

Recycled rubbish

A response to the plastic bag phase out
consultation

September 2018



About Tailrisk Economics

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“We need a world of litter pickers, not nitpickers” Albert Pistayck”

Introduction

In August 2018 the Ministry for the Environment (MFE) issued a consultation paper on options to phase out ‘single use’ plastic bags. The closing date for submissions is September 17, which is a short period for an important policy change.

Supermarket check-out plastic bags are not explicitly targeted but the regulations are designed to ensure that only bags with handles, and not a myriad of other plastic bags are captured. In the public’s mind supermarket bags will be the main effect of the policy, and this is the primary focus of this paper.

The discussion paper raises a number of issues, which we have grouped and discussed under the following headings.

- The case for banning or severely restricting the use of ‘double-use’ plastic bags
- The case for double-use bags
- A review of the arguments for a ban
- The ‘circular economy’ approach to decision making
- The Ministry’s evaluation procedure
- Applying a cost benefit test
- The thickness of allowable bags
- Future bans or restrictions
- Better options

Our conclusion is that the standard of the analysis in the consultation paper was poor. For the most part it just recycles assertions, misconceptions, and exaggerations found in numerous official studies in other countries. There was a poor understanding of the contribution plastic bags make to littering and almost no attempt to assess the costs and benefits of the proposals. ‘Unhelpful’ analysis and information is often ignored. Nothing we say in this paper is really new. In 2006 the

Australian Productivity Commission produced a comprehensive report on waste management, which pointed to the inefficiency of many waste reduction policies. The report was not referenced in the consultation paper

On an evidenced based assessment there is no case for banning plastic bags. The Prime Minister has said "We need to be far smarter in the way we manage waste, and this is a good start." It's a bad start.

Key conclusions

Supermarket checkout bags do not materially contribute to littering

Common sense and overseas evidence tells us that supermarket checkout bags are not littered frequently. There is more littering of very small bags, but mostly they will not be caught by a ban. Supermarket bags possibly contribute only around 0.1-0.2 percent of littered rubbish by weight. The Ministry has neglected to conduct a survey on the actual extent of supermarket bag littering.

Supermarket checkout bags are efficient and cheap

Checkout bags cost about 2 cents, weigh between 4 and 7 grams, and are generally reused for other purposes. They are best described as 'double-use' bags. The amount of plastic in supermarket bags has fallen by 75 percent over the past 20 years. Compliant 'emergency' bags weigh around 6 times as much and reusable bags 20 times as much. Research shows that they are typically not reused frequently enough to offset the higher weight, so the use of plastic in shopping bags could actually go up.

Impacts can be perverse

A shopper cannot be given a cheap lightweight plastic bag that is used to transport goods, and serve as a bin liner. But she can buy a much more expensive lightweight drawstring bin liner, which is used only once.

Supermarket bags likely to have a lower overall environmental impact than many alternatives

Alternatives bags have a much higher environmental impact that is unlikely to be offset by the higher number of times they are used.

Reusable bags are a health risk

Research shows that reusable bags harbor dangerous bacteria and are not cleaned frequently. Supermarket double-use bags are safe.

A ban is unlikely to materially reduce marine littering

The reduction in the small amount of plastic entering the marine environment of plastic checkout bags will tend to be offset by increased number of heavier bags littered.

The circular economy approach to environmental and economic management is often irrational

The circular economy approach to the economy is centered in China and has been part of their 5-year plans. China has one of the worst marine pollution records in the world. The circular economy can be an empty slogan, but if taken seriously it can result in very inefficient decision making because it tends to ignore the impact on people and the community when recycling is pursued at all costs.

A ban cannot be imposed by regulation

Under the Waste Minimisation Act the Minister must be satisfied that the benefits of a ban exceed the costs. As there is no analysis of the cost and benefits in the consultation paper, the Minister cannot be satisfied, unless serious work is done to assess the costs and benefits.

Evaluation methodology rigged to generate the right answer

The weights and evaluation criteria were set to bolster the score of the preferred option of a ban. The evaluation methodology has many flaws and is not a substitute for a proper cost benefit analysis.

A ban will have an economic cost of more than \$75 million per year

A cost of \$75 million a year is our assessment from an illustrative costing model.

A minimum charge is a more efficient response than a ban

The minimum charge that would reflect the costs of provision and associated environmental and social costs would be about 3 cents per bag.

Our role as responsible global citizen best served by reducing overseas pollution

A ban, will at best, have only a tiny impact on the amount of plastic entering the marine environment. Assisting Pacific countries to reduce their marine pollution will have a hugely larger impact at a much lower cost. We recommend that foreign aid to Pacific countries be increased by \$10 million a year for that purpose.

Mike Hosking is right¹

¹ Mike Hosking: Banning plastic bags dabbling in faux answers NZ Herald 4 July 2018

² <https://www.telegraph.co.uk/news/4788011/More-than-3000-shopping-trolleys-dumped-in-rivers-every->

The case for phasing out double-use bags

The stated policy objective is to substantially phase out 'single use' plastic bags and the document is primarily concerned with the assessment of the options for achieving this, with a strong preference for an outright ban.

In the Ministry's and the Associate Minister's mind's the case for banning or severely restricting the use of 'single-use' plastic bags is almost self evident.

In the preface the Associate Minister sets out the case, which we repeat below.

Scientists estimate that eight million tonnes of plastic enter the ocean every year, adding to plastics that have been accumulating since the 1950s. If nothing changes, this means there could be more plastic in our oceans (by weight) than fish by the year 2050. There is early evidence of the toxicity of these plastic particles to marine species, and potentially the human food chain.

One of the top five items in coastal litter is single-use plastic bags.

The impact of plastic bags in the sea was graphically illustrated recently by media reports of the discovery of dead whales, as far apart as Spain and Thailand, which had eaten large numbers of plastic bags.

Plastic contamination of the oceans is a complex, global problem which many countries and industries must address. New Zealanders can play their part as responsible global citizens. Our marine Exclusive Economic Zone is 15 times the size of our land mass, making it one of the largest in the world. Not surprisingly, it contains some of the world's most precious marine environments.

Single-use plastic bags also are often lost to landfill instead of being recycled.

They contribute to litter in our communities, natural areas, and waterways.

So there are four reasons, with the first apparently being the most important.

- The world's oceans are at risk and New Zealand as a good international citizen must do more to reduce plastic pollution
- Single use bags are not recycled
- An important contribution to littering
- Adverse impacts on human health

Overlaying these arguments is the 'precautionary' principle. The document states.

We do not yet know the full nature or extent of the impacts of single-use plastic shopping bags specifically, and marine microplastics generally. The Government's proposal takes a

precautionary approach to reduce the risk of them contributing to long-term impacts on the environment and human health, as well as their wider socio-economic and cultural impacts.

