10.19

Revised Regulatory Impact Statement:

Single-use Plastics By-law

October 2019

TOWARDS ZERO WASTE TO LANDFILL

hobartcity.com.au/singleuseplastics

City of HOBART

EXECUTIVE SUMMARY

The Hobart City Council resolved on 4 March 2019 to introduce a Single Use Plastics By-Law banning single use plastic takeaway packaging from Hobart food retailers. As part of this process, the City prepared and submitted to the Director of Location Government a Regulatory Impact Assessment (RIS) on the proposed by-law. This revised RIS addresses additional questions posed by the Director of Local Government, encompassing the current state of takeaway packaging in the City of Hobart and providing a policy impact analysis. The impact analysis includes:

- A Cost Benefit Analysis (CBA).
- An assessment of inter-council competition impacts.

To gain some insight into the state of Hobart's takeaway packaging, a survey of food retailers provided information on number of packaging units per annum and tonnage of packaging per annum. When viewed by units per annum: 55% of takeaway packaging was compostable, **43% was landfill**, and 2% recycling. When viewed by tonnes per annum: 67% was compostable, **30% landfill** and 3% recyclable. The difference between units and weight is likely due to the lightweight nature of single-use plastic packaging, such as straws and drink stirrers.

Using data gather from a food retailer survey, the level of single-use plastic litter was estimated. It was approximated that **9,030,180** pieces of single-use plastic are littered each year in the City of Hobart. When expressed as a weight, this worked out to be **36.85** tonnes of single-use plastic per year in plastic litter. Further investigation lead to the conclusion that a mandatory ban on single-use plastic would result in a **25%** reduction in land-based litter.

During the policy impact analysis it was estimated that the average increase in food retailer packaging costs would be approximately **$700** per annum. Takeaway food retailers and Bakeries were found to have the highest average increase in packaging costs. The maximum increase in annual costs was approximately **$21,000**, while the minimum was **-$175**.

Two scenarios were tested over a six year period (2019 to 2025) during the Cost Benefit Analysis (CBA);

- A Mandatory Ban by-law.
- A Voluntary Program.

The results of the CBA can be seen below:

	Option 1: Voluntary program	Option 2: By-law
NPV	-$1,379,577	-$2,710,318
Units of landfill (LF) plastic avoided	81,759,921	148,650,145
Tonnes of landfill (LF) plastic avoided	334	607

It is acknowledged that the CBA benefits were conservatively priced. Some benefits were possibly under-priced and at least one potential benefit was given a zero value; marine biodiversity. A Benefit Transfer carried out separately to the CBA, estimated the value of conserving 10% of marine biodiversity in the Hobart region to be approximately **$4,500,000.**

The competition impact analysis, carried out by SGS Economics and Planning showed that Hobart takeaway food prices already have a premium over neighbouring councils. When travel costs were compared against the increased cost of takeaway packaging, travel costs were found to be greater than the increase in packaging costs. It was concluded there would be no significant impact on competition from restrictions on single-use plastics. However, there is some risk that national or multi-national chains may outsource their packaging to avoid the by-law.

The revised RIS took four findings into consideration when deciding upon the appropriate course of action:

- The Net Present Value (NPV) results from the CBA.
- The amount of waste avoided.
- The Benefit Transfer.
- The assessment of inter-council competition impacts.

If the assumptions behind the Benefit Transfer stand, then the losses seen in the CBA would be neutralised. This leaves the Single-use Plastics by-law as being the preferred option, due to the greatest waste and litter avoidance and little to no competition impact.

ACRONYMS

APCO	Australian Packaging Covenant Organisation
ATO	Australian Tax Office
BCR	Benefit Cost Ratio
CBA	Cost Benefit Analysis
CUAD	Clean Up Australia Day
EPR	Extended Producer Responsibility
LGA	Local Government Area
MRF	Material Recovery Facility
NPV	Net Present Value
PLA	Polylactic Acidw
PV	Present Value
RIS	Regulatory Impact Statement

GLOSSARY

Compostable means (when used in relation to a bioplastic), when treated in an industrial composting facility, the following requirements are met: (a) 60% decomposition (aerobic) within 180 days, (b) 90% disintegration to less than 2mm in 84 days, and (c) is non-toxic.

Food packaging means any container which used to carry food from a retailer's premises to the point where the food is consumed, and related items, included but not limited to: (a) tubs and lids, (b) cups and cup lids, (c) utensils, including cutlery, stirrers and straws, and (d) sachets or packets which provide single serves of condiments including but not limited to soy sauce, wasabi and tomato sauce.

Industrial composting facility means a commercial scale facility which provides composting services at a minimum temperature of 55°C for at least 15 days (which may be non-consecutive) during the composting period.

Non-toxic means that the following tests are satisfied:

a. Plant germination test. The germination rate and the plant biomasss from a sample compost (using compost derived from the food packaging) shall be more than 90% of the germination rate and the plant biomass from a sample compost which does not contain the food packaging.

b. Packaging composition test. The food packaging will not exceed the following elemental limits: Zn 1400mg/kg, Cu 750 mg/kg, Ni 210 mg/kg, Cd 17 mg/kg, Pb 150 mg/kg, Hg 8.5 mg/kg, Se 50 mg/kg, As 20.5 mg/kg.

Net Present Value (NPV) is the difference between the present value of cash inflows and present value of cash outflows over a period of time.

Plastic means a material that contains large molecular weight organic polymeric substances as an essential ingredient, but does not include plastic which is compostable.

Single-use product means a product that is not conceived, designed or placed on the market to accomplish, within its life span, multiple use by being returned to the retailer for refill or re-used for the same purpose for which it was conceived.

CONTENTS

1. PURPOSE OF A REGULATORY IMPACT STATEMENT

When a council seeks to make a new by-law or a significant amendment to an existing by-law, the Local Government Act 1993 requires a Regulatory Impact Statement (RIS) be prepared.

The preparation of a RIS is a rigorous process aimed at analysing the most efficient and effective options available to address a particular issue and avoiding unnecessary regulation.

A RIS is required to identify whether the benefits of regulation outweigh the cost of a restriction on competition or an impact on business imposed by the by-law. It requires an assessment of direct and indirect social, economic and environmental impacts of the proposed by-law and alternatives considered.

A RIS should also briefly detail its purpose and the statutory context in which it operates to help the general public understand the function and role.

This RIS will assess two options to reduce the effect of Single-Use Plastic Takeaway Packaging on the environment:

- A voluntary program
- A mandatory ban on single-use plastic takeaway packaging

The voluntary program envisages an accreditation system managed by the City of Hobart (hereafter referred to as 'the City'), used to encourage food retailers to move away from single-use plastics. A mandatory ban describes the creation of a by-law, mandating the removal of single-use takeaway plastic packaging from food retailers.

2. OBJECTIVES OF THE BY-LAW

The City has the following aims in relation to single-use plastics:

- To minimise the exposure of community and the environment to the risks and harm associated with single-use plastic in takeaway food packaging.
- To reduce the overall quantity of plastic litter arising from takeaway food retailing, and its long-term impacts.
- To provide a stimulus for the development and uptake of innovative and sustainable takeaway food packaging solutions.
- To align the practices of takeaway food retailers with growing community concern regarding the risks of single-use plastic in everyday life.

3. BACKGROUND AND CONTEXT OF THE CITY'S TAKEAWAY PACKAGING

To provide additional context for the policy impact discussion, this section of the RIS presents the current profile of the City's takeaway packaging, provides additional information about Hobart's litter stream and discusses other single-use plastic policy being implemented.

3.1 THE CITY'S TAKEAWAY PACKAGING PROFILE

Hobart food retailers use a diverse mix of takeaway packaging. This has been demonstrated by a survey of Hobart food retailers, which provided insight into takeaway product types and takeaway product material types. Twelve takeaway packaging products were included in the survey and are presented in Table 1. Additional detail regarding the survey structure can be found in Appendix A.

Table 1. List of products included in the Food Retailer survey

Surveyed Products	
Hot chip containers	Drink stirrers
Noodle boxes	Straws
Sandwich wedges	Coffee cups
Food containers	Coffee cup lids
Cutlery	Cold drink cups
Sauce sachets	Cold drink cup lids

When profiled by material type, takeaway packaging was categorised into nine categories (Table 2). These categories were subsequently separated into 'plastic' or 'plastic free' products. Takeaway packaging labelled 'plastic free' included materials such as paper/cardboard, compostable bioplastic, wood, aluminium/cardboard, and cardboard/bioplastic. 'Plastic' or 'plastic composite' takeaway packaging consisted of plastic, cardboard/plastic, aluminium/plastic and unknown material types. A summary of these categories can be seen in Table 2.

Table 2. Material types included in plastic free or plastic categories

Plastic free	Plastic or plastic composite
Paper/cardboard	Plastic
Compostable Bioplastic (e.g. PLA)	Cardboard/plastic
Wood	Aluminium/plastic
Aluminium/cardboard	Unknown
Cardboard/bioplastic	

Using the categories from Table 1 and 2, the food retailer survey provided a profile of the City's takeaway packaging (Figure 1). Food containers and Hot Chip containers were predominantly plastic free, being dominated by paper/cardboard packaging (see Appendix C). A review of coffee cups and cold drink cups demonstrated that a significant proportion were cardboard/PLA lined, wholly PLA or wholly cardboard compostable cups. PLA or wooden cutlery and PLA coffee cups lids were also in common use. However, the survey demonstrated that the remaining products are mostly single-use plastic packaging.

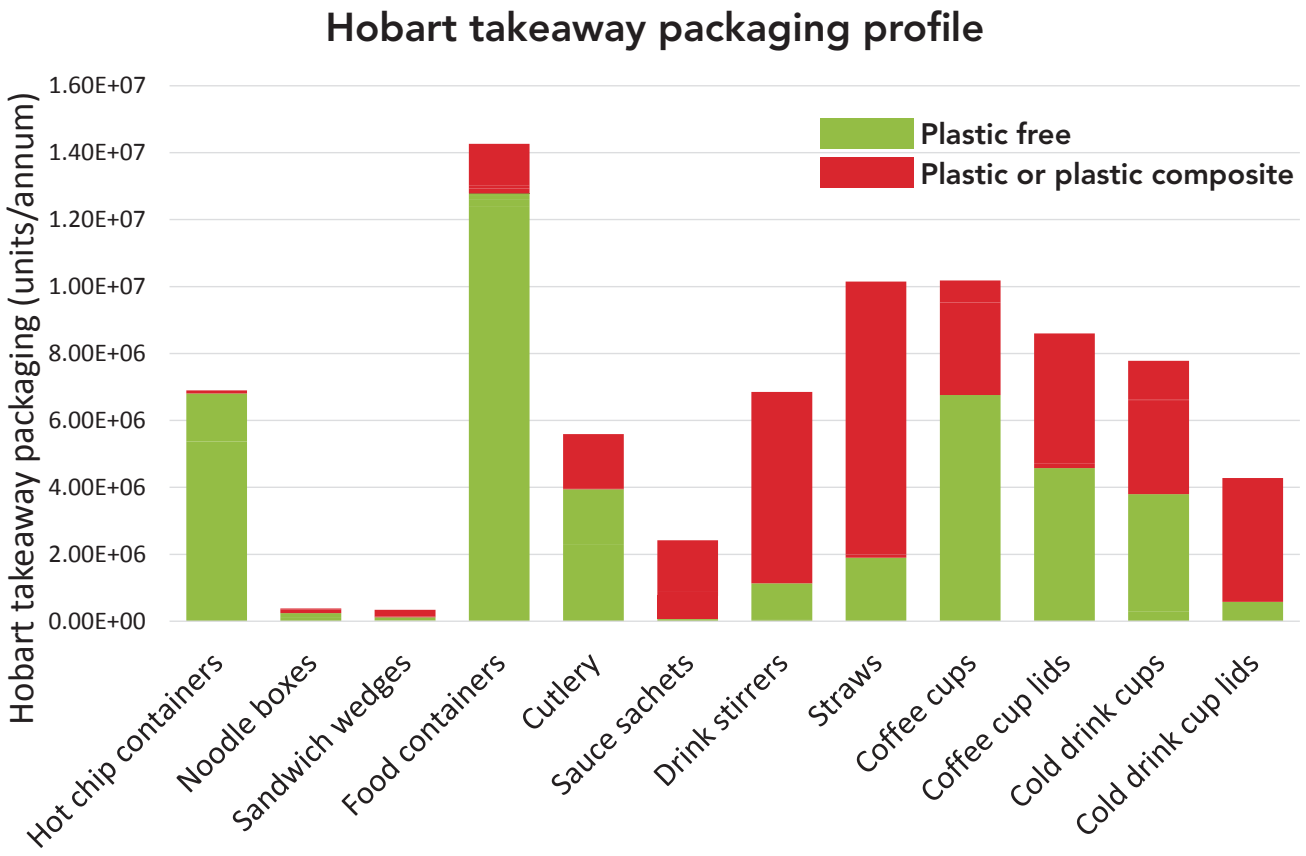

Figure 1. Plastic free vs plastic takeaway packaging (by product type)

