ANNEX B: DETAILED BAG PERFORMANCE AND REGULATION CONSIDERATIONS

COMMON BAG TYPES AND CHARACTERISTICS

Summary of Checkout Bag Performance Considerations

Scientific analysis of bag alternatives highlights that the key to reducing the environmental impacts of ANY bag type is to reuse it as many times as possible, thereby revealing that the reusable bags made and managed sustainably, used many times, pose the least overall negative impact.

The following important points[10] summarize the life cycle impacts and comparisons of the various bag alternatives:

- **All bag types pose negative impacts (ie. there is no ideal bag type).** All bag types have advantages and disadvantages, but some bag types impose more sustainability impacts than others.
- **Recycled content** in any bag-type greatly improves its environmental performance;
- **Plastic bags pose more of a litter problem**, due to their mobility (ie. subjected to wind and water forces, more so than other bags).
- Free, lightweight high density polyethylene (HDPE) bags are more likely to be littered than any reusable bag.
- **Even paper bags**, made from 100% recycled materials, **may pose higher environmental impacts than plastic bags, in all categories except litter**[11], due to pulp production energy use, its generation of solid waste, and acid-slurry, water pollution impacts
    - A 2011 UK Government study finds paper bags pose three times the GHG, and 3 times the waste generation, 14 times the water contamination, when compared to a conventional HDPE bag[12]).
- **Biodegradable/compostable/degradable bags** do NOT readily break down in our landfill, require industrial heat/temp to degrade, and would only be considered a viable future bag option if labelling, collection and recycling processes delivered transformative change to recovery, separation and processing
- What's the most environmentally friendly, reusable bag alternative?
    - A sustainably designed and managed bag used many times!
    - Each bag type performs differently across the various environmental factors, which include water quality impacts, atmospheric contamination, solid waste production etc.
    - For example: the greenhouse gas (GHG) performance of reusable bag types is only better than that of conventional plastic checkout bag, when reused a sufficient number of time, as follows[13]:
        - Paper: 3 times
        - Heavy Weight Plastic (LDPE): 4 times
        - Non-Woven Polypropylene (NWPP): 11 times
        - Cotton Bag: 131 times
    - Other factors and assumptions from each study are important to consider when assessing the comparable sustainability performance results of bag alternatives.

[10]. European Commission. (2011). Assessment of impact of options to reduce the use of single use plastic carrier bags. 12 Sep 2011. Bio Intelligence Service.

[11] This particular Life Cycle Assessment (LCA) study assumed a 50% recycling rate of the paper bags.

[12] PwC/Ecobilan (2004) Impact assessment of Carrefour plastic carrier bags, Carrefour, France, as cited in www.scotland.gov.uk/Publications/2005/08/1993259/33039.

[13] European Commission. (2011). Assessment of impact of options to reduce the use of single use plastic carrier bags. 12 Sep 2011. Bio Intelligence Service. Assumes the HDPE bag was used as a bin-liner 40% of cases.

- Reusable bags used a "sufficient" number of times, pose the least environmental impact of any bag alternative.
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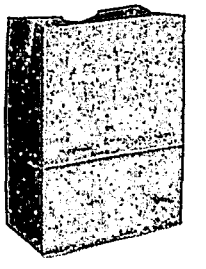
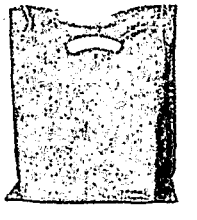
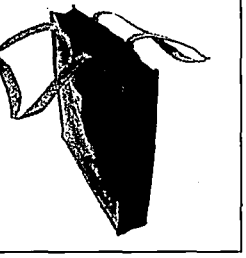
Table A1. Bag Types and Characteristics.

Type	Approx. Design Uses	Industry Name	Advantages	Disadvantages	Image (sources: various)
Single Use Plastic Checkout Bag	1-2	High Density Polyethylene (HDPE)	Inexpensive, lightweight, durable, waterproof	High landfill/litter rates, persistent for human generations.	
Paper Bag	1-2	KRAFT bag	Inexpensive, highly recyclable	Water soluble, heavier, water soluble / perishable, energy intensive.	
Bio Degradable / Compostable / Degradable Bag	1-2	Various	Inexpensive, lightweight, durable, waterproof	Unlikely to break down without industrial process, often confused with HDPE, fouls recycling / processing equipment	
Heavy Weight Plastic Bag	4-20	Low Density Polyethylene (LDPE)	Inexpensive, very durable, relatively lightweight, waterproof	High landfill rates, persistent for human generations, more resource intensive.	
Synthetic Reusable Bag	>100	Non Woven Polypropylene (NWPP)	Durable, relatively lightweight	Resource intensive, potentially difficult to recycle	

Cotton / Natural Fibre Bag	>100	Cotton / Canvas Bag	Durable, aesthetics	Potentially resource intensive, difficult to recycle	
Reusable – Various	>100	Various	Durable, aesthetics, can be made from recycled materials and/or recyclable, may have low resource intensity	May have resource penalties, and/or be difficult to recycle	 

The Risks of Biodegradable Bags

Many types of bio-based plastics are used as a part or all of the resin to make checkout bags. These bags may be marketed as "degradable", "biodegradable" or similar, suggesting that they offer a more environmentally friendly bag option. Many types of bio-based bags made with compostable polymers, are designed to be processed in industrial composting facilities, using micro-organisms, and / or controlled temperature, oxygen levels and processing times. These bio-based/biodegradable bags look and feel the same as conventional single use plastic checkout bags (ie. HDPE), and do not break down readily in landfills due to an absence of pressure, oxygen and heat. These types of bags are commonly mixed with conventional HDPE bags, and foul and contaminate film plastic recycling equipment and processes due to their different chemical makeup.