While there may be a case for the applying some form of precautionary principle to a limited number public policy decisions, too often it is just used as a cover to rescue proposals based on muddled thinking and the lack of any serious evidence, let alone robust scientific evidence.

As we demonstrate below the plastic bag ban proposal fits squarely into the latter category.

The case for the 'single-use' bags

Resource efficient and inexpensive

In New Zealand 'single use' plastic bags are an efficient and inexpensive means to transport shopping from the supermarket to home, where they are typically reused in a number of ways. Simply put, for most people, supermarket bags are better than the alternatives. Generally It is more efficient for the supermarket to provide just the right amount of bags when the shopper needs them than, rather requiring the shopper to remember to pick up reusable bags before they go shopping, and to guess how many they will need. Shoppers have a choice between single-use bags and using their own multiple use bag. Most prefer the former.

A single use supermarket bag costs about 2 cents. In New Zealand two thirds of bags (Plastics New Zealand - Colmar Brunton survey) are reused for other purposes. The Ministry tried to downplay the reuse factor by saying that a figure of 40 percent is used in overseas life-cycle studies. This is misleading. The 40 percent figures is just an assumption, along with assumptions of 0 and 100 percent intended to show how different reuse assumptions affect the results. A fair description of the supermarket checkout bag is that it is a 'double-use' not a single use bag. This is the term that we use in this paper

The most common use of double-use bags is for bin liners, but there are many other uses, including picking up dog-poo, wrapping shoes for travel, painting, bags for picking up litter in the environment, and litter bags for cars. The list goes on. At less than two cents for both shopping transportation and subsequent use, the double-use plastic bag is very good value.

One of the reasons that plastic bags are so inexpensive is that they are light but very strong. A bag can carry 1000 times its own weight. And this weight has come down markedly down over the years. The Plastics New Zealand report says that bags weigh 6-7 grams, and are 75 percent lighter than they were 20 years ago. Our survey

(Countdown 2018) found that the weight of a self-checkout bag was 4 grams. There are 250,000 bags per tonne.

Reusable bags are much heavier. The 'emergency' bag, designed for shoppers who had forgotten their reusable bag, costs 15 cents and weighs in at 32 grams. The regular reusable bag costs 95 cents and weighs 76 grams. Fancier bags are available costing \$2.50-3.00 and will weigh over 100 grams.

If plastic supermarket bags are banned, then many consumers will eventually purchase single use bin liners (after working through their store of supermarket bags). Some will not use a liner, because of the cost, opting for a less hygienic kitchen, or will incur the hot water, detergent and time costs of regular cleaning.

Three types of bin liners are available. There are bags without handles, which can't be readily closed up. The cheapest is 9 cents per bag (Countdown). Bags with handles cost 12 cents, but these will be captured by a ban, which leaves the consumer with a draw string bag at 24 cents each.

There are non-plastic offerings. New World is selling a small, impractical, Trelisse Cooper eco jute bag for just \$6.99. They are not designed for a family, rather they target the Wellington policy elite who like to signal their environmentally friendly credentials.

Alternatively the shopper could choose a paper bag. The price of these in Moore Wilson's is 25 cents. They are a genuine single use item, but may be selected by some shoppers because they are perceived of as being more 'environmentally friendly', which they are not (see below). Some stores may provide them because they have a more upmarket image.

Have a low health risk

A study of the potential for cross contamination of food products by reusable shopping bags (Gerber et al 2013) found

Large numbers of bacteria were found in almost all bags and coliform bacteria in half. Escherichia coli (E. Coli) were identified in 12% of the bags and a wide range of enteric bacteria, including several opportunistic pathogens. When meat juices were added to bags and stored in the trunks of cars for two hours the number of bacteria increased 10-fold indicating the potential for bacterial growth in the bags. Hand or machine washing was found to reduce the bacteria in bags by >99.9%. These results indicate that reusable bags can play a significant role in the cross contamination of foods if not properly washed on a regular basis.

Subsequently both US and UK health authorities have issued warnings on the need

to regularly wash reusable shopping bags.

By contrast, the Ministry has ignored this risk in the discussion document and instead promoted the use of homemade bags made from recycled cloth, which obviously presents a much higher health risk than reusable plastic bags.

Cross contamination is not a material risk with double-use plastic bags

Have a lower environmental impact

The Ministry sets out the results of two studies on the environmental impact of various types of carry bags. The Danish study addressed a broader range of environmental impacts. The study found that the environmental impact of paper bags was 43 times that of a single-use plastic bags. This result is particularly relevant for the paper bags that might be provided by convenience store and the like, if there is ban on plastic bags. We know that the great bulk of these bags will only be used once.

The multiuse plastic bag has 35 to 52 times the impact of a double-use bag. In New Zealand the relative impacts will be worse than this. The single use bags in the Danish study weighed 24.2 grams compared to 4 to 6 grams for New Zealand supermarket bags. The Danish bags were bigger, with a rated capacity of 12kg versus 6 kg. in New Zealand, but that capacity would not always be used. The multi-use bags in the Danish tests also appeared to be heavier than the New Zealand Countdown bag, so on a like for like basis we estimate that the relative environmental impacts will be at least 50 percent greater than the 35 to 52 figures.

What is the likelihood, that the average reusable bag will be used 70-80 times, when many will be lost, used to pack rubbish and so on, or simply wear out.

Evidence on reuse rates is slim. In Wales shopper purchase behavior suggest that 'bags for life', a thicker compliant version of the single-use bag, are used 5 times on average. A US survey (Edelman 2014) found the average use of these bags was 3.1 and that heavier nonwoven polypropylene bags were used 14.1 times.

The chance that the worse offenders, conventional cotton and organic cotton bags, will be used 7100 and 20,000 times respectively has to be nil. The Ministry's response to these results was to suggest that people should make bags out of old clothes. This is advice that is better suited to the home-tips section of the Woman's Weekly, than a serious policy paper. As noted above these bags pose health risks. The Ministry's advocacy, without any mention of these risks, borders on the irresponsible.

Given the probable increase in the use of paper bags, and normal human behavior with respect to the use of reusable plastic bags, it is reasonably clear that that a double-use plastic bag ban will have a negative environmental impact.

Ergonomically superior to alternatives

For many people 'double-use' checkout bags are ergonomically superior to multiple use bags. It is possible to carry eight or more at once when making the transfer from car to home. It is not possible to the same with reusable bags. The weight of the bags, their relative rigidity and harder plastic handles, makes such a load uncomfortable, so more trips are required. Paper bags can only be transported two or three at a time.

The advantage with the status quo is that people get a choice as to what type of bag they prefer because of their carrying characteristics.

Evaluation of the arguments for a ban

Risk to human health in New Zealand from marine littering

The Minister suggests that micro-plastics may 'potentially' enter the human food chain, while the consultation document says that *The Government's proposal takes a precautionary approach to reduce the risk of them contributing to long-term impacts on the environment and human health*. However, there is no discussion or analysis in the paper to support the health concern, nor is a single relevant paper cited in the references.

