items proposed to be banned have been sourced and detailed below. Table 21 reflects the costs sourced in respect to single-use plastic items and reusables.

Table 21: Estimated cost differential per hundred between reusable and single-use plastic items for hospitality and medical [121]

Item	Cost differential per hundred single-use items[122] ($)
Straw	1.96
Cutlery	(1.00)
Plate	(1.65)
Stirrer	(0.94)
EPS food container	(0.58)
EPS drink container	7.01
Cotton bud stick	2.43

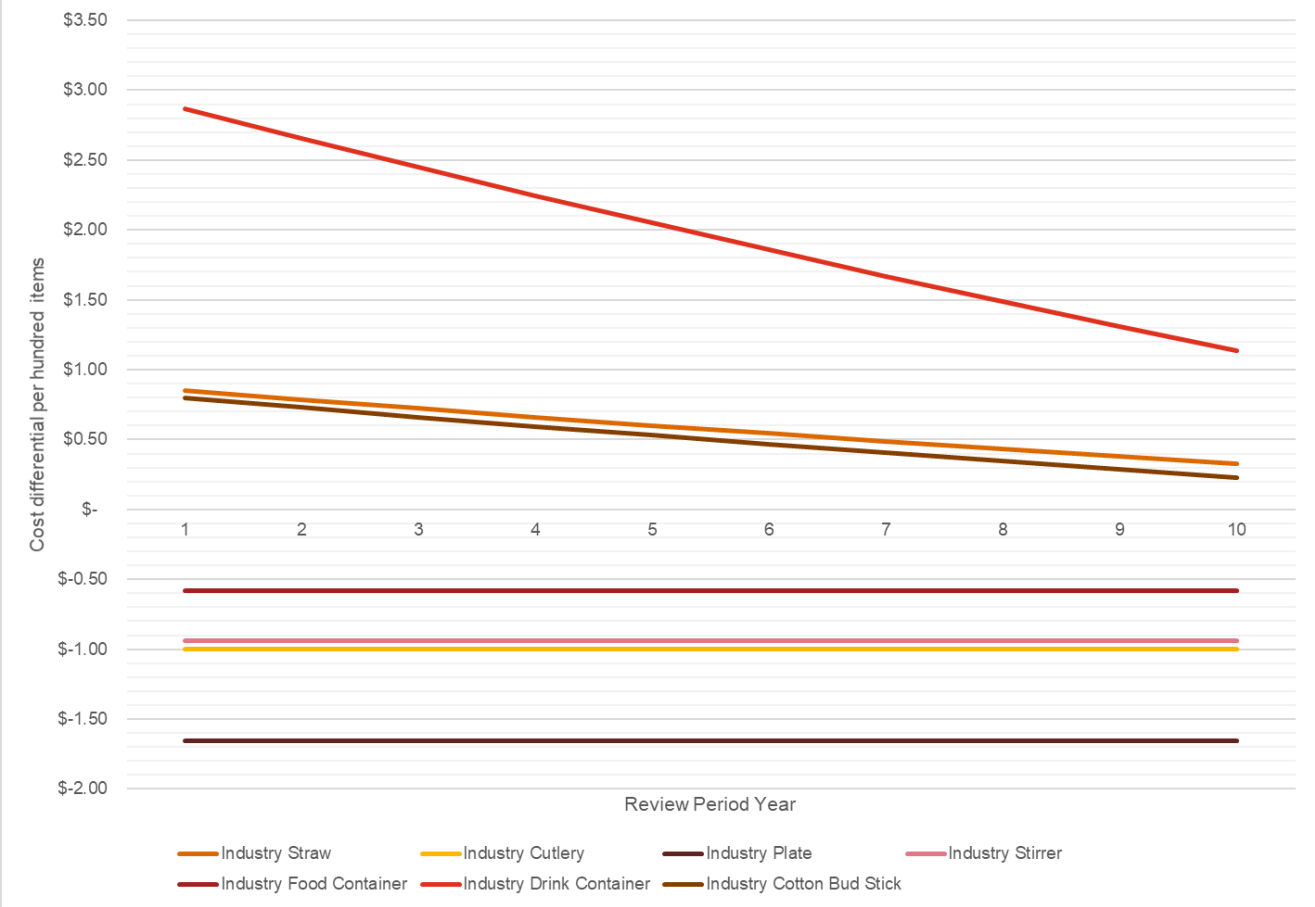
The calculations are based on a conservative estimate of expected uses of the reusable items over their life.

