

TBT PROGRAMME - REG/FED/022-667

**TRADE REGULATORY IMPACT
ASSESSMENT - MAURITIUS**

**INVESTIGATION OF OPTIONS TO REDUCE
THE IMPACTS OF PLASTIC BAGS IN
MAURITIUS**

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GLOSSARY

CED	Cumulative energy demand
GJ	Giga Joule (1,000 MJ)
GHG	Green house gases
GWh	Giga Watt hour
GWP	Global Warming Potential
HDPE	High Density Polyethylene
LCA	Life Cycle Analysis
LDPE	Low Density Polyethylene
MCCI	Mauritius Chamber of Commerce and Industry
MJ	Mega Joule (1,000,000 Joule)
MRA	Mauritius Revenue Authority
MWh	Mega Watt hour
PET	Polyethylene Terephthalate
PHA	Polyhydroxyalkanoate
PLA	Polylactic acid
PP	Polypropylene

EXECUTIVE SUMMARY

This regulatory impact assessment (RIA) aims at assessing policy options to reduce the use, landfill and the litter of predominantly single-use plastic carrier (shopping) bags in Mauritius. The RIA tries to provide evidence to policy-makers by replying to a series of questions, as summarised here below.

What ‘plastic bag’ are we talking about?

Before discussing the problem definition and the policy options, it is necessary to define in more detail the broad category of ‘plastic bags’. The definition of a plastic carrier bag for purposes of this RIA is:

a carry bag, the body of which comprises polymers in whole or part, provided by the seller for the carrying or transporting of goods, but does not include a carry bag which complies with prescribed design criteria.

The table below indicates a selection of products included and excluded from the scope of a “plastic carrier bag” for purposes of this RIA:

Bags included or excluded from definition

Plastic bags included	Bags excluded
High density polyethylene singlet-style bags	Roll-on bags/produce bags
Low density polyethylene singlet-style bags	Bait bags (no handles, integrated packaging)
Bags from small and major retailers and informal traders	Polypropylene ‘green’ bags (multiple use)
Bags for take-away food	Bin liners (no handles, size)
Degradable bags (oxo-degradable and biodegradable)	Paper bags

In Mauritius, the predominant type of plastic carrier bags is thin single-use bags made of HDPE; and more durable carrier bags made of LDPE. The HDPE ‘singlet’ bag is used as non-branded or branded bags, while LDPE bags are mainly used by large retailers. Currently, plastic carrier bags are commonly provided at the point of purchase, often with no transparent charge or at a charge that merely recovers the cost of the government levy (plus VAT), but not the actual cost of the bag itself.

How many plastic bags are used per year in Mauritius?

Plastic bags are currently subject to a Rs2 levy, collected from producers. The table below reports the level of levies collected and, accordingly, the estimated number of bags produced in Mauritius.

Excise duties (levies) collected on plastic bags

	2012	2013	2014
Levies collected	Rs41,837,192	Rs41,666,384	Rs43,464,772
Plastic bags	20,418,596	20,833,192	21,732,336

However, the total number of bags issued by major retailers approximates the levy collected by the Mauritius Revenue Authority. This appears to indicate that no levies are collected on any plastic bags provided by traders other than the major retailers.

Although retailers' and producers' estimates vary slightly, both estimated that fewer than 50 million plastic carrier bags are used in Mauritius annually, as opposed to government's estimate of 300 million bags. It appears that government's figure may include all types of bags, including roll-on bags and bin liners, rather than carrier bags only. On the other hand, industry's and retailers' estimate would indicate consumption of only 38 carrier bags per capita, which is significantly below world average consumption.

Because of the significant discrepancy between excise duty collection, government and industry figures, and in an attempt to have a figure that can be used in this study, on the basis of consultations the total carrier bag consumption was estimated to be 150 million bags per annum.

What is the size of the plastic bag manufacturing sector in Mauritius?

There are 18 plastics carrier bag producers in Mauritius. Some produce plastic bags exclusively, others as a major proportion of their business, or as a smaller part of their business. Approximately 300 people are directly employed in the production of plastic carrier bags. It is estimated that between 1,000 and 3,000 workers depend on plastic bags informally by buying and selling the bags.

What are the main impacts of plastic bags consumption?

There are several impacts, including economic, social and environmental ones, associated with plastic carrier bags. Economic impacts consider the physical production cost and price of the carrier bags to producers, retailers and consumers; and the effect any regulatory intervention would have on producers, retailers and consumers, as well as on employment, administrative and enforcement costs, and the change in public revenue from levies. They also consider the monetary costs due to tackling environmental impacts, including the costs of cleaning up the environment, solid waste disposal and landfill costs.

Environmental impacts include the effect on greenhouse gases (GHG), the global warming potential (GWP) of the product and the effect of litter on the marine and agricultural environments. Social impacts include the visual impact of litter and the effect this has on citizens, including on their behaviour.

What are the alternatives to plastic bags? What is their environmental footprint?

The table below lists various types of plastic bags and their alternatives, showing a qualitative estimate of their environmental performance over relevant dimensions.

Impact of different types of bags¹

Bag type	Material consumption	Climate change	Energy consumption	Water use	Litter marine impact	Litter aesthetics	Beneficial disposal options
HDPE	&&&	&&	&&	&	&&&&&	&&&&&	Reuse as garbage bag/ recycle at major supermarkets
LDPE	&&&	&	&	&	&&&&&	&&&&&	Reuse as garbage bag/ recycle at major supermarkets
Reusable LDPE	&&&&	&&	&&&	&	&&&&&	&&&&&	Reuse as garbage bag/ recycle at major supermarkets
Paper bag	&&&&&	&&&&&	&&&&&	&&&	&	&&&	Recycle in household recycle bin
Reusable paper	&&&&&	&&&&&	&&&&&	&&&	&	&&	Recycle in household recycle bin
Non-woven PP	&	&	&	&	&&	&	None - landfill
Reusable PET	&	&	&	&	&	&	None - landfill
Reusable nylon	&	&	&	&&	&&&	&	None - landfill
Reusable calico	&	&	&	&&&&&	&	&	None - landfill
Starch plastic	&&&&	&&	&&	&&	&&&	&&&	Commercial compost/ reuse as garbage bag
Reusable starch plastic	&&&&	&&	&&	&&	&&&	&&&	Commercial compost/ reuse as garbage bag
Oxo-degradable	&&&	&&&	&&&	&&	&&	&&&	Reuse as garbage bag
PLA	&&&&	&&	&&&	&&&	&&&	&&&&	Commercial compost/ reuse as garbage bag

What are the objectives of the policy intervention?

The Government of Mauritius intends to reduce the use of plastic carrier bags by at least 50% within a period of two years and to decrease the volume of plastic carrier bag landfill and litter by 50% over the same period.

The specific objectives of this government intervention are to:

- Reduce the impacts of plastic carrier bags, including the volume of litter and landfill;
- Satisfy community expectations for government intervention;
- Balance consumer choice with environmental protection; and
- Redress the market failure associated with plastic bag usage.

What are the policy options?

¹ O'Farrell (2009).

The RIA considers various policy options, including both regulatory and non-regulatory. Options retained for further analysis include:

- Option 1: the current situation;
- Option 2: the current legal framework, but with improved enforcement;
- Option 3: an increase in the current levy; more in detail, option 3.1 considers a Rs5 levy, and option 3.2 a Rs10 levy; and
- Option 4: a ban of all plastic bags.

The following options were considered, but discarded at an early stage:

- A minimum exit price for all plastic bags covering their full costs;
- Ban bags with a thickness of less than 20 (or 30) microns;
- A voluntary agreement amongst retailers to reduce the supply of plastic carrier bags;
- A public awareness programme, including education on waste, litter and reusable alternatives;
- Litter management and enforcement;
- Replacing single-use HDPE bags with degradable or compostable bags; and
- Promotion of and/or subsidy to increase use of reusable grocery bags.

What stakeholders will be impacted by the policy? And how?

1. Mauritian citizens. First, the production of carrier bags cause air, water and soil pollution. Second, litter can lead to animal deaths, loss of fish stocks, possible ingestion of contaminated fish and public health impacts. Third, government has to spend money on cleaning up litter, whereas it could have been spent better on other programmes.
2. Plastic bag producers. Those SMEs producing exclusively plastic carrier bags will be the hardest hit by any action to either include the bags that currently do not attract the levy within the scope of the levy or by any ban. This would result in the closure of these SMEs, with their full complement of employment. The impact will be lower on companies that produce a range of plastic products. However, some producers have cautioned that a ban on plastic carrier bags could force more producers into the remaining market for other types of bags (e.g. bin liners), and that this could negatively affect the overall health of the industry.
3. Traders. If plastic carrier bags were banned, retailers would have to make a different form of bag available. Alternatives are more expensive, weigh much more and take significantly more space in store. Small and informal traders currently provide consumers with carrier bags free of charge. If the bags were to be banned, this would affect the volume of trade conducted by these traders.
4. Public authorities. Public authorities are affected by the increased costs associated with plastic carrier bag consumption, in terms of litter clean-

up costs as well as enforcement of prevention measures aimed at reducing bag consumption. Any regulatory change may also have a significant impact on the levies collected.

5. Tourism industry and local businesses. Littering incurs an aesthetic cost to society. This may have a negative impact on local businesses, especially the tourism industry.

What are the impacts of the different policy options?

A series of impacts could be quantified across the four options and are reported in the tables below. A ban on single-use plastic bags would see the biggest reduction on the use of plastic carrier bags, followed by a combination of wider enforcement and an increased levy, but that the ban would lead to the largest negative effects on employment, government income, GHG and landfill.

Environmental impact of the four options

Environmental impact factor	Option 1	Option 2 (50%)	Option 3 (Rs5)	Option 2&3(Rs5)	Option 4
Energy use (MJ)	127,879,146	142,449,648	130,770,322	153,751,518	162,028,760
Fossil fuel (kg)	2,494,446	2,551,374	2,505,742	2,595,532	2,627,871
GHG emissions (CO ₂ equivalent kg)	6,698,272	6,995,112	6,757,173	7,225,361	7,393,990
Fresh water usage (litres)	36,759,870	37,909,199	36,987,928	38,800,695	39,453,608
Transport fuel (litres)	6,117	7,718	33,876	8,959	9,869
Municipal solid waste (kg)	1,174,188	1,387,882	1,216,590	1,553,637	2,052,974
Litter (kg)	12,805	11,852	12,616	11,112	10,571

Litter impact of the four options

Litter incidence	Option 1		Option 2		Option 3 (levy Rs5)		Option 2 & 3 (levy Rs5)		Option 4	
	Litter (000)	Litter (kg)	Litter (000)	Litter (kg)	Litter (000)	Litter (kg)	Litter (000)	Litter (kg)	Litter (000)	Litter (kg)
Imported PE bags	463	3,940	232	1,970	463	3,940	98	833	-	-
Local PE bags	1,037	8,810	628	5,340	910	7,731	266	2,258	-	-
Paper bags		55	82	4,542	17	945	145	8,022	192	10,571
Totals	1,501	12,805	942	11,852	1,390	12,616	509	11,112	192	10,571

Total cost of importation under the four options

Type of bag	Price/bag (Rs)	Option 1	Option 2.1	Option 3 (Rs5)	Option 2.1 & 3 (Rs5)	Option 4
Single-use HDPE bag	0.32	14,600,091	7,300,046	14,600,091	3,086,159	-
Domestic HDPE bag	0.23	23,321,363	14,135,682	20,464,020	5,975,984	-
Woven PP bags	17.20	9,039,446	40,970,070	15,375,333	65,737,628	83,876,846
Single-use paper bag	3.71	370,800	30,509,424	6,351,106	53,886,985	71,008,200
Bin liners	0.63	3,831,955	14,839,315	6,016,108	23,377,370	29,630,455

Cotton bags	42.23	-	5,405,184	1,072,533	9,597,811	12,668,400
Jute bags	44.14	-	5,650,176	1,121,146	10,032,836	13,242,600
Total cost of imports		36,563,564	118,809,896	65,000,337	171,694,773	210,426,501

Total levy generated under the four options

	Option 1	Option 2.1	Option 3.1	Option 3.2	Option 2&3.1	Option 2&3.2	Option 4
Levy generated (Rs000)	45,230	176,763	50,972	22,315	200,892	90,507	9,751

According to the nature of policy intervention addressed by this RIA, other impacts could be analysed only qualitatively. The table below summarises the overall assessment of the policy options analysed.

Advantages and disadvantages of the different options

Policy option	Advantages	Disadvantages
Option 1: Baseline	No legal or administrative changes or costs	Increased environmental, economic and social impacts over time
Option 2: Wider enforcement of current regulation	Significant reduction in plastic bags Retains consumers choice No additional burden for large producers/ retailers Significant impact on consumer awareness Significantly increased revenue	Significant impact on small/informal traders Higher cost for consumer Significantly increased burden for small producers/traders Additional enforcement costs
Option 3: Increased levy	Funds collected can be ring-fenced for environmental programmes Provides incentives for consumers to reduce usage/increase reuse, while maintaining choice Slightly increased revenue (Rs5 levy)	Administrative burden on producers, importers, retailers and government Cost to consumers – levy or multiple-use bags (only at major retailers) Little effect on consumer awareness Only small decrease in carrier bag consumption Decreased revenue (Rs10 levy)
Options 2 & 3 combined	Significant reduction in plastic bags and litter Retains consumers choice No additional burden for large producers/ retailers Significant impact on consumer awareness Significantly increased revenue	Significant impact on small/informal traders Higher cost for consumer Significantly increased burden for small producers/traders Additional enforcement costs
Option 4: Ban	High level of certainty in mitigation of environmental	Significant loss of revenue Loss jobs connected with

	impacts, especially litter Decreased clean-up costs Decreased administrative burden	single-use bags Loss of consumer choice Increased landfill Increased road congestion
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Concerning implementation and compliance of the various options, Option 2 would have the significant advantage of being simple to implement, as it extends current enforcement to other areas (small producers, and small and informal traders). Option 3 would add no additional burden on top of option 2, as the only change would be the amount of the levy. Option 4 would require a totally different type of enforcement, namely to ensure that no traders provide single-use plastic carrier bags.

What is the preferred option?

Taking into consideration the advantages and disadvantages of each of the different options, including the primary goal of government, i.e. to reduce litter and landfill, a combination of Options 2 (wider enforcement of the current levy) along with Option 3.1 (increase in the levy to Rs5/bag) is supported. The additional revenue collected should be used, at least partially, for environmental awareness campaigns to educate consumers to reuse their bags more often.

It is clear that the status quo is not sustainable as there are too many plastic carrier bags in circulation and the number increases each year along with population and economic growth. Voluntary options were discarded at an early stage, as it was found that these would be insufficient to meet the requirements of at least a 50% decrease in the usage of plastic carrier bags.

1. PROBLEM DEFINITION

1.1 Introduction

*"Every piece of litter has a human face behind it."*²

*"A policy to reduce the use of plastic carrier bags should be introduced only where it will have a positive environmental impact and where practical alternatives are available."*³

*"...on our last mission to Rodrigues, I was impressed by the decision of the Rodrigues Regional Assembly to ban plastic bags. We realised that this ban has enabled the flourishing of small scale initiatives to replace plastic bags. After careful consideration and consultation we have decided to ban the use of plastic bags in Mauritius effective on 1st January 2016."*⁴

This regulatory impact assessment (RIA) aims at assessing policy options to reduce the use and especially the litter of predominantly single-use plastic carrier (shopping) bags in Mauritius.

This section provides a note on the scope of the regulatory impact analysis and identifies the parameters for the study as set out by the Ministry of Environmental Affairs.

High density polyethylene (HDPE), from which most single-use plastic carrier bags are made, has a high strength-to-weight ratio, which makes it a good choice for many storage containers because they can hold a lot yet are light.⁵

Consumers choose plastic bags far more often than paper or reusable bags to carry their purchases. Consumers like the fact that compared to paper and reusable bags, plastic carrier bags are convenient, highly functional, lightweight, strong, flexible, moisture resistant, cheap and hygienic. In addition, they are easy to store and reusable for multiple purposes.⁶

Carrier bags are commonly provided at the point of purchase, often with no transparent charge (although the charge is spread over the price of all goods supplied by the retailer) or at a charge that merely recovers the cost of the government levy (plus VAT), but not the actual cost of the bag itself. Consumers have little economic incentives or visible signal to remind them to take their own shopping bags with them when they go shopping.

Plastic carrier bags are also used for secondary purposes such as bin liners and

² Rob Krebs, a spokesman for the American Plastics Council.

³ BIO Intelligence Service (2011) 73.

⁴ Para. 118 of the Mauritius Minister of Finance's budget speech 2015-2016.

⁵ Camann (2010).

⁶ Burnett (2013) 4.

barrier bags (for transporting different products). The widespread use of plastic carrier bags has meant that they are ubiquitous in society and have the potential to be littered in numerous ways. Therefore their impact as litter needs to be considered. At present, the volume of carrier bags that end in landfills is significant and government wishes to reduce the volume occupied by plastic bags in landfill by 50%.

Plastic carrier bags are useful and provide a hygienic, odourless, waterproof, robust and convenient way of carrying goods. Because of their strength and durability plastics carrier bags can be re-used time and again, either for a similar purpose or a wide range of other uses.

In Mauritius, the predominant types of plastics used for plastic carrier bags are HDPE (thin single-use bags) and low-density polyethylene (LDPE), used for more durable carrier bags. The HDPE 'singlet' bag is predominantly used in one of two ways:

- (a) as a non-branded bag, used mainly in supermarkets, superettes, take-away food and fresh-produce outlets, smaller retail outlets such as service stations and newsagents, and fresh produce markets; and
- (b) branded bags, used mainly by large retailers.

The LDPE boutique-style bags are generally branded and are used by stores selling higher value goods, such as department stores and fashion outlets. Some major retailers, such as Winners and Shoprite, also use LDPE bags.

In 2014, Government's estimate of the consumption of all plastic carrier bags in Mauritius was 300 million HDPE and LDPE bags. No comparative estimates are available for earlier periods. It must be noted that both the producers and retailers have estimated the consumption of plastic carrier bags in Mauritius to be less than 50 million, of which an estimated 22 million are supplied by the major retailers, based on the volume they produced and/or sold, and also based on an independent survey of retailers' market share.

1.2 Definition of a plastic carrier bag

As they can come in different shapes and formats, there is no widely accepted definition to distinguish the different types of plastic carrier bags. However, for the purpose of this assessment, we consider:

- "Single-use" plastic carrier bags as the thin-walled, lightweight plastic carrier bags distributed at the till point and used to carry goods from supermarkets and other shops. They are generally made of high density polyethylene (HDPE). They are single-use in the sense that they are usually only used for one shopping trip although they may be used again for some other purpose such as for domestic waste. The most relevant parameter to

distinguish between single-use and reusable plastic bags is related to their thickness; usually a single-use carrier bag has a thickness lower than 30 microns. Thick (>30 microns) carrier bags are reused several times, typically four to five times, before being used as a bin liner. Removing these plastic bags may significantly increase the demand for bin liners, as well as other carrier bags.

- “Multiple-use” or reusable plastic carrier bags are made either from low density polyethylene (LDPE/LLDPE), which has a glossy appearance, or polypropylene (PP), a thermoplastic polymer that resembles canvas in appearance and is even more durable. They are usually sold at supermarket cash registers for a higher price than single-use bags.
- Biodegradable plastic carrier bags are generally made of bio-based materials and are capable of undergoing physical, chemical, thermal or biological decomposition under certain defined conditions. Compostable polymers are biodegradable and also meet certain conditions relating to the rate of biodegradation and impact on the environment.

The definition of a plastic carrier bag needs to be broad enough to ensure that all problematic lightweight plastic bags are addressed by any legislation.⁷ Single-use carrier bags perform a service that can be either foregone or replaced by a range of alternatives, some more environmentally friendly than others. Many single-use carrier bags are used for a secondary use, such as to replace bin liners.

Videos of the extrusion process of plastic sheeting for making plastic carrier bags can be found through the following links:

<https://www.youtube.com/watch?v=O7BLsexJn0c> (3 July 2015)

<https://www.youtube.com/watch?v=8CfL5xl2N1Q> (3 July 2015)

The definition of a plastic carrier bag for purposes of this RIA is:

a carry bag, the body of which comprises polymers in whole or part, provided by the seller for the carrying or transporting of goods, but does not include a carry bag which complies with prescribed design criteria.

The prescribed design criteria define features – the presence of any one of which indicating that the bag is not a ‘plastic carrier bag’ for the purposes of regulatory intervention. Products exempted from the definition of “plastic carrier bags” for regulatory purposes include bags:

- that form part of the product’s integral packaging;
- that are primarily used for packing fresh fruit, vegetables, meat and fish for weighing or hygienic purposes;
- that are designed for multiple use as a carry bag (i.e. greater than 10 re-

⁷ Gogte (2009).