We are not expert in this field, but a review of survey articles suggests that most attention has been directed to identifying the vectors whereby plastics or plastic additives could enter the human food chain, or otherwise get into human bodies. We have seen nothing that measures dosages or that makes an assessment that this could exceed safe levels.

In terms of the food chain the consumption of shellfish is the most likely vector as micro-plastics can be present in the flesh that is consumed by humans. New Zealanders do not eat fish intestines.

Estimates of the amount of micro-plastics vary in shellfish vary, as this will obviously depend on the amount of micro-plastics in the immediate environment, but European studies (Vandermeersch, Van Cauwenberghe 2014, 2015) studies on

mussels report around 0.12 pieces per gram of wet mussel, or about 1 piece per a small mussel.

If these kinds of results are of concern to New Zealand policy makers then the appropriate response would be to:

- Test the incidence of micro-plastics in New Zealand farmed mussels
- Assess the direct impact of micro-plastics on human health. Is it for example, more harmful than the ingestion of sand?
- Assess the likelihood of leaching of chemical additives and the likely health impacts of plausible dosage rates

The chemical additive of primary interest is Bisphenol A (BPA), which is used to make plastics more flexible. The Ministry of Primary Industry reported on the health risks of plastic packaging in 2016. They concluded that New Zealanders' intake of chemicals from plastics is well below maximum safety limits. With respect to Bisphenol A they said *'Even the highest estimated dietary intake of BPA in New Zealand (0.0003mg/kg of body weight/day) is well below the European Commission's tolerable daily intake (TDI) of 0.05mg/kg body weight/day.'*

On the basis of the evidence, mussels could either be declared safe; an advisory limit placed on consumption; or mussels farming be banned altogether. While the MPI has not conducted a study on the safe levels of mussel consumption, we have little doubt that they would conclude that micro-plastics mussels do not pose a health risk

What you would not do to address the 'problem' is ban supermarket checkout bags. Ocean currents will potentially transport micro-plastics over long distances, so most of the sources could be foreign. A local plastic bag ban, which at best will have only a very small impact on the amount of plastics in the marine environment, will have no measureable impact on health risks.

But information based on evidence based assessments is not what the New Zealand public, and apparently the Associate Minister, are often hearing. For example, a Herald story (13 May 2018) picked up an article from the UK Telegraph under the heading 'Micro plastic pollution much worse than feared' about a high concentration of micro-plastics in one location in a river near Manchester. The story made some dramatic but unsubstantiated and unlikely claims.

Much of the plastic floats rather than sinks, so it is swallowed by marine animals who cannot digest it. Chemicals also leach into the water, and it has been shown that even humans who eat seafood ingest 11,000 pieces of microplastic each year (actually the claim was made in one study about Belgian mussel eaters).

*Microplastics harm marine life **and also present a grave danger** (our emphasis) to the human population, as the tiny plastic pieces end up being consumed by humans via seafood, other food, and tap water.*

The grave danger to the human population claim was a gross exaggeration and not supported by the science.

The consultation paper did discuss one New Zealand report (Clunies-Ross 2015) on the incidence of micro-plastics. As the kind of plastic from plastic bags made up 21 percent of the particles found the Ministry's inference that local plastic bags were somehow responsible. What was not reported was that tests of rivers and estuaries, found no micro-plastics, or only one or two. There were micro-plastics on beaches, but these could have come from anywhere as overtime ocean currents can deposit plastics over wide ranges. The number of micro-plastics found on our beaches was very small compared to heavily polluted sites in countries such as China.

The most convincing evidence we have seen of health risks from plastics bags was presented in a recent episode of Wellington Paranormal (TVNZ 2018). Sergeant Maaka was attacked by a plastic bag.

A significant contribution to littering

Supermarket bags are not an obvious major source of littering. They are filled with groceries at the supermarket, taken home and stored until reused or disposed of as rubbish. However, plastic bags do appear in the environment. The Associate Minister referred to data from Sustainable Coastlines on marine littering presented in the document, saying that plastic bags were in the top five. The data did show that around 140,000 plastic bags were recovered in 69 coastal cleanups over 7 years. However this number included all plastic bags, not just the bags that might be captured by a ban. We can tell from the Sustainable Coastlines data (we reviewed all of the data) that the bulk of these bags must have been small bags. The average weight of plastic bags in many of the cleanups fell in the 1.3-2 grams range, which is consistent with the small bags picked up from convenience stores, delicatessens, bakeries, sandwich bags and so on, that are more likely to be taken to the beach and littered, dropped by pedestrians, thrown out of cars or washed down storm water drains.

The more important indicator of the impact on the marine environment is the weight of the bags recovered, which was about 450 kilograms or 65 kilograms per year. We collated the Sustainable Coastline data, which is available online. By weight plastic bags accounted for significantly less than 1 percent of all litter

recovered. The share of supermarket bags is not known, because the data is not collected, but it very likely that it is around a few tenths of a percent.

With respect to land based littering in New Zealand, the only information we are given in the consultation paper is from a survey (National Litter Survey 2015) that included plastic bags in the 'other' category, which accounted for 8 percent of the litter. One would think that with this consultation looming that the Ministry would have commissioned a new survey, which identified plastic bags, and within that, supermarket bags, so they would have a better understanding on the nature and extent of the problem, or whether there is really a problem at all. We suspect that part of the reason that this was not done was that Ministry knew that the figure would be 'too small'. They would know, for example, that in the US, all plastic bags, account for 0.6 percent of litter.

While many surveys on litter composition around the world appear in the literature, and in official reports, only two studies, to our knowledge, have separately identified supermarket checkout plastic bags. First, is the Austin-Fort Worth study, which is referred to in the discussion paper. Austin banned supermarket plastic bags, while Fort Worth did not. After a year there was a massive cleanup by thousands of volunteers, and the number of supermarket plastic bags counted. In Fort Worth less than 9000 were found (accounting for .01 percent of recovered rubbish by weight), which given an estimated use of 300 million, suggests that one in 30,000 escaped normal street cleaning operations and got into the environment.

The second study (Environmental Resource Planning 2013) measured the percentage of grocery (supermarket checkout) bags as a percentage of all littered plastic bags in San Francisco and Oakland. The San Francisco percentage of two percent can be discounted because San Francisco had a plastic bag ban, but the percentage for Oakland was only four percent.

While the true supermarket 'escape rate' in New Zealand may well higher than 1:30,000, we found a low rate of supermarket checkout bag littering in our own survey (results shown in table one), which we had to conduct because the Ministry failed to do its job. Full-sized supermarket bags are a rarity, at least in Wellington, though no doubt there will be littering hotspots, such as freedom camping sites, where they are a problem.