The costs above have been reached based on a wide review of costs available.[123] As part of this process, costs relevant to industry have been captured on the understanding that industry may buy items in bulk or may have access to wholesale pricing compared to the regular public, and thereby will have a lower cost per item attributed compared to those considered for 'retail purposes'.

Recognising that single-use alternatives remain a relatively new entrant into the market in terms of single-use items, the costs across the review period have been decreased at a rate of 2.5 per cent per annum until either the model period ends, or they reach parity with single-use plastic items. This approach has been adopted factoring for the likelihood of innovation and efficiencies that will lead to these alternatives being cheaper to make and thus cheaper for industry to purchase in future. These single-use alternative costs have been reflected within Graph 1 below.

[121] The cost per item, with respect to single-use plastics and single-use alternatives, has been calculated by considering multiple cost sources. Upon considering these sources, an average cost of the item to industry has been quantified.
[122] Calculated as (reusable item price – SUP item price) * 100. Therefore, a positive figure indicates a higher cost of reusables relative to SUPs and vice versa. The multiplication by 100 (giving a value per hundred units) is simply to avoid figures comprising fractions of a cent.
[123] The cost per item has considered multiple sources across a number of alternatives (for example, paper, etc.) to quantify an average cost.

Graph 1: Estimated cost differential per hundred items between single-use alternatives and single-use plastics over the Review Period for industry - $[124]



Based on these assumptions, the cost to industry has been quantified with respect to the volumes of single-use plastics detailed within Section 5.2.

9.3.2 Cost to consumers

For the purposes of understanding the incremental costs associated with each of the options, the costs associated with each type of item proposed to be banned have been sourced and detailed below within a retail context. Table 22 reflects the costs of single-use plastic items and reusables. Considering consumers are often prone to purchasing smaller items of stock compared to that of industry, it has been observed that the costs of each item are typically higher than that of industry.

Table 22: Estimated cost of single-use plastic and reusable items for consumers[125]