The survey data also allowed for estimation of the quantities of takeaway packaging considered landfill, recyclable or compostable. The City's annual usage was forecasted using; a weekly packaging profile of an 'average' City food retailer, the categories seen in Table 3, and Equation 1. The results from this analysis can be seen in Figure 2. It should be noted that the use of these categories does not account for incorrect disposal, and therefore should only be used to understand the composition of the takeaway waste stream, not the final destination of takeaway packaging.

Table 3. Product types and their construction material matched to disposal categories

Landfill	Recycling	Composting
Plastic lined noodle boxes	Rigid plastic sandwich wedges	Cardboard hot chip containers
Plastic cutlery	Rigid plastic food containers	Bioplastic (PLA) sandwich wedges
Plastic sauce sachets		Bagasse food containers
Plastic drink stirrers		Bioplastic (PLA) food containers
Plastic straws		Cardboard food containers
Plastic lined coffee cups		Bioplastic (PLA) cutlery
Plastic coffee cup lids		Wood cutlery
Plastic lined cold drink cups		Wood drink stirrers
Plastic cold drink cups		Bioplastic (PLA) drink stirrers
Plastic cold drink cup lids		Paper straws
		Bioplastic (PLA) straws
		Bioplastic (PLA) lined coffee cups
		Bioplastic (PLA) coffee cup lids
		Bagasse coffee cup lids
		Bioplastic (PLA) lined cold drink cups
		Paper cups
		Bioplastic (PLA) cold drink cups

$$\text{City units per annum} = \text{average } \frac{\text{units}}{\text{week}} \times 52 \text{ weeks} \times 1083 \text{ food retailers} \times \frac{1}{2} \quad [1]$$

The annual tonnage of takeaway packaging has also been calculated using assumed weights for each type of packaging. These assigned weights, for the twelve products in Table 1, can be found in Appendix B. The results from these calculations can be seen in Figure 2.

When viewed by 'weight', 30% of Hobart's takeaway packaging contains plastic. However, when viewed by 'number of items' this increases to 43%. This significant change is likely due to small, lightweight plastic products, such as drink stirrers and straws, having minimal impact on litter weight but a large impact on unit count.

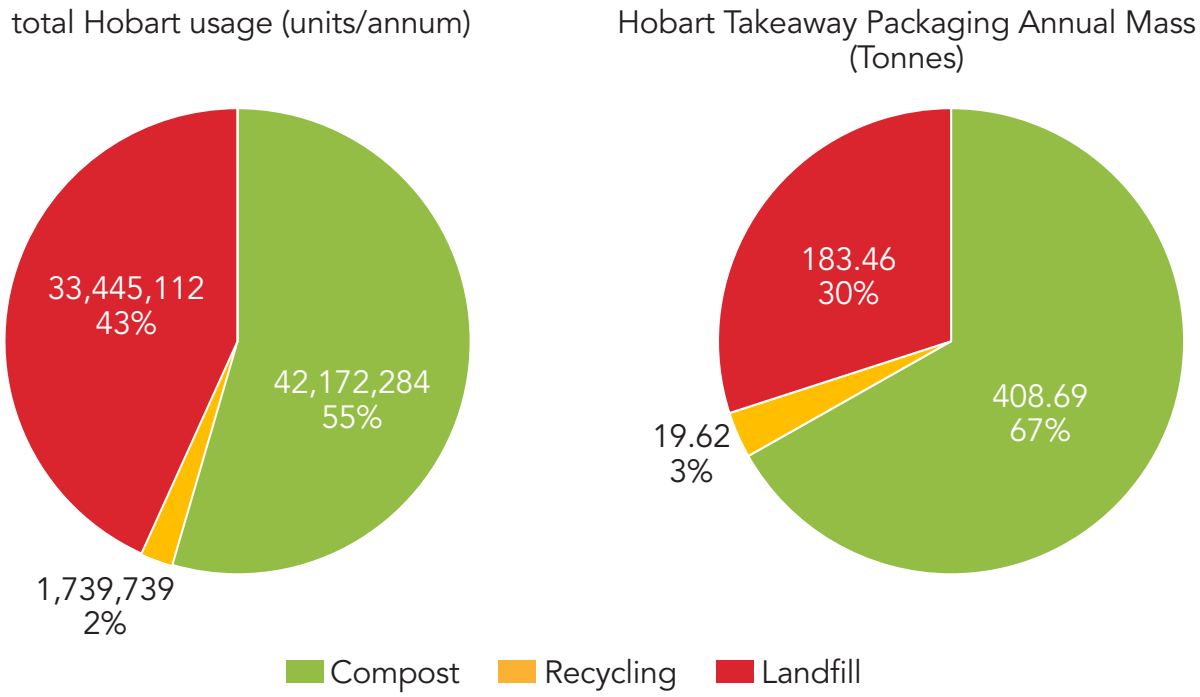

Figure 2. (a) City of Hobart Takeaway packaging quantities by number of units, and (b) takeaway packaging quantities by weight.

It is also possible to include litter as a disposal category, if an assumption is made about the proportion of takeaway packaging becoming litter. In a 2014 Regulatory Impact Statement investigating plastic bag bans, a litter rate of 27% was used for 'away from home' packaging[1]. If this proportion is applied to the figures seen in Figure 2, this would result in 165.18 tonnes of litter per annum or 20,886,426 pieces of litter. If it is assumed that the proportions seen in Figures 2 (a) and (b) are the same for litter, this results in the quantities seen in Table 4. Additional information about litter quantities can be found in Appendix D.

Table 4. City of Hobart takeaway packaging litter quantities derived from takeaway packaging survey

	Units/annum	Tonnes/annum
Compostable	11,386,517	110.35
Recyclable	469,729	5.30
Landfill	9,030,180	49.53
Total	20,886,426	165.18

3.2 THE WHOLE LITTER STREAM

It is also necessary to consider how takeaway packaging litter fits within the whole City litter stream. This requires asking:

- What proportion of the Hobart litter stream is takeaway packaging?
- What proportion of City of Hobart land-based litter enters the Derwent Estuary?
- What proportion of Derwent Estuary plastic litter originates from the City of Hobart?
- The rate compostable packaging decomposes when littered.

When these questions are resolved, it is possible to determine the estimated impact of reducing plastic takeaway packaging will have on the City and the Derwent Estuary litter levels.

[1] NEPC, 2014, Packaging Impacts: Decision Regulation Impact Statement

Table 5. Domestic and international action on single-use plastics reduction

	Query		Answer
A	What proportion of the Hobart litter stream is takeaway packaging?	This analysis will use data from the National Litter Index, that infers approximately 50% of the litter stream is takeaway packaging[2].	50%
B	What proportion of City of Hobart land-based litter enters the Derwent Estuary?	When investigating the proportion of land-based litter that enters the Derwent Estuary, it is possible to rely on existing academic studies. For instance, the Ocean Conservancy estimates that 59% of all marine litter is from land-based shoreline and recreational activities. An academic study estimated that about 80% of marine plastics come from land, while UNEP assumes 100% of land based litter becomes marine litter[3 4]. This RIS will assume that 80% of land-based litter will reach the Derwent Estuary.	80%
C	What proportion of Derwent Estuary plastic litter originates from the City of Hobart?	The proportion of plastic litter that the City of Hobart contributes to the Derwent Estuary is unknown. However, the City of Hobart is one of five major metropolitan councils with significant Derwent Estuary coast lines. Ideally, an analysis would be made of these councils and the quantity of plastic litter they release into the Derwent Estuary. As this data is not currently accessible, an assumption will be made that the City of Hobart contributes 20% of the plastic litter found in the Derwent Estuary.	20%
D	The rate compostable packaging decomposes when littered.	There is also considerable uncertainty around the behaviour of certified compostable packaging when present as land or marine litter. The City of Hobart will estimate a 50% drop in takeaway packaging litter levels (by number of items) if the by-law is implemented. This estimate is based upon the following: • As paper, cardboard, bagasse and wood are home compostable, they will compost over weeks or months if littered[5]. • All known products impacted by the by-law have home compostable options except for coffee cups, sandwich wedges and cold drink cup lids (see Appendix E). • Compostable bioplastics that are coated onto paper/ cardboard will experience significant decomposition over 1 to 2 years in a land-based or marine environment[6]. • Solid compostable bioplastics (e.g. PLA cutlery, PLA cup lids,PLA bioplastic cups, PLA bioplastic bowls) will take a significant time to decompose as terrestrial or marine litter[7].	50%

[2] KAB, 2018, National Litter Index – Tasmania (Cigarette butts and General other excluded)

[3] Li, W.C. et al, 2016, Plastic waste in the marine environment: A review of sources, occurence and effects

[4] UNEP, 2014, Valuing Plastic: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry

[5] 5 Gyres, 2017, Better Alternatives Now: Ban List 2.0, pg 21

[6] ibid

[7] 5 Gyres, 2017, Better Alternatives Now: Ban List 2.0, pg 21 & 23

When combined, these assumptions result in a 25% reduction in land litter and a 4% reduction in marine litter. The land litter figure was derived using figures discussed in this section and Equation 2, and marine litter was calculated from figures discussed in this section and Equation 3.

$$\left(\frac{A}{100} \times -\frac{D}{100}\right) \times 100 = \%\ \text{reduction in land litter [2]}$$

$$\left(\frac{A}{100} \times \frac{B}{100} \times \frac{C}{100} \times -\frac{D}{100}\right) \times 100 = \%\ \text{reduction in marine litter [3]}$$

The City of Hobart will encourage the use of takeaway packaging using a hierarchy system, prioritising avoidance or reduction of takeaway packaging, followed by the use of reusable containers, then home compostable packaging, and finally industrial compostables or non-plastic recyclables (Figure 3).

Figure 3. Takeaway packaging hierarchy

3.3 RELATED PLASTIC WASTE ACTIONS

The City of Hobart Single-use Plastics By-law is not an isolated action on single-use plastics. A non-exhaustive summary of related policies at a local, state, national and international level can be seen in Table 3.