For working purposes, in our later analysis, we have assumed, cautiously we believe, an 'escape rate' of 1:1000. So if one billion supermarket bags are issued each year 1,000,000 end up in the environment, or about over five tonnes a year. This is much lower than the assumption that has been used in Australia, where many reports

have assumed an escape rate of around one percent, with 70 or 80 million bags getting into the environments each year, so the reasons for the difference deserve a comment. The Australians start with litter surveys that show that all plastic bags account for about 1 percent of litter. This substantially overstates the number of supermarket bags, which are not counted separately by their litter guardian, Keep Australia Beautiful, or in reports from volunteer cleanups. They then assume that because the **stock** of littered bags is one percent at a survey date then this number can be applied to the **flow** of bags entering the environment. This simply doesn't follow. In reality their estimates are just guesses.

In Europe the BIO report, which provided the basis of the EU's approach to double-use bags, estimated the litter rate to be 4.6 percent. They cited a number of sources, which we followed up where possible (some were in foreign languages). None were based on objective information. They appeared to have been made up, and then cited and recited, until they appeared to become a fact.

The Irish experience is an example. The imposition of a 15p charge is credited in numerous papers with reducing the rate of plastic bag littering from 5 percent to 0.32 percent. Except they didn't introduce a littering survey until after the charge was imposed, and the 5 percent figure was simply made-up. The honest thing to do would have been to conduct a baseline survey first and then impose the charge.

In all of the reports and papers we have reviewed we have never seen a satisfactory answer to the following question: if supermarket bags are just a small part of the litter stream, why are you pursuing them with such a passion, when it won't make a material difference to the environment? Normally, the question is not even acknowledged, let alone answered. However, one statement, in a European Union report, did get to the heart of the matter. Plastic bags were a '*talisman of a throw away culture*'. So, to put words in a European bureaucrat's mouth, single-use bags have to be fought, and if that victory is won the whole wasteful consumerist culture will collapse with it. Lazy people, who use 'single-use' plastic bags just because they are convenient, cheap and frequently reused, will be re-educated.

Table 1 Tailrisk litter survey

Location	Supermarket checkout bags	Comments
Wellington waterfront, Oriental Bay to Balena Bay. The harbor was still so good line of sight on	0	1 supermarket trolley 6 drink bottles, numerous

sea floor. Inspected 5-7 metres out. Careful inspection of rocks in Balena Bay		confectionary wrappers. Paper based littering most common. Environment mostly clean at first sight. Litter mostly hidden.
East of Princess bay 100 metres of coast line	0	1 small plastic bag. Around 10 pieces of paper litter. 2 coffee cup lids. On litter on rocks.
Te Aro 2 km of footpaths, 3 alleyways. Co-benefit: dog got a good walk.	0	Litter count of 500 halfway through. Cigarette butts, paper pre-dominant.
Path to Red rocks. Also scan of hillsides above path to check for bags that may have escape from Wellington landfill.	0	1 small plastic bag. Some paper, 3 coffee-cup lids. Plastic ties used to identify plants for apparent science project
Wooded area to east of old Dominion museum. Visible surrounds close to paths groomed by Council. Inspection through the sloped wooded and vegetated areas. Close inspection aborted halfway through after fall down muddy slope.	6 confirmed, others possible	Heavily littered including multiple small bags out of sight from surrounding pathways. Apparently no cleanup for a number of years. Possible illegal dumping. Possible 'preloading' site, given number of alcohol containers.
Waikanae Beach each. Three road inspections. Two 2 km beach walk on high watermark. Beach reserve inspection	0	3 small bags. Numerous other litter but not obvious at first sight. Mostly paper and confectionary wrappers

The other vector for littering is escapes from landfill sites. The discussion paper showed a photograph of a historic dump in the West Coast that had been exposed by coastal erosion. A ban on supermarket bags now will, of course, make no difference to escapes from that landfill, and in the unlikely event that other landfills are similarly exposed in future, the plastic bag problem is trivial, because as the discussion paper notes, plastic bags only account for .01 percent of waste in landfills. A council will still have to deal with the other 99.99 percent.

The other perceived problem is windblown escapes from landfills. The discussion paper showed a photograph of some tattered plastic bags in a gully close to the Wellington landfill, supposedly to make this point.

Here the Wellington mayor pitched in an August 10 2018 release.

“Until now, local councils have borne the cost – both financial and environmental – of single-use plastic bags entering the waste stream. Moving to a ban will significantly reduce that burden.”

“We were seeing atrocious results that New Zealanders were becoming increasingly concerned with, from entire hillsides covered in single-use plastic bags dating as far back as the 1970s to researchers finding that around a third of dead turtles in New Zealand had likely ingested supermarket bags.”

We inspected the Wellington landfill. In general the road up to the public disposal site appeared to reasonably clean, given that this is a tip, not a nature walk, and the challenge posed by Wellington’s ferocious winds. The immediate surround of the access road is grassed and groomed, and there was only a very light peppering of plastic bags in the trees in the closest hillsides (except for a small area closest to the tip). Whole hillsides were not covered in plastic bags and we doubt if any date back to the 1970s. Plastic bags are photodegradable so the thin bags that are caught in trees will breakdown relatively quickly.

We did find the offending gully and it had been similarly grass and groomed, but only in the areas visible from the road. The end of the gully and the immediate slopes had a deep covering of rubbish. There were plenty of plastic bags but also heavyweight plastics, cardboard and other debris. It looked like a third world country and was, to use the Mayor’s word, atrocious. It was the same story on the sides of the road. If the rubbish wasn’t visible from the road the Council left it there. It looked like the Council hadn’t cleaned up for years, adopting a policy of ‘if they can’t see it, its not a problem’.

The Council has an arguable case here. The plastics are inert and if they lie there for years, then there is no harm done. Turtles do not climb up to the gully. The waste is not visually offensive to the vast majority of landfill users, and the Council should not bear the costs of a clean up just because one snoop has been offended. Fair enough, but it does rather undercut the Council taking the moral high ground. Perhaps the Council could redeem itself if the Mayor and his senior staff did a team-building weekend cleanup. At no cost to ratepayers.

A special point of sensitivity for marine littering is the possibility that marine animals might eat white or translucent plastic, mistaking it for natural prey. A simple solution would be to convert to grey plastic. Some retailers have already done so.

Single use bags not recycled

The response to this argument is, so what. The amount of plastics used in double-use bags is less than 6000 tonnes a year, which is a trivial use of oil resources compared to road transport, which is very much a single use of the resources. It is simply not economic to recycle this plastic. The Wellington Council stored collected plastic bags for years because there was no market, and lied about it to the public.

It is likely that most of the plastic will be used in the multi-use bags and bin liners that will replace double-use bags, will not be recycled, so there will be no net 'recycling advantage' advantage in banning double-use bags.

What about the wildlife

A single image of a bird or animal ensnared in a plastic bag brings an emotional response, which can be very influential. The issue, however, is how much difference would a double-use ban make. Probably not much, in part because these ensnarement events may be less common than people think.