- uses);
- with a surface area exceeding 3,000 cm²; or
- used for duty-free purchases at customs exit points.

Table 1 indicates a selection of products included and excluded from the scope of a “plastic carrier bag” for purposes of this RIA:

Table 1: Bags included or excluded from scope

Plastic bags included in RIA	Bags excluded from RIA
HDPE singlet-style bags LDPE singlet-style bags Bags from small and major retailers and informal traders Bags for take-away food Degradable bags (oxo-degradable and biodegradable)	Roll-on bags/produce bags Bait bags (no handles, integrated packaging) PP ‘green’ bags (multiple use) Bin liners (no handles, size)

The definition presented in this RIA has a focus on the purpose for which the bag will be used. The terms of reference for this RIA focus on single-use⁸ lightweight shopping bags.

Biodegradable and other degradable bags, which are not currently used in Mauritius to any significant extent, would not be exempt from the current proposals. If they were shown to meet appropriate Mauritian Standards and government was convinced that their use would decrease the environmental impacts associated with plastic carrier bag litter, both as regards landfill and marine litter, their exemption could be considered at a later time.

It is proposed that small businesses be subject to any regulatory change because they are the source of the major proportion of the plastic carrier bags in circulation. Bags from some small businesses, notably takeaway food stores, are also amongst those most likely to be littered.

1.3 Plastic carrier bags in Mauritius: facts and figures

Plastic carrier bags are popular with consumers and retailers because they provide a convenient, highly functional, lightweight, strong, cheap and hygienic way to transport food and other products. Plastic carrier bags are commonly provided at the point of purchase with no transparent charge other than the levy (although the charge is spread over the cost of all goods supplied by the retailer). Consumers have no economic signal to remind them to take other shopping bags with them. Plastic bags are also used for secondary purposes such as bin liners

⁸ Note that BIO Intelligence Service (2011) 23 defines a single-use bag as a bag with a wall thickness of 15 microns or less. This means that 35-micron bags, as are used by Winner and Shoprite, are technically multiple-use bags. However, for purposes of this RIA all LDPE and HDPE carrier bags are included.

and barrier bags (for transporting shoes, clothes or anything else).

In Mauritius, plastic carrier bags are predominantly high-density polyethylene (HDPE) and low-density polyethylene (LDPE). The HDPE 'singlet' bag is usually (but not always) a non-branded bag, used mainly in supermarkets, quick service restaurants and small and informal markets.

Although more than 47 million bags were imported in 2014. Only Rs530,770 were collected as customs duty. The applicable rate is 30%, indicating a total value of imports of only Rs1,769,233. Even if a very low value of only Rs0.80/bag is attributed to imports, this would indicate a maximum of 2.2 million carrier bags imported each year, or around 1.5% of total consumption.

Table 2: Excise duties (levies) collected on plastic bags

	2012	2013	2014
Levies collected	Rs41,837,192	Rs41,666,384	Rs43,464,772
Levies exempted	Rs6,000	Rs23,760	Rs128,150

This would equate to 20,418,596 bags in 2012; 20,833,192 bags in 2013 and 21,732,336 bags in 2014. In terms of Customs Rules, duty-free shopping bags are exempted from payment of the excise duty.

Although no historic data are available, producers and retailers both indicated that the original imposition of the levy led to a very significant decrease in plastic carrier bag usage, while the increase in the levy from Rs1 to Rs2 had a smaller, albeit still noticeable, impact. Retailers' information also shows that there had been no increase in plastic bags usage between 2013/14 and 2014/15, despite an increase in both GDP and population.

Although retailers' and producers' estimates vary slightly, both estimated that fewer than 50 million plastic carrier bags are used in Mauritius annually, as opposed to government's estimate of 300 million bags. It appears that government's figure may include all types of bags, including roll-on bags and bin liners, rather than carrier bags only. On the other hand, industry's and retailers' estimate would indicate consumption of only 38 carrier bags per capita, which is significantly below world average consumption. The total number of bags issued by retailers approximates the levy collected by the MRA. This appears to indicate that no levies are collected on any plastic bags provided by traders other than the major retailers. As a result of the significant discrepancy between government and industry figures, and in an attempt to have a figure that can be used in this study, total carrier bag consumption was estimated to be 150 million

bags per annum.⁹ It is estimated that at least 98% of these bags are HDPE or LDPE carrier bags, with less than 2% relating to multiple-use PP bags.

There are 18 plastics carrier bag producers in Mauritius. Some produce plastic bags exclusively, other as a major proportion of their business or as a smaller part of their business. Approximately 300 people are directly employed in the production of plastic carrier bags, although some of these workers may be reemployed elsewhere at the producers if plastic bags were banned. It is estimated that between 1,000 and 3,000 workers depend on plastic bags, informally by buying and selling the bags.

A role exists for government to address the market failures and especially the externalities associated with littered plastic carrier bags. Littered plastic carrier bags create a negative externality because it imposes costs on parties other than the person who disposed of it, as the cost of littering is not borne by the person doing the littering. These costs can include environmental damage, loss of aesthetic value and damage to recreational equipment. Government intervention targeted at reducing littering of plastic carrier bags will produce a more efficient allocation of resources than the market.

Information asymmetries exist in the market for plastic bags, as consumers do not have full information on the goods they are purchasing. The cost of plastic carrier bags is amortised across the cost of groceries generally, making them appear free of charge. This pricing arrangement provides no monetary incentive for consumers to reduce their bag usage.

1.4 Prior actions

Discussions on the possible banning of plastic carrier bags in Mauritius were first mooted in 2002. Producers then proposed the introduction of biodegradable bags, which was originally accepted by government, but later rejected on the basis that it was difficult to monitor and enforce.

Product taxes attempt to influence consumer behaviour by the imposition of a levy that reflects some or all of the external costs associated with the product that are not initially included in their price. In 2006 the Government imposed a levy of Rs1 (plus VAT) on all carrier bags meeting the requirements of the definition above. This had an immediate and significant impact on the volume of bags consumed, as consumers now had to pay for the bags for the first time. When the levy was first introduced, there was little government communication with the population and it was left to supermarkets to inform the public – all supermarkets made a joint effort and published a single poster that was put up in all outlets across Mauritius. The levy had a very significant impact on the

⁹ This is a liberal estimate and the actual figure would rather be lower than higher, and could be as low as 100 million units.

number of bags sold, with retailers estimating a decrease in sales of anything between 50% and 80%. However, it led to a smaller overall decrease, as small and informal traders were not affected.

In 2010 the levy was increased to Rs2 (plus VAT), but this did not have a significant impact on the usage of plastic bags, as consumers were already paying for the bag and as the price was such that it did not affect behaviour, unlike the original resistance to paying anything.

Following the introduction of the original levy and the consequent decrease in the number of plastic bags in the market, one of the two companies recycling plastics in Mauritius left the market. When the levy was increased to Rs2, the other recycling company also closed down and moved to Madagascar.

In 2014 Government banned the use of plastic carrier bags in Rodrigues. However, all stakeholders indicated that a distinction must be drawn between Mauritius and Rodrigues. Rodrigues had no plastics industry and the only packaging industry was the basket industry. Imported plastics directly competed with the basket industry hence the ban could be seen as a means to protect this industry and halt imports of plastic bags. The structure of the market is also completely different and there is hardly a supermarket, with most people growing their own fruit, vegetables and chicken and catching their own fish. The effect of the ban of plastic carrier bags in Rodrigues can therefore not be used as a model for banning similar bags in Mauritius.

Both producers and retailers have indicated that there is not proper enforcement of the current legislation and the major problem relates to the “little black bag”, i.e. an unbranded HDPE bag with a thickness of <15 microns. Technically these bags are subject to the levy, but this is not enforced. These bags constitute the major proportion of visible plastic carrier bag litter in Mauritius. Producers have indicated that all bags should be traceable back to the producer, i.e. the producer’s name and contact details should be printed on every bag. They opine that this will assist with enforcement.

1.5 Literature review

Cognisance was taken of several RIAs and LCAs conducted in different jurisdictions, including in Australia, Canada, the EU, Ireland, New Zealand and the US. These analyses have significantly informed the cost and benefit analyses of this RIA. Significant internet research was also undertaken to obtain additional information. This was done in addition to interviews with affected stakeholders.

Rwanda, a small developing country, was one of the first countries to completely ban the use of polyethylene plastic bags in 2007. No alternatives were available at the time. Its government also provided tax incentives to companies to

purchase equipment that would help recycle plastic or manufacture environmental friendly bags.¹⁰

Following the ban of plastic carrier bags by a number of local governments in California, US, the state of California imposed a ban on the sale of plastic carrier bags in 2014, but it only came into effect in July 2015, giving retailers and consumers time to adjust. At the outset it will only apply to large retailers (at least five stores) and pharmacies, but in June 2016 it will extend to all providers. Consumers will still be able to reuse their own bags purchased before the ban. Washington, DC, also banned plastic carrier bags, but it resulted in decreased turnover and decreased employment at retailers, as consumers moved their business to retailers just outside of Washington. The same happened at local authorities in California before the state-wide ban.

Following significant flooding in Bangladesh attributed in part to plastic carrier bags blocking drains, Bangladesh banned the use of plastic bags. Plastic carrier bags have been replaced with cotton and jute bags, as well as big reusable non-woven PP bags. It should be noted that because of the low cost of labour in Bangladesh, the cotton and jute bags are supplied at a cost to the consumer very similar to the cost of plastic bags.

A number of local authorities in New Zealand have started to ban the sale of plastic carrier bags. However, as consumers may still use their own plastic carrier bags and as the bans have only been in place for a very limited period of time, it is too early to determine the effect of the ban.

South Africa has banned plastic carrier bags with a thickness of less than 30 microns and adopted legislation prohibiting the supply of plastic carrier bags without charge to the consumer. Consumers now pay approximately Rs1.30 per bag (plus VAT), which represents the cost of the bags to the retailers. No levy is in place. Retailers also started marketing “green bags”, i.e. multiple-use bags of different raw materials. When the levy and the ban were first introduced, it resulted in a significant decrease in the use of plastic bags, but because the cost is so low, overall usage of bags did not decrease as much as anticipated.

Ireland imposed a levy of €0.15/carrier bag, which led to a bag usage decrease of nearly 90%. However, over time the effect of the levy was eroded and usage started to increase again. Once the levy was increased, usage decreased again. Current legislation makes provision for the levy to be increased annually in line with the inflation rate plus an additional amount.

1.6 Economic impacts of plastic bags

There are several impacts associated with plastic carrier bags. These can be

¹⁰ <http://www.thedeliciousday.com/environment/rwanda-plastic-bag-ban/>

divided into economic, social and environmental impacts. **Economic impacts** consider the physical production cost and price of the carrier bags to producers, retailers and consumers; and the effect any regulatory intervention would have on producers, retailers and consumers, as well as on employment, administrative and enforcement costs, and the change in public revenue from levies. It also considers the actual costs incurred under the environmental impact, including the actual costs of cleaning up the environment, solid waste disposal and landfill costs.

Environmental impacts include the effect on greenhouse gases (GHG), the global warming potential (GWP) of the product and the effect of litter on the marine and agricultural environments. **Social impacts** include the visual impact of litter and the effect this has on citizens, including on their behaviour.

Considering all economic, environmental and social aspects is a key issue of this RIA. Many proponents of the plastic bag ban spend the majority of their time on environmental impacts and offer little substantive analysis as to the economic impacts of a plastic bag ban or tax.¹¹ To avoid a too narrow analysis, all of the above impacts must be assessed.

In determining the economic impacts, cognisance must be taken of the extent to which consumers reuse any plastic carrier bags. In the UK, studies found that more than 80% of consumers reuse their plastic bags.¹²

Proponents of plastic carrier bag bans argue that banning plastic bags saves public money by reducing litter, solid waste disposal and recycling costs. However, research has shown that while plastic bag restrictions may reduce visible litter, it does not necessarily lead to decreased solid waste disposal or recycling costs.¹³ For example, in San Francisco, despite a ban on plastic bags, the budget for solid waste collection rose by more than 30% over a 5-year period,¹⁴ and despite a levy imposed on bags in Brownsville, Texas, solid waste expenses rose in each of the two years after the introduction of the levy. In Washington, DC, during the first two years after a levy was imposed, 60% and 52% of inspected enterprises did not comply with the law.¹⁵ In Austin, Texas, the local authority spent as much money on a public awareness programme to reduce carrier bag use after the introduction of a ban as it had spent the previous year on the collection of *all* litter.¹⁶

At present, a large proportion of all plastic carrier bags are produced in

¹¹ Green and DeMeo (2013) 23.

¹² <http://www.eco-ethical.co.uk/plasticbag.html> (1 July 2015).

¹³ Burnett (2013). Note that any increase in solid waste disposal costs might be attributed to other factors, including increased waste of other products or increased costs for performing the same functions as previously (e.g. increased fuel costs).

¹⁴ Burnett (2013) 7.

¹⁵ Burnett (2013) 10.

¹⁶ Burnett (2013) 12.

Mauritius by as many as 18 different companies. Of the eight biggest plastic carrier bag producers in Mauritius, at least five concentrate on plastic bags, while it also constitutes an important product for at least two others. This means that seven of the top eight plastic bag carrier producers in Mauritius are likely to close down if a ban is imposed on all plastic carrier bags, or to severally curtail their product range, with a direct impact on employment.

Industry has explained that plastic carrier bags are like one of the four wheels of a car. Without all four wheels, the car cannot move and the whole company will close down. Should these companies close down, there would be a consequent loss in direct and indirect employment. Estimates of the number of jobs that would be lost vary between 300 and 3,000.

The impact on the consumer must also be determined. This will be done by calculating the current cost to the consumer vis-à-vis the costs consumers would incur if they had to pay a higher levy or buy alternative packing material.

The impact on small businesses would also have to be considered. Indications are that small traders will suffer disproportionately more than the big retailers as “spur-of-the-moment” purchases will decrease if no cheap alternative is available for plastic carrier bags and could significantly impact small business employment.

One of the main concerns is that current legislation is not properly enforced and that levies are only paid on the bags sold to supermarkets, which are thicker products (>35 microns) that can be reused several times, whereas the real problem lies with the bags of <15 microns on which no levies are paid. These smaller, lighter bags are more susceptible to littering, as they are easily blown around by even the lightest of zephyrs.

Industry is further of the opinion that PET (plastic bottle) litter is a significantly bigger problem than plastic bag litter and that Government should rather focus on this problem.

Another problem industry identified is that the levy has to be paid to the MRA at the end of each month based on the volume of bags sold during the month, while producers often only get paid after 60-90 days. Considering that the levy is approximately 10 times the price of a bag, this means that the producers have to carry a cost 10 times their monthly production. This has a major negative impact on business.

Plastic carrier bag producers add 30%-40% value to the imported raw material and operate at profit margins of 5%-10%. Government will lose the tax receipts on salaries and corporate tax commensurate with any decrease in the industry's profitability and employment, while it will also have an impact on the balance of trade and the current account. Export sales to Reunion will also be lost.

Plastic bag littering undermines the “clean” image of countries like Mauritius and

the presence of plastic bags littering the environment can be the difference between travellers opting to stop in an appealing village or drive through because it lacks appeal.¹⁷

Litter in scenic places can have negative impacts on tourism. This is particularly the case for plastic bags because of their visibility.¹⁸ Degraded scenic areas are less likely to attract visitors, as confirmed by studies in Ireland.¹⁹ The Irish levy on plastic bags led to a reduction of 90% in the number of bags used, with an associated gain in the form of reduced littering and negative landscape effects.

Industry, however, is of the opinion that improper disposal of plastic carrier bags is not an issue in Mauritius and that most of the visible carrier bag litter stems from dogs searching for food in garbage, especially where garbage boxes don't have doors, and from mistreatment by the garbage collection lorries (driving without tarpaulin over the garbage). Both of these issues can be addressed with relative ease and without regulatory intervention.

This RIA did not take into account the fact that government takes responsibility for provision of public rubbish bins (to prevent litter by providing a more appropriate means for disposal of unwanted items) and clearing up litter in public places, as these activities will continue regardless any regulatory reform on plastic bags and as it would be difficult to determine the cost specifically attributable to plastic carrier bags.

1.7 Social impacts of plastic bags

1.7.1 Introduction

Several aspects of the impacts and consumption of plastic bags relate to community views and aspirations. The social aspect of the problem is important to many in the community, and for some people this can be more important than the direct harm caused by plastic bag litter.

1.7.2 Community participation in reducing plastic bag consumption

There is community concern about plastic bags in the environment, particularly in the form of litter. People are concerned about the impact of plastic bags in public places, parks and on beaches and want these areas to be free of such litter. At the same time, single-use plastic carrier bags are highly valued by some consumers for transport and reuse purposes.

Community interest does not mean that plastic bags should be placed as a higher

¹⁷ Whitelaw (2014).

¹⁸ Environmental Protection and Heritage Council (2008) 19.

¹⁹ <http://www.colby.edu/personal/t/thtieten/litter/htm> and <http://www.environ.ie/en/Environment/Waste/PlasticBags/>

priority than other policy issues to be considered by the government, but that the development of policy solutions should consider social impacts as well as environmental and economic impacts.

1.7.3 Loss of aesthetic values and reduced public amenity

It is difficult to place a value on the beauty and integrity of public spaces. Litter makes places look unclean, unattractive and uninviting. This applies equally to urban, rural and more natural landscapes. Communities expect Government to provide safe and clean locations for leisure activities.

Once a public place is littered, perceptions thereof can alter as “litter begets litter”. If action is not taken to reduce litter levels, people perceive that an area is not cared for and that its cleanliness is not valued, thus reducing the social inhibition against littering. Urban public places with continuing high levels of litter can become perceived as being dirty and unsafe to visit, leading to changes in the demographics of people visiting them.

1.7.4 Plastic bags as an awareness raiser

Worldwide, many environmental associations have promoted plastic carrier bag awareness and reduction campaigns for two reasons: First, there are the harmful effects of litter, particularly on wildlife; and secondly, there is a view that action on plastic bag litter increases awareness of other, more important, environmental issues.

1.7.5 Impacts on recreational equipment

Plastic debris, including plastic carrier bags, can damage vessels’ propellers and clog seawater intakes and evaporators, causing engine failure and costly repairs. This type of disablement can be life-threatening if a boat is stranded a long way from land. No data are available on the proportion of disablements due directly to plastic bags in Mauritius.

1.7.6 Plastic bags as a symbol of the throw-away society

In recent years there have been changes in community attitudes about litter and Australia has reported a trend in community connecting litter to the wider environmental issues of waste management, illegal dumping and recycling; and growth in people’s concern that litter is damaging to the environment.²⁰

Because of their high visibility, people see plastic bags as symbols of wasteful

²⁰ Environmental Protection and Heritage Council (2008) 20.

consumption.

1.8 Environmental impacts of plastic bags

Plastic carrier bags as an environmental issue is an international concern. Some countries have banned or plan to ban lightweight bags completely (Bangladesh, China, California state, Rodrigues and some municipalities in Australia, New Zealand and the US), while various countries have introduced plastic bag taxes or prohibited the sale of free bags (Hong Kong Ireland, Malta, Taiwan, South Africa) and some have recently considered plastic bag taxes or are still considering them (England, Scotland and Spain).

Although plastic bags are a very efficient means of carrying goods, the very large numbers of plastic bags used amounts to a wasteful use of resources compared with using long-life bags. It has been estimated that the energy consumed for each plastic carrier bag for its life cycle is equivalent to about 13.8 millilitres of crude oil.²¹ If 300 million bags were currently being used in Mauritius annually, this would equate to equivalent of 4.14 million litres of crude oil consumption.

Life cycle analysis (LCA) shows that over a two-year period (the estimated life of a “green” bag) five “green” bags would be sufficient to replace 1,040 plastic bags, which could significantly cut down on crude oil usage for plastic bags.²²

Government has indicated that at present, Mauritius uses around 300 million plastic carrier bags per year. With a population of 1.33 million, this would give a figure of 225 bags per person per year.

Visible plastic carrier bag pollution is not a major issue in Mauritius and it appears that most of the visible pollution is caused either by animals accessing household waste that is not properly secured, or from bags blowing off refuse trucks on the way to landfills. All stakeholders have indicated that plastic (PET) bottles are actually more of a problem than plastic carrier bags. However, government has indicated that plastic carrier bags cause a problem as virtually all bags end in landfill.

Even with the best engineering and management systems, there is a range of social, environmental, and economic problems associated with landfills. From an environmental perspective, plastic bags slow decomposition rates, produce trace constituents associated with odour problems, and produce methane and carbon dioxide, the two most important contributors to climate change. In addition to toxic substances from landfills, burning even small quantities of plastics such as bags mixed with food scraps releases dioxins, a diverse range of chemical

²¹ Environmental Protection and Heritage Council (2008) 21.