For these reasons, it is assessed that the current family of bio-based bag alternatives actually pose greater risks than conventional HDPE bags, and should be avoided until such a time that standardized labelling, sorting and performance standards are achieved. Only then could they would be easily separated and managed at the requisite industrial facilities, without fouling plastic recycling processes.

Reusable Bag - Usage Rates

The success of any single-use plastic bag regulation will depend on the resultant net environmental impacts caused by the shift away from HDPE bags, towards one or more bag alternatives. Any successful shift to reusable bags must promote the uptake of a minimum number of cloth reusable bags used well over a 100 times each, to avoid excessive production, use and waste generation. This success can only be reached if reusable bag alternatives are sustainably designed, reused a "sufficient" number of times, and retired sustainably. .

A small 2014 online survey suggested that a sample of USA consumers were reusing their NWPP bags only 15 times, and only slightly more in communities with bag legislation[14]. The study also suggested that heavier weight plastic bags (LDPE) held the least potential to be reused (~3 times). These low re-usage rates of any reusable bag must be overcome for a bag regulation to be

[14] Edelman Berland. (2014, May 15). *Reusable Bag Study*. Retrieved May 15, 2014, from www. slideshare.net: http://www.slideshare.net/EdelmanBerland/reusable-bag-study-results#

successful. This study also highlights the poor recycling rates of LDPE plastic bags. LDPE bags are challenged by low rates of reuse and recycling, and risks once litter, which are all important factors in determining what role the LDPE bag should play in any future bag legislation. That being said, the comparative net environmental impacts of LDPE bags, if used a "sufficient" number of times, should not be ignored.

Research from the City of San Francisco has defined reusable bag design standards must accommodate over 125 uses[15]. Retailers and customers will have to adopt the habit of reusing checkout bags well over 100 uses. Many different bag types, each with different reuse targets, could confuse the public, whereas a common target for all reusable bags will likely increase understanding and habit-forming. The low reuse and recycling rates and littering risk of LDPE bags support their restriction via this bylaw. Instead, a checkout design and reuse standard of 125 uses could help build a common understanding and habit towards reusable bag adoption.

THE RISKS AND BENEFITS OF A PLASTIC BAG BAN

All stakeholders agree that a wholesale shift to sustainable reusable checkout bags is an ideal end-state, and that increased education and awareness is required for meaningful consumer behaviour change. Many stakeholders believe that a rapid shift is required to avoid the most negative impacts from this growing waste-problem, and that a regulatory ban is the most appropriate and effective management option. Other stakeholders consider an immediate or near-term ban too severe and disruptive, and one which poses several risks of disproportionate unintended consequences. Alternatively, this group considers that additional education and awareness and even a bag levy should be favoured, instead of any ban.

The long term phasing-out of materials that quickly become waste is the most sustainable and responsible outcome, but views differ on how to best achieve it. Council has clearly expressed their favour for a deliberate, phased-in ban of single-use plastic bags, and that more education and awareness is necessary to equip consumers and business with additional information and tools necessary to shift towards reusable checkout bags.

A ban on single-use plastic bags may result in the following potential advantages or **benefits**:

- Rapid and consistently applied shift away from single use plastic checkout bags across the community,
- A deliberate shift towards more sustainable business and consumer behaviours;
- Improved waste avoidance, and subsequent cost and operational savings, and potential level-of-service enhancements;
- Reduced risk of community litter and debris, reduced risk of cross-contamination of other recycling and compost streams, and reduced risk of underground infrastructure fouling.

Unless properly mitigated, a ban on single-use plastic retail bags, could potentially result in the following disadvantages or **risks**:

- Unintended, increased paper bag use, and greater financial, environmental and social impacts,
- Unintended, excessive reusable bag use, and subsequently greater resource intensity and subsequent financial, environmental and social impacts;
- May dissuade businesses from investing in their own proactive waste management programs (extended producer responsibility, take-back or waste-minimizing), due to any imposed bag regulations that penalize with additional costs and hardship,
- May disrupt business and consumers, who have to plan and prepare differently for bag

[15] How to verify if a reusable bag meets the checkout bag ordinance requirements. San Francisco Environment. Reusable bag requirements. Available online at: https://sfenvironment.org/sites/default/files/editor-uploads/zero_waste/pdf/sfe_zw_check_out_bag_verification.pdf

alternatives;

- May create market forces that result in undesirable financial or social impacts across the supply chain;
- May confuse or dissatisfy consumers if regulation is unfamiliar or incoherent with regional or provincial programs;
- Cause concerns of an actual or perceived customer revenue loss due to an unwillingness to pay for more sustainable bag alternatives;
- Allocation of resources to away from higher priority waste management issues.