"Assessment of Benefits and Effects of the Plastic Shopping Bag Charging Scheme" by GHK (Hong Kong) Ltd.

This paper presents the "Assessment of Benefits and Effects of the Plastic Shopping Bag Charging Scheme" conducted by GHK (Hong Kong) Limited ("GHK" hereafter), as well as the views of the Administration on the GHK's findings.

Scope

2. In December 2005, the Environmental Protection Department ("EPD" hereafter) commissioned GHK to conduct an "Assessment of the Benefits and Effects of the Plastic Shopping Bag Charging Scheme" ("the Assessment" hereafter). The key tasks included:

(a) to collect data on plastic shopping bags;
(b) to review overseas experience on plastic shopping bag reduction;
(c) to identify options for plastic shopping bag reduction in Hong Kong;
(d) to solicit views from major stakeholders;
(e) to assess the impact of options identified; and
(f) to recommend a way forward for Hong Kong.

Options Identified and Assessment

3. Having considered the information collected, the experience overseas, as well as the views from major stakeholders, GHK identified and assessed four options for plastic shopping bag reduction in Hong Kong. The four options were:

Option 1: Voluntary Approach
To continue and strengthen voluntary plastic shopping bag initiatives such as the "Voluntary Agreement on Plastic Bag Reduction" and the "No Plastic Bag Day".

Option 2: Supplier Levy and Consumer Charge
To impose a supplier levy at the manufacturing and import level for cost recovery, *and* a consumer charge at all retail outlets as economic disincentive.

Option 3: Consumer Charge at All Retail Outlets
To introduce a consumer charge at all retail outlets.

Option 4: Consumer Charge at Selected Retail Outlets
To introduce a consumer charge in phases at selected retail outlets.

4. The assessment of GHK over the four options is summarized as follows:

(a) The incentive to reduce the use of plastic shopping bags can only come through a consumer charge. A supplier levy is *not* effective in this respect.

(b) All options can reduce the number of plastic shopping bags, but a key issue to address is the risk of "switching" to alternative bags, such as paper bags that are heavier and bulkier than plastic bags.

(c) Option 1 can achieve certain reduction in plastic shopping bags, and the risk of "switching" to alternative bags is minimal.

(d) Options 2 and 3 can achieve significant reduction in plastic shopping bags (in the order of four billions), but the risk of "switching" to alternative bags is substantial, and would likely result in *more waste* to our landfills;

(e) Option 4 can achieve considerable reduction in plastic shopping bags (in the order of one billion), but the risk of "switching" to alternative bags is still present. Depending on the extent of switching, there could either be a net increase or decrease in the amount of waste

Recommendation

5. In views of the assessment above, GHK suggests that "*the Government (should) continue with its voluntary initiative…Should the Government…decide to press ahead with implementing a mandatory plastic shopping bag charging scheme, then there appears to be merits in introducing a scheme in phases*". The Executive Summary and the Report of GHK's Assessment are at **Annex**.

Views of the Administration

6. The Administration has taken note of GHK's Assessment. We generally share GHK's view that a voluntary approach can achieve certain reduction in plastic shopping bags. In fact, the "Voluntary Agreement on Plastic Bag Reduction" signed by major retailers managed to reduce about 150 million plastic shopping in the past year. Yet, the reduction figure is dwarfed by the sheer scale of the problem. We consider that it is time to take a more decisive action by introducing an environmental levy on plastic shopping bags in accordance with the "polluter pays" principle.

7. The Administration also generally shares GHK's concern over the risk of "switching" to alternative bags. We have, therefore, proposed a phased approach by first introducing the environmental levy at chain or large supermarkets, convenience stores and personal health and beauty stores. Given the nature of products offered by these retailers and the shopping habit of Hong Kong people, the risk of "switching" to alternative bags at these retailers would be limited. In fact, at our meetings with these retailers, none of them had indicated any plan to switch *en masse* to alternative carriers, such as paper bags. According to GHK's assessment, under such a "no switching" scenario, option 4 would result in *less* waste to our landfills. Yet, we would closely monitor the situation, and address any problem of indiscriminate use that may arise.

Environmental Protection Department
August 2007

The Benefits and Effects of the Plastic Shopping Bag Charging Scheme

Executive Summary

May 2007

GHK

Study Background and Policy Agenda in Hong Kong

Municipal Solid Waste (MSW) management is a top priority policy issue in Hong Kong. The Environmental Protection Department's *A Policy Framework for the Management of MSW (2005-2014) (the Policy Framework)* sets out the Government's strategy for implementing sustainable practices in MSW management, as well as policy objectives and targets to reduce the amount of MSW generated, increase the recovery and recycling of MSW and reduce the MSW disposed of at landfills. The Policy Framework suggests introducing producer responsibility schemes (PRS) as a key policy tool based on the polluter pays principle as one of a series of initiatives to help achieve MSW objectives. The Government intends to introduce a piece of PRS legislation in 2007 with priority given to plastic shopping bags, vehicle tyres and electrical and electronic equipment. Of these, the plastic shopping bag PRS is planned to be the first, setting the scene for future PRS's, raising public awareness of the impact of wastefulness and promoting environmental responsibility.