For instance, the City of Hobart waste strategy focuses upon litter clean-up and offers general support for Extended Producer Responsibility (EPR). The reference to an EPR infers support for the 2025 the Australian Packaging Covenant Organisation (APCO) targets, a national packaging EPR program.

APCO is a co-regulatory body, working with its business members and government to meet the packaging goals seen in Table 3, and its targets are likely to be a significant influence on the use of single-use plastics nationwide[8]. Two of the APCO targets also appear in similar form in the Draft Tasmanian Waste Action Plan, released by the Tasmanian state government in June 2019;

- 100% of packaging to be reusable, recyclable or compostable by 2025
- the elimination of problematic single-use plastics

As there is reference to the APCO targets at the local, state and national level; this suggests they will be a key influence on all single-use plastic packaging over the next six years, and should be considered in any impact analysis of the Single-use Plastics By-law.

In addition, the South Australian (SA) and European Union (EU) have announced single-use plastic product bans.[9] [10] A list of impacted products can be seen in Table 3. These product bans, while being significant new policy, do not directly impact single-use plastics in the City of Hobart.

[8] APCO, 2019, Australian Packaging Covenant Strategic Plan 2017-2022

[9] EP, 2019, Reduction of the impact of certain plastic products on the environment

[10] GI, 2019, Turning the tide on single-use plastic products: Approach and next steps

Table 5. Domestic and international action on single-use plastics reduction

	Target/ Products banned
City of Hobart Waste Management Strategy[11]	• Action 5.1: Support extended producer responsibility programs to address localised litter generation and removal • Action 5.2: Continue to refine the public waste and recycling bin program, including locations, sizes, and collection frequencies, and increasing the number of recycling bins. • Action 5.6: Monitor the quality and appearance of waterways through regular testing and litter reduction measures.
Tasmanian Waste Action Plan[12]	• Ensure 100% of packaging is reusable, recyclable or compostable by 2025. • Have the lowest incidence of littering in the country by 2023. • Work at the national level and with local government and businesses in Tasmania to phase out problematic and unnecessary plastics by 2030.
South Australia[13]	• Banning plastic straws, cutlery, and drink stirrers. • Also considering the banning of polystyrene containers and cups, coffee cups and reusable plastic bags.
National Waste Policy (APCO targets)[14]	• 100% of packaging to be reusable, recyclable or compostable by 2025. • 70% of Australia's plastic packaging will be recycled or composted by 2025. • 30% average recycled content will be included across all packaging by 2025. • Problematic and unnecessary single-use plastic packaging will be phased out through design, innovation or introduction of alternatives.
EU[15]	• Ban on plastic cutlery, cotton buds, plastic plates, plastic balloon sticks, oxo-degradable plastics, plastic food containers, expanded polystyrene cups, straws and drink stirrers by 2021.

[11] COH, 2016, Waste Management Strategy 2015-2030

[12] DPIPWE, 2019, Draft Waste Action Plan, pg 10

[13] GI, 2019, Turning the tide on single-use plastic products: Approach and next steps

[14] APCO, 2019, Australian Packaging Covenant Strategic Plan 2017-2022

[15] EP, 2019, Reduction of the impact of certain plastic products on the environment

4. IMPACT ON BUSINESS AND RESTRICTION OF COMPETITION

This section examines the possibility of businesses within Hobart City Council losing business to neighbouring areas as a result of increased prices resultant of the plastic by-law. Section 4.1 examined the impact of a plastic ban on takeaway packaging prices, using data collected from the survey of food retailer packaging.

Sections 4.2, 4.3 and 4.4 include an investigation of cross-municipality competition impacts, a review of the likelihood of bylaw shifting demand to lower-cost municipalities, and a discussion regarding possible biases towards National and multi-national companies over small business. These analyses were completed by SGS Economics and Planning. Figure 6 highlights the City of Hobart and surrounding councils to provide context for municipality competition.

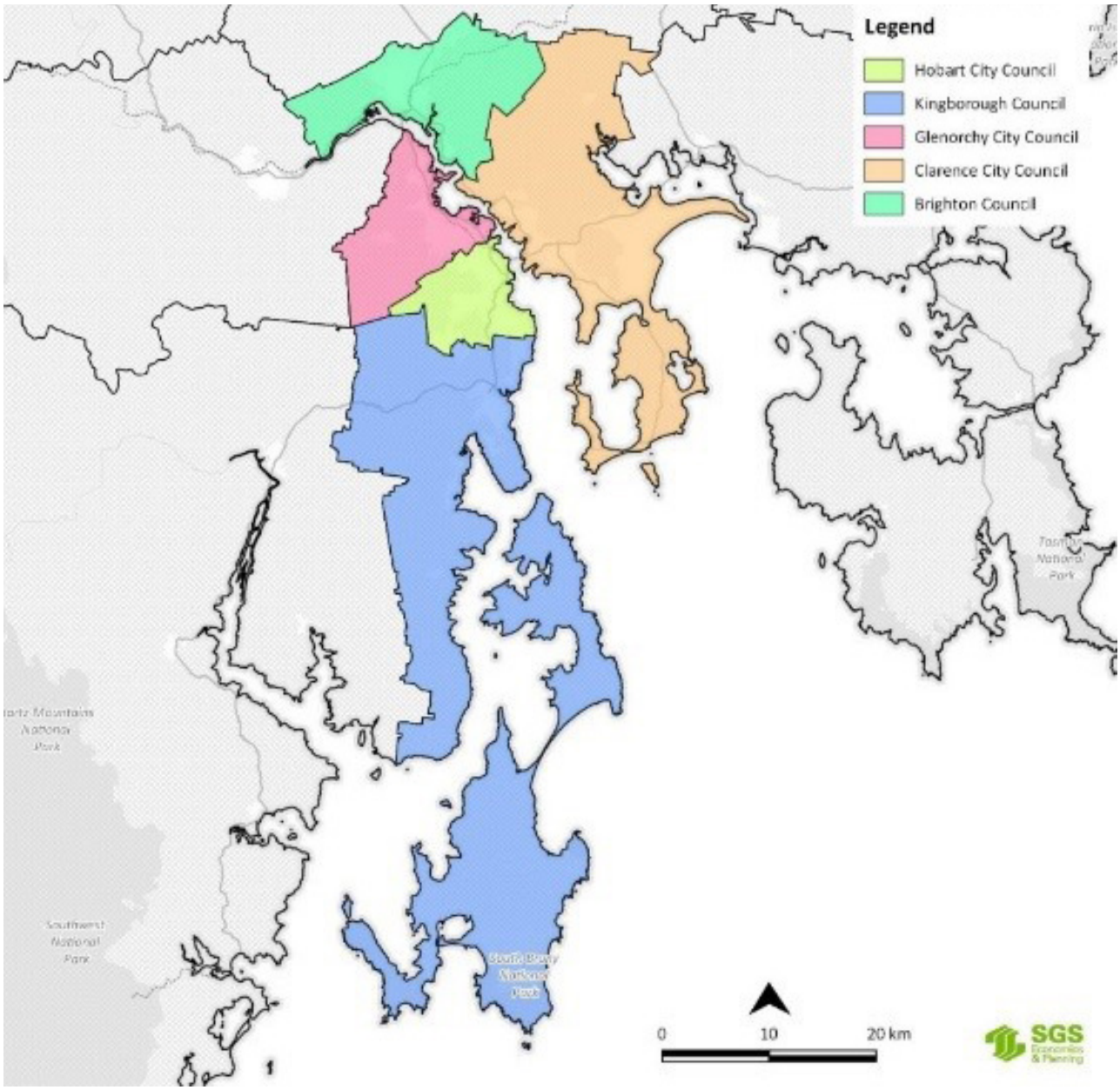

Figure 4. Hobart City Council & Neighbouring Councils, 2016

4.1 CHANGE IN TAKEAWAY PACKAGING COSTS

Using the survey responses from Hobart food retailers, the change in annual packaging costs were able to be estimated. To achieve this, a generic price change was assumed for each of the twelve takeaway packaging items seen in the survey (see Appendix F). These price changes were then multiplied against the annual packaging use for each of the survey responders. The City of Hobart registered food business database was used to categorise food retailers by business type (e.g. Takeaway food retailer, Bar & Brewery). The results of these calculations can be seen in Figure 5.

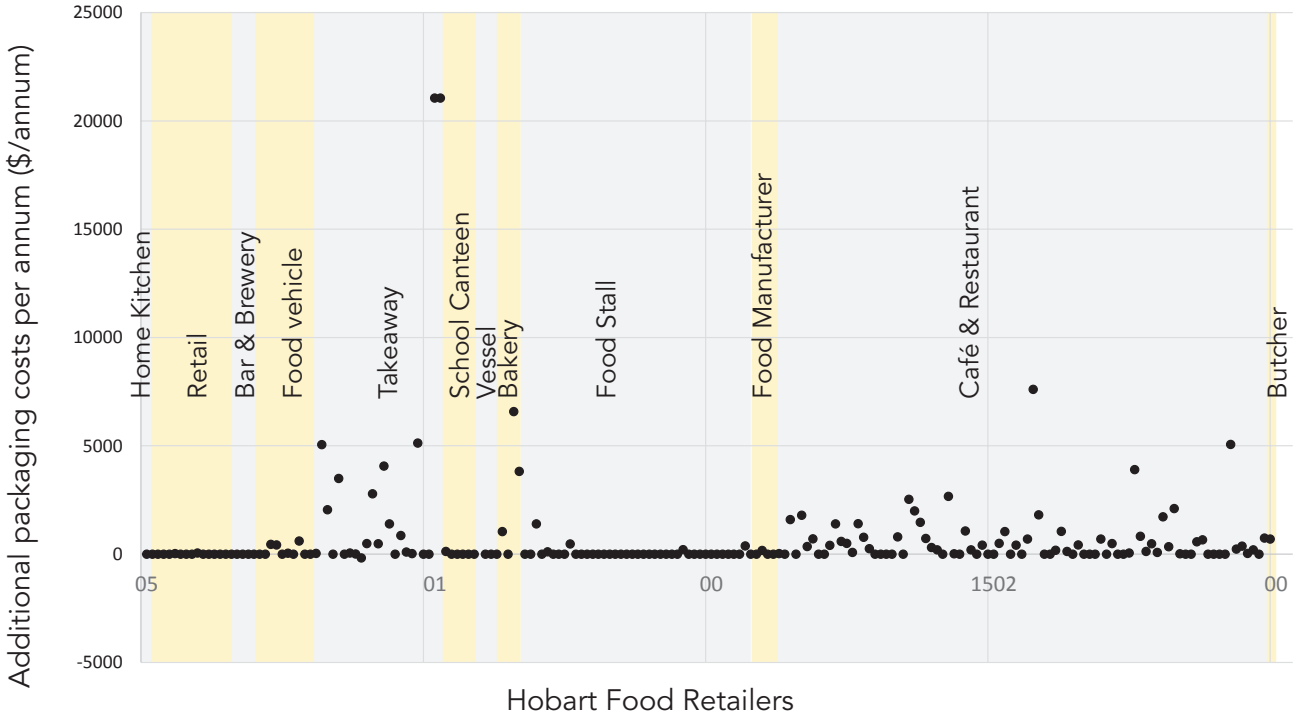

Figure 5. Annual change in takeaway packaging costs for food retailer survey responders, by business type

When these results are reviewed, some interesting patterns are observed (Table 6). There appear to be a category of highly impacted food retailers, and a second class of retailers experiencing milder packaging cost effects. In the high risk category we found Takeaways, Bakeries, Butchers and Cafes & Restaurants. This group is characterised by a higher average annual increase in packaging cost, particularly regarding the Takeaway food businesses. Within the Takeaway retailers, we also saw the maximum increase in annual packaging cost. This maximum indicated that high customer volume takeaway franchises would likely be heavily impacted by a ban on single-use takeaway plastics.