²² Environmental Protection and Heritage Council (2008) 21.

compounds known to be extremely toxic to humans.²³

Single-use bags contribute to litter and may cause negative effects on wildlife, particularly in the ocean. Paper litter can also cause negative impacts, although some studies estimate these tend to be shorter-lived as paper bags decompose much faster than plastic bags.²⁴ Plastic is bad for the environment and has a very long half-life, which is generally regarded to be between 48 and 60 years, although some authors indicate that plastics do not properly disintegrate for up to 1,000 years.²⁵ Globally it is estimated that 1,000,000 birds and 100,000 marine animals and turtles die each year from entanglement in or ingestion of plastics.²⁶ Studies often refer to marine debris or plastic debris rather than plastic bags per se. Although plastic carrier bags are only the sixth biggest component of plastic marine debris with an arguably low impact compared with other plastic debris such as discarded fishing nets and lines, this impact should not be underestimated.

Birds, sea turtles and marine mammals can swallow debris such as plastic food packaging and plastic bags, which interfere with their ability to eat, breathe, and move. This is of greatest concern when it impacts endangered species such as whales, seabirds and turtles. Data on plastic ingestion by sea turtles indicates that they are unable to distinguish synthetic materials from prey. Researchers believe young turtles mistake plastic bags and other synthetic materials for squid and jellyfish. Internal blockages caused by plastic bags can make turtles more buoyant, thus impeding their ability to dive deep to feed and avoid predation.

Many examples of impacts on individual marine animals have been documented, but there is no reliable method for extrapolating this data to the overall impacts of debris in the open ocean. It is also difficult to determine whether debris has originated from ships or from land. Specific examples of the detrimental impact plastic carrier bags have had on the environment include the following:

- A Northern Territory veterinary practice reported that it treats one turtle a month for illnesses caused by plastic bags.
- 30 marine turtle strandings in Queensland were studied in 2007 and it was found that 23 were caused by the ingestion of marine rubbish, including common plastic shopping bags.

²³ Whitelaw (2014).

²⁴ Oregon Department of Environmental Quality “Land quality: Solid Waste”, available at <http://www.deq.state.or.us/lq/sw/wasteprevention/bags.htm>. Note that this view is not supported by other studies, which shows that once paper bags enter landfill, they also last for many years because of the way landfills are managed to contain garbage.

²⁵ Note that Camann (2010) 39 has indicated that the estimate of 500 to 1000 years is usually just to make the point that plastic bags would take a long time to degrade, but that there is no scientific proof that it would take that long to degrade.

²⁶ <http://www.eco-ethical.co.uk/plasticbag.html>, (5 July 2015). Tullo (2015) indicates that this is mostly from *fishing nets* and not from plastic bags.

- A Mink whale was stranded in France with plastic bags in its stomach.
- Two sea turtles died after eating plastic bags off the coast of Brazil.
- Necropsies of three turtle species from Southern Brazil found that 60% had swallowed plastic bags, that white and transparent plastic bags were the main debris ingested, and that 13% of the green turtles had died as a result of the ingestion of those bags.
- A 1997 study found that at least 267 species worldwide had been affected through entanglement and ingestion of marine debris.
- A farmer near Mudgee, in NSW, Australia, found eight plastic bags in the stomach of a dead calf.
- In 2000 India reported that local cows were dying at the rate of 100 per day as a result of discarded plastic bags.
- In Irbid, Jordan, 7% of goats at abattoirs contained plastic in their stomachs
- Many animals necropsied in Dubai died from the ingestion of plastic bags and plastic rope.
- The US National Oceanic and Atmospheric Administration found that plastic bags may wrap around living corals and smother them.
- On the Chilean coast it was found that 47% of floating marine debris was plastic bags.
- In 2006, the International Coastal Clean-Up found that plastic bags represented 9% of all litter found.²⁷
- In a 2014 global study during which more than 5,000 tons of marine debris was collected, it was found that plastic bags (all types, including non-carrier bags) constituted the sixth most prevalent waste item after cigarette butts, food wrappers, bottles, bottle caps, and straws.²⁸

Marine biodegradation tests reveal “important and interesting differences” in behaviour of polyethylene (PE) compared to biological plastic such as PLA (polylactic acid) and PHA (polyhydroxyalkanoate) polymers, showing that PE had a half-life of 48 years compared to 24 years for PLA. Switching from polyethylene to PHA reduced the marine half-life from 48 years to 11-months.

It is estimated that a total of 1.2 trillion plastic bags are used worldwide each year, or roughly 2,300,000 bags *per minute*. It is not clear whether this relates to all plastic bags or only single-use carrier bags and in the US, single-use plastic carrier bags make up only 26% of all plastic bags. Plastic carrier bags typically only constitute somewhere between 0.3% and 1.0% of the volume of landfill.²⁹

Many plastic carrier bags are currently re-used as bin liners for household rubbish and often also for other purposes before they end their lives as bin

²⁷ National Environment Protection Council Service Corporation (2008) 12-13.

²⁸ Tullo (2015).

²⁹ <http://www.eco-ethical.co.uk/plasticbag.html>, (5 July 2015).

liners. Reducing the availability of plastic carrier bags may lead to increased use of heavier gauge bin liners, which have a larger impact on the environment. The Irish Government reported an 80% increase in bin liner and an 84% increase in disposable nappy bag purchases.³⁰ Nevertheless, the levy resulted in a reduction of over one billion plastic carrier bags per year.³¹ In Australia, carrier bag sales decreased by 560 million units, while bin liner sales increased by 38 million units.

Since many of the alternatives to carrier bags are much bigger and heavier, this may result in additional transport costs. A major Irish retailer remarked that it required three times as many trucks to transport its alternative bags than was previously required for plastic carrier bags.³² This could cause more air pollution and road congestion.

Banning plastic bags may not reduce the landfill, as people will simply buy alternative packaging, made of heavier plastic or paper. These products may cause more landfill, GHG and have a greater GWP.³³

Unless the number of bags used in Mauritius is significantly reduced, the impact will increase annually as plastic bags take very long to disintegrate, meaning that each new bag simply adds to the total of all bags previously sent to landfill.

1.9 Underlying drivers

1.9.1 Market failure

Most of the environmental impacts of plastic bags are externalities associated with **littering**. Externalities are the unintended impacts of an activity experienced by persons other than those directly involved in the activity. A littered plastic bag creates a negative externality because it imposes costs on parties other than the person who disposed of it, including environmental damage, loss of aesthetic value, cost of cleaning up the litter and damage to recreational equipment.

The use of plastic carrier bags entails negative environmental externalities (littering, greenhouse gas emissions, contamination of air, soil and water, and impacts on ecosystems and human health) that are not reflected in the prices paid by the end-users, who normally only pay the levy and no cost for the bag itself. Consumers are not encouraged to limit their use of plastic carrier bags because they obtain them for a very low price from retailers and for free at informal markets. Retailers and traders are not encouraged to limit the provision

³⁰ Burnett (2013) 14.

³¹ It should be noted that bin liners are significantly bigger and heavier than carrier bags and the net effect, although still significant, would have been smaller.

³² <http://www.eco-ethical.co.uk/plasticbag.html>, (5 July 2015).

³³ <http://www.bagtheban.com/learn-the-facts/environment>, (accessed 3 July 2015).

of plastic carrier bags because they are inexpensive. The low (or no) price distribution prevents consumers from being aware of the associated impacts of their use, and creates the perception that they represent an infinite resource.

Government's role in addressing the market failures lies in the externalities associated with littered plastic carrier bags. Government intervention targeted at reducing the usage and littering of plastic carrier bags will produce a more efficient allocation of resources than the market, providing that the benefits of intervention outweigh the costs.

The market for plastic carrier bags also contains information asymmetries, as consumers do not have full information on the goods they are purchasing. Other than the levy, the cost of plastic bags is amortised across the cost of groceries generally, making them seem free of charge and providing little incentive for consumers to reduce their bag usage. The market failure continues as bags are being littered because they are insufficiently valued. The cost of the littered bag is borne by the community generally through governments and volunteers, and not by the litterer.

A retailer charge could address the market failure by pricing bags to better take into account the environmental externalities associated with plastic bag litter. This higher price of bags should be reflected in reduced litter rates.

Another market failure relates to **recycling** and it is linked to a missing market in Mauritius. Plastics are recycled more than any other material, but the overall plastic recycling percentage is still low compared to other materials.³⁴ Recycling would reduce both the feedstock required to produce plastic and the energy required during the production process. As awareness increases, the amount of plastic that ends in landfills worldwide has decreased in recent years.³⁵ However, no recycling opportunities currently exist in Mauritius as both plastics recyclers have closed down.

Further market failures relate to low consumer awareness of the problem of litter and the overall environmental benefits of reusing plastic carrier bags or switching to multiple-use bags; and retail practices, where retailers are not encouraged to limit use of plastic carrier bags as they are both inexpensive and assist with quick turnaround at till points.³⁶

1.9.2 Regulatory and implementation failure

The current levy requires producers to pay a levy of Rs2 at the end of the month for each bag produced and sold during that month. The same levy also applies to any imported bags. It also requires retailers to charge consumers the levy plus

³⁴ Camann (2015) 39.

³⁵ Camann (2015) 39.

³⁶ BIO Intelligence Service (2011) 54.

VAT, for a total cost of Rs2.30 per bag.

The first regulatory failure is that the levy is only collected on bags sold to and through the major retailers. No enforcement takes place at small retailers and informal markets, where plastic carrier bags are provided free of charge. No levies are collected from small producers, especially on production of the lightweight (<15 micron) bags, which are the major cause of plastic carrier bag litter. If the levy was enforced on all plastic carrier bags, the use of carrier bags would decrease significantly, with a commensurate decrease in litter and landfill, as well as a significant increase in government revenue.³⁷ In this regard it is important to note that although government estimates that plastic carrier bag consumption is around 300 million bags per annum, which should result in levies of Rs 600 million per annum, the total levies collected amount to only Rs 45 million per annum. Even if industry's estimates of 50 million bags per annum were correct, the levies should amount to at least Rs 100 million per annum.

The second regulatory failure is the requirement that the levies be paid in the same month that production or sales took place, regardless of when the producer receives payment for its product. This has the effect of placing a huge financial burden on producers, who often have to pay levies upfront long before they receive payment. Considering that the levies are often as much as ten times the actual value of the bags, this may have contributed to small producers not paying any levies.

1.10 Alternatives to plastic carrier bags

Although Mauritian plastic carrier bag producers have indicated that there are no viable alternatives to the bags, studies and experience in other jurisdictions have found a number of possible alternatives for single-use plastic carrier bags. Generally, these centre around a limited number of options:

- Biodegradable single-use products;
- Multiple-use carrier bags, generally made from a thicker material or woven from PP; and
- Paper bags.

Many people believe that paper is a more environmentally friendly product than plastic and therefore believe that replacing plastic carrier bags with paper bags is a good idea, while others propagate the use of degradable plastic bags made from starch-polymers or the addition of certain additives to plastic polymers. However, life cycle analyses (LCAs) of the different products show a different story and it is important that the real impact of the different products be

³⁷ The impact analysis below shows that wider enforcement would lead to a decrease of an estimated 64 million plastic carrier bags (to 86 million) and increase revenue from the current Rs 45 million to Rs 172 million. No information is available on the cost of landfill.

understood before any policy decisions are made. Paper, specifically, has a very high carbon footprint and there would be an ecological disaster if plastic carrier bags were replaced with paper carrier bags.

Several studies have considered the environmental impacts of conventional single-use plastic bags, different degradable or compostable plastic carrier bags, paper bags and cotton or jute bags.³⁸ In considering the number of bags of each type an average family would need to purchase for one year's groceries, these studies found that paper, LDPE, non-woven PP and cotton bags should be reused at least three, four, 11 and 131 times respectively to ensure that they have lower global warming potential than conventional HDPE carrier bags that are not reused.³⁹ Including assumptions on the reuse of HDPE bags as bin liners, these figures will increase to four, five, 14 and 173 respectively. The different bags' impact (based on the aforementioned number of reuses) was determined to be as follows:

Table 3: Environmental impacts of carrier bags

Impact category	HDPE bag	HDPE pro-de-gradant	Starch-poly bags	Paper bags	LDPE bags	Non-woven PP bags	Cotton bag
Global warming potential (kg CO ₂ eq.)	1.578	1.750	4.184	1.381	1.385	1.536	1.570
Abiotic depletion (g Sb eq.)	16.227	19.331	15.734	6.697	16.452	19.626	8.785
Acidification (g SO ₂ eq.)	11.399	12.276	18.064	9.367	5.868	7.237	16.114
Eutrophication (g PO ₄ eq.)	0.775	0.839	7.240	1.260	0.515	1.041	1.760
Human toxicity (kg 1,4 BD eq.)	0.211	0.228	1.151	0.812	0.140	0.218	0.383
Fresh water aquatic ecotoxicity (g 1,4 BD eq.)	66.880	72.146	199.955	37.551	37.345	33.408	135.706
Marine aquatic ecotoxicity (k g 1,4 BD eq.)	126.475	134.264	282.754	61.164	62.362	100.808	258.477
Terrestrial ecotoxicity (g 1,4 BD eq.)	1.690	1.797	8.173	6.180	1.465	3.629	18.458
Photochemical oxidation (smog) (g C ₂ H ₄ eq.)	0.531	0.581	1.232	0.489	0.278	0.375	0.550

Source: Edwards and Fry (2001), adapted to the current RIA

However, if all conventional HDPE bags were reused as bin liners the number of uses would rise to 7 for the paper bag, 9 for the LDPE bag, 26 for the PP bag⁴⁰ and 327 for the cotton bag. This is quite feasible for the LDPE and PP bags but less likely for the cotton bag. This did not take into consideration composting, which would reduce the paper bag GWP by 9%, but could cause significant rises

³⁸ See the technical background material in Annexure A.

³⁹ Although it is shown that the bags would have to be reused these numbers of times the study did not suggest that this would be feasible. See also Burnett (2013); BIO Intelligence Service (2011) 30.

⁴⁰ A study in the US has found that a multiple-use bag is only used 7.81 times on average – see Burnett (2013) 14. This may be because they become dirty, fear of contamination, or wear and tear from washing.

in aquatic and terrestrial eco-toxicity.

Although reusable bags are more eco-friendly they also spread bacteria and disease. These bags need to be properly cleaned or washed on a regular basis.⁴¹ Any bag that is reused, even if inspected, has a higher risk of contamination. The safest option is to use bags that are used only once to carry groceries, while the most risky option is to use bags that are reused multiple times and with months between washes.⁴² A University of Arizona study found that 50% of all reusable bags contained food-borne bacteria, such as salmonella, while 12% contained *E. coli*, indicating the presence of fecal matter and other pathogens. A Canadian study found bacteria build-up on reusable bags was 300% higher than what is considered safe. This problem can become even worse if the bags are stored in a hot, humid place like the boot of a car, because these conditions can cause bacteria to grow 10 times faster. The reusable bag may be dangerous not only to its owner, but also the general public, because the bags can leave bacteria on store checkout counters and conveyor belts.⁴³

According to the National Center for Public Policy Research (NCPFR), several leading authorities on the subject say paper bags and canvas attract cockroaches and other disease-carrying insects. In many climates where disease-carrying bugs are more prominent, paper and canvas bags contain elements that attract these insects. When are stacked and stored, as in grocery stores, these bags provide a perfect environment for bugs to crawl in and lay eggs.⁴⁴

Table 4: Advantages and disadvantages of different types of bags⁴⁵

Type	Advantages	Disadvantages
“Green” non-woven PP bags	Very durable and cost effective. Can be branded to promote business or reinforce consumer’s ‘good’ behaviour: contributes to changing consumer behaviour towards packaging	Oil-based non-renewable plastic product that is often not recycled because it is contaminated by the time it is disposed. Unless it is recycled it breaks down in the environment and contributes to environmental toxins. More expensive.
Jute/hemp bag	Very durable and cost effective. : can be branded to promote business or reinforce consumer’s ‘good’ behaviour : contributes to changing consumer behaviour towards packaging	More expensive than non-woven PP ‘green’ bags

⁴¹ Gonzaga (2014).

⁴² Van Leeuwen and Williams (2013).

⁴³ Burnett (2013) 14.

⁴⁴ MacKay (2014).

⁴⁵ Whitelaw (2014) 6.1.

100% compostable bags	100% biodegradable and 100% compostable – they can be thrown into a compost bin and will fully degrade within weeks: or they can be safely fed to the birds or fish. Does not require consumers to change their habits. The bags and containers appear identical to oil-based plastics: The food containers cost much the same as current plastic and plasticized food containers : Microwavable without releasing toxins commonly releases when microwaving plastics : Retains heat (e.g. coffee cups or food bowls)	Considerably more expensive than HDPE carrier bags. : They cater to the ‘throw away’ disposable mind set rather than changing consumer behaviour
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Table 5: Impact of different types of bags⁴⁶

Bag type	Material consumption	Climate change	Energy consumption	Water use	Litter marine impact	Litter aesthetics	Beneficial disposal options
HDPE	&&&	&&	&&	&	&&&&&&	&&&&&&	Reuse as garbage bag/ recycle at major supermarkets
LDPE	&&&	&	&	&	&&&&&&	&&&&&&	Reuse as garbage bag/ recycle at major supermarkets
Reusable LDPE	&&&&	&&	&&&	&	&&&&&&	&&&&&&	Reuse as garbage bag/ recycle at major supermarkets
Paper bag	&&&&&&	&&&&&&	&&&&&&	&&&	&	&&&	Recycle in household recycle bin
Reusable paper	&&&&&&	&&&&&&	&&&&&&	&&&	&	&&	Recycle in household recycle bin
Non-woven PP	&	&	&	&	&&	&	None - landfill
Reusable PET	&	&	&	&	&	&	None - landfill
Reusable nylon	&	&	&	&&	&&&	&	None - landfill
Reusable calico	&	&	&	&&&&&&	&	&	None - landfill
Starch plastic	&&&&	&&	&&	&&	&&&	&&&	Commercial compost/ reuse as garbage bag
Reusable starch plastic	&&&&	&&	&&	&&	&&&	&&&	Commercial compost/ reuse as garbage bag
Oxo-degradable	&&&	&&&	&&&	&&	&&	&&&	Reuse as garbage bag
PLA	&&&&	&&	&&&	&&&	&&&	&&&&&&	Commercial compost/ reuse as garbage bag

⁴⁶ O’Farrell (2009).

Summary of findings: paper bags performed the worst; recycled content lowered overall impact of bags; reusable PET bag achieved greatest environmental benefits.

Cost of bags

The European Commission considered the different costs of alternative bags and found the following:

Table 6: Price of different types of bags

Type of bag	Price/1,000 (€)	Price/1,000 (Rs)
Single-use HDPE bag	€8.31	Rs315
Multiple use LDPE bag	€17.87	Rs679
Single-use biodegradable bag	€82.87	Rs3,149
Single-use paper bag	€97.58	Rs3,708
Woven PP bags	€452.73	Rs17,204
Cotton bags	€1,111.25	Rs42,228
Jute bags	€1,161.52	Rs44,142

Source: European Commission (2013) 74.

1.11 Problem statement

1.11.1 Introduction

Plastics have many properties that make them a popular choice in packaging applications. Their light weight, durability, flexibility, cushioning, and barrier properties make plastic carrier bags ideally suited for efficiently containing and transporting many types of products from the shop to home without leaks, spoilage, or other damage.

The problem with plastic carrier bags is their impacts on the environment and society. Plastics generally have a negative image in comparison with other materials, in particular with regard to their perceived impact on the environment and use of resources.

Most plastic bags are designed to be used once and are then discarded. Plastic bags have become a symbol of excessive consumption. Reducing plastic bag use is seen as something simple that everyone can do, as well as a way to increase community awareness of other issues affecting the environment.

The very features that make plastic bags so useful contribute to their impacts on the environment. Because they are so light, they are easily carried by the wind, leading to terrestrial and marine litter and decreasing the visual amenity of urban, rural and natural vistas.