International Coastal Cleanup, an international environmental charity, provided information on their record of animal entanglements recorded over 25 years all over the world, in its 2011 annual report. Of 1449 bird entanglements, 102 were due to plastic bags and of 331 mammal entanglements, plastic bags accounted for 33. The main causes were fishing equipment and ropes.

How much difference will a ban make?

The key issue is the difference a ban on certain plastic bags will make to the most sensitive issue, the amount of plastic entering the marine environment. The answer has to be, very little, and possibly none.

To make an assessment we need a status quo starting point. As noted above Sustainable Coastline cleanups collected 65 kilos of plastic bags per year over 2010-2016 (though there is evidence of a reduction in this rate in 2017 and 2018). There are other cleanup operations, of course, with The Auckland Trust accounting for three times as much coastline waste since 2002. With other organised and individual efforts, the annual plastic, bag coastline littering might be in the order of,

say, 200-300 kilograms a year. This is a 'drop in the ocean' compared to the estimates of 8 million tonnes of plastic littered in the world's oceans each year.

The Austin Fort-Worth experiment provides some real-world guidance on what difference a plastic bag ban would make. As noted in the discussion document the ban did not reduce the amount of plastic going into landfills. The reason is that shoppers were sometimes buying reusable bags, because they forgot their regular reusable bags, or didn't have enough, or were happy to buy them because they could be reused for other purposes. Because these were much heavier than the 'single use bags' this offset the fall in the number of bags sent to the landfill.

Other evidence comes from an analysis of a consumer behavior in Australian supermarkets (Nolan ITU) that charged for bags and those that didn't.

Within supermarkets that do not charge for single-use bags, 67% of transactions involved a single-use bag, 16% of transactions involved a reusable carry bag and 17% of transactions did not involve the provision or use of a carry bag.

Within supermarkets that do charge for single-use bags, 30.5% of transactions involved a single-use bag, 30.5% of transactions involved a reusable carry bag and 39% of transactions did not involve the provision or use of a carry bag.

The effect of the charge was to increase the amount of plastics in the bags provided by supermarkets by 30 percent, based on the weights of the relevant New Zealand supermarket bags.

As noted above an 'emergency' multiple use bag has at least six times the plastic of a double-use bag, and a standard multiple uses bag 19 times as much. Fancier bags will be heavier again. As the use of these bags grows some will inevitably make their way into the environment.

With respect to the small bags, many will not be caught by the proposed bans because they do not have handles, so there will be no change there. Other handled bags used by small convenience retailers may be replaced by bags that don't have handles, but will be longer so they can be carried, and hence a little heavier. In other cases these retailers may opt for a heavier weight bag with handles, because it is still cheaper than the paper alternative. As these bags are generally single use, the overall effect may be to increase the amount of plastic going into the environment.

Overall we do not know whether a plastic bag ban will have a positive effect on the already small impact that plastic bags have on the environment.

To the extent that there is a shift to paper bags, then the effect could be to increase land littering because people are inclined to be less careful in retrieving their litter, if they think that the bag they have dropped is degradable.

Our experience is that paper littering is much more common than plastic bag littering in terms of degrading the look of public spaces. Frequently what we thought was a plastic bag was actually, on close inspection, a piece of paper or card.

Another perspective on the way a ban might work is to look at the impact on an 'average' imperfect family.

Table 2: Impact on plastic use and costs

	Number of bags annual	Use per bag	Total bag use	Total weight of bags	Cost
Pre ban	600 dual-use	1	600	$600 \times .05 = 3.0$ kg	$.02 \times 600 = \$12.00$ embedded in prices
Bin liners reused			300	0	0
Total				3.0 kg	\$12.00
Post ban					
Reusable bags	20	15	300	$20 \times 0.76 = 1.52$	$1 \times 20 = \$20.00$
Emergency Bags	60	5	300	$60 \times 0.32 = 1.920$	$60 \times 0.15 = \$9.00$
Bin liners e-bags			60	0	0
Binliners drawstring Handle tie bag banned	240	1	240	$240 \times 0.06g = 1.44kg$	$240 \times 0.24 = \$57.60$
Total				4.88	\$86.60

The effect of a ban would be to increase plastic use by 1.88 kg. and directly cost \$74.60. Washing reusable banks would have additional time, hot water and detergent costs.

The circular economy approach to policy

The Associate Minister explained that

The Government's long-term approach to this problem is to help reduce the amount of plastic waste we generate and take a circular economy approach to design waste out of the system. This Government seeks transition to a sustainable, productive and inclusive economy, which includes designing out waste, pollution, and greenhouse gas emissions.

There is more on the Ministry's website.

The products we use for all aspects of life are often designed and manufactured with little thought for the resources consumed in making them or what happens to them at the end of their life. Apart from the most expensive purchases we make, like a car or house, when something breaks in our modern world it is often more expensive to repair than to buy a new one, and usually it goes to the landfill. Simply put, these products are not designed for reuse, repair, refurbishment or to be remanufactured. This take-make-dispose mind-set has created a linear economy.

Actually, a huge amount of thought has gone into the resources used in the manufacture of plastic bags, hence the 75 percent fall in their weight.

A circular economy is an alternative to the traditional linear economy in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.

When a product is designed for the longest use possible, and can be easily repaired, remanufactured or recycled (or used, composted and nutrients returned) we consider it to have a circular life cycle. A circular economy is fueled by renewable energy (e.g. solar, hydro, wind and tidal power, and biofuels).

Under the heading 'Why transition to the circular economy' we are told.

Growing international research and evidence shows numerous benefits over the traditional linear economy.

These include:

- *long-term cost savings*
- *increased local job opportunities*
- *encouragement of technical innovation*
- *reducing the amount of harmful waste produced*
- *reversing our impacts on climate change.*

And under the heading on evidence and research on the circular economy there are references to four websites.

The Government of South Australia

Ellan Macarthur foundation

London waste and recycling board

Sitra - a Finnish public investment fund

We didn't see much that would pass as research on these sites. The South Australian Government reported on the outputs of an input-output model (essentially 70 year old economic model technology-with some 'environmental' clip-ons), that more or less just assumed that the economy would become more efficiently if waste was reduced, and that 25,000 jobs would be created. The real economic content, where prices, costs and profitability matter, was very low.

The circular economy concept is certainly trending. A literature review found that since 2006 more than 300 articles with the term in the title, abstract or key words, have been published with a rapid acceleration from 30 in 2014 to 127 in 2016. Unusually, 40 percent of the articles were linked to China and only 24 to the US, which is generally regarded as the centre of gravity of serious economics. No mainstream environmental economics journals appeared in the list of journals. However, 80 articles appeared in the Journal of Cleaner Production a Chinese English language publication.