The low risk category of food retailers consisted of mobile businesses and businesses unlikely to use high quantities of single-use packaging, with average annual increases in packaging cost ranging from zero to the low hundreds. Zero values represented no change in annual packaging costs. This may occur because a business does not use takeaway packaging, or has already adopted non-plastic takeaway packaging.

Table 6. Change in annual takeaway packaging costs

	Average annual change in costs ($)	Min ($)	Max ($)	Median ($)
Food Manufacturer	0	0	0	0
Home Kitchen	0	0	0	0
Bar & Brewery	0	0	0	0
Vessel	0	0	0	0
Retail	$5.61	0	$53.04	0
School Canteen	$21.23	0	$127.4	0
Food Stall	$62.54	0	$1393.6	0
Food Vehicle	$153.24	0	$603.2	0
Café & Restaurant	$674.94	0	$7612.8	$195
Butcher	$696.80	$696.80	$696.80	$696.80
Bakery	$2861.69	0	$6579.56	$2433.6
Takeaway	$2956.02	-$175.76	$21060	$483.6
Total	$700.90	-$175.76	$21060	0

4.2 METHOD TO TEST CROSS-BORDER COMPETITION IMPACT

This assessment is based on the reasoning that the single-use plastic by-laws in the City could have cross-border competition impacts if:

- Takeaway food prices close to the borders were similar.
- The plastic ban increases the price of takeaway food in Hobart.
- Travel costs from Hobart to the nearest takeaway in a neighbouring LGA are less than the price impact of the plastic ban.

To test this theory, SGS conducted a search of online menus for cafes and restaurants with similar takeaway options within the Council areas of Hobart, Glenorchy and Kingborough, focusing on food outlets close to the council borders.

Glenorchy and Kingborough Councils were selected for comparison as they share borders with the City and have retail/hospitality offerings that are within 5km of similar offerings on the other side of the Council border. Clarence City Council and Brighton Council were not chosen as there are no comparable retail/hospitality offerings within 5km of similar offerings in the City of Hobart.

Table 7 shows the average prices of five typical and comparable takeaways in Hobart, Kingborough and Glenorchy, mostly from restaurants or cafes close to the LGA borders. The average price of the drinks was the same in all three LGAs, while the average price of takeaway meals was higher in Hobart.

Table 7: Impact on takeaway food prices

	Meal	Price in Hobart	Price in Kingborough	Price in Glenorchy	Packaging required	Price increase from plastics ban	% increase in Hobart meal price
Café	Sandwich & coffee	$28.00	$18.50	$20.00	Box, cup, lid	$0.08	0.27%
Café	Sandwich / Burger & cold drink	$29.00	$22.00	$22.00	Box, cold cup, cold lid, straw	$0.19	0.64%
Café	4 small coffees	$16.00	$16.00	$16.00	4 x cup, 4 x lid	$0.07	0.45%
Café	4 cold drinks	$24.00	$24.00	$24.00	4 x cold cup, 4 x cold lid, 4 x straw	$0.37	1.53%
Restaurant	Curry & Rice	$23.83	$21.00	$21.70	Large takeaway container, small takeaway container, fork	$0.28	1.18%

Figure 6 shows the current price premium of Hobart meals and drinks compared to average prices in Glenorchy and Kingborough, and the impact on price of the plastics ban. It shows that the price premiums that already exist in Hobart takeaway food prices are greater than the potential impacts of the plastics ban.

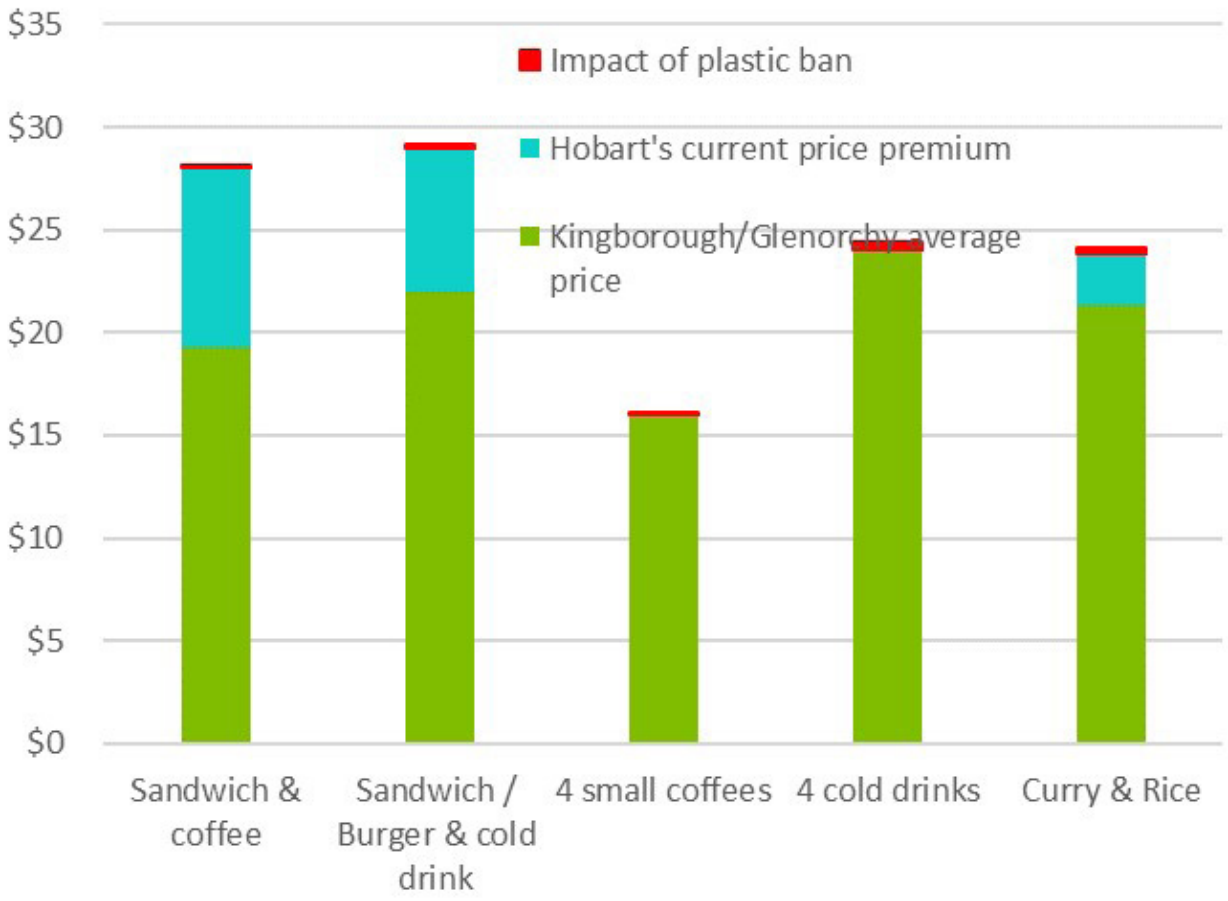

Figure 6. Takeaway food prices differences between local government regions

4.3 COMPETITION IMPACTS AND TRAVEL COSTS

Table 8 compares the cost to the consumer per meal of the plastic ban compared to the travel costs of travelling to neighbouring councils. Travel costs were calculated by multiplying the Australian Taxation Office's (ATO) standard cents per kilometre car costs for tax purposes (0.68c/km) by the distance between a takeaway store close to the City's border with comparable takeaways over the border in Kingborough and Glenorchy. Only takeaway stores less than 5km from the LGA borders were compared.

The full cost comparisons of takeaway food between the LGAs are shown in Appendix I.

Table 8: consumer Costs incurred from plastic ban compared to travel costs

Meal	Cost outside of Hobart	Increase in cost from plastic ban ($)	Travel distance between options (km)	Travel cost (68c/km)
Kingborough				
Sandwich & coffee	$20.00	$0.08	2.50	$1.70
Sandwich & cold drink	$22.00	$0.19	2.50	$1.70
Four small coffees	$16.00	$0.07	2.50	$1.70
Four cold drinks	$24.00	$0.37	2.50	$1.70
Glenorchy				
Curry and Rice	$25.00	$0.18	0.70	$0.48
Burger & chips	$24.00	$0.28	0.60	$0.41
Curry & Rice	$19.00	$0.18	0.75	$0.51
Burger & chips	$15.00	$0.08	1.30	$0.88
Sandwich & coffee	$20.00	$0.19	0.75	$0.51
Sandwich & cold drink	$22.00	$0.07	0.75	$0.51
Four small coffees	$16.00	$0.37	0.75	$0.51
Four cold drinks	$24.00	$0.28	0.75	$0.51
Curry & Rice	$19.00	$0.18	0.55	$0.37
Burger & chips	$24.00	$0.28	0.60	$0.41
Curry & Rice	$23.80	$0.08	3.30	$2.24

For every takeaway food option considered, travelling from the City to Glenorchy or Kingborough to a takeaway that is cheaper due to stocking plastic packaging would not be an economic decision – the vehicle costs of travelling over the border outweigh the savings from purchasing takeaway that is packaged in plastic instead of non-plastic packaging (refer to Table 8).

It is possible that a person making a bulk order of takeaway food may save enough from travelling outside the City for takeaway, but these would only be in very limited circumstances. If a person was:

- Making a large order of a takeaway foods that have a relatively large cost differential between plastic and compostables.
- Crossing the border to get to an alternative takeaway in Glenorchy or Kingborough would add less than 1km to the journey.
- Otherwise indifferent to other price and quality factors of the comparable stores.

then they might consider driving from the City to another LGA. For example, based on Table 8 and Figure 7, a person might be prepared to drive around 750 metres outside the LGA to buy two curries and rice, three burgers and chips or eight cold drinks. This is a very marginal case.