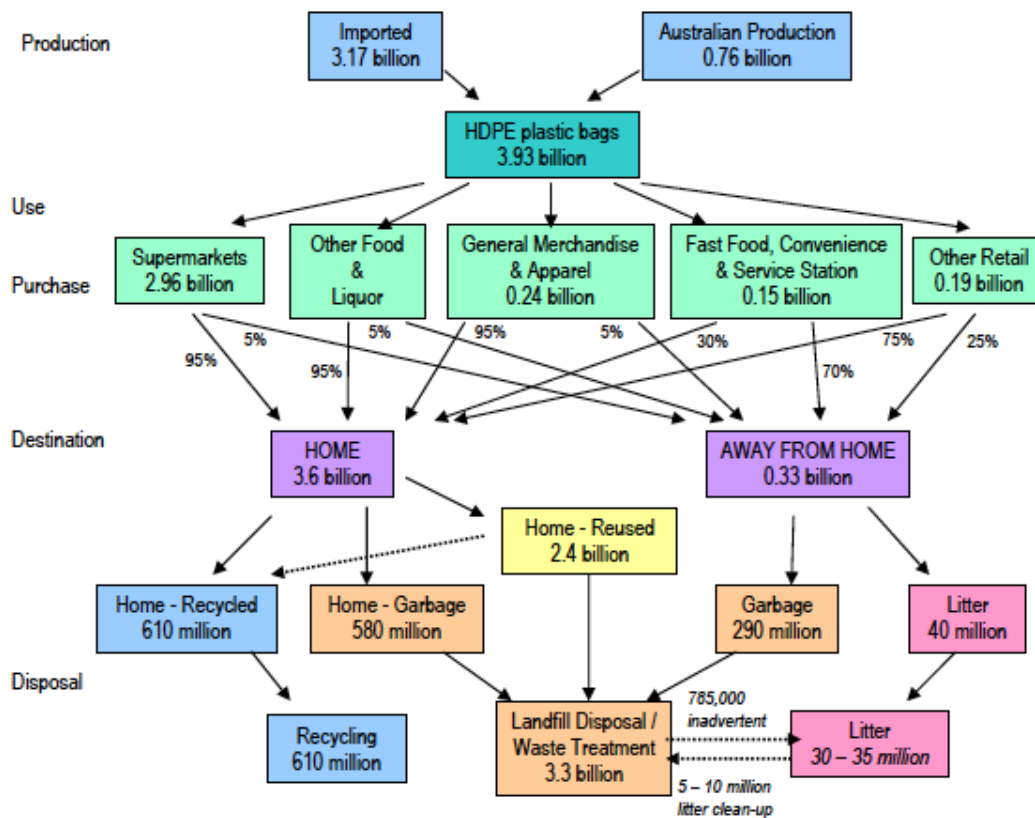
1.11.2 Plastic bag consumption in Mauritius

In 2006, government imposed the first levy on plastic carrier bags in Mauritius. The levy was set at Rs1 per bag, on top of which VAT was levied. In 2010 the levy was increased to Rs2 (plus VAT). This levy is paid over monthly by the producers, and is also recouped from consumers by the major retailers. Government estimates that a total of 300 million bags were used in Mauritius in 2014, whereas plastic carrier bag producers and the major retailers set the figure at around 50 million only. The government figure appears very high, while the retailers' and producers' figure appears too low. In a developed market such as Australia, supermarkets supply 75% of all plastic carrier bags. Mauritius, however, has a much larger small trader and informal market than Australia. Retailers have indicated that they supply a total of approximately 22-24 million plastic carrier bags per year. Even if it is assumed that a figure of 30 million applies, and it is assumed that the supermarkets supply only 20% of the bags in Mauritius, it appears that the maximum number of bags in circulation in a year would be around 150 million. For purposes of this RIA, this figure will be used.

Interviews with two major retailers have indicated that the use of plastic carriers bags has decreased significantly since the introduction of the levy, but that the major impact was felt when the levy was first introduced, rather than when the levy was increased. The rationale for this is that consumers had to change their perception from having always received something for free and then having to pay for it, as opposed to an increased from Rs1 to Rs2. One of the retailers indicated a decrease of around 80% in the number of bags it supplied since the year before the levy was introduced to 2014, whereas the other indicated a decrease of around 50%.

The following figure shows plastic bag flows in Australia. Although the situation in Mauritius would be somewhat different, this does provide a useful indication of who supplies bags and what happens to those bags:

Figure 1 - Summary of Plastic Bags Flows 2007



Source: The Allen Consulting Group Phasing Out Lightweight Bags Supplementary Analysis February 2008

In Mauritius, a significant proportion of all plastic carrier bags, estimated to be between 50% and 80% of total usage, are provided by small or informal traders.

1.11.3 Plastic bags and litter

1.11.3.1 Introduction

Traders, whether major retailers, small or informal traders, introduce plastic bags into the market. Consumer choices about reuse or disposal determine where plastic bags go after they leave the shop. While most plastic bags end up in landfill, some bags are littered, both in marine and terrestrial environments. Estimates of plastic bag litter vary in different countries, from 0.25% (Ireland, after the introduction of a levy) of all litter collected to 2% (US). It is further estimated that single-use plastic carrier bags are reused, mostly as bin liners, between 40% (US) and 80% (EU) of the time. No recycling of plastic bags take place in Mauritius. There are no data available to indicate which percentage of plastic bags, if any, is incinerated with or without energy recovery.

Because of their low weight and ability to be carried on the wind, carrier plastic bags can be dispersed by the slightest of breezes. The resulting wide dispersal and lodgement in places that are difficult to access (such as tree branches, drain

grills and fencing) makes cleaning up plastic bag litter costly and time consuming. Even as they break down, plastic bags leave varying size fragments. Littered bags and fragments may end up in highly sensitive natural environments and impact species already under stress.

Although numerically less significant than other litter types, plastic bags are a prominent component of the litter stream because of a combination of three elements:

- High visibility
- Persistence
- Ease of dispersal

Littered plastic bags are easily seen in the urban or natural environment because of their size, shape, colour, mobility and longevity. Bags accumulate while others are still breaking down, increasing the overall negative impact on the environment.

An Australia study concluded that all plastic bag types were prone to being caught by the wind and dispersed long distances, but that the lighter bags tended to be blown around easier and in lighter winds and would snag more easily than heavier bags.

On a practical note, visual inspection has shown a very low incidence of plastic carrier bags in the Mauritian environment and it does not appear to be a significant problem at present. In fact, while there is significant evidence of other forms of plastic waste, especially plastic bottles and caps, very few examples of plastic carriers bags are evident and of those, at least 90% were <15 microns.

1.11.3.2 Degradable plastic bags

Some stakeholders have promoted degradable plastic bags as a means of reducing the environmental impacts of plastic bag litter, even if it would not reduce the actual number of bags in use. However, even degradable bags remain in the environment for some time when littered, and they do not provide a comprehensive solution to the plastic bag litter problem. The amount of time degradable bags will remain in the environment if littered is unclear. The most common form of degradable bags, oxo-degradable bags (those which contain a prodegradant that catalyses faster breakdown) break into fragments in the environment and may take a very long time to completely degrade. Biodegradable bags can be expected to remain as litter for some time as in most cases they are unlikely to be subject to the biologically active conditions most conducive for rapid degradation. If consumers believe that bags will degrade, they may not care as much if it is littered. This may increase the litter incidence.

Lifecycle analysis indicates that long-life, reusable bags give better overall

environmental performance than single use bags, regardless of degradability.

1.11.3.3 Sources of plastic bag litter

Most plastic carrier bag litter results from inappropriate disposal by consumers. People may leave bags behind especially where suitable infrastructure (such as bins) is not available. Plastic bags taken into outdoor settings generally have greater potential to become litter than plastic bags taken into the home and used for a secondary purpose such as bin liners.

Inadvertent litter is usually associated with plastic carrier bags that are wind blown from sources such as bins, uncovered loads on moving vehicles, kerbside waste collection, transfer stations, and material recovery facilities. On Australian beaches lightweight plastic bags outnumber the heavier bags by eight to one.

1.11.3.4 The link between plastic bag consumption and litter

In Australia, plastic litter items were 19% of the total litter objects, with plastic bags comprising 7% of plastic items, or 1.3% of all litter items. Litter constituted around 1% of all plastic bags provided, that is, one in 100 bags ended up as litter (and 85 in every 100 ended up in landfill). In Australia, voluntary efforts have seen significant reductions in plastic bag consumption, but litter levels have not changed significantly. This may reflect the fact that the major reduction in bag use was in the supermarket sector.

In Mauritius, the majority of bags given out in supermarkets are taken straight home so are less likely to end up as litter. The hypothesis is that littered bags tend to result from purchases from retailers other than the major supermarkets (i.e. those retailers who collect the levy from consumers) and where there has been a significant decrease in the supply of carrier bags. If this were the case, then the supply of carrier bags likely to be littered did not substantially diminish as the levy is not enforced on the bags provided by small and informal traders.

1.11.4 Nature of the plastic bag transaction

Since being introduced into supermarkets and retail outlets, plastic bags have quickly become part of shoppers' expectations regarding the service provided by the retailer. However, as plastic bags are not an integral packaging item, they are not essential to the integrity of the product purchased. They assist the carrying of an item, and are part of the shopping experience, but are not essential thereto.

While most plastic bags appear to the consumer to be provided free of charge (or against payment of the levy only), the consumer is actually paying for them because the price of bags is spread across all goods on sale. Research has shown

that the hidden nature of this cost provides no monetary incentive for consumers to reduce their use.⁴⁷ Consumers who choose to use a reusable bag are not seeing a reduction in the price of their groceries, so there is no economic incentive to use green bags. They are, in effect, still sharing the cost of plastic carrier bags they no longer use or want.

A family that opts out of paying for plastic bags by bringing their own bag to a retailer that charges explicitly for plastic bags (at say, RS2/bag) would save around Rs970.⁴⁸ Most consumers are unable to make this saving because the majority of shops do not charge visibly for bags.⁴⁹

Consumer behaviour observations carried out in 2007 reveal that placing a visible charge on plastic bags has a profound impact on the consumption of plastic bags. Hyder observed that in stores that do not charge for single-use bags, 72% of transactions involved a single-use bag, made either of HDPE, LDPE or paper. This dropped to 27% in stores that charge for plastic bags.⁵⁰

A key part of the plastic bag transaction is that it is the consumer who transports the bag to the place where it is disposed of or littered. Bags are disposed of in a variety of ways that can have economic, social and environmental costs, whether disposed of correctly or littered accidentally or deliberately.

1.11.5 Waste and litter management

The costs of cleaning up current levels of plastic bag litter are generally borne by governments, volunteers and the general community, and not by those who litter. This is a market failure.

1.11.5.1 Landfill

The majority of plastic bags used, even those reused by consumers, end up in landfill. Research shows that the major impact associated with the disposal of plastic bags was as litter, not their impact at landfills. Plastic bags make up less than 2% of the total landfill.

1.11.5.2 Clean up and infrastructure

Plastic bag litter has direct social and economic impacts on communities. Where litter is allowed to build up, there are often flow-on social and economic effects in the local community. These relate to the aesthetics of public places and how

⁴⁷ Environmental Protection and Heritage Council (2008).

⁴⁸ This is based on 150 million bags spread over 1,330,000 people and assuming an average household size of 4.3, giving 485 bags per family.

⁴⁹ This excludes the levy.

⁵⁰ Hyder (2008).

the community perceive them. These factors can play a role in determining how, or even whether, public spaces will be used by various sectors of the community.

Local and central government spend significant amounts each year on litter management in general, including on the maintenance of litter bins and rubbish removal. It has been estimated that storm water gross pollutants are composed of approximately 20% litter (plastic, paper and metal) and 80% organic material (such as leaves and twigs). Any reduction in plastic bags would have an effect on storm water volumes.

While litter management costs are significant, it is difficult to determine the percentage attributable to plastic bag litter, or indeed whether costs of clean-up would be reduced if all plastic carrier bag litter were eliminated. However, even though these figures are not restricted to the plastic carrier bag component of litter, plastic carrier bags comprise a highly visible and mobile component of litter and thus help prompt the need for litter prevention and clean-up activity.

1.12 Consultation and expertise

A study on the production and consumption patterns of plastic carrier bags, their related impacts and the impacts incurred by the different policy options to reduce their use was performed in preparation of this impact assessment. This study was conducted by Economist Associati and BKP Development as part of the EU-sponsored “037-14 Mauritius – Trade Regulatory Impact Assessment” programme, between 8 April and 30 July 2015.

The preparation of this report was preceded by a public consultation launched on 17 April 2015 via the MCCI website. The consultation ran until 30 July 2015. Very few responses were received.

In addition, direct consultations were held with the MCCI, plastic carrier bag producers and supermarkets, while some informal consultations were held with members of the public.

Both the producers and the supermarkets indicated that the major problem was that the current regulation was not enforced on most of the plastic carrier bags currently distributed in Mauritius. They therefore proposed that wider enforcement, rather than regulatory intervention, be used as a solution to decrease the number of plastic carrier bags used in Mauritius and to increase the levy collected. They also indicated that wider enforcement would increase the value of the bags, leading to a significant decrease in plastic carrier bag litter.

1.13 Objectives of plastic bag policy intervention

Regulatory intervention is proposed with regard to plastic carrier bags to reduce the use of such bags by at least 50% within a period of two years and to decrease

the volume of plastic carrier bag landfill and litter by 50% over the same period.

In essence, the objectives of government regulation are to:

- Reduce the impacts of plastic carrier bags, including the volume of litter and landfill;
- Satisfy community expectations for government intervention;
- Balance consumer choice with environmental protection; and
- Redress the market failure associated with plastic bag usage.

2. STAKEHOLDER CONSULTATIONS

As part of the RIA requirements and best practice, stakeholder consultations were conducted at the outset of the report research. Due to the short timescale available for completion of the full RIA, very little time could be afforded to stakeholders to provide their responses and to have consultations.

Feedback was obtained through electronic submissions and meetings with various stakeholders. Meetings were held with plastic bag producers, major retailers, the MRA as well as informally with consumers.

The opinions and issues detailed in this section are representations of the consultation feedback. They are not necessarily the conclusions of the RIA.

2.1 Reaction to wider application of the levy

The larger producers and the major retailers were all in favour of a much wider application of the levy to also apply to the small black plastic carrier bags provided free of charge to consumers by small and informal traders. The levy has not reduced the use of these bags at all and virtually all visible plastic bag litter relates to these bags.

Another idea to balance out the plastic bag levy was the notion of extending it to paper bags in order to capture the retail segment of the bag industry. Paper bags have a significantly bigger impact on the environment in general and on landfill in particular. A levy on paper bags would better convey the message that consumers should use less packaging material.

Exemptions to the levy should be very limited to prevent complicating enforcement.

It was noted that in California, the ban on the provision of single-use plastic bags was imposed only on large retailers and pharmacies on 1 July 2015, but that it would be extended to small retailers on 1 July 2016. This gives the smaller retailers and consumers more time to adjust.

An increase in the levy may also convince more people to buy multiple-use bags, which have been shown to have a lower environmental impact.

2.2 Reaction to levy increase

An increase in the plastic bag levy was met with general approval, although there was no agreement on what the levy should be. The flexibility of an increase in the levy while maintaining consumer choice, ensuring hygienic transport of products, and protecting jobs was supported. Both producers and retailers indicated that an increase in the levy should be accompanied by an awareness

programme or education on the environment (and not on plastic bags only).

A concern arising about the plastic bag levy was what to do with the revenue from the levy. Producers, retailers and consumers alike indicated that the levy should be ring-fenced for environmental projects, including awareness programmes.

2.3 Reaction to outright ban

Producers, retailers and consumers all oppose the ban, especially if insufficient time has been provided for adjustment. Several of the smaller producers have recently invested in new machinery and still owe significant amounts on these machines, which cannot be used for other purposes. These investments would be lost with no possibility of recouping the investment, unless they can find buyers for the equipment. Producers have also pointed out the increased negative impact other products would have on the environment, business and employment, including indirect employment. An outright ban, if enforced on all market segments, would have a very adverse effect on small traders, as people not carrying their own multiple-use bags with them will simply skip buying anything from the small traders.

Retailers have indicated that the options such as paper bags are not viable and cannot be obtained or produced in Mauritius. They indicated that although organic bags might provide a long-term solution, this would be difficult to monitor. Retailers indicated that they already provided consumers with boxes and that all these boxes are currently used, so this is not an option that can be further expanded. They also pointed out that shoplifting becomes an increased concern if consumers supply their own bags. Retailers also pointed out that plastic bottles are a significantly bigger concern from a litter and landfill perspective than plastic bags.

Consumers are concerned about their options as they find plastic bags convenient and cheap, and as most consumers reuse the plastic carrier bags, which they would not be able to do with paper bags.

For government, enforcing a ban will decrease the administrative burden, but it would also lead to decreased revenue and may lead to increased costs at landfills, as paper bags take up nine times the space of plastic bags.

3. DATA AND METHODOLOGY

3.1 Introduction

This section of the RIA provides information regarding the data sourced as part of the RIA and identifies some of the associated constraints. With regard to methodology, specific sections for the methodologies employed with regard to analysis are not presented in this section, but rather are detailed within the individual supplementary research section.

3.2 General note on data

Data availability is a major concern in Mauritius. There is a very significant gap between the number of bags government on the one hand, and producers and major retailers on the other hand, estimates are sold each year. Government has indicated a figure of 300 million bags, whereas producers and major retailers have all indicated that the figure would be below 50 million bags.

Estimates for the baseline scenario were based on the most recent population and GDP growth rate forecasts.

Estimates for the effect of the proper implementation of the current levy, an increase in the existing levy and a complete ban have been based on similar exercises undertaken in other countries, taking cognisance of differences in market structure with Mauritius.

3.3 Impacts

Inefficient use of resources

In general, the production and use of plastic carrier bags contributes to the depletion of natural resources and the increase of waste. Due to their short life span, they rapidly enter the waste stream in high numbers. The inappropriate disposal and end-of-life treatment of plastic carrier bags exacerbate this. No plastic bags are actually recycled in Mauritius, as both plastic recyclers have closed down.⁵¹

The bulk of plastic bags collected through municipal or private waste collection systems is instead used for landfill (there are no data available to indicate whether any bags are incinerated for power generation). If it is assumed that 99% of all plastic bags end up in landfill (with 1% ending up as litter), and given that the total energy (calorific value) used to produce one HDPE bag is about 0.39 MJ (around 100 Watt-hour), it is estimated that the equivalent of 57.9

⁵¹ Plastic bag producers recycle in-factory waste, but not outside plastic waste. Source: interviews.

million MJ (16.1 GWh) is landfilled every year in Mauritius, representing an estimated 234,800 tons of greenhouse gas emissions. However, if plastic carrier bags are incinerated for power generation, a portion of this wasted energy can be recouped, along with a significant saving in landfill.

The energy generated and recovered⁵² calorific values, and, assuming complete combustion, the resulting estimated CO₂ emissions, per kilogram of bags for the various carrier bags, are estimated as follows:⁵³

Table 7: Energy generated and recovered and CO₂ emissions per kg of bags

	Paper bags	HDPE bags	Degradable bags
MJ generated/kg of bags	17.7MJ	40.0 MJ	19.6 MJ
MJ recovered/kg of bags	4.07MJ	9.20 MJ	4.51 MJ
CO ₂ emissions/kg of bags (grams)	1,650	3,150	1,360

Therefore, using the above information, Table 7 shows the recovered energy and resulting carbon dioxide emissions per 1,000 bags combusted with 23% energy recovery. This is based on product weights of 55.2 g for paper bags, 8.5 g for plastic carrier bags and 8.9 g for degradable bags.⁵⁴

Table 8: Energy recovery and CO₂ emissions per 1,000 bags

	Paper bags	HDPE bags	Degradable bags
Recovered energy (MJ)	224.66 MJ	78.20 MJ	40.14 MJ
CO ₂ emissions (g)	91,080 g	26,775 g	12,104 g

Table 8 below shows the same information based on the total number of carrier bags used in Mauritius (150 million).

Table 9: Energy recovery and CO₂ emissions with incineration⁵⁵

	Paper bags	HDPE bags	Degradable bags
Recovered energy (MJ)	33,699,600 MJ	11,730,000MJ	6,020,000MJ
Recovered energy (MWh)	9,358 MWh	3,257 MWh	1,672 MWh
CO ₂ emissions (tons)	13,662 t	4,016 t	1,816 t

If all plastic carrier bags were incinerated rather than landfilled, this would

⁵² It is estimated that 23% of the energy generated will be captured: Chaffee and Yaros (2007) 41.

⁵³ Chaffee and Yaros (2007) 41.

⁵⁴ Brendle Group (2012).

⁵⁵ For purposes of this analysis it was assumed that there would be a one-on-one replacement of plastic carrier bags with paper bags.

provide only 0.14% of Mauritius' current annual energy consumption.

Littering

The same properties that have made plastic bags commercially successful – low weight and resistance to degradation – have also contributed to their proliferation in the environment. They escape waste management streams and accumulate in natural habitats, especially the marine environment. Because they last so long, the cumulative number of plastic bags littered increases over time.