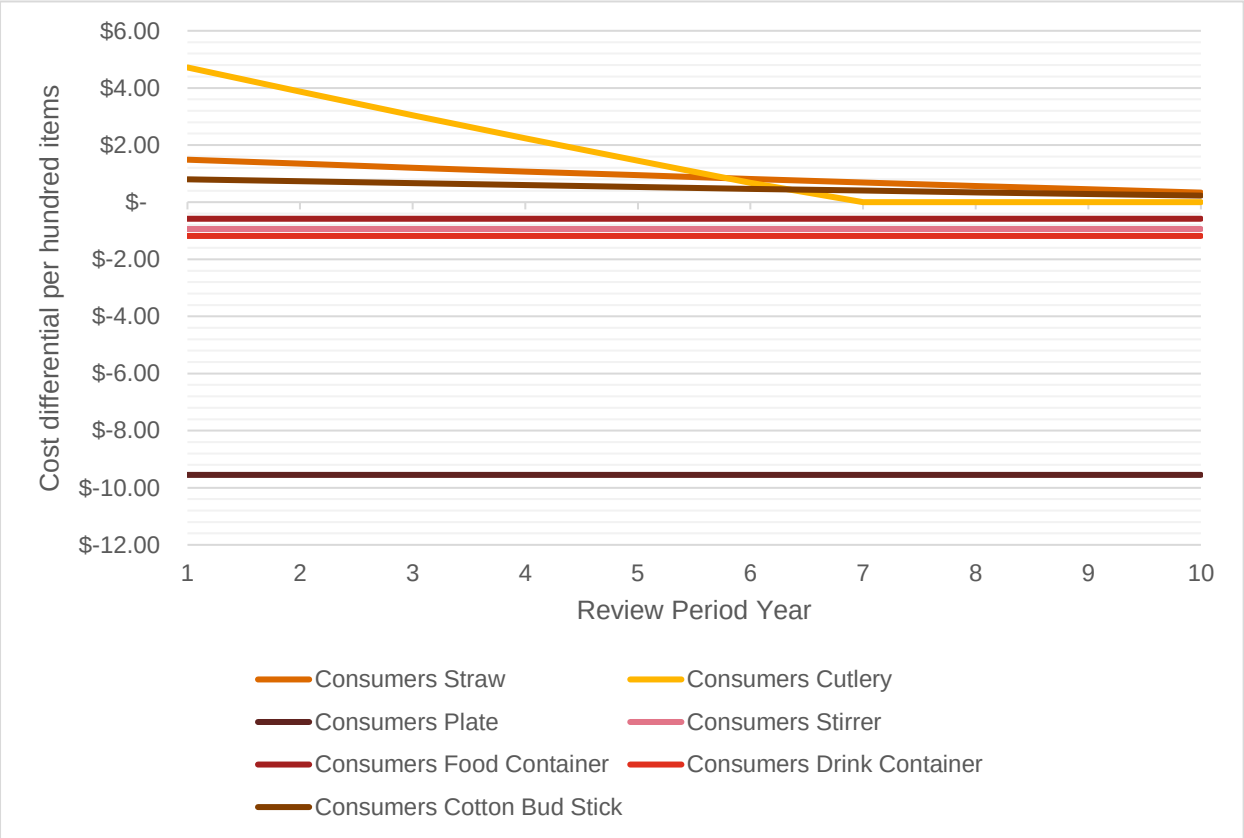
Item	Cost differential per hundred items[126] ($)
Straw	(0.50)
Cutlery	(27.20)
Plate	(32.41)
Stirrer	(1.05)

[124] The cost per item has considered multiple sources across a number of alternatives (for example, paper, etc.) to quantify an average cost.
[125] The cost per item has considered multiple sources to quantify an average cost.
[126] Calculated as (reusable item price – SUP item price) * 100. Therefore, a positive figure indicates a higher cost of reusables relative to SUPs and vice versa. The multiplication by 100 (giving a value per hundred units) is simply to avoid figures comprising fractions of a cent.

Item	Cost differential per hundred items[126] ($)
EPS food container	(0.58)
EPS drink cup	2.96
Cotton bud sticks	2.43

Further, the costs across the review period for single-use alternatives have been decreased at a rate of 2.5 per cent per annum, until they align to the current costs of single-use plastic items, i.e. where the curve for cutlery flattens in 2030. This approach factors for the likelihood of innovation and efficiencies that will lead to these items being cheaper to make and thus cheaper for consumers to purchase in future. These single-use alternative costs have been reflected within Graph 2 below.

Graph 2: Estimated cost differential per hundred items between single-use alternatives and single-use plastics over the Review Period for retail - $[127]



Based on these assumptions, the cost to consumers has been quantified with respect to the quantity of single-use plastics detailed within Section 5.2.

[127] The cost per item has considered multiple sources across a number of alternatives (for example, paper, etc.) to quantify an average cost. In a retail setting, the cost of alternative food containers and plates were identified to be the same cost, thereby resulting in these two items to be aligned in the graph above.