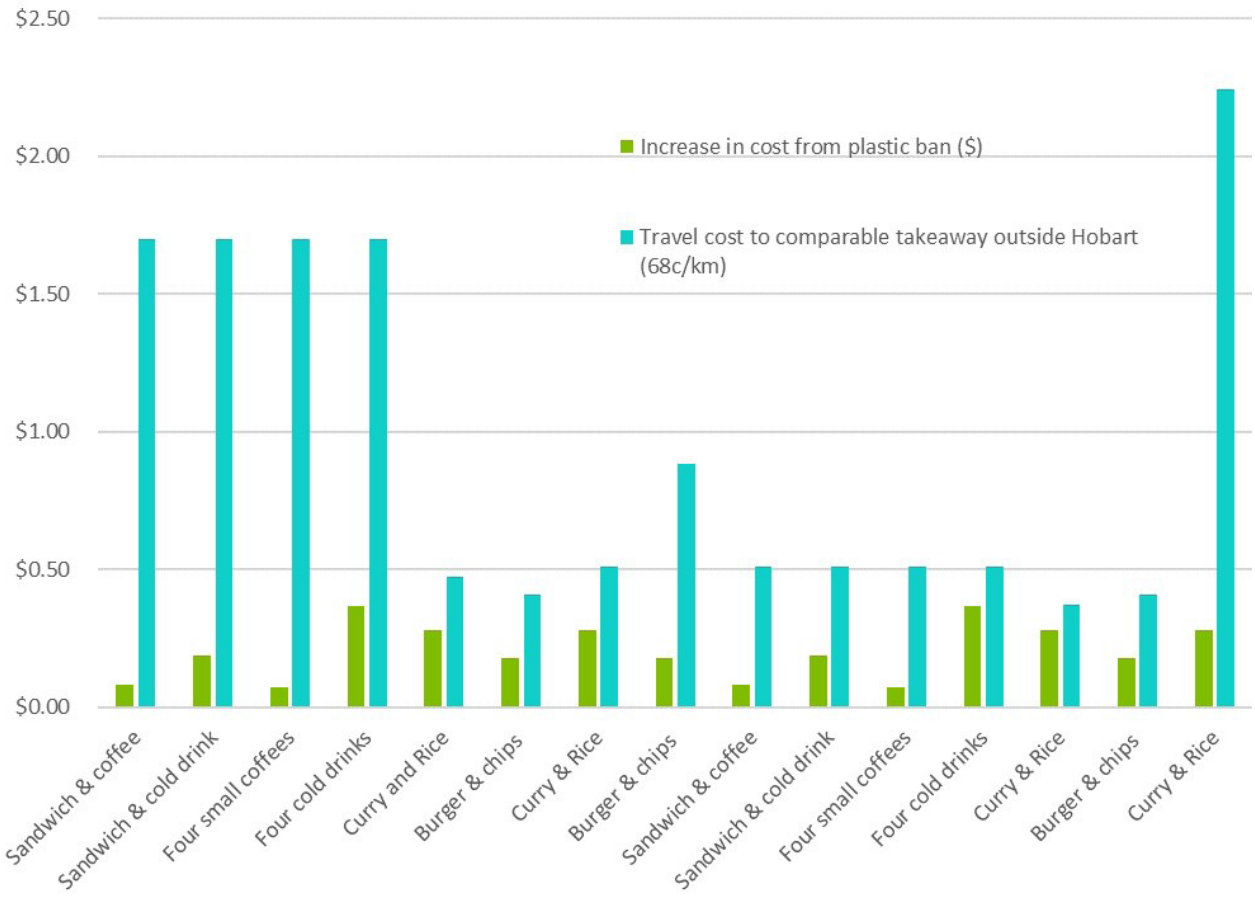

Figure 7. Takeaway meal price Increase incurred from plastic ban & Travel cost to travel to neighbouring LGAs

While the plastic by-law will make takeaway food prices marginally more expensive in Hobart than those in neighbouring LGAs, the cost of travelling even a few hundred metres to a neighbouring LGA is higher than the cost of compostable packaging. The impacts on inter-LGA competition are expected to be minimal to none. The costs of takeaway meals in Hobart, Glenorchy and Kingborough already show price variation much greater than the potential price increase from compostable packaging.

4.4 NATIONAL AND MULTI-NATIONAL CHAINS VS SMALL BUSINESS

Comments from DPAC on the RIS suggested that larger national and multi-national chains might find it easier than small firms to either adapt to or avoid the ban on plastics. The comments suggest two ways in which this could occur:

- National and multi-national chains might find it easier than smaller chains to switch away from plastic packaging.
- Chains may contract with unrelated entities who supply their foods in single-use plastic; for example buying pre-packaged plastic wrapped muffins from a separate company for same. This would fall outside the scope of the ban, but a small store that prepares their own muffins would not be liable for the ban.

These questions have been discussed qualitatively, with some reference to the quantitative analysis on from previous sections. It was not possible to obtain information from chains on their costs of packaging and the costs of switching to alternatives due to commercial factors, although some stores have provided general information through personal communications.

The City is engaging with large chain takeaway stores to discuss their use of plastic. The stores spoken to have generally been supportive of the concept and are planning to phase out disposable plastic in their stores, however, they are unsure if they can meet the City's proposed timeframe.

In this case, it may be easier for small stores to switch compared to large chains. Small stores simply need to buy compostable packaging from their current supplier instead of plastic, or find a new supplier. There may need to be some lead time to allow suppliers to meet demand, but these products are already available. For example, one multi-national expressed concern that they wouldn't be able to access the quantity of product required for their stores in time to meet the by-law's proposed dates. This issue will not impact smaller operators.

Large chains who make their own packaging or have it made to their specifications may need to make arrangements to change their whole manufacturing process, which is likely to take significant time and resources. Consultation conducted suggests that the cost for individual Hobart retailers will be around $700 per year, while multinational chains could face cost increases of $20,000 to $30,000 due to needing to make significant changes to their supply chain.

It is possible that larger chains could get around the ban by ordering more pre-packaged takeaway food, which falls outside the ban. There would be nothing in the by-law stopping large chains from doing so, or from stopping small chains from doing so. If many takeaway stores did this, then it would thwart the intention of the ban.

The impact of this is likely to be small to insignificant for the same reasons discussed in Sections 4.2 and 4.3 – the costs of using compostable or biodegradable packaging is minimal compared to the overall price of the product.

5. OPTIONS TO ADDRESS THE PROBLEM

Two scenarios have been considered in regard to Single-use plastics. A description of each of these options is provided in Table 9.

Table 9. Single-use takeaway plastic scenarios

1. Voluntary scheme	• An accreditation system that acknowledges and rewards retailers that adopt non-plastic takeaway packaging. • Use composting certifications as the benchmark (i.e. AS4736, AS5810, ASTM D6400, EN13432). • The City acts as the accreditation body. • City Officers act as accreditation officers, however any checks would be requested by the Food Retailer to receive "accreditation". • Focusing upon education, incentives and encouragement.
2. Mandatory ban	• A ban on plastic takeaway packaging from food retailers implemented by the City. • Use composting certifications as the benchmark (i.e. AS4736, AS5810, ASTM D6400, EN13432). • City Officers act as compliance officers. • Combined with education and encouragement.

A Cost Benefit Analysis (CBA) has been undertaken for each of these scenarios and covered in Section 6.

Compostable products

6. POLICY IMPACT ANALYSIS

To measure the impact of single-use plastic policies, two analyses were completed; a Cost Benefit Analysis (CBA) and a Benefit Transfer.

6.1 COST BENEFIT ANALYSIS

To assess the economic impact of Single-use Plastics policy, a Cost Benefit Analysis was employed. Using a timeframe of 2019 to 2025, the two scenarios discussed in Section 5 were modelled. The scenarios included: a Voluntary Scheme and a Mandatory Single-use Plastics Ban. The 2025 end date was applied to align with the APCO 2025 goals. Due to the APCO goals, it is assumed that all Australian food retailers will be using reusable, recyclable or compostable takeaway packaging by 2025.

However, as the City of Hobart is emphasising the removal of all plastic takeaway packaging, a 'compliant' food retailer would be prohibited from using recyclable plastic takeaway packaging. This sets a stricter standard than the APCO targets. It should therefore be clearly stated, that for the purposes of this Cost Benefit Analysis, a food retailer is only described as fully 'compliant', when it has transitioned to reusable, compostable or non-plastic recyclable takeaway packaging. If a food retailer has met APCO's target of using reusable, recyclable or compostable packaging, it will not be considered fully 'compliant' in City of Hobart as they may still be using recyclable plastics.

As both the Voluntary Scheme and the Mandatory Ban focus on removing single-use plastic takeaway packaging, there is the assumption that all single-use plastic will be removed from takeaway packaging before 2025, thus resulting in 100% compliant packaging. It is also expected for this packaging transition to have differing 'rates of change'. The assumed 'rates of change' can be seen in Figure 8.

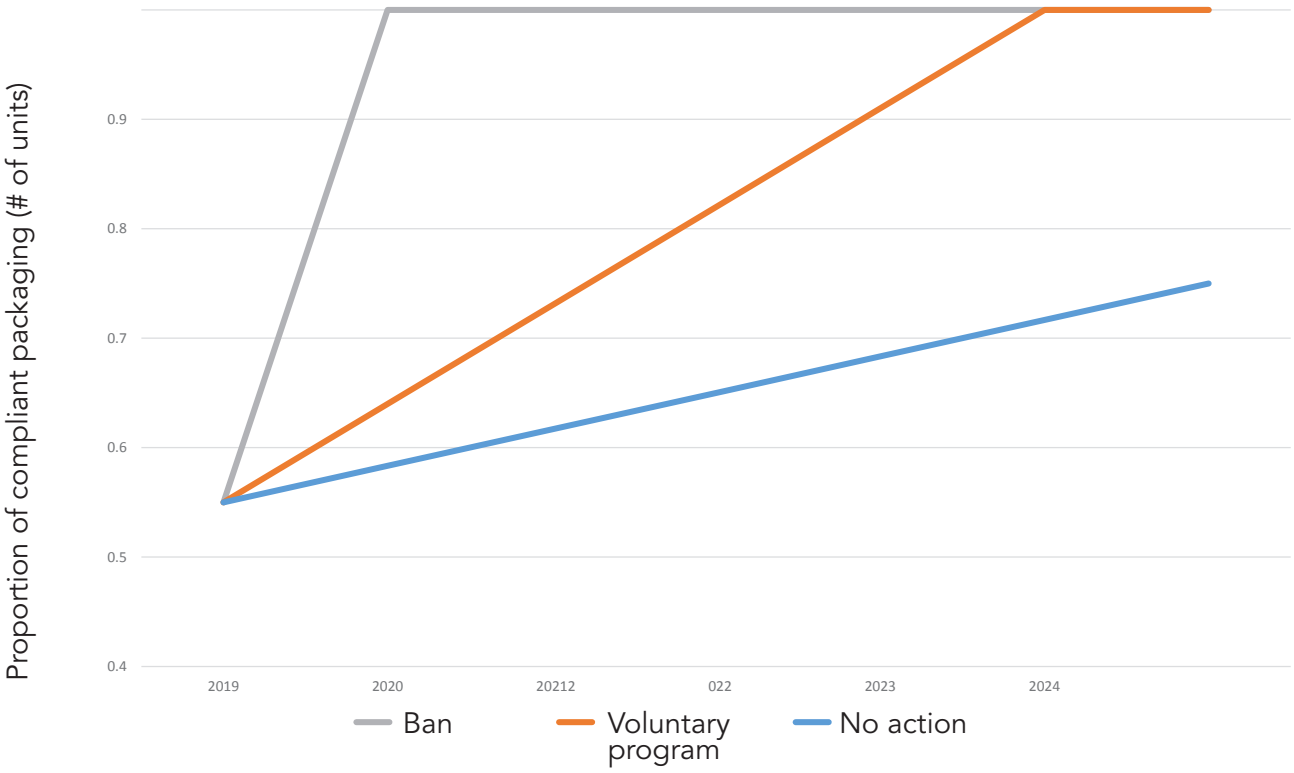

Figure 8. Assumed rate of packaging change for each scenario

A summary of the Cost Benefit Analysis results can be seen in Table 12 and 13. It is evident that costs generally outweigh benefits over all scenarios. A Mandatory Ban on Single-use Plastics resulted in the greatest NPV deficit, followed by the Voluntary Scheme. When focusing upon the avoidance of Single-use plastics, again the Mandatory Ban By-law had the greatest impact, with lesser effects seen in the Voluntary Scheme.