It turns out that China has a circular economy promotion law, which was passed on August 29, 2008 during the fourth meeting of the Standing Committee of the 11th National People's Congress. According to Wiki *'The law was outlined as a key strategy in national economic and social development, while promoting resource utilization efficiency, natural environment protection and sustainable development.'*¹ *The law contends that circular economies strategies will be implemented only if it is viable in technology, practical in economy, suitable in saving resources and protecting the environment.*

The circular economy has been part of China's 5-year plans.

Outside China the circular economy approach is being increasingly sold to business as a way to operationalise the much discussed virtue of 'sustainable development', and it is one of those appealing slogans which is increasingly turning up in job titles and in public authority statements and plans.

But what does the term circular economy mean and, importantly, does it signify some sort of fundamental shift in New Zealand's economic objectives, and in particular a new set of rules for policy analysis? On the first point apparently it can mean pretty much anything you like. According to a literature survey (Kirchherr 2017) there are 114 meanings given to the term circular economy, and in China the caveats on its application give plenty of outs. Despite being first to formally adopt the circular economy approach, China does not appear to be a shining light of environmental rectitude. It is the worse polluter of the world's oceans by a margin.

Though to be fair, they have set the standard on recycling human organs when prisoners are executed.

In terms of decision-making processes in New Zealand, the apparent decision to ban plastic bags echoes the Chinese approach. A central decision was made to substantially phase out double-use plastic bags, using the coercive power of the state, and while there is a consultation on the means, it is mostly a sham.

In terms of possible changes to the conventional policy formulation the key difference appears to be as follows. All that matters, in the pure version of the approach (there were no economic rationality outs on the MFE website), is the amount of physical inputs into production, and the more that these can be recycled, the better for the economy. The cost of recycling and the time spent doing it simply doesn't count. And this is pretty much how the consultation document works. There is mention of the number of bags, tonnes of plastic used, but not a single mention of the price of plastic bags (other than in the context of taxes to severely curtail their use) and their alternatives, or any assessment of the time cost the policies will impose on consumers or businesses. Resources might be ultimately finite, but time for people is finite right now, and most don't like to waste it.

In a conventional economic analysis it would matter that it costs, say, \$2000 a tonne to collect plastic bags, which have a negative market value, because they can't be recycled, and have to be stored in the hope that someone will eventually want them. The best approach is to put them in a landfill. From the circular economy perspective the value in the plastic is being saved for the economy, and the collection is a good thing.

It is way of thinking, they comes out of the 'limits to growth' perspective (Boulding 1966). The earth is finite, resources are finite, so they must be recycled and not lost to the economy. While this finite resources proposition is literally true in the very, very long run, what the approach tends to downplay or ignore, is the role of the price system in allocating resources. As resources become scarcer, prices increases, resources are allocated to the most valuable uses, and innovation is encouraged that finds new ways of doing things. More natural resources are discovered because they are more valuable. The world economy does not suddenly collapse when the resources suddenly run out.

Even if we were worried about the economic consequences of the 'end of oil', banning plastic bags will not make much of a difference. Estimates vary, but it appears that current reserves will suffice for 70 years (assuming no increase in prices and no new discoveries that would be induced by higher prices). At best, the net

effect of the plastic bag ban might put that off by a minute or so.

The Ministry's evaluation process

The paper sets out its proposed evaluation procedure for nine options in appendix 3. There are five assessment criteria.

1. Can substantially advance the phase out of a single-use plastic product that contributes to litter and the risks associated with marine plastics while over the longer term take a circular economy approach to design waste out of the system

As the primary purpose of the intervention this criterion receives a triple weighting.

2. Can be implemented without placing undue costs on the community, business, or public funds.

This receives a double weighting as a key regulatory principle.

3. Can be progressed under existing legislation

4. Can provide a financial incentive to return used shopping bags for reuse or recycling

5. Can transfer funds for community or environmental benefit

The scoring criteria are:

Yes	2
Somewhat	1
Uncertain (?)	0
No	-1

The results are set out in table 2. The highest scoring option is a mandatory phase out with a score of 8. Various charging options, scored 7, though the tax preconsumer option, which is closely equivalent to the other three scored -1 based on the Ministry's lack of understanding of the issue. The status quo scores only 4. Hence mandatory phase out is the preferred option.

Table 3: Option scores

Criterion	Option 1 Mandatory phase out	Options 2 Increased price 2a levy to central government	2b Minimum charge	2c Levy by councils	2d Tax preconsumer	Option 3 Deposit refund	Option 4 Formal agreement	Option 5 Product stewardship	Option 6 Status quo
1	Yes (2 X 3 = 6)	Yes (2X3)=6	Yes (2 x 3)=6	Yes (2X 3)=6	?	?	?	/	?
2	Somewhat (1x 2)=2	somewhat	somewhat	somewhat	?	?	yes	?	Yes (2 x 2= 4)
3	Yes = 1	No	No	No	No	Yes	Yes	Yes	Yes
4	No = -1	No	No	No	No	Yes	?	?	No
5	No = -1	Somewhat	Somewhat	Somewhat	Somewhat	?	?	?-0.2	No
Total	8	7	7	7	-1	4	6	2	4

Criticisms of the assessment methodology

Too many options

Nine options is too many, and are confusing to work through. The most important options are:

1. A ban, or nearly equivalently a prohibitive minimum price.
2. Imposing an efficient minimum price that captures the cost of the bags and externalities. How this is done and who collects the money is a second order consideration
3. The status quo.

There are four pricing options but not one of them mentions the price. It makes a big difference whether the price is economically efficient (about three cents), or it is prohibitive.

Assessment criteria and weights are arbitrary

This kind of assessment process is essentially arbitrary and can, and has on this occasion, be easily manipulated to generate the 'correct' answer by the selection of criteria and weights. There is, at least, one important omission from the list of criteria. The Treasury sets out the Government's expectations on the design of regulatory systems on its website. Amongst the expectations is that a regulatory

system will achieve its objectives with the least impact on individual autonomy and responsibility. An outright ban does not do that, and would score low on this count. But this criterion does not appear.

Some of the criteria do not appear do not appear to be appropriate.

Providing a financial incentive for return for reuse or recycling doesn't make sense for a 2 cent bag that no one else wants to reuse, and when no one wants to recycle the plastic.

It is not obvious that a positive weight should be applied to the criterion *Can transfer funds for community environment benefit*. A minimum price, which is above the cost of provision, embeds a tax and it is not clear why the retailer should be distributing that tax to 'worthy' causes. Supermarkets are not charitable trusts. If the government wishes to distribute money it is better to raise it by general taxation, and then distribute the funds using transparent and clear criteria.

Avoiding legislation

The positive weight on avoiding legislation is overstated or even has the wrong sign. This is an important change and it is desirable that it is subject to the kind of scrutiny it would get through a legislative change, rather than being slipped through by regulation.

As it stands, a ban cannot be imposed by regulation. Under the 3 b (ii) of section 23 of the Waste Minimisation Act, the Minister must be satisfied that *the benefits expected from implementing the regulations exceed the costs expected from implementing the regulations*. There it insufficient analysis in the paper for anyone to be satisfied that the benefits exceed the costs.