Plastics make up most of the marine litter. Some studies have shown that plastics, mostly PET bottles, caps, straws and plastic bags, constitute up to 70% of total marine litter. Worldwide, a large number of different species are known to have suffered from entanglement or ingestion of marine litter. In the North Sea, the stomachs of 94% of all birds contain plastic, and fragments of plastics were found in the stomachs of 35% of fish in the North Pacific, with an average of two pieces of plastic ingested per fish.⁵⁶

Upon degradation, plastic bags break into small pieces, ending up as micro-particles that pollute soil, water and the sea-bed. Small organisms can use plastic debris to drift long distances across oceans, where they may become invasive, while the accumulation of plastic debris on the seabed can inhibit gas exchange between the sediment layers and the overlying waters, thus depriving organisms of adequate oxygen supply and altering the make-up of life on the sea floor.⁵⁷

Besides impacts on the environment and the fishing industry, littering also has economic and social costs in terms of wider loss of tourism and the need for litter clean-up activities. In Luxembourg, which approximates Mauritius in physical size,⁵⁸ annual costs for cleaning littering only along the national roads and highways were estimated to around €1 million.⁵⁹

3.4 Stakeholders and the impact on them

Mauritian citizens:

Plastic carrier bags affect Mauritians in many ways. First, the production of carrier bags cause air, water and soil pollution. Second, litter can lead to animal deaths, loss of fish stocks, possible ingestion of contaminated fish and public health impacts. Third, government has to spend a lot of money on cleaning up litter, whereas the money could have been spent better on other social programmes.

⁵⁶ European Commission (2013) 16.

⁵⁷ European Commission (2013) 17.

⁵⁸ Luxembourg covers 2,586 km², while Mauritius covers 2,040 km².

⁵⁹ European Commission (2013) 17.

Plastic bag producers

There are 18 plastic bag producers in Mauritius. Some of them produce plastic carrier bags exclusively, while others produce the bags as part of a wider range of products. There are several SMEs producing plastic carrier bags exclusively that have invested in the necessary machinery only recently and still owe money to the banks extending the loans for the capital investment. These SMEs will be the hardest hit by any action to either include the bags that currently do not attract the levy within the scope of the levy or by any ban. They have no alternatives and the machinery cannot be used for other purposes. This would result in the closure of these SMEs, with their full complement of employment.

The impact will be less on companies that produce a range of products. The smaller the plastic carrier bag turnover as a percentage of total turnover, the lower the impact of any regulatory intervention. However, some producers have cautioned that a ban on plastic carrier bags could force more producers into the remaining market for other types of bags (e.g. bin liners), and that this could negatively affect the overall health of the industry, as too many players cannot exist in such a small market.

Plastics recyclers:

Plastic carrier bags in Mauritius are overwhelmingly veered towards landfilling, which causes problems of its own, as space is at a premium. There are no plastic carrier bag recyclers in Mauritius.

Public authorities:

Public authorities are affected by the increased costs and administrative burden associated with plastic carrier bag consumption, in terms of litter clean-up costs as well as enforcement of prevention measures aimed at reducing bag consumption.

Tourism industry and local businesses:

Littering incurs an aesthetic cost to society. This may have a negative impact on local businesses, especially the tourism industry.

Fishing industry:

Marine pollution may result in decreased fishing stocks, which may lead to smaller catches, as well as extra costs due to damaged equipment.

Traders:

Large retailers provide consumers with plastic bags against payment of the levy and VAT, i.e. Rs 2.30/bag. If these bags are banned, retailers would have to make a different form of bag available, which could be multiple-use woven PP bags, cloth bags or paper bags. All of these bags are significantly more expensive, weigh much more and take significantly more space in store. This could have negative impacts both on consumers, who would have to pay more for their bags, and on retailers, who would have to allocate more space to the bags and pay more to have the bags delivered.

Small and informal traders provide consumers with carrier bags free of charge. If the bags were to be banned, this would significantly affect the volume of trade conducted by these traders, as consumers are likely to make less “spur-of-the-moment” purchases if carrier bags are not available. It would also add to consumers’ costs if they now had to buy a different type of bag from a trader.

4. DESCRIPTION OF POLICY OPTIONS

4.1 Introduction

Between government, plastic carrier bag producers, the major retailers and an analysis of policy options considered in other jurisdictions, various policy options were placed on the table. These are the following:

- Retain the status quo
- Increase the scope of enforcement to ensure that the levy is paid on *all* plastic carrier bags and not only those provided by the major retailers
- Increase the levy to Rs5 or Rs10 per bag
- A minimum exit price for all plastic bags that recover the full cost of the bag and not only the levy
- Ban bags with a thickness of less than 20 (or 30) microns
- Complete ban of all HDPE and LDPE plastic bags
- A voluntary agreement amongst retailers to reduce the supply of plastic carrier bags
- A public awareness programme, including education on waste, litter and reusable alternatives
- Litter management and enforcement
- Replacing single-use HDPE bags with degradable or compostable bags
- Making reusable grocery bags conveniently and inexpensively available in retail stores

4.2 Options used in other countries

Plastic carrier bags have been **banned** in the following places:

- South Australia and Tasmania, Australia
- Bangladesh
- Canada: Leaf Rapids, MB; Fort McMurray, AB; Nain, NFLD; and Huntington, QB municipalities (Toronto considered a ban but decided against it)
- Rwanda
- US: California state; Washington, DC; Brownsville, TX; Austin, TX; Boulder, CO; Dallas, TX; Chicago, IL

In the US, the bans were phased in. Thus, a ban was imposed in California State on 23 September 2014, but only came into effect on 1 July 2015 for large grocery stores, pharmacies and other food retailers, and will only come into effect on 1

July 2016 for convenience markets, liquor stores and other small retailers.⁶⁰ In California, plastic bag usage had dropped from 30.8 billion in 2000 to 13.1 billion in 2012, i.e. *before* the ban took place, as local governments **restricted access** to plastic carrier bags.⁶¹

In Tasmania, consumers are allowed to reuse their bags despite the ban, i.e. they may take their own bags when shopping, but the retailers may no longer stock or provide any single-use plastic carrier bags.⁶²

Some jurisdictions have **banned thin bags**, although the actual thickness varies between jurisdictions. The following countries have banned bags with a thickness below the indicated value:

- Australia (bags <45 microns)
- Bulgaria (bags <23 microns)
- South Africa (bags <30 microns)

In South Africa, over and above banning thin bags, regulation provides that carrier bags may not be provided free of charge, but government has not set a minimum price and it is up to retailers to decide. The typical price for a large carrier bag is R0.46, or around Rs1.25 (plus VAT).

In Australia, 90% of retailers have signed up with the government's **voluntary program** to reduce plastic bag use.

A law that went into effect in Taiwan in 2014 requires restaurants, supermarkets and convenience stores to **charge** customers for plastic bags and utensils. It has resulted in a 69% drop in use of plastic products.⁶³

Denmark imposed a **tax** of DKK 22/kg of plastic bags, which is included in the price to retailers. This led to a 66% reduction in plastic bag usage. In Denmark, Government has collected around DKK170 million to date and has used that money to fund many environmental projects.⁶⁴

In Quebec, Canada, plastic carrier bag usage decreased from 2.2 billion bags per year to 1.0 billion over a 3-year period following the introduction of a CAD0.05/bag **levy** imposed by the retailers.⁶⁵

When one retailer in the US started a plastic **recycling** program where plastic bags, dry-cleaning bags and plastic shrink-wrap could be recycled in all its stores, the program resulted in 12,400 tonnes (approximately 1.8 billion bags) of plastic being recycled from stores and distribution centres in 2010, while at another retailer it was hoped that simply teaching packers how to properly pack

⁶⁰ Brennan (2014).

⁶¹ Sweeney (2014).

⁶² <http://www.plasticbags.tas.gov.au/faq>.

⁶³ Gogte (2009) 366.

⁶⁴ Gogte (2009) 367.

⁶⁵ Bruemmer (2015).

bags could result in a saving of 1 billion bags per year.⁶⁶ Another US retailer started reducing the plastic content in its bags, reusing bags, and recycling unwanted bags. It estimates that over a 2-year period these actions saved the use of one billion HDPE bags.⁶⁷

Another option is converting to COG-based degradable bags, such as ECO-grade bags. They are made from an entirely new compound, called Calcium Olefinic Glucosate. If littered or lost, these bags degrade to a non-toxic residue within 240 days of exposure to sunlight, which can then further biodegrade. They are approved for recycling with plastics. They produce 34% less greenhouse gases in pre-production, and use less energy in manufacturing than plastic or paper bags, yet cost the same on a weight basis as plastic bags.⁶⁸

A **voluntary effort** by retailers in parts of the US has seen the number of bags sold reduce by 346 million between 2006 and 2008, a 26% decrease, and a further decrease by 48% between 2006 and 2009, simply by encouraging consumers to reuse their old bags and reduce the amount of waste.⁶⁹

A British retailer implemented a **reward programme** whereby consumers were rewarded for reusing their bags. They estimate that more than 3 billion bags have been saved over a 3-year period as a result.⁷⁰ Another UK-based retailer **hid PE bags from view, offered cheap multiple-use bags** to customers, and asked if customers needed bags. It noticed an initial 1,100% increase in sales of reusable bags, along with a decline as customers started reusing them. At the same time, PE bag usage dropped by 45%-50%.⁷¹

Research has shown that a **levy on all bags** is more effective than a levy on plastic bags only, as the levy serves as education. Thus, whereas a levy on plastic bags only reduced plastic bag consumption by 37%, a levy on both plastic and paper bags reduced plastic bag usage by 52%.⁷²

4.3 Options discarded at an early stage

The options below were considered but not shortlisted for a detailed assessment:

4.3.1 *Voluntary agreement of the retail sector*

A voluntary agreement is unlikely to meet with consensus in the short term, as

⁶⁶ Caliendo (2013).

⁶⁷ Camann (2010) 102.

⁶⁸ Weisberg.

⁶⁹ Camann (2010) 90.

⁷⁰ Camann (2010) 95.

⁷¹ Camann (2010) 97.

⁷² Brendle Group (2012).

the supply and branding of bags is part of the overall competition between the retailers. It would not make sense to restrict the voluntary agreement to the large retailers only, yet it is expected that small retailers will have more difficulties in implementing the commitment, therefore entailing a high administrative burden in relation to the results.

This option was further discarded as it was found that a large proportion of plastic bags is distributed through entities other than the large retailers and that these distributors would not be bound by the retailers' code of conduct. Accordingly, while such code of conduct may result in a decrease in the use of plastic bags provided by the large retailers party to the code, the impact would be relatively small and would be insufficient to meet the objective of decreasing the use of plastic bags by 50%.

4.3.2 Awareness campaign

Awareness-raising measures by government and non-government agencies (such as the MCCI and the Mauritius Retailers' Association) may contribute to heightened community awareness of and concern about the number of plastic bags used and causing litter in Mauritius, as well as to limiting the negative impact both on the environment and on tourism.

Increasing consumers' awareness may lead many consumers to choose reusable bags, with the result that, overall, plastic bag use will decline and that sales of alternatives such as polypropylene 'green' (multiple-use) bags will increase.

The 'Four Rs' – reduce, reuse, recycle, and recover – are very important for understanding, measuring, and improving sustainability. However, the awareness campaign was discarded as it was found that such awareness campaign would be very costly, while it would be unlikely achieve the objective of reducing plastic carrier bag usage by 50%. This does not mean that it cannot be used in conjunction with any of the other policy options.

4.3.3 Replacing single-use HDPE bags with degradable or compostable bags

While replacing single-use HDPE bags with degradable or compostable bags would have a significant positive impact on the environment, it would be very difficult to enforce the policy to ensure that all bags supplied are indeed degradable or compostable. In addition, it would serve no educational purpose if one plastic carrier bag is merely replaced with another. There is no guarantee that this option would actually decrease plastic carrier bag consumption by 50%.

4.3.4 Litter management

This option targets litter reduction through a combination of behaviour change, enforcement and infrastructure improvements. It is designed to deliver a net economic benefit to the community – its cost is lower than the value of the bags it aims to remove from the litter stream. Such programme would include the enhanced enforcement of landfill regulations; supplying adequate numbers of properly designed rubbish bins in public places; improve education and awareness and change consumer behaviour, through media and public events, promotion of new enforcement requirements, and advisory campaigns on how to minimise inadvertent litter; direct litter clean-up, through grants to community organisations and local groups to clean up sensitive sites, such as coastal areas and near landfills; improvements to infrastructure, through grants to support better placement and design of public rubbish bins, and grants to local governments to ensure bins are cleared regularly. There is no guarantee that this option would actually decrease plastic carrier bag consumption by 50%.

4.3.5 Mandatory retailer charge at point of sale

This option is a mandatory charge for single-use carrier bags at the point of sale, which would include not only the levy, but also the cost of the bag. Retailers would be required to apply a minimum charge to consumers who choose to use a plastic carrier bag, with the revenue (other than the levy and VAT) to be retained by retailers.

This option would utilise a market instrument (a visible price for a bag) to encourage consumers to bring their own carry bags and avoid paying the charge. The charge would be recorded for the consumer through inclusion of the price on the customer's receipt. While it may be relatively easy to enforce at the level of the large retailers, enforcement at smaller retailers and the informal market would be very difficult as there is no bookkeeping in especially the informal sector.

4.3.6 Supply of cheap multiple-use bags

Under this option, retailers would be required to provide consumers with cheap multiple-use shopping bags, such as unwoven PP bags or cotton bags. This option was discarded as the cost on retailers would be significant and there is no guarantee that this option would actually decrease plastic carrier bag consumption by 50%.

4.4 Options shortlisted for scenario analysis

The RIA has considered various policy options, including both regulatory and

non-regulatory. Options that were considered include:

- Option 1: the current status, i.e., the situation with no regulatory intervention
- Option 2: the current status, but with wider enforcement to ensure the levy is collected on all plastic carrier bags and not only on those supplied by the large retailers
- Option 3: an increase in the current levy of Rs2/bag
- Option 4: a ban of all plastic bags

4.4.1 *Option 1: status quo*

In this "do-nothing" option, the current situation would continue. There would be no additional policies and measures aiming to limit the consumption of single-use plastic carrier bags. This analysis is based on historical data on production and imports; stakeholder estimates of level and share of plastic carrier bag production, imports and use (including reuse); population data (historical and projected); current policies and regulations; and voluntary actions in place.⁷³

Information from major retailers shows that the number of plastic bags provided by them has decreased marginally over the past year and there is no reason to believe that the trend would be reversed. At the same time, information shows that while the levy actually collected decreased by 0.8% from 2012 to 2013, it increased by 5.4% from 2013 to 2014.

Population growth is very low at just under 0.5%,⁷⁴ while the GDP growth rate is currently at 3.7%.⁷⁵ In view of the above and considering that plastics in general and plastic bags specifically have been receiving increased bad press internationally, the assumption is made that if no action is taken, plastic carrier bag consumption will either remain stable or increase by not more than 1% per year over the next five years.

Under current regulation, which includes a levy of Rs2/bag levied at the point of ex-warehouse for producers and at point of importation for importers, and which is recovered from consumers by the major retailers, the use of plastics bags has decreased significantly since the introduction of the original levy. Estimates of the decrease vary from 50% to 80%, but this relates only to plastic bags provided by the major retailers. Considering that the major retailers only provide approximately 22-24 million of the estimated 150 million bags, it would

⁷³ BIO Intelligence Service (2011).

⁷⁴ Source: Working Paper NRFE 05/11: Projections for the Resident Population of the Island of Mauritius from 2009/10 to 2034/9. Note that http://www.indexmundi.com/mauritius/demographics_profile.html has placed population growth rate of 0.66% in 2014.

⁷⁵ <http://www.tradingeconomics.com/mauritius/gdp-growth-annual> (accessed 21 July 2015). Note that http://www.indexmundi.com/mauritius/gdp_real_growth_rate.html placed growth at 3.4% in 2013.

indicate an overall of decrease of between 14% and 40%.

Considering projected population growth of 0.5% and GDP growth of 3.7% for the period 2015 to 2020, and bearing in mind the recent trend in plastic bag consumption and the international bad press for plastics, it is estimated that without any regulatory intervention and the current level of enforcement the consumption of plastic bags will increase to 153.8 million by 2020.⁷⁶

4.4.2 Option 2: Status quo, with wider enforcement

Retailers provided an estimated 22-24 million plastic carrier bags to consumers between July 2014 and June 2015. Since the figure has not changed much over the past 30 months, it would be a reasonable assumption that the supply during calendar year 2014 was similar. MRA information shows that in 2014, a total of Rs45,229,526 was collected in levies, equivalent to 22,614,763 bags. Indications are therefore that levies are not collected on bags other than those supplied by the major retailers, even though all plastic carrier bags are subject to the levy.

According to Customs statistics 47,110,140 bags were imported under tariff subheading 39.23.21.10, while the statistics also indicate that 21,839,623 bags were produced domestically under the same tariff heading in calendar 2014. This would give a total of 68,949,763 bags. On this, a levy of Rs137,899,526 should have been collected. However, the total levy collected in the last financial year (July 2014 to June 2015) was only Rs43,464,772, with Rs128,150 levy exemption. This shows a shortfall of Rs93,306,604.

It appears that not all imports under this tariff heading relate to plastic carrier bags. The problem is that it is not clear what is actually imported under each tariff subheading. For purposes of this RIA it is assumed that in each instance (per bullet) the different products actually describe the same product (and regardless of whether the singular or plural is used):

- Plastic carry/carrier bag(s); carrier bag(s); plastic handle carry bags; plastic shopping bag(s); shopping plastic bags; HDPE T-shirt bags; plastic bag with handle(s); polythene carry bags = 39,370,528 bags imported.
- Plastic bags, empty plastic bags; sac plastique = 6,978,968 bags imported (if these are added to the previous bullet, this would give a total of 46,349,496 bags, the figure used in this RIA).⁷⁷
- Bin liners; bin bags; plastic bag garbage; plastic bin bags; plastic bin bags with handles; sac poubelle = 624,938 bags imported – since these products are without handles, it appears that they should have been declared under tariff subheading 3923.21.20. For purposes of this RIA, these bags were viewed as bin liners.

⁷⁶ This is based on an estimated 0.5% increase annually and cumulatively.

⁷⁷ For purposes of the RIA, the figure was rounded to 46,350,000 bags.

Some other product descriptions also feature under this tariff heading, but does not appear to relate to plastic carrier bags classifiable under this tariff subheading. This includes laundry bags, PP plain-woven bags*, PVC bags*, plastic bags not vest type, sac congelation, sac isothermes, sanitary bags, and traveling bags. (* - both these items appear to relate to products that should have been cleared under tariff subheading 3923.29.10, i.e. plastic bags with handles made from other plastics and have been included in this RIA as multiple-use bags).

Even if it is assumed that only imports under bullet 1 are subject to the levy, this would mean that a levy of Rs78,741,056 should have been collected (in addition to what was collected from domestic producers). If it is assumed that a levy should have been collected from imports under both bullets 1 and 2 above, this would mean that a levy of Rs92,798,992 should have been collected (in addition to what was collected from domestic producers).

If enforcement is spread wider to ensure that the levy is also collected on all other plastic carrier bags provided to consumers, this would mean that the other estimated 128 million bags will also become subject to the levy.⁷⁸ Considering that retailers have indicated that they supplied between 50% and 80% fewer bags after the introduction and the increase in the levy, a similar reduction in the bags supplied by small retailers and informal traders can be expected. This would reduce overall supply to between 50 million and 87 million bags, an overall decrease of between 42% and 67%. It would also lead to an increased levy collection of between Rs55 million and Rs130 million, to a total of between Rs100 million and Rs174 million. This would also increase VAT by between Rs8.25 million and Rs19.5 million. This information can be summarised as follows:

Table 10: Summary of effect of wider enforcement of current levy

	Current situation	42% decrease	67% decrease
Number of bags	150,000,000	87,000,000	50,000,000
Levy collected	Rs45,000,000	Rs174,000,000	Rs100,000,000
VAT collected	Rs6,750,000	Rs26,100,000	Rs15,000,000

Applying the same growth rate as in option 1, the total number of bags by 2020 will then be between 51.3 million and 89.7 million.

This option would not require any regulatory amendments, but would place an additional administrative burden in the form of wider enforcement on government, as well as on small producers and traders. Consumer would be

⁷⁸ This is based on the estimate of 150 million bags in the market. Even if the lower estimate of 50 million bags by producers and the major retailers is accepted, this would still mean that the levy should be collected on at least another 28 million bags.

exposed to additional taxes, more precisely, to the proper enforcement of an existing tax.

4.4.3 Option 3: Increase in levy

In order to achieve an effective phase out, the minimum price of a plastic bag needs to be set at a sufficiently high level to effect changes in consumer behaviour. The effectiveness of the levy would need to be monitored and reviewed regularly to ensure its continuing relevance and effectiveness, failing which consumption may increase again. This may require an annual increase in line with the consumer price index.

Under this option, the existing levy of Rs2/bag will be increased. This option would be similar to the system applied in Ireland, where the government originally imposed a mandatory €0.15/bag levy, which was later increased to €0.22/bag after bag usage started to increase again. Although the levy is collected directly from the producer or importer, this charge is paid by the consumer at the point of sale to provide a visible price signal to change behaviour.

This option would involve a regulation that includes:

- a charge to be applied at the point of sale in all retail outlets
- a requirement that retailers pass on the full amount of the levy to consumers
- the charge for a plastic bag to be itemised on all invoices or receipts
- the levy to be set at a specified amount, with a provision that it may be increased annually by a maximum of the consumer price index
- administration of the levy by government
 - producer and retailer administration: maintaining records; reporting to government; paying levies to the MRA
- penalties for non-payment or non-compliance
- enforcement by authorised officers.