Table 10. CBA results

	Option 1: Voluntary program	Option 2: By-law
Costs (PV)*	$1,645,606	$3,248,568
Benefits (PV)*	$266,028	$538,250
NPV*	-$1,379,577	-$2,710,318
BCR*	0.162	0.166
Units of LF plastic avoided	81,759,921	148,650,145
Tonnes of LF plastic avoided	334	607

*Discount rate of 7% used, based upon recommendations by DPMC Guidance Note [16]

Table 11. Incremental annual costs and benefits over the analysis period (7% discount rate)

	Option 1: Voluntary program		Option 2: By-law	
	Costs	Benefits	Costs	Benefits
2019	0	0	$6120	0
2020	$118,076	$16,817	$789,448	$116,487
2021	$199,935	$31,434	$675,629	$104,422
2022	$270,578	$44,065	$562,424	$93,438
2023	$331,123	$54,911	$475,140	$83,444
2024	$390,365	$64,148	$396,871	$74,357
2025	$335,529	$54,653	$342,936	$66,102
Total	**$1,645,606**	**$266,028**	**$3,248,568**	**$538,250**

Additional insights are possible when costs and benefits are disaggregated. For instance, it is apparent from Table 12 that the greatest cost increases are due to a rise in packaging costs and organic collection costs, both borne by food retailers. The City is also impacted, due to lower landfill revenue and increased costs for education, administration and compliance. The Hobart recycling facility may also see some revenue loss due to decreased quantities of recyclable plastic packaging in use under the by-law.

Table 12. A summary of costs (7% discount rate)

	Description of cost	Data source	Option 1: Voluntary program	Option 2: By-law
Education costs	Annual hours for by-law education of business & residents* Waste Education Officer hourly wage	• Estimated annual hours dedicated to education	$29,166	$34,238
By-law compliance costs	Annual hours for by-law compliance * Environmental Health Officer hourly wage	• Estimated annual hours dedicated to by-law compliance	0	$34,238
Administration costs	Annual hours for administration * Council officer hourly wage	• Estimated annual hours dedicated to voluntary program admin	$47,665	0
Reduced Landfill revenue	Tonnage of landfill avoided * gate fee	• Tonnage of landfill avoided estimated from food retailer survey	$21,564	$59,693
Takeaway packaging costs	Average weekly change in packaging cost * # of Hobart food retailers*52 weeks/annum	• Change in packaging cost sourced from food retailer survey. • # of Hobart food retailers sourced from Council data set	$1,427,956	$2,840,925
Retailer organics collection	# of food retailers adopting organics collection * pick-up fee	• Estimated number of Hobart food retailers adopting organics collection • Cost of organics collection based upon council FOGO service	$119,255	$241,812
Non-compliance cost	# of infringements * fine per infringement	• Estimated number of infringements	0	$4,673
Loss of recyclables	Recyclables tonnage * market price	• Recyclables tonnage sourced from food retailer survey.	0	$32,989
Total			**$1,645,606**	**$3,248,568**

With regard to benefits, the greatest impact was seen in forms of litter collection; including formal collections, marina clean ups and shipping de-fouling (Table 13). Significant benefits were also seen in marine tourism, due to a decrease in plastic marine litter. The impact on marine tourism was based upon studies showing a relationship between environmental cleanliness and tourism levels. Empirical evidence was also used to support the claim that decreased levels of plastic litter would benefit fisheries and aquaculture. Smaller financial benefits were observed for the City landfill and compost facilities. It was found that landfill operational costs decrease if there are reduced inputs and compost revenues increase due to increased organic inputs.

Table 13. A summary of benefits (7% discount rate)

	Description of benefit	Data source	Option 1: Voluntary program	Option 2: By-law
Reduction in landfill GHG emissions	Reduction in landfill tonnage * GHG emission costs/tonne	• The full cost of landfill disposal in Australia report[19]. • Tonnage of landfill avoided estimated from food retailer survey	$5,675	$15,477
Reduction in landfill operation costs	Reduction in landfill tonnage * OPEX/tonne	• The full cost of landfill disposal in Australia report. • Tonnage of landfill avoided estimated from food retailer survey	$9,080	$24,763
Compost facility revenue	Increased tonnage of compostables * compost facility gate fees	• Increased tonnage of compostables estimated from food retailer survey • Composting fees	$11,350	$30,953

[19] BDA Group, 2009, The full cost of landfill disposal in Australia. DEWHA.

Aquaculture (salmon)	% impact of marine plastics on aquaculture revenue * salmon aquaculture revenue	• Economic Impacts of Marine Litter report[20] • Australian fisheries and aquaculture statistics 2017 - Production.[21]	$13,115	$25,531
Fisheries (abalone)	% impact of marine plastics on fishery revenue * abalone fishery revenue	• Economic Impacts of Marine Litter report. • Tasmanian Abalone Fishery - 2010.[22] • Abalone Council Annual Report 2017/2018.[23]	$34,399	$66,965
Marine tourism	% impact of plastic pollution of marine tourism revenue * marine tourism revenue	• Guidelines on the use of market-based instruments to address the problem of marine litter.[24]	$44,386	$86,406
Formal litter collection	Volunteer hours * average Tasmanian hourly wage*Fractional decrease in litter after by-law	• Based on CUAD and City Bushcare figures	$70,347	$136,944
Marina Clean-up	Cost of marina litter collection	• Impacts of Marine Debirs and oil: Economic and social costs to coastal communities.[25]	$46,236	$90,007
Shipping de-fouling	Cost of de-fouling shipping due to plastic pollution	• Impacts of Marine Debirs and oil: Economic and social costs to coastal communities.	$31,440	$61,204
Total			**$266,028**	**$538,250**

[20] Mouat, J., Lopez Lozano, R. & Bateson, H. 2010. Economic impacts of marine litter. KIMO.

[21] ABARES. 2017. Australian fisheries and aquaculture statistics 2017 – Production. Department of Agriculture.

[22] Tarbath, D & Gardner, C. 2011. Tasmanian Abalone Fishery – 2010. IMAS.

[23] TAC. 2018. Annual report 2017/2018. Tasmanian Abalone council.

[24] Ten Brink, P., Lutchman, I., Bassi, S., Speck, S., Sheavly, S., Register, K. & Woolaway, C. 2009. Guidelines on the use of market-based instruments to address the problem of marine litter. IEEP.

[25] Hall, K. 2000. Impacts of marine debris and oil: economic and social costs to coastal communities. KIMO.

It should be emphasised that the benefit pricing was carried out conservatively, with some benefits potentially under-priced and other possible benefits being given a zero value (Appendix G). For example, a price was assigned to the economic benefit of reduced plastic marine litter on Hobart's commercial fisheries and marine tourism. However, only Salmon aquaculture and Abalone fisheries were considered, due to their close proximity to the Derwent Estuary system. Nevertheless, it is highly likely that other fisheries would be impacted by a reduction in plastic marine litter.

It should also be noted that only three marine-focused tourist companies were considered when pricing the impact of marine plastics on tourism. Again, these were companies that operated in or around to the Derwent Estuary region. It is possible that land-based tourism or a more diverse range of marine tourism could be effected by reduced plastic litter in land and marine environments.

Furthermore, while potential savings were assigned to formal litter collections, such as Clean Up Australia Day (CUAD) or Hobart Bush Care, it was not possible to estimate the savings from reduced informal litter collection. It is expected that if informal litter collection was also tallied, significantly higher savings would be seen.

As a final point, the impact of reduced plastic litter on marine biodiversity went completely unpriced. An attempt to estimate some of this value will be carried out in the next section using a Benefit Transfer.

Photo: Alastair Bett, Hobart waterfront

[26] M. Barbera, 2010, Benefit Transfer Approaches
[27] ibid
[28] Ressurreicao, A. 2011, Economic valuation of species loss in the open sea
[29] IMAS, 2018, Economic and social assessment of Tasmanian fisheries 2017/18

6.2 BENEFIT TRANSFER - TO ASSESS VALUE OF HOBART'S MARINE DIVERSITY

A Benefit Transfer is a commonly used technique to assess the value of intangible (or difficult to measure) variables using results from existing research, when significant research resources are not available. A Benefit Transfer has been used in this RIS to estimate the value of Hobart's marine biodiversity or natural capital.

Four steps were followed to complete the Benefit Transfer; (a) a study was identified for the transfer, (b) a decision was made regarding whether the values were transferable, (c) the quality of study was evaluated, and (d) values were adjusted to better reflect the values for the site under consideration. The chosen study measured the economic value of marine biodiversity in a Portuguese autonomous region. An assessment was made about the comparability of locations, similarity of the service being valued and the quality of the study. The assessment can be found in Appendix H.

To determine the value of Hobart marine biodiversity, the Willingness to Pay to conserve 10% of marine biodiversity was taken from the chosen study. In addition, an estimate was made of the proportion of Hobart's adult population engaged with marine biodiversity. The proportion of the population participating in fishing sports was used as a surrogate for engagement with marine biodiversity. These figures were multiplied to estimate the total amount that would make a one-off payment by City of Hobart population to conserve 10% of marine biodiversity in this region (Equation 3). The result of this calculation was $4,522,250, and can be seen in Table 12.

$$\text{Value of Hobart marine biodiversity} = \text{WTP} \times \text{engaged population}$$

Table 14. Benefit Transfer summary table

	Benefit Transfer metrics
Willingness to pay (WTP) (per person)	$654[30]
Engaged population (City of Hobart)	7260[31] [32]
Value of Hobart marine biodiversity	$4,522,250

It was assumed that a 4% reduction in marine litter would preserve 10% of marine biodiversity in this region. The 10% figure was taken from the Benefit Transfer study.

[30] Ressurreicao, A. 2011

[31] IMAS, 2018

[32] ABS, http://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA62810

7. PROPOSED PUBLIC CONSULTATION PROCESS

The City of Hobart has resolved to make the proposed by-law, and this revised RIS completes the further information required to be submitted to the Director of Local Government. If satisfied the RIS meets the statutory requirements, a public consultation process will be undertaken.

The City of Hobart's research and consultation with businesses and the community to date shows a favourable response to banning single-use plastic packaging in takeaway food businesses.

A community survey conducted from February to March 2018 returned a significant response strongly in favour of reducing the use of single-use plastic. Of the 2,962 responses, 96% disagreed wen asked "do you think it is appropriate to use single-use plastics?" An overwhelming 90% said they were willing to pay more for food and drinks if it meant that sustainable packaging was used. Survey responses indicated a sensitivity to how much more consumers would be willing to pay, with around two-thirds willing to pay up to 5% extra.

While a state government ban was perceived more favourably, 75% of surveyed participants felt that a local government ban would be an effective or highly effective way of getting more takeaway food businesses to use less single-use packaging. A ban was perceived to be significantly more effective than the use of support and education.

In a separate poll, 96% of the 638 survey responses supported a ban on single-use plastic takeaway items.

Over half of the City's approximately 1000 food and beverage businesses already supply some form of compostable packaging, demonstrating there is minimal competitive disadvantage to retailers supplying this type of packaging. In surveys to date, businesses have indicated a favourable response to banning single-use plastic packaging, with a strong understanding of the reasons behind it.

Copies of the proposed by-law and RIS will be made available to the public, and feedback invited from businesses and the community via the City's facebook page, website and on-line forum at **yoursay.hobartcity.com.au**.

Targeted consultation will also be held with business groups. Where appropriate, focus groups will be established in order to test out certain packaging requirements and share solutions with others.

Affected businesses will receive an information pack or 'toolkit' explaining how to achieve compliance. The kit will include a list of replacement products and suppliers. Businesses will be offered support during the transition to compliance, including one-on-one education with business owners.

The City will continue to consult with all stakeholders to clarify the scope of the by-law and minimise any disadvantage that arises due to new single-use plastics policy (e.g. disability access).