Framework calibrated to deliver perverse results

Consider the case where the benefits of a ban are \$1 million and the costs \$50 million. An honest assessment would be a minus one score, which with a weighting of 2, gives a score of -2. However a ban will score 6 on the first criteria, for a total of 4. A decision to do nothing (assuming stores had not decided to phase out plastic bags in anticipation of a ban) would score -3 on the first criteria and 4 on the second, for a total of 1. So the bans wins by 4 to 1, when this is clearly the wrong decision based on the assessment of the costs and benefits.

Some assessments are biased

The status quo receives a zero score under criterion 1 because the Ministry claimed that it has insufficient information to make an assessment. In a situation where the major supermarket chains, and some other major retailers, had either announced

that they were phasing out or were seriously looking at it, there was enough information to assign a score of at least four, and with a phone call or two, a six. On the second criteria, the ban received a 'somewhat' (whatever that means) score when there was no structured analysis of the costs and benefit. The best possible assessment it could receive is a ? and a score of 0.

The important requirement here is to minimise costs. The Ministry would probably claim that it has met this test in its second criteria and its 'somewhat' assessment. But there is no analysis in the paper to back up this assessment, nor any understanding that outright bans, are generally inferior to pricing or other strategies when assessed against the criteria of least cost, and its impact on market competition, property and individual autonomy and responsibility.

The Ministry and the Associate Minister might respond that the Government's criteria do not apply (despite the admission in the Consultation document that they do) when a circular economy approach to policy assessment is being used. The previous New Zealand government's weighting given to individual autonomy and responsibility has been replaced by the weighting given by the Government of the Peoples Republic of China.

No cost benefit analysis of phase out proposal

The (New Zealand) Government's expectation is that regulation should be underpinned by robust analysis and there is a general expectation that proposals should be supported by a cost benefit analysis. This was not even attempted by the Ministry. While there are number of assertions and some brief qualitative discussions it was just assumed that the benefits of substantially reducing 'single use' plastic bags substantially outweighed the costs. This is clearly not acceptable. A single word assessment 'somewhat' does not meet the requirement. It is essential that the Ministry produces a cost benefit analysis using conventional, proven, economic techniques.

Cost benefit analysis illustration

A few public authorities have undertaken cost benefit analyses of plastic bag control proposals. Here we first focus on the UK Government report (DEFRA 2015) , which supported their decision to introduce a minimum charge of 5p for double-use plastic bags. We have done so because the Ministry might use a similar to approach to eventually produce a cost benefit analysis, and also because it does set out some of the important elements of a cost benefit analysis.

The results of the analysis looked very positive with the study claiming a net benefit

of 780 million pounds over 10 years. However, on close inspection we found that the analysis was essentially fabricated to generate a positive result.

The logic behind the intervention is familiar and correct as far as it goes. Because plastic bags are given away free, consumers are not directly confronted with the cost of bags and there is little incentive for them to limit their consumption to an economically efficient level. In addition, there are negative externalities associated with double-use plastic bags, such as the disamenity (eyesore) impact of littered bags and the greenhouse gas emissions and non-renewable resource use associated with their production.

The cost of a plastic bag at the time was around 1p but this was increased to 1.8 p, purportedly to account for 'administration costs', in the analysis.

In terms of benefits of the reduction in external costs, greenhouse gas emissions and public cleaning costs were calculated, but these came to only about 0.1p a bag. Landfill costs were also calculated, at less than 0.1p, but these are not external costs in New Zealand, as the consumer generally bears those charges.

It was stated that it was not possible to monetize other economic impacts of littered plastic bag, but a long qualitative list was set out implying that the costs must be high, and without saying so, that they justify a 5p price. Actually, it is possible to monetize the other external costs, and least in broad order of magnitude terms. We have attempted to do so, but even assuming some high disamenity costs per littered bag, we struggled to come up with external costs in excess of 1 cent per bag.

The key result in the analysis that there are net benefits of 780 million pounds, was substantially driven by their assumption that the replacement bags, which are really just heavier versions of the double-use bags, were cheaper on a per use basis than double-use bags. This was based on some dubious assumptions on the number of times the heavier bags were used. Essentially what they are saying is that the real market failure here is that consumers don't realize that the heavier bags are better value, and that this justifies the intervention. On that logic any government intervention to incentivize the purchase of larger packages of a good would be justified because they are cheaper on a per unit basis.

They recognize that there is a cost to the disutility, or inconvenience of no longer having access to 'free' bags, and that it would be possible to calculate the loss of consumer surplus from the demand curve. But they say

The demand curve (which shows consumers' 'willingness to pay' for bags and therefore the benefit they derive from them) is unknown so it is not clear what proportion of consumers

value access to 'free' SUPB at, for example, 4.9p per bag as opposed to 0.1p per bag. An economic valuation study would be required to estimate the distribution of consumer valuations and the degree to which it is skewed towards the top or bottom of the range.

But they then give the game away.

This (an economic valuation) has not been judged necessary because the aim of the policy is to encourage behavioral change so that consumers become accustomed to re-using bags.

Or in other words, we could do the analysis, but that would not generate the right result, so we haven't.

Instead they say Consumers will be inconvenienced by reduced access to 'free' bags, but this will be mitigated by behavioral responses to the charge, i.e. increased re-use of bags.

This is wrong, increased use of bags after an inefficiently high tax imposed doesn't reduce the loss of consumer surplus. What they are trying to say here is that people will eventually get use to it, and the pain will go away. Re-education by force will eventually work and the new perfect environmentally conscious person will emerge.

De Leeuwen and Williams (2014) present a different perspective based on the US experience. He says that plastic bag bans lead to stress, frustration and resentment.

All of these challenges add up to a significant amount of stress. In addition to everything else going on, such as planning a person's day, deciding where to go, what to buy, and what to eat, caring for children, or managing and optimizing schedules, now people are burdened with having to remember reusable bags for all of these events. Did they bring enough bags? What will they do with the bags during the part of the day they are not shopping?

The second emotion people feel is frustration. A person's frustrated look or expression is often seen in stores when they realize they forgot their reusable bags (even if the bags are in the car) or purchased more than they planned. Unfortunately, the store clerks are the main outlet for customer frustration. Customers will often try to get the clerk to pass them a free bag (illegally), and blame them if they insist on the bag charge. Checkout stands turn into scenes from a communist movie or prohibition, where the consumer is looking around at the video cameras and whispering to the clerk to slip them a free bag against the government's iron hand.

Stress and frustration lead to resentment. People resent two things: Politicians who treated them like children and who prevent them from getting a simple clean plastic bag when they need it based on senseless arguments, and the stores and clerks who now smile at them and ask "how many bags would you like to buy?"

These factors have led to eight US states banning bans on plastic bags by local authorities.