For consumers, this option is similar in impact to the mandatory retailer charge, but with Government retaining monies from the levy.

The levy would be set at a level that would be most likely to deliver a significant reduction in plastic bag use and litter. This should achieve a target of at least a 50% reduction in plastic bag use within two years. The only exclusions or exemptions would be for duty free bags. The effectiveness of the levy would need to be monitored and reviewed regularly to ensure its continuing effectiveness.

4.4.4 Option 4: Ban on all plastic carrier bags

Under this option, the provision of single-use plastic carrier bags in retail service would be prohibited. Although this option has been modelled to provide elimination of bags, a 100% reduction would not be achieved in practice due to the need for exemptions on health and safety grounds, and for duty-free purchases. In considering exemptions, it will be necessary to strike a workable balance between health and safety issues and exemptions to minimise the potential for the bag to become litter. A large number of exemptions could negate the effective of a regulations as well as complicating enforcement.

However, as LCAs have shown, any decision to ban traditional plastic carrier bags in favour of bags made from alternative materials (compostable plastic or recycled paper) may result in a significant increase in environmental impacts across a number of categories, including increased landfill.⁷⁹

Retailers and producers were also opposed towards the option of a ban.

Table 11: Strengths and weaknesses of the four basic options⁸⁰

Scenario	Social/Community	Environment	Economic
Option 2: Wider enforcement	<p>Less litter, retains consumer choice; favoured by retailers and industry</p> <p>High administrative costs, especially on small traders; education required</p>	Significant decreased disposable bag consumption	<p>Significant cost recovery option for state and retailers; “polluters-pay” model</p> <p>May affect low-income households more; increases retailer costs</p>
Option 3: Increased levy	<p>Less litter, retains consumer choice; favoured by retailers and industry</p> <p>High administrative costs; education required</p>	Moderate decreased disposable bag consumption	<p>Cost recovery option for state and retailers; “polluters-pay” model</p> <p>May affect low-income households more; increases retailer costs</p>
Option 4: Ban	<p>Relatively easy to enforce; less litter</p> <p>Requires more education; requires supply of reusable bags/increased supply of bin liners; removes consumer choice; not</p>	Significant decreased disposable bag consumption	<p>Reduced retailer cost for bags</p> <p>No cost recovery; consumers must purchase reusable or paper bags; lost business; lost</p>

⁷⁹ Chaffee and Yaros (2007) 4.

⁸⁰ Brendle Group (2012), adjusted to the specifics of this RIA.

	generally supported by producers and retailers		employment
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In each instance, a community education and a well-advertised phased-in period are required.

5. ANALYSIS OF IMPACTS

5.1 Introduction

This section analyses the impacts of the different policy options proposed in section 4.4, taking account of the experiences of other countries or regions that have already introduced reduction measures on single-use carrier bags.

This section describes the options to reduce the impacts of plastic bags. It also provides an economic, social and environmental analysis of the impacts of those options. The data presented here are based on statistics supplied by the MRA, estimates provided by both producers and major retailers, and on studies conducted by other countries.

All costs are indicative only and are presented so that the options can be compared against one another.

Consumers' willingness to pay various prices for plastic bags is unknown. A price-elasticity test was conducted purely on the basis of the difference in the number of bags on which the levy collected between 2012 and 2014 and the real cost of the levy, after making provision for inflation. The impact of an increased levy would be higher on products not yet subject to the levy (provided enforcement also applies to these bags), as the increase in levy on these bags would be from zero to the new amount.

The plastics industry association has signalled that regulatory action may have significant impact on the domestic plastic bag manufacturing industry. Imports are already supplying a significant proportion of the total market, but if single-use plastic carrier bags are phased out, virtually all alternative products (paper bags and multiple-use plastic bags) will have to be imported, although there may be a small niche market for local products, e.g. baskets woven from local products such as banana or cane sugar leaves.

Studies in Australia, Ireland and the US have placed the ideal minimum price at around Rs8 per bag. The Australian study also found that a mandatory retailer charge would be clear and relatively simple to administer by governments and implement by retailers and the public, and would require minimal government intervention. On the other hand, it found that a levy would be a cheaper option, although it would subject retailers to increased costs for compliance, especially on small retailers. It found that a total ban on bags would be an effective option, but it was the most expensive option. A total ban of plastic bags would be out of proportion to the extent of the problem.

To the extent possible, a cost-benefit analysis (CBA) has been applied, but this has been augmented by a multi criteria analysis (MCA) to assist in assessing the full range of impacts arising from an environmental policy proposal, including a

comparison of “apples and oranges” without having to reduce all elements to an economic valuation.

5.2 Underlying assumptions

The impacts of the measures presented here depend on their exact design and the evolution of consumer behaviour following their introduction. The following assumptions apply:

- An entry into force of the measures on 1 January 2016.
- For the resource use and CO₂ impacts, it was assumed that:
 - The production 1 kg of PE plastic requires about 2 kg of oil (including raw material and energy).⁸¹
 - One single-use non-biodegradable plastic carrier bag weighing 8.5 g entails the emission of 1.58 kg of CO₂, assuming a rate of 40% of reuse.⁸²
- The total market for single-use plastic carrier bags is 150 million, of which 46.4 million are imported. It is therefore assumed that the other 103.6 million bags are produced in Mauritius.
- No paper bags and no multiple-use plastic bags are or can be produced in Mauritius. A total of 519,277 plastic bags were imported under tariff subheading 3923.23.10, which relates to plastic bags with handles of plastics other than polyethylene. It is assumed that these relate to multiple-use bags, such as PP or PVC bags.
- The following product weights were assumed: single-use plastic carrier bags: 8.5 g; paper bags: 55.2 g; multiple-use plastic bags: 78.9 g; bin liners 17.3 g.
- Switches from single-use plastic bags to other types of bags: Research in the EU shows that where single-use plastic bag consumption has already been curbed, for every 1,000 single-use plastic bags avoided, people use on average an additional 29 multiple-use plastic bags; 4 other multiple-use bags; 127 paper bags; and 273 plastic bin-liners.⁸³
- Retailers would charge for both multiple-use and paper bags at least at cost-recovery prices.

Table 12: Domestic versus imported bags

	Mauritius	Imported	Mauritius %
Single-use bags (#)	103,650,000	46,350,000	69.10%
Multiple-use bags (#)	-	519,200	0.00%
Paper bags (#)	-	100,000	0.00%

⁸¹ Bio Intelligence Service (2012) 85; European Commission (2013) 31.

⁸² Bio Intelligence Service (2012) 85; European Commission (2013) 31.

⁸³ European Commission (2013) 32.

Total bags (#)	103,650,000	46,969,200	68.82%
Single-use bags (kg)	881,025	393,975	69.10%
Multiple-use bags (kg)	-	40,965	0.00%
Paper bags (kg)	-	5,520	0.00%
Total bags (kg)	881,025	440,460	66.67%

Based on the amount of plastic carrier bags placed on the market, projected population and GDP growth, and the average weights of different types of plastic bags, the consumption was projected to 2020.

5.3 Types of impacts

All options to reduce the use of single-use plastic carrier bags share the same types of impacts. The magnitude of these impacts will differ from one option to another depending on the degree of ambition and effectiveness of each measure.

The analysis that follows is focused on nine main issues. It looks at three environmental impacts (benefits):

- Resource use
- Littering rates
- Impacts on public spending on waste management and litter collection

The analysis of economic and social costs and benefits will cover six main issues:

- Administrative burden on government
- Impact on Mauritian producers
- Impact on employment
- Impacts on Mauritian retailers/traders
- Impacts on consumers
- Public awareness

5.3.1 Environmental impacts

The main environmental benefits of the proposed measures are linked to the reduced use of resources embedded in the production of single-use plastic carrier bags, and corresponding greenhouse gas emissions; a decline in the amount of waste and the number of bags littered. This will decrease litter clean-up expenses, and expenses incurred in waste management.⁸⁴ It is also expected to place less costs on the marine and tourism environments.

In this regard, to the extent possible, the effect on emissions (CO₂, GWP, GHG); littering (marine litter, visible land litter); resource efficiency/waste prevention

⁸⁴ European Commission (2013) 33.

(raw material extraction, recycle rate); biodiversity (number of animals/turtles entangled, impact on fish stock) and land use (landfill) will be considered.⁸⁵

Littered plastic bags may cause flooding by blocking up drains and septic tanks.⁸⁶ However, it is not possible to attach a cost to this.

All options will increase awareness of the environmental impacts of single-use plastic bags and resource efficiency aspects at large, and could help promote more sustainable consumption patterns. If designed and implemented in an optimal way, measures have the potential to influence consumer behaviour more broadly (e.g. limit use of disposable items, promote re-use), as well as guide manufacturers' and retailers' business models (e.g. promoting reusable, resource efficient alternatives, provide sizes that better suit consumer needs).

5.3.2 Economic and social impacts

Measures to reduce the consumption of single-use plastic carrier bags, especially regulatory measures, are likely to entail some administrative burden, falling on both the public and the private sector, to ensure implementation and enforcement. The extent of the administrative burden will depend on the choice and the exact design of the measures to be implemented.⁸⁷

Costs to be considered include the cost for conducting business, especially for small retailers and the informal trade; administrative burden on businesses and government; waste management costs; employment; the impact on the balance of trade and the impact on the MRA.⁸⁸

An often-overlooked cost is the possibility of incinerating plastics to produce energy. Plastic has a high calorific value that can be released during incineration. Essentially, plastic is placed in special incineration chambers, the solid wastes are burned, and the heat produced in the reaction is harnessed to generate electricity and steam. The volume of municipal solid waste can be reduced by up to 90% when subjected to this process. The calorific value of plastic carrier bags is significantly higher than that of paper bags.

5.3.2.1 Impacts on producers

The impacts on producers will be mixed. Some producers rely entirely on plastic

⁸⁵ BIO Intelligence Service (2011).

⁸⁶ Whitelaw (2014).

⁸⁷ In countries where measures to reduce single-use plastic bags have been particularly successful, such as Ireland, charges are paid into an environment fund, which is used for financing recycling centres and other environmental activities such as cleaning up illegal landfill sites. Collection and associated administration costs are low, at about 3% of revenues. The remainder of the revenues are used to support a wide range of environmental programmes.

⁸⁸ BIO Intelligence Service (2011).

carrier bags and their current equipment cannot be changed to produce alternative products. These companies will close down. Other producers only partially rely on plastic carrier bags and should be able to switch production and workers to other products.

5.3.2.2 Impact on retailers/traders

In the short term, retailers and traders may face costs to implement any of the proposed measures (e.g. awareness raising, administrative costs, and an increase in costs of providing alternatives such as paper bags) but it is likely that these costs can be offset by the increased sale of reusable alternatives and the overall reduction of consumption of single-use carrier bags which retailers currently often provide free of charge. Another cost that needs to be considered is that retailers have indicated an increase in shoplifting when consumers bring along their own bags.⁸⁹ Retailers in Mauritius confirmed this trend.

The impact on smaller traders may be more pronounced, as consumers may simply stop making “impulse” purchases when bags are not available or too expensive.

5.3.2.3 Impacts on employment

Impacts on employment levels are likely to be negative as some companies may have to close down and as the number of plastic bag resellers will decrease as plastic carrier bag usage decreases. This will vary depending on which option is selected. A study in the US found that banning plastic bags resulted in a net reduction in employment.⁹⁰

5.3.2.4 Impact on consumers

Consumers may face an initial increase of costs under all options, as the recommended use of economic instruments would imply that they are asked to pay more for carrier bags. However, these costs will decrease as consumers switch to reusable alternatives, which save costs in the longer run.

A US study has determined the cost on the consumer to be as follows: If a consumer has to provide his own bags, this takes additional time, estimated at US\$20.80/year. If there was a ban on shops providing plastic bags, but consumers were able to supply their own bags, the total packaging (carrier bag) costs per year to the consumer would amount to \$45.80. If paper bags had to be used, this would amount to at least \$78. For machine-washable multiple-use

⁸⁹ Little (2014).

⁹⁰ Green and DeMeo (2013) 24.

bags, and assuming a 2-year lifespan, the cost would come to \$262. For cheap reusable bags, selling at \$2 each, the total cost would amount to \$300.⁹¹

5.3.2.5 Impact on government

Industry estimates that the total levies collected per year are around Rs50 million, while the NRA has confirmed that it collected Rs45 million in 2014. However, considering that industry supplies at least 22 million bags to the major retailers and that at least 46 million bags are imported, there appears to be a major shortfall of revenue. If all plastic bags are banned, government will lose the current levies. However, if the levy is increased or wider enforcement takes place, the levies collected should increase even if there is a significant decline in the use of plastic carrier bags.

Wider enforcement will increase enforcement and monitoring costs, while a complete ban should reduce the current enforcement costs.

5.4 Specific impacts per type of measure

5.4.1 Option 1: Status quo ("baseline scenario")

If no additional action is taken and enforcement remains at current levels, it is projected that demand for plastic carrier bags will change as follows:

Table 13: Evolution of demand for plastic carrier bags

	Total bags	Retailers	Others
2015	150,000,000	25,000,000	125,000,000
2016	150,750,000	25,125,000	125,625,000
2017	151,503,750	25,250,625	126,253,125
2018	152,261,269	25,376,878	126,884,391
2019	153,022,575	25,503,763	127,518,813
2020	153,787,688	25,631,281	128,156,407

In the baseline scenario, there are no additional policies and measures aiming to limit the use of plastic carrier bags beyond those already in place by mid-2015. A baseline scenario was constructed in order to assess how the plastic carrier bags consumption and end-of-life is likely to evolve without additional regulatory initiative. The analysis has been limited to the "foreseeable future", i.e. until 2020.

Environmental impacts

⁹¹ Van Leewen and Williams (2013). Note that most of these costs related to the cost of "time" and were priced at US labour rates.

Increased use of bags will result in more litter and increased landfill, with a bigger impact on environment. However, since the increase in usage is small, the additional negative effect on the environment will also be small, albeit cumulative.

In the projected period, the amount of plastic bags consumed rises by 2.53%, with single-use plastic carrier bags experiencing a similar trend. If no action is taken, consumption will keep rising beyond 2020. Unless action is taken to either start recycling plastic bags or to incinerate bags to produce energy, total litter will increase, as will the amount of GHG emitted in the production process. Assessing related impacts in quantitative terms – e.g. in terms of numbers of marine species affected – is however difficult.

Because plastic takes so long to degrade, this means that the stock of plastic carrier bag litter in the marine and land environments will add up every year, and will accumulate in the environment. As weathering and disintegration takes place, particle size will reduce, increasing the potential for ingestion by a wider range of fish, birds and animals.⁹²

The following table shows the environmental impact.⁹³

Table 14: Option 1 – Environmental impact

Environmental impact factor	Option 1
Energy use (MJ)	127,879,146
Fossil fuel (kg)	2,494,446
GHG emissions (CO ₂ equivalent kg)	6,698,272
Fresh water usage (litres)	36,759,870
Transport fuel (litres)	6,117
Municipal solid waste (kg)	1,174,188
Litter (kg)	12,805

Economic and social impacts

Under option 1, no major change is expected in terms of impacts on administrative burden, producers, retailers, employment, consumers, and public awareness: these remain almost constant. It is worth mentioning that the projected increase in single-use plastic bag consumption will further increase the costs faced by retailers to provide such bags free of charge, but should also slightly increase producers' profits with increased economies of scale.

There should be no additional effects on employment, although there might be a small increase in indirect employment as the increased usage might result in a few more resellers entering the market. The increased total stock of plastic bags

⁹² European Commission (2013) 21.

⁹³ Please note that impacts presented in the tables below are in absolute terms, and not in comparative terms with the baseline scenario.

will increase public spending on clean-up activities.⁹⁴ However, since the increase in usage is small, the additional economic costs and benefits will also be small, albeit cumulative.

It is assumed that the share of single-use plastic carrier bags will remain stable at 99% of the amount of all carrier bags over the projected period. The share of plastic carrier bags that end up as litter is also expected to remain stable at 1%, with the remainder ending in landfill. However, the absolute numbers of plastic carrier bags littered will grow from 1.5 million to 1.54 million per annum.

Public expenses to deal with plastic bag waste (formal collection and end-of-life treatment) and litter (clean-up costs) are also expected to increase.

The total delivery costs of plastic bags for 2015 under option 1 are as follows:

Table 15: Option 1 bag delivery costs

Option 1: Status quo	Units	Weight (kg)	Delivery trips	Delivery km	Fuel (l)	Fuel cost (Rs)
Imported PE bags	46,349,496	393,971	788	23,638	1,688	63,823
Local PE bags	103,650,504	881,029	1,762	52,862	3,776	142,727
Multiple-use bags	525,427	41,456	83	2,487	178	6,716
Paper bags	100,000	5,520	11	331	24	894
Imported bin liners	6,082,468	105,227	210	6,314	451	17,047
Other bags	-	-	-	-	-	-
Totals	156,707,895	1,427,203	2,854	85,632	6,117	231,207

This is based on one delivery by car/light commercial vehicle for every 500 kg⁹⁵ of bags over an average distance of 30 km from Port Louis to traders, and assuming fuel efficiency of 14km/litre at the current diesel price of Rs37.80/litre.

Conclusion

The business-as-usual scenario shows a trend with a slight increase in the amount of plastic bags consumed over the 2010-2020 period, as shown in Table 11 above.

Table 16: Evaluation of impacts for Option 1

	Environmental impacts	Social impacts	Economic impacts
Strengths	None	None	No impact on consumers (no change in cost or choice), producers or retailers No additional

⁹⁴ BIO Intelligence Service (2011).

⁹⁵ It is assumed that standard vehicles such as pick-up trucks rather than heavy commercial vehicles are used to distribute the bags.

			administrative burden for government
Weaknesses	Increased GHG emissions, increased impact on marine environment, increased landfill	Does not facilitate changed consumer behaviour	Continued and increasing costs for clean-up

All other policy options are compared to this baseline scenario. In line with the findings by the EU, it is assumed that for every 1,000 plastic carrier bags reduction, there will be an increased consumption of 127 paper bags; 273 plastic bin-liners; 29 multiple-use plastic bags; and 4 other multiple-use bags.

5.4.2 Option 2: Status quo, with wider enforcement

Considering that retailers' supply of plastic carrier bags decreased by between 50% and 80% following the introduction and subsequent increase in the levy, it is assumed that the same savings would be experienced as regards the imposing the levy on the bags not currently subject to it. For purposes of this RIA, both the 50% and 80% reduction scenarios are investigated.

Environmental impacts

Considering that parties other than the major retailers supply an estimated 85.3% of all plastic carrier bags (128 million), a decrease of 50% would translate to a decrease of 64 million bags, or a 42.7% overall reduction in single-use plastic carrier bags, while an 80% decrease would render a decrease of 102.4 million bags, or a 68.3% overall reduction in single-use plastic carrier bags.

There would be a significant overall reduction in GHG emissions in Mauritius, generally in line with the decrease in the number of plastic carrier bags. This is because the alternatives, multiple-use plastic bags and paper bags, are not produced in Mauritius. While the GHG emissions related to the alternative products will be felt globally and needs to be offset against any savings from the plastic carrier bag production in Mauritius, those emissions will not take place in Mauritius. The only additional emissions relate to additional transport emissions to supply retailers and other traders with the product, as studies have indicated that around seven times as much transport is required to move paper bags and multiple-use bags (on a volume basis) than plastic carrier bags.

Wider enforcement of the levy on all plastic carrier bags and at all levels of trade will significantly raise public awareness of the problem.

The following tables show the change in bag consumption:

Table 17: Option 2 – Change in carrier bag consumption (number)

	Baseline	Impact (50%	Impact (80%
--	----------	-------------	-------------

		reduction)	reduction)
Plastic carrier bags	150,000,000	86,000,000	47,600,000
Paper bags	100,000	8,228,000	13,104,800
Bin liners	6,082,468	23,554,468	34,037,668
Multiple-use bags (plastic)	525,427	2,381,427	3,495,027
Multiple-use bags (other)	0	256,000	409,600
Total bags	156,707,895	120,419,895	98,647,095

Table 18: Option 2 - Change in carrier bag consumption (kg)

	Baseline	Impact (50% reduction)	Impact (80% reduction)
Plastic carrier bags	1,275,000	731,000	404,600
Paper bags	5,520	454,186	723,385
Bin liners	105,227	407,492	588,852
Multiple-use bags (plastic)	41,456	187,895	275,758
Multiple-use bags (other)	0	20,198	32,317
Total bags	1,427,203	1,800,771	2,024,912

The following table shows the environmental impact.