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APPENDIX

Appendix A: Survey structure

	# of businesses	Survey participation	Participation rate (%)
Café & Restaurants	392	89	22.70%
Food stalls	300	42	14%
Takeaway	144	23	15.97%
Retail	88	14	15.91%
Food vehicles	55	11	20%
Canteen	30	7	23.33%
Bar & Breweries	29	3	10.34%
Bakeries	25	4	16%
Vessels	12	3	25%
Butchers	8	1	12.5%
Total	**1083**	**204**	18.84%

*Home kitchens and Food Manufacturers excluded due to no reported takeaway packaging use

Please select the takeaway packaging and material type used by your business.

Business name: _____ Type of business you operate: _____

Takeaway packaging	Material type/s (Please tick a box and/ or write down other options)	Packaging Brand (e.g. Biopak, Vegware)	Individual units used/ week (e.g. 500)	If change required due to bylaw….. preferred future option/s (Please tick a box and/or write down other options)
Food containers (all sizes, inclusive of boxes & bowls)	☐ Plastic ☐ Bagasse ☐ Paper/cardboard ☐ Other ……			☐ Avoid takeaway food containers ☐ Adopt reusable takeaway food containers ☐ Adopt compostable* takeaway food containers ☐ Other ……
Hot chip containers (all sizes)	☐ Plastic ☐ Paper/ cardboardPaper/ cardboard ☐ Compostable bioplastic* ☐ Other ……			☐ Avoid takeaway hot chip containers ☐ Adopt reusable takeaway food containers ☐ Adopt takeaway compostable* hot chip containers ☐ Other ……
Noodle boxes	☐ Cardboard/plastic ☐ Paper/cardboard ☐ Plastic ☐ Compostable bioplastic* ☐ Other ……			☐ Avoid takeaway noodle boxes ☐ Adopt reusable takeaway food containers ☐ Adopt compostable* takeaway noodle boxes ☐ Other ……
Sandwich wedges	☐ Plastic ☐ Cardboard/plastic ☐ Cardboard/ compostable bioplastic ☐ Compostable bioplastic* ☐ Other ……			☐ Avoid takeaway sandwich wedges ☐ Adopt compostable* takeaway sandwich wedges ☐ Other ……

Cutlery (knives, forks & spoons)	☐ Plastic ☐ Wood ☐ Compostable bioplastic* ☐ Other			☐ Avoid takeaway cutlery ☐ Adopt compostable* takeaway cutlery ☐ Other .....
Sauce Sachets	☐ Plastic/Aluminium ☐ Plastic ☐ Other			☐ Avoid takeaway sachets ☐ Adopt reusable sauce containers ☐ Adopt compostable* sachets ☐ Other .....
Drink stirrers	☐ Plastic ☐ Compostable bioplastic* ☐ Wood ☐ Other			☐ Avoid takeaway stirrers ☐ Adopt reusable takeaway stirrers ☐ Adopt compostable* takeaway stirrers ☐ Other .....
Straws	☐ Plastic ☐ Paper ☐ Bamboo ☐ Other			☐ Avoid takeaway straws ☐ Adopt reusable straws ☐ Adopt compostable* takeaway straws ☐ Other .....
Coffee cups (all sizes)	☐ Cardboard/plastic ☐ Cardboard/ compostable bioplastic* ☐ Other			☐ Avoid takeaway coffee cups ☐ Adopt reusable coffee cups (e.g. mug library) ☐ Adopt compostable* takeaway coffee cups ☐ Other .....
Coffee cup lids (all sizes)	☐ Plastic ☐ Compostable bioplastic* ☐ Bagasse ☐ Other			☐ Avoid takeaway coffee cups lids ☐ Adopt compostable* coffee cups lids ☐ Other .....

OTHER: For other takeaway items with plastic content less than 1l in volume, please enter:

Takeaway packaging	Material type/s (Please tick a box and/ or write down other options)	Packaging Brand (e.g. Biopak, Vegware)	Individual units used/ week (e.g. 500)	If change required due to bylaw….. preferred future option/s (Please tick a box and/or write down other options)
	☐ Plastic ☐ Compostable bioplastic* ☐ Cardboard/ plastic ☐ Other ……………………………………….			☐ Avoid ☐ Reusables ☐ Compostables* ☐ Other …………………………………………………………
	☐ Plastic ☐ Compostable bioplastic* ☐ Cardboard/ plastic ☐ Other ……………………………………….			☐ Avoid ☐ Reusables ☐ Compostables* ☐ Other …………………………………………………………
	☐ Plastic ☐ Compostable bioplastic* ☐ Cardboard/ plastic ☐ Other ……………………………………….			☐ Avoid ☐ Reusables ☐ Compostables* ☐ Other …………………………………………………………
	☐ Plastic ☐ Compostable bioplastic* ☐ Cardboard/ plastic ☐ Other ……………………………………….			☐ Avoid ☐ Reusables ☐ Compostables* ☐ Other …………………………………………………………
	☐ Plastic ☐ Compostable bioplastic* ☐ Cardboard/ plastic ☐ Other ……………………………………….			☐ Avoid ☐ Reusables ☐ Compostables* ☐ Other …………………………………………………………

Appendix B: Assumed weight per product type

Packaging type	Kg/unit
Hot chip container	0.014
Noodle box	0.0185
Sandwich wedge	0.012
Food container	0.011
Cutlery	0.0025
Sauce sachet	0.02
Drink stirrer	0.0003
Straw	0.0005
Coffee cup	0.015
Coffee cup lid	0.003
Cold drink cup	0.012
Cold drink cup lid	0.003

Appendix C: Average number of Takeaway packaging products and material types per week

Type	Paper/ cardboard	Plastic	Compostable bioplastic	Cardboard/ plastic	Cardboard/ bioplastic	Aluminium/ cardboard	Wood	Aluminium/ plastic	Unknown
Hot chip containers	95.3	1.6	25.5	0.0	0.0	0.0	0.0	0.0	0.0
Noodle boxes	2.2	0.4	2.1	2.0	0.0	0.0	0.0	0.0	0.0
Sandwich wedges	0.0	3.6	0.5	0.4	1.6	0.0	0.0	0.0	0.0
Food containers	220.3	22.3	3.2	2.5	2.6	0.1	0.8	0.0	1.5
Cutlery	0.0	29.1	40.5	0.0	0.0	0.0	29.5	0.0	0.3
Sauce sachets	0.7	26.8	0.5	0.0	0.0	0.0	0.0	12.3	2.6
Drink stirrers	0.0	101.5	1.2	0.0	0.0	0.0	19.0	0.0	0.0
Straws	31.9	144.9	1.8	0.0	0.0	0.0	0.0	0.0	1.6
Coffee cups	0.0	0.0	0.0	49.2	120.0	0.0	0.0	0.0	11.7
Coffee cup lids	0.0	68.9	81.3	0.0	0.0	0.0	0.0	0.0	2.5
Cold drink cups	5.0	20.3	62.4	50.0	0.0	0.0	0.0	0.0	0.5
Cold drink cup lids	0.0	65.6	10.3	0.0	0.0	0.0	0.0	0.0	0.0

Appendix D: Litter figures derived from survey

	retail average (units/week)	total Hobart usage (units/annum)	Hobart Retail Annual Mass (Tonnes/annum)	Litter (units/annum)	Litter (tonnes/ annum)
Compost	748.85	42,172,284	407.36	11,386,517	109.99
Recycling	30.89	1,739,739	19.62	469,729	5.30
Landfill	593.88	33,445,112	136.47	9,030,180	36.85
Total	1373.63	77,357,134.53	563.45	20,886,426	152.13

Appendix E: Packaging types vs material types

It is assumed that food retailers will consider price, suitability for purpose and by-law compliance when choosing takeaway packaging.

✕ Packaging does not exist

✓ Packaging exists

	Hot chip containers	Noodle boxes	Sandwich wedges	Hot Food Containers	Hot Food container lid	Cutlery	Sauce Sachets	Drink stirrers	Straws	Coffee cups	Coffee cup lids	Cold drink cups	Cold drink cup lids
Paper/ cardboard	✓	✕	✕	✓	✓	✕	✕	✕	✓	✕	✕	✓	✕
Cardboard/ bioplastic	✓	✓	✓	✓	✕	✕	✕	✕	✕	✓	✕	✓	✕
Compostable /bioplastic	✕	✕	✓	✕	✕	✓	✓	✓	✓	✕	✓	✓	✓
Bagasse	✕	✓	✕	✓	✓	✕	✓	✕	✕	✕	✓	✕	✕
Wood	✕	✕	✕	✕	✕	✓	✕	✓	✓	✕	✕	✕	✕
Aluminium	✕	✓	✕	✓	✕	✕	✕	✕	✕	✕	✕	✕	✕

Appendix F: Change in packaging costs

	Cost difference	Weeks	# of Retailers	Average # of units to convert	Cost impact
Hot chip	0	52	1083	2	$0.00
Noodle box	-0.08	52	1083	2	-$10,594.10
Sandwich wedges	0.16	52	1083	4	$35,997.63
Food containers	0.134	52	1083	26	$198,910.96
Cutlery	0.03	52	1083	29	$49,595.92
Sauce sachets	0.05	52	1083	42	$117,469.4
Drink stirrers	0.0021	52	1083	101	$12,002.00
Straws	0.006	52	1083	147	$49,505.32
Coffee cups	0.022	52	1083	61	$75,426.65
Coffee cup lids	0.027	52	1083	71	$108,552.09
Cold drink cups	0.026	52	1083	71	$103,546.17
Cold drink lids	0.016	52	1083	66	$59,151.41
					$799,563.45

Appendix G: Cost Benefit Analysis

1. No action			0	1	2	3	4	5	6	
	Costs									
		Single-use plastics education costs (hours for by-law education * Waste Education Officer hourly wage)	0	0	0	0	0	0	0	
		Reduced landfill revenue due to reduction in takeaway packaging landfilling (tonnage reduced * gate fee)	0	311.27	622.55	933.82	1245.09	1556.36	1867.64	
		Takeaway packaging cost (Avg weekly change in packaging cost * # of Hobart food retailers)	0	59226.92	123384.62	187542.32	251700.02	315857.72	355361.53	
		Retailer Organics collection cost (Assumption)	0	5833.33	11666.66	17499.99	23333.32	29166.65	35000.00	
	Total costs		0	65371.53	135673.83	205976.13	276278.44	346580.74	392229.17	1422109.843
	Present value of costs	3% Discount rate	0	63467.50	127885.60	188497.34	245469.81	298963.59	328485.76	1252769.603
		7% Discount rate	0	61094.89	118502.78	168137.88	210771.50	247107.28	261358.86	1066973.179
		10% Discount rate	0	59428.66	112127.13	154752.92	188701.89	215199.37	221403.14	951613.1175
	Benefits									
		Reduction in landfill GHG emissions due to reduced takeaway packaging in landfill (tonnage reduced * GHG emission costs/tonne)	0	81.91	163.83	245.74	327.66	409.57	491.48	
		Reduction in landfilling operation costs due to reduced takeaway packaging in landfill (tonnage reduced * Opex/tonnes)	0	131.06	262.12	393.19	524.25	655.31	786.37	
		Compost facility input revenue (tonnage increase * gate fees)	0	163.83	327.66	491.48	655.31	819.14	982.97	
		Aquaculture (Salmon)	0	525.29	1050.59	1575.88	2101.17	2626.47	3151.76	
		Fisheries (Abalone)	0	1377.78	2755.56	4133.33	5511.11	6888.89	8266.67	
		Marine tourism	0	1777.78	3555.56	5333.33	7111.11	8888.89	10666.67	
		Formal Litter collection	0	2817.59	5635.19	8452.78	11270.37	14087.96	16905.56	
		Marinas clean-up	0	1851.85	3703.70	5555.56	7407.41	9259.26	11111.11	
		Shipping de-fouling	0	1259.26	2518.52	3777.78	5037.04	6296.30	7555.56	
	Total benefits		0	9986.36	19972.71	29959.07	39945.43	49931.78	59918.14	209713.4937
	Present value of benefits	3% Discount rate	0	9695.49	18826.20	27416.79	35490.99	43071.60	50180.50	184681.5742
		7% Discount rate	0	9333.04	17444.94	24455.53	30474.18	35600.67	39925.99	157234.3458
		10% Discount rate	0	9078.51	16506.37	22508.69	27283.26	31003.71	33822.23	140202.7767
	Net Present Value	3% Discount rate	0	-53772.01	-109059.40	-161080.55	-209978.82	-255892.00	-278305.26	-1068088.029
		7% Discount rate	0	-51761.84	-101057.84	-143682.36	-180297.32	-211506.61	-221432.87	-909738.8334
		10% Discount rate	0	-50350.16	-95620.76	-132244.23	-161418.63	-184195.66	-187580.91	-811410.3407