9.4 Benefits Methodology

9.4.1 Methodology - benefit of avoided land and marine litter and avoided landfill cost

Quantification of single-use plastics avoided

To calculate the expected litter and landfill which will be avoided under Option 1, the single-use quantity estimates projected to be avoided under Option 1 have been converted to metric totals (i.e. tonnes). These metric values have been sourced from the analysis commissioned by Sustainability Victoria and have been increased at a rate of 1.5 per cent per annum over the appraisal period in line with population forecasts for Victoria.[128]

Table 23: Average weight per single-use plastic item - grams

Item	Average weight
Cutlery	4.9
Plates	10.8
Drink stirrers	0.3
EPS food containers	9.5
EPS drink cups	3.3
Straws	0.6

Single-use plastic items which are treated as exempt (i.e. straws used by a designated person, cutlery sets for correctional and mental health facilities, etc.) has not been included in calculating benefits.

Avoidable plastics capture two different benefits. The first benefit considered is the transition away from single-use plastic use, leading to avoided litter of such items. This quantity directly relates to the benefit of avoided land and marine litter.

The second benefit centres on avoiding landfill, due to the use of reusables and single-use alternatives, in conjunction with a shift away from using such an item altogether. Given the breadth of materials that single-use alternatives could be made of (i.e. bamboo, sugarcane, paper, etc.), an assumed compostable rate of 50 per cent has been attributed to single-use alternatives to appropriately cater for the fact that not all items will avoid landfill.

Attributing a dollar value to avoided litter and landfill under Option 1 is detailed below.

Benefit of avoided land and marine litter in terms of avoided clean-up costs

The benefit of avoided land and marine litter captures the benefit of avoided litter of single-use plastics within the community by the Victorian public. In quantifying this benefit, avoided clean-up cost estimates has been used. While it is recognised that the effectiveness of capturing the benefits of avoided litter may be limited due to the nature of clean-up costs, the value does provide a relative base to quantify the potential level of the benefit.

In terms of reaching an avoided clean-up cost[129], a blended cost for avoided land and marine litter (per tonne) has been quantified in an effort to capture the benefit of avoided litter entering both land and marine environments.[130] The cost used for avoided land litter, per tonne, is $2,103 (adjusted for CPI from $1,876).[131] The cost for avoided marine litter, per tonne, is $40,929.95 (adjusted for CPI from $36,512).[132] In blending these two costs together, it has been assumed that single-use

[128] Department of Environment, Land, Water and Planning. (2019). Victoria in Future. https://www.planning.vic.gov.au/land-use-and-population-research/victoria-in-future
[129] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).
[130] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).
[131] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).
[132] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).

litter within oceans only equates to approximately 20 per cent of the total litter experienced within Victoria, of which the remaining 80 per cent would be associated with land litter. This results in a blended cost for avoided land and marine litter of $9,868 per tonne.

The calculation in determining the blended cost for avoided land and marine litter has been reflected within Table 24 below:

Table 24: Blended avoided clean-up cost calculation

Category	Unit	Formula	Value
Avoided litter (land) avoided clean-up cost per tonne[133] - 2022 price	Dollar	A	$2,103.00
Avoided litter (marine) avoided clean-up cost per tonne[134] - 2022 price	Dollar	B	$40,929.95
Assumed litter estimated to end up in oceans and waterways	Percentage	C	20
Assumed litter estimated to end up in the land environment	Percentage	D	80
Calculation			
Proportion of avoided litter (land) clean-up cost per tonne	Dollar	E = (A * D)	$1,682.40
Proportion of avoided litter (marine) clean-up cost per tonne	Dollar	F = (B * C)	$8,185.99
Blended avoided clean-up cost	Dollar	E + F	$9,868.39

This dataset was used for consistency as it utilises the same analysis for both land and marine litter.

[133] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).
[134] Marsden Jacob Associates (2016). Plastic Bags Ban Options – Cost Benefit Analysis. Report prepared for the Victorian Department of Environment, Land, Water and Planning. (p. 23).