Calculating the costs of a ban for New Zealand

Responses to minimum bag prices in UK and elsewhere provide useful data to inform a New Zealand estimate of the costs of a ban. For example, assume that there are one billion bags issued, and that this falls by 80 percent at a price of 9 cents (from the UK experience) and that the full social cost of a double-use bag is 2.5 cents (the resource cost of 2 cents plus the net value of avoided external costs). The optimal price is 2.5 cents and the higher price imposes a distortionary tax of 6.5 cents a bag. We assuming a linear demand curve from a cost of 0 cents to 9 cents. There are two impacts from the ban. First there is a welfare gain of \$6 million from the movement from a zero price to 2.5 cents. Then there is the loss of \$38 million due to the price increase to 9 cents

For the remaining 20 percent of demand, which will be impacted by a ban, we assume that shoppers can purchase a heavier, compliant, bag at 15 cents, which sets a limit on the loss of consumer surplus. The average loss is estimated at around 10 cents, for a total annual cost of \$20 million.

Then there is the cost to the supermarket. The 2002 Australian government report put this at \$A 82 million based on an increase in the average transaction time of 5 seconds. Translating this into current New Zealand circumstances gives a cost of around \$25 million.

These estimates add to an annual net cost of \$77 million.

The thickness of compliant plastic bags

There are questions on the minimum thickness for a bag to be classed as a compliant reusable bag. However, there is no discussion of what the considerations are here. It should be obvious that a bag should be thin as possible, while still meeting the reusable test. The thicker the bag the more plastic is used and the higher the cost. Some countries have a 35 micron test, but only the 50 and 70 micron options appear to be on the table.

Additional measures to reduce environmental impact of littering

The Associate Minister has clearly signalled that phasing out plastic bags is just the start of a process to reduce the environmental and social impact of waste. Below we set out a few possibilities. The Ministry is welcome to use the ideas and text in future discussion documents.

Ban Xmas

There is evidence that plastic toys are a significant risk to the environment, human health and cultural and socio-economic values (Scrooge 1843, Burgess Salmon 2017). Plastic toys are very plastic intensive. The World Economic Forum (2017) has found that plastic toys have the highest plastic content (46.9 tonnes) per \$US1 million of sales of any commodity. By contrast the plastic intensity of supermarket plastic bags is less than .01 tonnes per \$1 million.

Plastic toys are frequently littered in the environment. 13,400 toys were recovered in the 2017 Manukau Harbour cleanup (Sustainable Coastline 2017), compared to 1200 plastic bags.

There is evidence that the deliveries of these toys are concentrated on 25 December (Claus 2018). The manufacturing of plastic toys involves the exploitation of a minority group and has a significant impact on the sensitive Artic environment. Xmas has links to a minority colonial ideology and is not consistent with the values of modern inclusive multicultural society.

The Government has decided to phase out Xmas. This consultation paper explores the main options. They include:

- A 500% tax on plastic toys, from 30 September to 5 January each year.
- A ban on plastic toys being given as gifts given on 25 December.
- Xmas day and Boxing day will not be public holidays

We do not yet know the full nature or extent of the impacts of Xmas. The Government's proposal takes a precautionary approach to reduce the risk of it contributing to long-term impacts on the environment and human health, as well as their wider socio-economic and cultural impacts.

Ban on shopping trolleys

Shopping trolley littering poses a risk to the marine environment. Harrison (2018) found that the number of supermarket trollies in Wellington Harbour exceeded the

number of plastics bags. In the UK² more than 3000 trolleys are dumped in rivers each year. There is a risk that supermarket trolleys may harm large marine mammals if mistaken for food.

Supermarket trolleys are frequently used to transport supermarket products with a plastic wrapping or a plastic component, which pose a risk to the environment. More generally supermarket trolleys encourage overconsumption, which is also a threat to the environment.

The Government has decided to phase out the use of shopping trolleys. The options are:

- A charge of \$20 per use of a shopping trolley.
- A ban on the use of shopping trolley from 1 January 2019.

We do not yet know the full nature or extent of the impacts of shopping trolley littering. The Government's proposal takes a precautionary approach to reduce the risk of them contributing to long-term impacts on the environment and human health, as well as their wider socio-economic and cultural impacts.

Ban on the sale of pianos

Littering of pianos on beaches and dumping in the marine environment have been of historical concern in New Zealand (Campion 1993). Piano littering poses a threat to fish and marine mammals, and to human health. The enjoyment of piano playing is a colonial construct and has no place in a modern inclusive multicultural society.

Pianos are heavier than plastic bags (MFE 2017) so each case of littering has more serious consequences.

The Government has decided to phase out the sale of pianos.

We do not yet know the full nature or extent of the impacts of piano littering. The Government's proposal takes a precautionary approach to reduce the risk of them contributing to long-term impacts on the environment and human health, as well as their wider socio-economic and cultural impacts.

² <https://www.telegraph.co.uk/news/4788011/More-than-3000-shopping-trolleys-dumped-in-rivers-every-year.html>

Better options

Alternatively we could do something that actually makes a difference.

In 2009 Sustainable Coastlines did a cleanup, with wide community support, on a small Tongan island with a population of 4600. They removed 50 tonnes of rubbish, compared to around 80 tonnes for all their New Zealand operations spanning seven years.

Below is a table taken from the report (Jambeck 2015) that provided the estimate of 8 million tonnes of plastics going into the oceans each year that has received wide spread attention. It shows annual total of mismanaged plastic waste, but this figure appears to be about four times larger than actual flows into oceans. While the individual country figures, the inputs and the methodology may be questionable in some respects, the data provides a reasonable representation of the scope for making improvement in the performance of our Pacific neighbours. Because New Zealand already has a robust refuse collection system and a reasonably good anti-littering culture, the scope for large cost effective improvements here are limited. As we have demonstrated a plastic bag ban will make almost no difference, but has a large cost.

Table 4: Mismanaged Plastics by Country

Country	Mismanaged plastic weight per capita per day kg.	Total mismanaged plastic waste tonnes 2010
New Zealand	.007	9,258
China	0.090	8,819,712
Pacific islands		
Fiji	0.151	49,257
Cook Islands	0.054	416
Nauru	0.099	534
Nuie.	0.006	4
Papua New Guinea	.090	89,535
Samoa	.051	5,222
Solomon islands	0.090	20,394
Tonga	0.176	6,624
Vanuatu	0.245	22,478

Our best strategy is to continue to build on voluntary efforts to clean up the coastal environment and to redirect, or supplement, our aid budget, to Pacific countries, where there will be a much higher payoff in terms of reduced plastic pollution.

Specifically:

- We should continue to support community action.
- This support should be extended to individuals. Many New Zealand walk and should be encouraged to pick up litter when they do so. They could be provided with a highviz vest, a litter picker and a bag.
- The foreign aid budget should be increased by \$10 million to reduce coastal littering in the Pacific Islands.

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