2. Voluntary			0	1	2	3	4	5	6	
	Costs									
		Voluntary program education costs (hours for by-law education * Waste Education Officer hourly wage)	0	6119.00	6119.00	6119.00	6119.00	6119.00	6119.00	
		Voluntary program administration cost (administration hours * admin hourly wage)	0	10000.00	10000.00	10000.00	10000.00	10000.00	10000.00	
		Reduced landfill revenue due to reduction in takeaway packaging landfilling (tonnage reduced * gate fee)	0	1680.87	3361.75	5042.62	6723.50	8404.37	10085.24	
		Takeaway packaging cost (Avg weekly change in packaging cost * # of Hobart food retailers)	0	159912.69	317098.69	474284.69	631470.69	799563.45	799563.45	
		Retailer Organics collection cost (Assumption)	0	14000.00	28000.00	42000.00	56000.00	70000.00	70000.00	
	Total costs		0	191712.56	364579.44	537446.31	710313.19	894086.82	895767.69	3593906.01
	Present value of costs	3% Discount rate	0	186128.70	343651.09	491839.51	631104.07	771247.14	750191.34	3174161.848
		7% Discount rate	0	179170.62	318437.80	438716.28	541894.53	637471.55	596887.84	2712578.614
		10% Discount rate	0	174284.15	301305.32	403791.37	485153.46	555157.57	505637.51	2425329.382
	Benefits									
		Reduction in landfill GHG emissions due to reduced takeaway packaging in landfill (tonnage reduced * GHG emission costs/tonne)	0	442.34	884.67	1327.01	1769.34	2211.68	2654.01	
		Reduction in landfilling operation costs due to reduced takeaway packaging in landfill (tonnage reduced * Opex/tonnes)	0	707.74	1415.47	2123.21	2830.95	3538.68	4246.42	
		Compost facility input revenue (tonnage increase * gate fees)		884.67	1769.34	2654.01	3538.68	4423.35	5308.02	
		Aquaculture (Salmon)	0	1418.29	2836.58	4254.88	5673.17	7091.46	7091.46	
		Fisheries (Abalone)	0	3720.00	7440.00	11160.00	14880.00	18600.00	18600.00	
		Marine tourism	0	4800.00	9600.00	14400.00	19200.00	24000.00	24000.00	
		Formal Litter collection	0	7607.50	15215.00	22822.50	30430.00	38037.50	38037.50	
		Marinas clean-up	0	5000.00	10000.00	15000.00	20000.00	25000.00	25000.00	
		Shipping de-fouling	0	3400.00	6800.00	10200.00	13600.00	17000.00	17000.00	
	Total benefits		0	27980.53	55961.07	83941.60	111922.14	139902.67	141937.41	561645.4315
	Present value of benefits	3% Discount rate	0	27165.57	52748.67	76818.46	99441.37	120681.27	118870.35	495725.6944
		7% Discount rate	0	26150.03	48878.56	68521.35	85384.86	99748.67	94578.89	423262.3771
		10% Discount rate	0	25436.85	46248.82	63066.57	76444.33	86868.55	80119.97	378185.0846
	Net Present Value	3% Discount rate	0	-158963.14	-290902.41	-415021.05	-531662.70	-650565.87	-631320.99	-2678436.154
		7% Discount rate	0	-153020.59	-269559.24	-370194.93	-456509.66	-537722.87	-502308.94	-2289316.237
		10% Discount rate	0	-148847.30	-255056.50	-340724.80	-408709.14	-468289.02	-425517.54	-2047144.297

3. By-law			0	1	2	3	4	5	6	
	Costs									
		By-law education costs (hours for by-law education * Waste Education Officer hourly wage)	3060	12237	12237	3060	3060	3060	3060	
		By-law compliance costs (hours for by-law compliance * Environmental Health Officer hourly wage)	3060	12237	12237	3060	3060	3060	3060	
		Reduced landfill revenue due to reduction in takeaway packaging landfilling (tonnage reduced * gate fee)	0	4122	8243	12365	16486	20608	24279.28853	
		Loss of recyclables (recyclables tonnage * market price)	0	6921	6921	6921	6921	6921	6921	
		Takeaway packaging cost (Avg weekly change in packaging cost * # of Hobart food retailers)	0	799563.45	799563.45	799563.45	799563.45	799563.45	799563.45	
		Non-compliance cost (Assumption)	0	5000	0	0	0	0	0	
		Retailer Organics collection cost (Assumption)	0	70000	70000	70000	70000	70000	70000	
	Total costs		6120	910080.45	909201.45	894969.45	899090.45	903212.45	906883.7385	5429557.989
	Present value of costs	3% Discount rate	6120	883573.2524	857009.5673	819023.8275	798830.2197	779118.9935	759500.8537	4903176.714
		7% Discount rate	6120	850542.4766	794131.7582	730561.6619	685911.7995	643977.994	604294.9271	4315540.617
		10% Discount rate	6120	827345.8636	751406.157	672403.7941	614090.8749	560823.8695	511912.228	3944102.787
	Benefits									
		Reduction in landfill GHG emissions due to reduced takeaway packaging in landfill (tonnage reduced * GHG emission costs/tonne)	0	1064.881076	2129.762152	3194.643228	4259.524304	5324.40538	6389.286456	
		Reduction in landfilling operation costs due to reduced takeaway packaging in landfill (tonnage reduced * Opex/tonnes)	0	1703.809722	3407.619443	5111.429165	6815.238887	8519.048608	10222.85833	
		Compost facility input revenue (tonnage increase * gate fees)	0	2129.762152	4259.524304	6389.286456	8519.048608	10648.81076	12778.57291	
		Aquaculture (Salmon)	0	7091.4624	7091.4624	7091.4624	7091.4624	7091.4624	7091.4624	
		Fisheries (Abalone)	0	18600	18600	18600	18600	18600	18600	
		Marine tourism	0	24000	24000	24000	24000	24000	24000	
		Formal Litter collection	0	38037.5	38037.5	38037.5	38037.5	38037.5	38037.5	
		Marinas clean-up	0	25000	25000	25000	25000	25000	25000	
		Shipping de-fouling	0	17000	17000	17000	17000	17000	17000	
	Total benefits		0	134627.4153	139525.8683	144424.3212	149322.7742	154221.2271	159119.6801	881241.2863
	Present value of benefits	3% Discount rate	0	130706.2285	131516.5127	132168.713	132671.3508	133032.5853	133260.227	793355.6173
		7% Discount rate	0	125820.0143	121867.297	117893.2668	113917.6295	109957.6035	106028.1615	695483.9726
		10% Discount rate	0	122388.5594	115310.635	108508.1302	101989.464	95759.24841	89818.91117	633774.9481
	Net Present Value	3% Discount rate	-6120	-752867.0239	-725493.0547	-686855.1145	-666158.8689	-646086.4083	-626240.6267	-4109821.097
		7% Discount rate	-6120	-724722.4623	-672264.4613	-612668.3951	-571994.17	-534020.3904	-498266.7656	-3620056.645
		10% Discount rate	-6120	-704957.3042	-636095.5221	-563895.664	-512101.411	-465064.6211	-422093.3168	-3310327.839

Appendix H: Benefit Transfer

	Azores	City of Hobart	Greater Hobart	Tasmania
Population	245,746	50,439	206,097	2
Culture	Portuguese autonomous region	Australian state		
	Major industries include agriculture, fishing and tourism		Major industries include agriculture, aquaculture, fishing, and tourism	
Fishing licenses in Tasmania				98000
Tasmania population				515000
Proportion of population engaged with marine biodiversity			0.190291262	
City of Hobart population (20-74)		36,300		
Average income	33,900	29,796		
Willingness to pay (to save 10% of marine species	$654.68			
Amount paid by CoH to conserve 10% of Derwent Estuary biodiversity		$4,522,249.77		
Assumption	That reducing marine plastic litter by 4% is synonymous with conserving 10% of Derwent Estuary biodiversity			

Appendix I: Packaging cost as a proportion of meal price

Council	Vendor type	Takeaway Meal	Price	Average Price increase	% of meal price
Hobart	Café	Smashed avo & small coffee	$23.20	$0.08	0.33%
Hobart	Café	Granola & small coffee	$20.20	$0.15	0.74%
Hobart	Café	Burger & cold drink	$37.00	$0.19	0.50%
Hobart	Café	BLAT & small coffee	$28.00	$0.08	0.27%
Hobart	Café	Granola & small coffee	$16.50	$0.13	0.81%
Hobart	Café	Smashed avo & small coffee	$20.00	$0.08	0.38%
Hobart	Café	Burger & cold drink	$29.00	$0.19	0.64%
Hobart	Restaurant	Curry & Rice	$24.00	$0.28	1.17%
Hobart	Restaurant	Curry & Rice	$22.50	$0.28	1.25%
Hobart	Restaurant	Curry & Rice	$25.00	$0.28	1.12%
Kingborough	Café	Sandwich & coffee	$20.00		
Kingborough	Café	Sandwich & cold drink	$22.00		
Kingborough	Café	Four small coffees	$16.00	$0.08	0.38%
Kingborough	Café	Four cold drinks	$24.00	$0.19	0.84%
Kingborough	Restaurant	Curry & Rice	$21.00	$0.07	0.45%
Kingborough	Café	Sandwich & coffee	$16.00	$0.37	1.53%
Kingborough	Café	Sandwich & coffee	$16.00	$0.28	1.34%
Glenorchy	Restaurant	Curry and Rice	$25.00	$0.08	0.48%
Glenorchy	Takeaway	Burger & chips	$24.00	$0.08	0.48%
Glenorchy	Restaurant	Curry & Rice	$19.00		
Glenorchy	Takeaway	Burger & chips	$15.00		
Glenorchy	Café	Sandwich & coffee	$20.00		

Council	Vendor type	Takeaway Meal	Price	Average Price increase	% of meal price
Glenorchy	Café	Sandwich & cold drink	$22.00	$0.32	1.28%
Glenorchy	Café	Four small coffees	$16.00	$0.18	0.75%
Glenorchy	Café	Four cold drinks	$24.00	$0.32	1.69%
Glenorchy	Restaurant	Curry & Rice	$19.00	$0.18	1.20%
Glenorchy	Takeaway	Burger & chips	$24.00	$0.08	0.38%
Glenorchy	Restaurant	Curry & Rice	$23.80	$0.19	0.84%

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