10 Appendix B

10.1 Sensitivity analysis

A sensitivity analysis was conducted to understand the impacts of varying key input cost assumptions on the assessment of Option 1. The sensitivity analysis has considered the following assumptions:

- single-use plastic item numbers
- the cost differential of key single-use alternative items
- the proportion of plates with an exemption, being plastic-lined paper and cardboard plates
- estimation of benefits of avoided litter.

Each of the assumptions has been varied from its central assumption to provide a low cost and high cost scenario. Table 25 provides an overview of the different scenarios for each assumption.

Table 25: Low/central/high cost scenarios for each assumption

Assumption	Low cost scenario	Central cost scenario	High cost scenario
Single-use plastic item numbers	20% decrease	As quantified	20% increase
Cost differential of key single-use alternative items	10% decrease	As quantified	10% increase
The value of clean-up costs for avoided litter	Breakeven analysis and comparative study considered		
The proportion of plates with exemptions as plastic-lined paper and cardboard	10 p.p. decrease	As quantified	10 p.p. increase

10.1.1 Single-use plastic item numbers

The sensitivity analysis was conducted with the parameters of a 20 per cent increase/decrease in central number estimates of all single-use plastic items simultaneously. Given that the stated estimate uncertainties for each item were a minimum of ±20 per cent, these parameters mirror the margins for error of each estimate. However, given the linear nature of the model and the importance of this input to the final outcome, it was determined that a sensitivity test would be integral to ensuring a robust study.

A 20 per cent change in the overall volume estimate of 1,228 million was found to effect an absolute change of approximately 246 million in the total number of SUP units. This had the effect of changing the estimated PV of costs by approximately 15 per cent in either direction. Furthermore, the NPV was shifted by an accordant 20 per cent, or approximately 2.69 million in dollar terms.

While the model is reasonably sensitive to small changes in volume estimates, every effort has been made to ensure that the estimates utilised are as accurate as possible. Commissioned estimates have generally been considered the most rigorous and directly relevant to Victoria and have only been deviated from where substantial evidence indicates a revision would be preferable. Where additional information was available, additional estimates were calculated to assess whether or not these corroborated the commissioned values. These were used to corroborate with other sources, even if this process did not result in any revisions taking place.

Table 26: Item Number Sensitivity - total change in cost of option

Number of items	-20%	Model Base Case	+20%
Present Value of Costs	2,004,209	2,368,189	2,732,168
Change in Present Value of Costs	-15%	-	15%
NPV	10,655,899	13,333,051	16,023,522
Change in NPV	-20%	-	20%

10.1.2 The cost of single-use alternatives

Another key input where sensitivity was tested was the cost differential of replacing single-use plastic items with single-use alternatives. For this analysis, a 10 per cent parameter was tested, applied to key items that were assessed to likely have the greatest impact on the model outcome.

The sensitivity analysis identified three main drivers of cost sensitivity in the model, namely straws and drink containers in the hospitality sector, and cotton bud sticks in the retail sector. This is, in part, due to the fact that, of the absolute total number of single-use plastic units estimated to be consumed in Victoria across the whole study, these sector-items have among the highest proportions. They also have among the highest cost differentials between single-use plastic and the single-use alternative items.

Large volume proportionality and cost differentials mean that cost increases and decreases in a post-ban scenario are proportionally heavier weighted in the final analysis. Recalling that, for each of these items, it has been assumed the majority of existing single-use plastics will be substituted for single-use alternatives, it is this cost relativity that has been tested under this analysis. A 10 per cent adjustment was applied to the cost differential to gauge the effect on the model outcome.

Hospitality-Sector Straws

It is estimated that 274 million single-use plastic straws are consumed by the Victorian hospitality sector annually. It has been assumed within the model that 90 per cent of these will be substituted for single-use alternatives. The cost differential between a single SUP straw and its single-use alternative equivalent is $0.01. A 10 per cent increase in this differential results in a 71 per cent increase in present value of costs across the model. The same is true in the opposite direction, with signs inverted. This is equivalent to a 13 per cent increase/decrease in the NPV across the project. The NPV remains comfortably positive, as does the BCR, under this scenario.