Table 19: Option 2 - Environmental impact⁹⁶

Environmental impact factor	Option 2 - 50% reduction	Option 2 - 80% reduction
Energy use (MJ)	142,449,648	151,191,949
Fossil fuel (kg)	2,551,374	2,585,531
GHG emissions (CO ₂ equivalent kg)	6,995,112	7,173,216
Fresh water usage (litres)	37,909,199	38,598,795
Transport fuel (litres)	7,718	8,678
Municipal solid waste (kg)	1,387,882	1,516,098
Litter (kg)	11,852	11,280

The impact of a 50% reduction in the use of plastic bags for 2015 under option 2 is as follows:

Table 20: Option 2 - Bag delivery costs (with 50% reduction)⁹⁷

Option 2.1:Wider enforcement (50%)	Units	Weight (kg)	Delivery trips	Delivery km	Fuel (l)	Fuel cost (Rs)
Imported PE bags	23,174,748	196,985	394	11,819	844	31,912
Local PE bags	62,825,252	534,015	1,068	32,041	2,289	86,510
Multiple-use bags	2,381,427	187,895	376	11,274	805	30,439
Paper bags	8,228,000	454,186	908	27,251	1,947	73,578

⁹⁶ Based on Chaffee and Yaros (2007).

⁹⁷ Note that "50% reduction" and "80% reduction" under option 2 only refers to the reduction in respect of the bags not currently subject to the levy, i.e. bags other than those supplied by the major retailers.

Imported bin liners	23,554,468	407,492	815	24,450	1,746	66,014
Other bags	256,000	20,198	40	1,212	87	3,272
Totals	120,419,895	1,800,771	3,602	108,046	7,718	291,725

The impact of an 80% reduction in the use of plastic bags for 2015 under option 2 is as follows:

Table 21: Option 2 – Bag delivery costs (with 80% reduction)

Option 2.2:Wider enforcement (80%)	Units	Weight (kg)	Delivery trips	Delivery km	Fuel (l)	Fuel cost (Rs)
Imported PE bags	9,269,899	78,794	158	4,728	338	12,765
Local PE bags	38,330,101	325,806	652	19,548	1,396	52,781
Multiple-use bags	3,495,027	275,758	552	16,545	1,182	44,673
Paper bags	13,104,800	723,385	1,447	43,403	3,100	117,188
Imported bin liners	34,037,668	588,852	1,178	35,331	2,524	95,394
Other bags	409,600	32,317	65	1,939	139	5,235
Totals	98,647,095	2,024,912	4,050	121,495	8,678	328,036

Economic and social impacts

Approximately six small producers (6,000,000 bags per annum each) of plastic bags are expected to close down, resulting in 80-90 direct job losses under the 50% scenario, while 10 small producers may close down under the 80% scenario, resulting in 140-150 direct job losses. In addition, it may result in 150-500 indirect job losses relating mostly to resellers of plastic carrier bags.

Since the impact on producers will mainly be limited to small producers, it is not expected that there will be a measurable impact on the larger producers.

This option would have no impact on the major retailers, as they are already subject to the levy. The option could have a significant impact on small and informal traders for two reasons: first, it will add significantly to their operational costs; and second, many consumers may decide to no longer do “impulse” purchases at these traders, thereby affecting their overall sales.

While there will be no additional burden on the major retailers that already report on their sales of plastic bags and the levies collected, there will be an additional burden on small and informal traders to report on their sales. This could be addressed by ensuring enforcement at the level of the producer, which means that government will receive its revenue and it will then be up to the trader to collect the duties or forfeit that income. The MRA could conduct random checks at small and informal traders to ensure that they pass on the levies to the consumer.

It would impact on the balance of trade, as currently 66.7% of all carrier bags (by weight) are produced domestically. If single-use plastic carrier bags usage

decreases, while consumption of paper bags and multiple-use bags, which are not produced in Mauritius, increases, this would mean that significantly more products will be imported. Whereas at present a total of 546,174 kg of various bags are imported, this is expected to increase to between 1,266,756 kg and 1,699,106 kg, for the 50% and 80% scenarios respectively. From this should be deducted the lower-value imported raw materials used to produce the plastic carrier bags need.

It is not possible to determine the additional administrative cost on public authorities to implement and enforce this option. However, the levy actually collected is expected to increase from Rs45.23 million in 2014 to between Rs 95.2 million (80% scenario) and Rs 172 million (50% scenario).

Overall, the combined savings and profits by public authorities, producers and retailers would be significant, despite the closure of six to 10 small producers.

Table 22: Option 2 economic impact on stakeholders

	Impact (50%)	Impact (80%)
Major retailers	+	++
Small/informal traders	--	---
Producer profits	-	--
Balance of trade	-	--
Additional enforcement costs	++	++
Additional levy generated	+++	++
Job losses	-	--

Conclusion

Option 2 shows a significant decrease in plastic carrier bag usage.

Table 23: Evaluation of impacts for Option 2

	Environmental impacts	Social impacts	Economic impacts
Strengths	Decreased GHG emissions, decreased impact on marine environment, decreased landfill	Significantly facilitates changed consumer behaviour	Significantly increased levies collected that can be earmarked for environmental programmes Consumer maintains choice Decreased cost on retailers (if paper and multiple-use bags are sold at cost or higher)
Weaknesses	Increased landfill from paper bags	Greater use of multiple-use bags may increase illness; slightly increased road congestion through more delivery vehicles	Increased cost to consumers; additional administrative/enforcement burden for government; decreased profit for producers; some job losses

A significant risk exists that if there is strict enforcement of the levy on bags

distributed in the informal market, this market may shift to plastic bags without handles (e.g. roll-on bags), so this will have to be monitored.

5.4.3 Option 3: Increased levy

Option 3 considers an increase in the current levy of Rs2/bag. Two possible levels of duties are considered: Rs5/bag and Rs10/bag. Following the increase in the levy from Rs1 to Rs2 at major retailers, the amount of levy collected decreased. However, in 2014 the levy collected increased by 5.4%. This may reflect a combination of a higher volume of purchases and erosion of the impact of the Rs2/bag levy, i.e. the effect of the levy was lower than at the time it was increased. The total amount of levies collected developed as follows:

Table 24: Amount of levies collected

YEAR	HS CODE	LEVY PAYABLE	LEVY EXEMPTED
2012	3923.2110	41,837,192	6,000
	3923.2120	157,778	1,897,932
	3923.2910	602,428	-
	3923.2920	665,292	3,996,386
TOTAL		43,262,690	5,900,318
2013	3923.2110	41,666,384	23,760
	3923.2120	131,916	8,573,408
	3923.2910	514,588	116,088
	3923.2920	606,932	3,291,014
TOTAL		42,919,820	12,004,270
2014	3923.2110	43,464,772	128,150
	3923.2120	100,924	10,692,235
	3923.2910	769,160	142,092
	3923.2920	894,670	2,346,124
TOTAL		45,229,526	13,308,601

Price Elasticity of Demand

A 2008 study in **Australia** showed sales of plastic carrier bags would decrease by 80%, 90% and 99% if a levy of Rs3, Rs6 and Rs7.50 were imposed (no levy was in place at the time). At Rs3 it was assumed that many consumers would continue buying plastic bags on a regular basis, but that at Rs7.50 it would be so expensive that they would rather buy multiple-use bags.⁹⁸

In **Ireland**, it was found that an increase in the levy was met by a less than proportionate decrease in demand, that is, the increase in the levy was met with a proportionally smaller decrease in the quantity of plastic bags demanded, showing the demand to be somewhat price inelastic. The same was experienced in Mauritius, where an increase from Rs1/bag to Rs2/bag did not see a

⁹⁸ NEPC (2008)

commensurate decrease in the number of bags distributed by the major retailers. The key implication with respect to revenue from the levy is therefore that the net effect of the increase was higher revenues from a reduced level of demand for plastic bags. Accordingly, revenues raised from a levy increase could increase due to the smaller reduction in demand for plastic bags.

Mauritius: Based on collected levies of Rs43,262,690 (21,631,345 bags) in 2012, with a price of Rs2, and collected levies of Rs45,229,526 (22,614,763 bags) with a real price of Rs1.865,⁹⁹ the price elasticity of demand formula, as below, can be utilised to estimate the price elasticity of demand:

$$E_p = \frac{\frac{Q_2 - Q_1}{(Q_1 + Q_2)/2}}{\frac{P_2 - P_1}{(P_1 + P_2)/2}}$$

Using this formula results in the calculation of a price elasticity of demand estimate of -0.385.

Thus, between these two price points, an increase in the price by 1% results in a decline in quantity demanded of 0.385%. This indicates that the price elasticity of demand for plastic bags under these conditions is relatively inelastic. Therefore, the percentage change in quantity demanded in plastic bags is smaller than that in the percentage change in price and a levy increase will likely result in a rise in total revenue. Based strictly on the result of the price elasticity test, an increase in the levy to Rs5 (a 150% increase) would result in a 57.724% decrease in consumption. It also means that theoretically a levy of Rs7.20 will result in the complete elimination of all plastic carrier bags.

Price elasticity, however, is not linear and a small increase in the levy may have no impact on demand and a larger impact will have a larger impact, but only to a certain point. Thus, it is estimated that an increase to Rs10 would decrease consumption by no more than 95%, as e.g. consumers who forgot their own bags will still have to buy a carry bag of some sort, with some consumers opting for a single-use bag while most will opt for a multiple-use bag (depending on the price difference). For purposes of this RIA the reduction in use for a Rs5/bag levy will be based on the price elasticity test, but it will be assumed that a Rs10 levy will decrease consumption by 95%.

Table 25: Option 3 – Change in carrier bag consumption (units)

	Baseline	Impact (Rs5 levy)	Impact (Rs10 levy)
Plastic carrier bags	150,000,000	137,300,694	129,100,000
Paper bags	100,000	893,707	1,131,527
Bin liners	6,082,468	1,712,812	2,754,300

⁹⁹ Based on CPI of 3.5% in 2013 and 3.6% in 2014. See <http://www.indexmundi.com/g/g.aspx?c=mp&v=71> (accessed 23 July 2015).

Multiple-use bags (plastic)	525,427	9,549,379	11,788,168
Multiple-use bags (other)	0	50,797	83,600
Total bags	156,707,895	149,507,496	144,857,595

Table 26: Option 3 - Change in carrier bag consumption (kg)

	Impact (Rs5 levy)	Impact (Rs10 levy)
Plastic carrier bags	1,167,056	1,097,350
Paper bags	70,513	89,277
Bin liners	94,547	152,037
Multiple-use bags (plastic)	165,204	203,935
Multiple-use bags (other)	4,008	6,596
Total bags	1,501,329	1,549,196

Note that the limited reduction under Option 3 is based on the assumption that the increased levy would only be paid by the parties that are currently subject (and actually pay) the Rs2/bag levy.

However, an increase in the levy will only be marginally effective if it is only enforced on the plastic bags currently sold by the major retailers. Even if an increase were to reduce consumption by 50%, considering that the major retailers provide only 14.7% of all carrier bags in Mauritius, this would only decrease overall usage by around 7.4%. The actual figure might be lower, as it could convince consumers to buy less from the major retailers and more from small retailers and informal traders, thus resulting in an *increase* in bag consumption, along with a decrease in revenue. Option 3 can therefore only be effective if it is combined with option 2.

Estimated consumption change when combining options 2¹⁰⁰ and 3 - that is when ensuring that a higher levy is collected on all plastic bags:

Table 27: Options 2&3 - Change in carrier bag consumption (units)

	Impact (Rs5 levy)	Impact (Rs10 levy)
Plastic carrier bags	36,357,259	4,300,000
Paper bags	3,821,067	4,750,727
Bin liners	14,532,628	18,603,900
Multiple-use bags (plastic)	37,106,936	45,858,568
Multiple-use bags (other)	454,571	582,800
Total bags	92,272,461	74,095,995

Table 28: Option2&3 - Change in carrier bag consumption (kg)

	Impact (Rs5 levy)	Impact (Rs10 levy)
Plastic carrier bags	309,037	36,550

¹⁰⁰ For purposes of this combination it is assumed that under Option 2 there would be a 50% decrease in plastic bag usage, i.e. the more conservative option was followed.

Paper bags	301,482	374,832
Bin liners	802,201	1,026,935
Multiple-use bags (plastic)	641,950	793,353
Multiple-use bags (other)	35,866	45,983
Total bags	2,090,536	2,277,654

Estimated GHG, water and fuel savings (combined options 2 and 3):

Table 29: Option 2&3 – Environmental impact

Environmental impact factor	Option 3 - Rs5 levy	Option 3 - Rs10 levy	Options 2&Rs5 levy	Options 2&Rs10 levy
Energy use (MJ)	130,770,322	132,637,326	153,751,518	161,049,805
Fossil fuel (kg)	2,505,742	2,513,037	2,595,532	2,624,046
GHG emissions (CO ₂ equivalent kg)	6,757,173	6,795,209	7,225,361	7,374,046
Fresh water usage (litres)	36,987,928	37,135,198	38,800,695	39,376,388
Transport fuel (litres)	33,876	6,938	8,959	9,761
Municipal solid waste (kg)	1,216,590	1,243,972	1,553,637	1,660,676
Litter (kg)	76,646	13,191	11,112	10,635

The total delivery costs of plastic bags for 2015 under option 3 (Rs5/bag levy) are as follows (combined with the wider enforcement proposed under option 2):

Table 30: Option 2 & 3 Rs5 levy – Bag delivery costs

Option 2&3.1: Wider & increased (Rs5)	Units	Weight (kg)	Delivery trips	Delivery km	Fuel (l)	Fuel cost (Rs)
Imported PE bags	9,797,329	83,277	167	4,997	357	13,491
Local PE bags	26,559,929	225,759	452	13,546	968	36,573
Multiple-use bags	3,821,067	301,482	603	18,089	1,292	48,840
Paper bags	14,532,628	802,201	1,604	48,132	3,438	129,957
Imported bin liners	37,106,936	641,950	1,284	38,517	2,751	103,996
Other bags	454,571	35,866	72	2,152	154	5,810
Totals	92,272,461	2,090,536	4,181	125,432	8,959	338,667

The total delivery costs of plastic bags for 2015 under option 3 (Rs10/bag levy) are as follows (combined with the wider enforcement proposed under option 2):

Table 31: Option 2 & 3 Rs10 levy – Bag delivery costs

Option 2&3.2: Wider & increased (Rs10)	Units	Weight (kg)	Delivery trips	Delivery km	Fuel (l)	Fuel cost (Rs)
Imported PE bags	1,158,737	9,849	20	591	42	1,596
Local PE bags	3,141,263	26,701	53	1,602	114	4,326
Multiple-use bags	4,750,727	374,832	750	22,490	1,606	60,723
Paper bags	18,603,900	1,026,935	2,054	61,616	4,401	166,364
Imported bin liners	45,858,568	793,353	1,587	47,601	3,400	128,523
Other bags	582,800	45,983	92	2,759	197	7,449

Totals	74,095,995	2,277,654	4,555	136,659	9,761	368,980
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Environmental impacts

An Australian study showed that the most striking element of the national survey of litter prevalence is that the proportion of litter made up by plastic bags decreased significantly from 5% before the introduction of the levy to under 0.5%.¹⁰¹ A figure of 0.6% has been indicated for the US.¹⁰²

In Ireland, the increase in the levy from 2007 was met with a downward trend in the volume of plastic carrier bag litter. This is consistent with the assumption that reductions in the demand for, or increased value of, plastic bags will reduce litter. However, it was not possible to directly correlate price to litter incidence. The study concluded that plastic bag litter is inversely related to changes in the plastic bag levy and associated demand for plastic bags, such that an increase in the levy will reduce demand and litter, but not necessarily in direct relationship. Accordingly, it was assumed that litter rates will remain at 1% for all single-use bags, that is, for both plastic and paper single-use bags.

As for Option 2, there will be a significant overall reduction in GHG emissions in Mauritius for Option 3, generally in line with the decrease in the number of plastic carrier bags (excluding imports). Again, the additional transport required to deliver alternative bags must be considered.

As regards litter, it is assumed that only single-use bags (plastic and paper) will be littered, while multiple-use bags and bin liners will end in landfill. It is further assumed that the litter rate will remain constant at 1%. Litter volumes (units and weight) will therefore change as follows:

Table 32: Option 3 – litter incidence

Litter incidence	Option 3.1 (levy Rs5)		Option 3.2 (levy Rs10)		Option 2 & 3.1 (levy Rs5)		Option 2 & 3.2 (levy Rs10)	
	Litter (#)	Litter (kg)	Litter (#)	Litter (kg)	Litter (#)	Litter (kg)	Litter (#)	Litter (kg)
Imported PE bags	463,495	3,940	463,495	3,940	97,973	833	11,587	98
Local PE bags	909,512	71,760	827,505	7,731	265,599	2,258	31,413	267
Paper bags	17,128	945	27,543	1,520	145,326	8,022	186,039	10,269
Totals	1,390,135	76,646	1,318,543	13,191	508,899	11,112	229,039	10,635

Economic and social impacts

Consumers will be negatively affected as they would have to pay more for their bags or buy alternative bags, which may be more expensive, especially at the outset. However, these costs will decrease as consumers switch to reusable

¹⁰¹ EPHC (2008).

¹⁰² Burnett (2013) 4, who also indicates that the US Environmental Protection Agency places the figure at 0.5%.

alternatives, which save costs in the longer run. There will also be the immediate saving of the levy paid for bags at retailers.

There will be an increased administrative burden on **producers** as they will have to comply with new rules on the levy. This will include both the burden of reporting on their production and sales volumes, and the increased pressure paying over the levy would have on their business. The levy is payable at the end of each month, whereas producers often get paid for their sales only significantly later, meaning that the producers effectively subsidise the levy until they receive payment from their clients. An increased levy that is widely enforced, including on small producers and sales by small and informal traders, may lead to the closure of some of the smaller producers, who will not be able to afford paying over a levy significantly higher than the value of the plastic bag itself. This could be managed in two ways: producers can decrease the terms of payment; or government could require producers to only pay the levy over after a pre-determined period, e.g. by the end of the month following the month in which production or sales took place, or to demand payment of the levy only once the sales itself has been paid. While this may have a once-off implication on government, and may increase risk to government, it may allow more producers to remain in business.

There will be no additional burden on **large retailers**, as they already have systems in place reporting on the sales of plastic bags and the levy collected. All that will need to be changed is the amount of levy.

There will be no additional burden on **government** compared to option 2, but there will be an increased burden compared to option 1, as enforcement will have to take place on a wider scale.

From a social perspective, this option provides a market instrument to significantly decrease the number of plastic bags used, addresses community concerns about the impact of plastic bags on the environment, including visual amenity, wildlife and domestic species safety, resource efficiency and unnecessary consumption, while also serving as a major step to stimulate behavioural change in the broader community for other more significant environmental issues (for example, plastic bottles and caps, general littering). This option maximises consumer choice because consumers retain the choice of a plastic bag; can choose between a multiple-use bag, a single-use bag and a paper bag; and can avoid paying a fee by using other (e.g. multiple-use) bags. However, all of this is only possible in a combination of options 2 and 3.

Table 33: Evaluation of impacts for Option 3

	Environmental impacts	Social impacts	Economic impacts
Strengths	More decreased GHG emissions, decreased impact on marine	Significantly facilitates changed consumer behaviour, while	Significantly increased levies collected that can be earmarked for environ-

	environment, decreased landfill than option 2	retaining consumer choice	mental programmes Consumer maintains choice Decreased cost on retailers (if paper and multiple-use bags are sold at cost or higher)
Weaknesses	Increased landfill from paper bags	Greater use of multiple-use bags may increase illness; slightly increased road congestion through more delivery vehicles; does not decrease bag usage as much as a ban	Increased cost to consumers, which can effect especially low-income families; additional administrative/enforcement burden for government; decreased profit for producers; some job losses; increased transport costs & road congestion

An ambitious and clear reduction target – underpinned by a pricing mechanisms and other measures – would contribute to raising awareness about the problem of high levels of single-use plastic bags consumption, as well as of sustainability and resource use issues in general.

5.4.4 Option 4: Ban on single-use plastic carrier bags

While this RIA assumes a total ban, that is, a 100% reduction in single-use plastic carrier bag use, in practice there may be a need for bags to be exempted for a variety of health and safety purposes. Exemptions will mean that some bags will still need to be supplied at point of sale, and thus the market failure is not fully addressed. A ban will therefore not achieve a total elimination of bags, and in Australia it was shown to be less effective in practice at phasing out plastic bags than a levy.

Option 4 seeks a maximum effect in reducing consumption of single-use plastic carrier bags by a full ban on these products. This can help maximize the reduction of impacts of disposable plastic bags on the environment and community. However, as the alternatives weight significantly more, this would have a significant negative impact on solid waste management operations associated with litter control. Relative to other options that involve the collection of fees, this option would be more straightforward to administer. From the perspective of the retailer, not having to provide plastic carrier bags at all would reduce their costs for providing such bags, but as other bags (multiple-use plastic bags and paper bags) take more space, it may affect their operations negatively.

This option would place the greatest restrictions on consumers by requiring them to provide their own bags or buy paper, multiple-use plastic or cotton bags. This translates into a limitation of consumer choice and leads to opposition, and is also not supported by either producers or retailers. It could have an especially profound impact on small and informal traders, who may be forced out of

business. This option offers no revenue source to offset costs of enforcement and education as fee-based options do.

Like a fee, this policy scenario has a larger impact on lower-income households because the ban will require households to purchase reusable bags and that cost will represent a larger percentage of their income.¹⁰³

Table 34: Option 4 – Change in carrier bag consumption (units/kg)

	Baseline		Option 4	
			Units	Kg
Imported PE bags	46,349,496	393,971	-	-
Local PE bags	103,650,504	881,029	-	-
Multiple-use bags	525,427	41,456	4,875,427	384,671
Paper bags	100,000	5,520	19,150,000	1,057,080
Imported bin liners	6,082,468	105,227	47,032,468	813,662
Other bags	-	-	600,000	47,340
Totals	156,707,895	1,427,203	71,657,895	2,302,753

Table 32 below shows the savings in GHG, energy and water and the impact on litter and municipal solid waste:

Table 35: Option 4 – Environmental impact

Environmental impact factor	Option 4
Energy use (MJ)	162,028,760
Fossil fuel (kg)	2,627,871
GHG emissions (CO ₂ equivalent kg)	7,393,990
Fresh water usage (litres)	39,453,608
Transport fuel (litres)	9,869
Municipal solid waste (kg)	2,052,974
Litter (kg)	10,571

The total delivery costs of plastic bags for 2015 under option 4 are as follows:

Table 36: Option 4 – Bag delivery costs

Option 4: Ban	Units	Weight (kg)	Delivery trips	Delivery km	Fuel (l)	Fuel cost (Rs)
Imported PE bags	-	-	-	-	-	-
Local PE bags	-	-	-	-	-	-
Multiple-use bags	4,875,427	384,671	769	23,080	1,649	62,317
Paper bags	19,150,000	1,057,080	2,114	63,425	4,530	171,247
Imported bin liners	47,032,468	813,662	1,627	48,820	3,487	131,813
Other bags	600,000	47,340	95	2,840	203	7,669
Totals	71,657,895	2,302,753	4,606	138,165	9,869	373,046

Environmental impacts

¹⁰³ Brendle Group (2012).

This option will have a very significant impact on the number of plastic bags consumed and littered and will have a significant positive impact on marine litter.¹⁰⁴ At the same time, there will be a very significant increase in the total amount of landfill, as alternative products such as paper bags weigh much more. It will also cause more GHG and have a higher GWP as more resources are required to produce and transport the alternative products. Considering that once products are enclosed in a landfill, degrading effectively ceases, there is no advantage in using paper bags over plastic bags.

Economic and social impacts

A ban on plastic bags that is not accompanied by a proper environmental awareness programme will not facilitate consumer behaviour and people will simply litter the alternatives, such as paper bags, rather than consuming less packaging material.

Consumers will be negatively affected, as they would have to pay more for their bags or buy alternative bags, which may be more expensive, especially at the outset. However, these costs will decrease as consumers switch to reusable alternatives, which save costs in the longer run. There will also be the immediate saving of the levy, which they currently have to pay for every bag purchased from a major retailer.

There are no paper bag **producers** in Mauritius and the raw materials to produce paper bags are not available. Bearing in mind the increased scarce resources required to produce paper products compared to plastic products, such as water, it is not anticipated that any paper bags will be produced in Mauritius in future. There is also no production of multiple-use plastic bags, e.g. from PP or PVC. This means that all carrier bag requirements will have to be imported. It is estimated that at least 10 producers will close down, while more producers may be forced to either close down or scale down their operations, and that at least 180 to 200 direct job losses will occur, while many more jobs may be lost in the informal sector. There will be higher transport costs to supply carrier bags to the market, with increased road congestion as a consequence.

There will be a decreased administrative burden on producers as they will no longer have to comply with the existing rules on the levy, including the burden of reporting on their production and sales volumes, and the pressure paying over the levy to government before they have received payment from their clients.

Direct costs for **large retailers** will decrease, as the cost of plastic carrier bags is currently factored into the overall price of their operations. This is conditional on the retailers requiring consumers to pay for the alternative bags. Multiple-use

¹⁰⁴ It should be noted that a large proportion of plastic marine litter relates to other plastic products, including bottle, caps and bags not covered by this RIA, such as roll-on bags.

or paper bags may also increase costs for retailers as these products consume significantly more space. This may require a change to the way in which pay points are structured and may require additional staff to replenish the supply of packing material at pay points. A policy that reduces disposable bag consumption will reduce the direct cost to retailers for purchasing bags. However, if the policy discourages plastic bags in favour of paper, costs could increase because paper bags are more expensive than plastic bags.

The ban would incur a significant administrative burden for **government** in terms of enforcement and compliance checks. On the other hand, there would be no reporting burden for retailers. There is also a significant cost to government in the form of lost levies.

From a **social** perspective, this option provides a command and control intervention to significantly decrease the number of plastic bags used, addresses community concerns about the impact of plastic bags on the environment, including visual amenity, wildlife and domestic species safety, and resource efficiency and unnecessary consumption. Less plastic litter will increase the value of public spaces. However, since this does not affect consumers' mind sets but only forces them to move to different products, it will have no impact on the broader community for other more significant environmental issues (for example, plastic bottles and caps, and general littering). This option minimises consumer choice.

International studies show that a transitional period of 18-24 months would need to be given to enable producers and consumers to adapt to the new rules. Bans normally specify a minimum thickness, ensuring that heavier, more durable (i.e. reusable) bags are still permitted.¹⁰⁵

Table 37: Evaluation of impacts for Option 4

	Environmental impacts	Social impacts	Economic impacts
Strengths	More decreased GHG emissions in Mauritius, decreased impact on marine environment Decreased visible littering	Cleaner public spaces enhance quality of life	Decreased administrative burden on government Decreased cost on retailers (if paper and multiple-use bags are sold at cost or higher) Decreased administrative burden on producers
Weaknesses	Increased landfill from paper and multiple-use bags Increased GHG globally	Does not facilitate consumer behavioural change Minimises consumer choice	Increased cost to consumers, which can affect especially low-income families; decreased income for government; decreased profit for producers; increased job losses; increased transport costs

¹⁰⁵ BIO Intelligence Services (2011) 77.

			& road congestion; increased cost for small and informal traders
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International studies view a ban as a 'blunt instrument' for achieving the objective of reducing the environmental impact of plastic bag litter and rather support a market-based mechanism such as a levy as a more efficient means of achieving the stated objectives. Bans are generally reserved only for those products that pose a significant risk to human health and the environment.

6. COMPARING THE POLICY OPTIONS

6.1 Quantitative impacts

This Section compares the different policy options based on a quantitative analysis. In terms of quantitative impacts Table 38 to Table 41 show that a ban on single-use plastic bags would see the biggest reduction on the use of plastic carrier bags, followed by a combination of wider enforcement and an increased levy, but that the ban would lead to the largest negative effects on employment, government income, GHG and landfill. The methodology and assumptions used to arrive at these conclusions are described in section 7.

In each instance the difference between options 1 and the other options indicates the additional trade balance deficit that will occur.

Table 38: Environmental impact

Environmental impact factor	Option 1	Option 2 (50%)	Option 3 (Rs5)	Option 2&3(Rs5)	Option 4
Energy use (MJ)	127,879,146	142,449,648	130,770,322	153,751,518	162,028,760
Fossil fuel (kg)	2,494,446	2,551,374	2,505,742	2,595,532	2,627,871
GHG emissions (CO ₂ equivalent kg)	6,698,272	6,995,112	6,757,173	7,225,361	7,393,990
Fresh water usage (litres)	36,759,870	37,909,199	36,987,928	38,800,695	39,453,608
Transport fuel (litres)	6,117	7,718	33,876	8,959	9,869
Municipal solid waste (kg)	1,174,188	1,387,882	1,216,590	1,553,637	2,052,974
Litter (kg)	12,805	11,852	12,616	11,112	10,571

Table 39: Litter impact

Litter incidence	Option 1		Option 2		Option 3 (levy Rs5)		Option 2 & 3 (levy Rs5)		Option 4	
	Litter (000)	Litter (kg)	Litter (000)	Litter (kg)	Litter (000)	Litter (kg)	Litter (000)	Litter (kg)	Litter (000)	Litter (kg)
Imported PE bags	463	3,940	232	1,970	463	3,940	98	833	-	-
Local PE bags	1,037	8,810	628	5,340	910	7,731	266	2,258	-	-
Paper bags		55	82	4,542	17	945	145	8,022	192	10,571
Totals	1,501	12,805	942	11,852	1,390	12,616	509	11,112	192	10,571

Table 40: Total cost of importation¹⁰⁶

Type of bag	Price/bag (Rs)	Option 1	Option 2.1	Option 3 (Rs5)	Option 2.1 & 3 (Rs5)	Option 4
Single-use HDPE bag	0.32	14,600,091	7,300,046	14,600,091	3,086,159	-

¹⁰⁶ Costs based on EU Commission (2013) 74. For bin liners it was assumed that the cost would be double that of single-use plastic carrier bags (based on double the weight), while the cost for local PE bags are based on the import of raw materials and where industry indicated a 40% value-added on the raw materials.

Domestic HDPE bag	0.23	23,321,363	14,135,682	20,464,020	5,975,984	-
Woven PP bags	17.20	9,039,446	40,970,070	15,375,333	65,737,628	83,876,846
Single-use paper bag	3.71	370,800	30,509,424	6,351,106	53,886,985	71,008,200
Bin liners	0.63	3,831,955	14,839,315	6,016,108	23,377,370	29,630,455
Cotton bags	42.23	-	5,405,184	1,072,533	9,597,811	12,668,400
Jute bags	44.14	-	5,650,176	1,121,146	10,032,836	13,242,600
Total cost of imports		36,563,564	118,809,896	65,000,337	171,694,773	210,426,501

Table 41: Total levy generated¹⁰⁷

	Option 1	Option 2.1	Option 3.1	Option 3.2	Option 2&3.1	Option 2&3.2	Option 4
Levy generated (Rs000)	45,230	176,763	50,972	22,315	200,892	90,507	9,751

6.2 Multi-criteria decision analysis

Bearing in mind the objective of a policy initiative on single-use plastic carrier bags, namely to limit the negative impacts on the environment and to reduce resource and energy use, it is important to complement the quantitative assessment above with a qualitative analysis of impacts. Tables Table 42 and Table 43 provide an overall assessment of the policy options analysed in this RIA.

Table 42: Advantages and disadvantages of the different options

Policy option	Advantages	Disadvantages
Option 1: Baseline	No legal or administrative changes or costs	Increased environmental, economic and social impacts over time
Option 2: Wider enforcement of current regulation	Significant reduction in plastic bags Retains consumers choice No additional burden for large producers/ retailers Significant impact on consumer awareness Significantly increased revenue	Significant impact on small/ informal traders Higher cost for consumer Significantly increased burden for small producers/ traders Additional enforcement costs
Option 3: Increased levy	Funds collected can be ring-fenced for environmental programmes Provides incentives for consumers to reduce usage/increase reuse, while maintaining choice Slightly increased revenue (Rs5 levy)	Administrative burden on producers, importers, retailers and government Cost to consumers – levy or multiple-use bags (only at major retailers) Little effect on consumer awareness Only small decrease in carrier bag consumption

¹⁰⁷ Note that the levy also applies to multiple-use bags, which is why there would still be some revenue income even if all single-use plastic carrier bags are banned.

		Decreased revenue (Rs10 levy)
Options 2 & 3 combined	Significant reduction in plastic bags and litter Retains consumers choice No additional burden for large producers/ retailers Significant impact on consumer awareness Significantly increased revenue	Significant impact on small/informal traders Higher cost for consumer Significantly increased burden for small producers/traders Additional enforcement costs
Option 4: Ban	High level of certainty in mitigation of environmental impacts, especially litter Decreased clean-up costs Decreased administrative burden	Significant loss of revenue Loss jobs connected with single-use bags Loss of consumer choice Increased landfill Increased road congestion

Table 43: Multi-criteria analysis

Criteria/Option	1	2	3.1	3.2	2&3.1	2&3.2	4
Socio-environmental impacts							
Consumption of single-use plastic bags	--	+	+	+	+	+	++
Support behaviour change in consumers	--	+	=	=	++	+	--
Facilitate consumer choice	++	+	=	=	-	-	--
Environmental impacts							
Litter	-	-	=	--	+	++	++
Resource efficiency	++	+	++	++	=	-	--
Emissions	++	+	++	++	=	-	-
Landfill	++	+	+	+	=	=	--
Reduction in GHGs	++	+	++	++	=	-	-
Reduction in road congestion	++	=	++	+	-	--	--
Reduction in water usage	++	=	++	+	-	--	--
Reduction in marine pollution	--	+	-	-	+	+	++
Economic impacts							
Impacts on producers	++	=	+	-	+	-	--
Impacts on consumers	++	=	+	=	+	--	--
Impact on major retailers	=	++	+	-	+	--	--
Impact on small/informal traders	++	-	++	++	-	--	--
Administrative burden	+	--	+	+	--	--	++
Minimise job losses	=	=	-	=	-	--	
Reduce clean-up costs	--	-	=	--	+	++	++
Road congestion	++	=	++	+	-	--	--
Transport costs	++	=	++	+	-	--	--
Trade balance/balance of payments	++	=	+	+	-	-	--
Government levy	=	++	+	=	+++	+	--

Option 2 would have the significant advantage of being simple to implement, as it simply means extending current enforcement to other areas (small producers, and small and informal traders). Option 3 would add no additional burden on top of option 2, as the only change would be in the amount of the levy. Option 4 would require a totally different type of enforcement, namely to ensure that no traders provide single-use plastic carrier bags.

6.3 Implementation

6.3.1 Introduction

Changes in institutional arrangements needed to implement a new measure may entail administrative and human resources' costs. This will apply both to Options 2 (expanded enforcement) and 4 (new type of enforcement).

The administrative costs associated with the regulatory change will depend on which option is selected. The combination of Options 2 and 3 may carry the highest burden, as it combines the additional burden of Option 2 (wider enforcement) with the additional burden of an increased levy. This additional burden will be both on public authorities and on producers/retailers, including on small and informal traders.

Public authorities are likely to face additional costs related to monitoring (in particular to ensure compliance by retailers with reporting obligations, and to determine if small and informal traders simply move from plastic carrier bags to other plastic bags, e.g. roll-on bags), but this would be small compared to the benefits, including the additional revenue collected.

6.3.2 Possibility to generate revenues

Under Option 4, there exists virtually no possibility to generate any revenues (revenues decrease by 78% compared to Option 1), while revenue generation under Option 1 is not ideal. Option 2 and the combination of Options 2 and 3 (with a Rs5/bag levy) provide by far the best revenue-generation options. The recommended wider enforcement of the levy for plastic carrier bags along with an increase in the levy, which was found to be relatively price-inelastic, would maximise revenues.

If revenues flow to public authorities, they could be used to offset the necessary administrative costs related to implementation and enforcement. Revenues could also be used to finance environmental projects, including awareness projects.

6.3.3 Supporting the measure

Most producers and the major retailers support wider enforcement of the current levy, while they have no major concerns regarding an increase in the levy to Rs5. Retailers also support this position. Consumers would retain the choice of buying a plastic carrier bag, but at additional cost, which is likely to support a switch to multiple-use bags. Small and informal traders all oppose the wider enforcement of the current levy for obvious reasons.

On the other hand, producers, retailers, small and informal traders, and consumers all perceive a ban as excessive and disproportional, especially in light of the positive experiences in other countries having taken less stringent measures.

6.3.4 Raising awareness on sustainable consumption

Making single-use plastic bags more scarce by introducing a levy on all plastic bag carriers, including those supplied by small and informal traders, would raise consumer awareness of unsustainable consumption patterns more broadly, that is, beyond the consumption of plastic bags only. This effect is likely to be much smaller in the case of a ban, which would not be informative as regards the consumer behaviour. A combination of Options 2 and 3.1 would raise awareness not only on plastic carrier bags, but to consumerism in general, which may result in decreased usage and litter of other products, including plastic bottles and caps.

6.3.5 Other issues

A ban may affect small and informal traders proportionately more than larger retailers because it might discourage “impulse” buying by consumers. For larger retailers, which represent a significant channel for plastic bags distribution to consumers, 'impulse shopping' is likely to account for a smaller share of sales. If there is a significant reduction in “impulse” buying, it might lead to the closure of several of the small or informal traders, which could have a major impact on employment.

7. PREFERRED OPTION

It is clear that Option 1 is not sustainable as there are too many plastic carrier bags in circulation and the number increases each year along with population and economic growth. Considering the durability of plastic bags, all new bags are either landfilled or littered on top of all previous bags, which exacerbates the problem over time. Plastic bag litter may cause significant harm to the environment, especially the marine environment, and may lead to decreased fishing reserves, increased fishing costs (through the cleaning of equipment) and may negatively impact the tourism industry, both directly (through higher clean-up costs) and indirectly (loss of tourists as a result of unsightly litter). Voluntary options were discarded at an early stage, as it was found that these would be insufficient to meet the requirements of at least a 50% decrease in the usage of plastic carrier bags. This means that additional regulatory intervention is required.

Industry proposes an awareness programme to educate consumers of the dangers and hidden costs of plastic bags and other plastic products (e.g. bottles) in general, as well as a significantly increased number of public litter bins to be provided for litter disposal. It indicated that for reusable PP bags the price would have to be less than Rs10/bag to make it viable. As PP bags cannot be locally produced at those prices, they will have to be imported.

Paper bags are not a viable alternative as they could lead to an increase in shoplifting – clear bags are required for security purposes. If plastic carrier bags are to be replaced with paper bags, for hygienic reasons these would have to be wax-lined, making them more expensive and more harmful to the environment.

Industry indicated that current bags cost around Rs3 each (excluding levy), but consumers are only charged the levy and not the cost of the bag. The price could be increased to a level at which the consumer is charged the full price of the bag. Accordingly, producers have proposed that the levy be increased to Rs5/bag on all bags, with a ban for products under 30 microns. Finally, producers proposed that there should be enforcement of the levy on *all* plastic carrier bags, especially as regards <20 micron bags, as these cause the biggest problems.

Taking into consideration the advantages and disadvantages of each of the different options, including the primary goal of government, i.e. to reduce litter and landfill, a combination of Options 2 (wider enforcement of the current levy) along with Option 3.1 (increase in the levy to Rs5/bag) is supported. Although no additional analysis has been done in this regard, in line with actions in several other jurisdictions, it might be wise to also extend the levy to paper bags to prevent a one-on-one switch. This will be necessary, as it has been shown that the landfill impact of paper bags is significantly higher than that of plastic carrier bags.

The additional revenue collected should be used, at least partially, for environmental awareness campaigns to educate consumers to reuse their bags more often. This would have an impact at all levels and could also lead to a change in consumer behaviour on other products, such as plastic bottles and caps.

8. MONITORING AND EVALUATION

8.1 Core indicators of progress towards meeting the objectives

The core indicators for progress towards meeting the objectives set for this policy initiative are:

- Decreased use of single-use plastic carrier bags
- Decreased landfill from single-use plastic carrier bags
- Decreased litter caused by single-use plastic carrier bags

Progress towards meeting the objectives can be monitored by monitoring the production volumes of both small and larger producers, along with import statistics for single-use plastic carrier bags, paper bags, bin liners and multiple-use bags.

8.2 Broad outline for possible monitoring and evaluation arrangements

As indicated above, monitoring can take place through the administrative burden placed on producers and traders, as well as monitoring imports. The collection of levies should be as transparent as possible, with regular publication of the amounts raised in respect of each category of product (single-use plastic carrier bags, multiple-use plastic bags, paper bags), as well as whether raised from domestic producers or imports. Necessarily, the actual data of each producer should be protected.

Systematic litter surveys can be conducted on beaches, along roads and in the countryside.¹⁰⁸

Monitoring should also take place to determine whether the informal market moves from single-use plastic carrier bags to roll-on bags, which would defy the object of the regulatory intervention.

Previous studies in the EU have indicated that monitoring a reduction in the consumption of single-use plastic carrier bags combined with a pricing measure should be relatively straightforward, given the monitoring instruments that already exist for the implementation of the current levy. The proposed measures aiming to reduce the use of single-use plastic carrier bags should not imply major changes to existing monitoring obligations.

There should be report back on a regular basis, e.g. quarterly, on the amounts of single-use plastic carrier bags (and perhaps the alternative products) placed on the market and on how the regulatory intervention contributes to achieving a reduction of single-use plastic bag consumption.

¹⁰⁸ In Ireland, for instance, these types of surveys are paid for by the Environment Fund, resourced by the single-use plastic bag levy.

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