Table 27: Cost sensitivity of alternative straws in the hospitality sector - total change in cost of option

Hospitality-Sector Straws	-10%	Model Base Case	+10%
Present Value of Costs	693,132	2,368,189	4,043,245
Change in Present Value of Costs	-71%	-	71%
NPV	15,008,107	13,333,051	11,657,995
Change in NPV	13%	-	-13%

Retail-Sector Cotton Buds

The retail sector consumption of cotton buds in Victoria has been placed at 213 million per annum. While this estimate is lower than that for the medical sector, given the exemptions in place for medical, forensic and scientific use under the proposed ban, the retail estimate proves to be the more influential figure. Given the assumed multitude of single-use alternatives being adopted after the ban, it is again this price differential that has been subjected to a sensitivity analysis. A 10 per cent movement in this differential results in a 10 per cent change in the NPV.

Again, however, the NPV and BCR remain positive and are largely unaffected as decision-making tools.

Table 28: Cost sensitivity of alternative cotton buds in the retail sector - total change in cost of option

Retail-Sector Cotton Buds	-10%	Model Base Case	+10%
Present Value of Costs	1,006,603	2,368,189	3,729,775
Change in Present Value of Costs	-57%	-	57%
NPV	14,694,637	13,333,051	11,971,465
Change in NPV	10%	-	-10%

Hospitality-Sector Drink Containers

The hospitality-sector estimate of EPS drink containers is relatively lower compared to the other items in the cost-sensitivity analysis, at 37 million units. However, the key price differential between single-use plastic items and single-use alternatives for this category is relatively large, at 51 per cent or $0.03. For this reason, a sensitivity analysis was carried out on this item to understand the comparative influence of the price differential. A 10 per cent movement in this differential results in a 36 per cent change in the total present value of costs, and a 6 per cent movement in the model's NPV.

Again, however, the NPV and BCR remain positive and are largely unaffected as decision-making tools.

Table 29: Cost sensitivity of alternative drink containers in the hospitality sector - total change in cost of option

Hospitality-Sector Drink Containers	-10%	Model Base Case	+10%
Present Value of Costs	1,517,063	2,368,189	3,219,314
Change in Present Value of Costs	-36%	-	36%
NPV	14,184,176	13,333,051	12,481,926
Change in NPV	6%	-	-6%

10.1.3 Benefit of avoided litter

Due to the value and impact this benefit has on the final outcome, a sensitivity analysis was applied to the per-tonne clean-up cost for avoided land and marine litter. While single-use plastic litter would inevitably be substantially reduced under the proposed ban, it is recognised that there would likely be a not-insignificant quantity of non-plastic litter that would be introduced to the environment in place of the banned single-use plastics.

Under the reform, it is estimated that 1,893 tonnes of single-use plastic litter will be avoided in Victoria over 10 years, but will be replaced by 1,769 tonnes of litter from single-use alternatives over that same period[135]. Despite this replacement, single-use plastic item litter will be reduced by 88 per cent.[136] Based on this, there would be an overall reduction of 124 tonnes of litter in Victoria.

In assessing the appropriateness of this variable, a linear relationship has been derived between the avoided clean-up cost and model NPV across the model, using the resulting equation to solve for a cost that gives an NPV of 0 – that is, breakeven.

[135] This value is quantified assuming that single-use plastic items weigh the same as single-use alternatives. This assumption has been considered reasonable for the purposes of quantifying at a high level the impact alternatives may have on the economy. It remains unclear the type of alternatives industry and consumers will switch to, to inform the litter tonne estimation.

[136] This percentage is based on the estimation that a total of approximately 19,487 tonnes of single-use plastic items would be used in Victoria over 10 years under the base case, excluding the consideration of integrated items.

Table 30: Linear algebraic estimation of relationship between clean-up cost and NPV

Clean-up cost per Tonne	x	m	+/-	c	=	NPV
$0	x	1,528	-	1,749,282	=	-$1,749,282
$5,000	x	1,528	-	1,749,282	=	$5,892,459
$9,868	x	1,528	-	1,749,282	=	$13,333,051

Taking the results as displayed in Table 30 and rearranging the equation to solve for an NPV of 0 gives a clean-up cost per Tonne breakeven value. This is shown in Table 31.

Table 31: Solving for the breakeven clean-up cost

(NPV	+/-	c)	÷	m	=	Cost per Tonne
($0	+	1,749,282)	÷	1,528	=	$1,145

This shows that, from the initial clean-up cost of $9,868 per tonne of litter used in the analysis, any reduction of that value down to $1,145 would still result in a net positive outcome. In other words, the net clean-up cost could be reduced by as much as 88 per cent and the proposed ban would still break even over 10 years. That is, as long as the total net clean-up cost, which is the difference between the benefit recorded by the removal of single-use plastics and the disbenefit of still having to remove non-plastic litter, is greater than or equal to $1,145, then the proposed reform will at least break even.

Alternative single-use items, typically made out of materials such as paper, bamboo, and cardboard - are less toxic and pose significantly less environmental issues than their plastic counterparts. Such alternatives generally break down in the environment over time, given the biodegradable nature of the material. These items are significantly less likely to persist in the environment in comparison to plastic which doesn't break down but fragments into smaller pieces.

Where these alternative items are captured in litter clean up, it is expected that this happens incidentally as part of general litter clean ups, as there is expected to be less non-plastic single-use item litter as these materials naturally degrade over time. This is particularly the case in marine environments, where non-plastic litter is more likely to decompose, pose significantly less damage to marine environments, and have less associated clean-up costs compared to plastic litter. It is therefore reasonable to expect that the policy will break even.

Equally, it is possible that the clean-up cost for single-use plastic litter is higher than the value used in this analysis. Analysis of the clean-up cost of beverage container litter using recent data, provided to PwC by DELWP, estimated a clean-up cost of $29,110 per tonne. Although the value would be different for single-use plastic items, this nonetheless provides a more recent estimate of litter clean-up costs that may be indicative of clean-up costs for single-use plastic items. If this value is applied to the analysis, then the benefits would be significantly higher than the central estimate in this RIS. Indeed, under this scenario, the model produces a 10-year NPV of $42.7 million. Under this alternative assumption, the proposed SUP ban would have a significantly higher net positive outcome and therefore remain the preferred option.

10.1.4 The proportion of SUP plates being plastic-lined paper and cardboard

The final influential variable to undergo sensitivity analysis was the assumed proportion of single-use plastic plates which are plastic-lined paper and cardboard plates. No indicative data was found regarding the proportion of single-use plates that would be made from plastic-lined paper or cardboard rather than solely plastic. Therefore a 'best estimate' value of 20 per cent was assumed in the modelling based on a scan of the market. To test the impact of this assumption, a 10 percentage-point parameter was applied in both directions to the estimate.

Table 32 - Proportion sensitivity of single-use plastic plates estimate which are plastic-lined - total change in cost of option

Assumed Proportion of Retail Price of SUPs as Value of Materials	**-10 p.p.**	**Model Base Case**	**+10 p.p.**
Present Value of Costs	**1,734,524**	2,368,189	3,001,853
Change in Present Value of Costs	-27%	-	27%
NPV	14,179,656	13,333,051	12,486,445
Change in NPV	6%	-	-6%

While the effect of such a change was not insignificant on the model, it is also notable that the outcome of such a change was not particularly consequential, either, and thus no additional safeguards were required. The fundamental outcome of a positive NPV remained unchanged under either parameter scenario.

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