GHK (Hong Kong) Ltd. was commissioned by the Environmental Protection Department (EPD) to carry out the *Assessment of the Benefits and Effects of the Plastic Shopping Bag Charging Scheme* (the Study) in December 2005. The primary objective of the plastic shopping bag PRS is to significantly reduce the "indiscriminate use of plastic shopping bags" in Hong Kong. The scope of the Study was to develop a scheme which makes use of financial incentives, whereby retailers are required to charge consumers who request a plastic shopping bag, rather than by direct regulation. The intention is to reduce plastic shopping bag use and bag use generally, but not to eliminate the use of plastic shopping bags, nor affect other forms of plastic or other types of waste.

At the heart of the Study was an impact assessment that evaluated the impacts of potential charging schemes on key stakeholders (consumers, retailers, manufacturers, traders and the Government). The assessment was made on the basis of evidence drawn from prior plastic bag reduction initiatives in Hong Kong, experiences from international schemes and views from stakeholders. In light of the findings from the impact assessment and under guidance from EPD, potential plastic shopping bag charging schemes were developed[1] with reference to what was considered practical and achievable in Hong Kong and proposals were made for Government consideration.

Environmental Objectives and the Plastic Shopping Bag Problem

In 2005, more than 23 million plastic shopping bags were sent to landfill every day in Hong Kong; equivalent to more than three bags per person per day[2]. Although accounting for just over 3% of MSW and less than 2% of all waste[3] sent to landfill in Hong Kong, plastic shopping bags create additional environmental concerns as they take between 20 and 1,000 years to decompose and release carcinogenic and highly toxic dioxin if burned below 800 degrees Celsius.

By targeting plastic shopping bags for its first application of PRS legislation, the Hong Kong Government is not suggesting that plastic shopping bags are a problem per se. Neither is the Government suggesting that they are better or worse than other bags provided free at the point of

[1] Scheme development was specifically limited by EPD to schemes that charged for plastic shopping bags only.

[2] As recorded by the special ad-hoc survey of plastic shopping bags in the waste stream conducted by EPD in late 2005 (the Landfill Survey). However, there is a considerable discrepancy between the number of plastic shopping bags disposed at landfill and data on plastic shopping bags provided by retailers in the supermarket and convenience store sectors. Data from retailers for other sectors is not available so it is not clear whether this trend applies to all sectors or is specific to supermarkets and convenience stores. The discrepancy could reflect differences in the timing of data collection, retailers under-reporting the number of bags provided and the landfill survey over-estimating the numbers disposed each day.

[3] Waste sent to landfill is measured by wet weight and includes MSW, (53% in 2005), construction waste and special wastes. EPD does not publish waste disposal data by bulk, a more direct measure of landfill capacity, but indicative calculations based on the Landfill Survey suggest plastic shopping bags account for just 0.14% of MSW by bulk.

sale. The problem, according to the Policy Framework, is the indiscriminate use of such bags. The proposal for the PRS for plastic shopping bags is to encourage more environmentally responsible behaviour through direct polluter pays charges for an item where habit and social norm have resulted in what is considered to be wasteful and excessive use. Moreover, with average MSW generation in Hong Kong growing at over three times the rate of population growth since 1996 and current disposal trends predicting the Special Administrative Region's landfills will be full by 2015, changing consumer attitudes by highlighting wasteful behaviour could have wider benefits for future waste management and sustainability.

However, reducing the use of plastic shopping bags does not automatically confer environmental benefits since consumers still require a means to transport their goods home and alternative bag types are not necessarily any better for the environment, despite widespread public opinion to the contrary. Paper bags are heavier and bulkier than plastic bags and thus require more resources in transportation and take up more space at landfill. They also entail greater water consumption, greenhouse gas emission and eutrophication of water bodies during production. Likewise, biodegradable plastic bags create difficulties if mixed in with conventional plastic bags for recycling and upon disposal create landfill gas, leachate, decompose at a non-homogenous rate and may soon be banned from landfill altogether under future EPD plans. Even non-woven bags, which are commonly marketed as being 'environmental', are only more environmentally friendly if they are used at least as many times than as their relative increase in weight and bulk over conventional shopping bags. These bags also often include such features as metal eyelets which make them difficult to recycle. Reducing the indiscriminate use of plastic shopping bags therefore will only truly achieve environmental gains if switching to alternative bags distributed free at the point of sale is limited and consumers either reuse long term bags many times or use no bag at all.

International Plastic Bag Reduction Schemes

More than 10 countries or regions have already implemented schemes to reduce plastic bag use, ranging from outright bans to specification controls, levies on bag suppliers and charges on consumer consumption. Case studies and investigations were conducted into eight schemes but the lessons learnt are difficult to generalise since schemes vary considerably in terms of the type of bags included in the charge (plastic/paper); rate and measure (weight or per bag); method of implementation (voluntary/compulsory); collection mechanism and use of funds. In particular, each scheme is different and responds to the particular concerns of the country.

In countries where the rationale lies in concerns over littering and drain congestion causing flooding, outright bans are more popular. In others, charging and incentive structures are often used to reflect concerns about MSW growth and the associated management costs, pressures on landfill, meeting environmental targets and the requirement to act as good environmental custodians. Despite the prevalence of schemes of varying types, there exists little by way of overall scheme impact assessments, either because the schemes are too recent, or because they focused only on the reduction in plastic bag use alone and not the schemes' wider impacts. Of the evidence that is available, it is clear that the introduction of a charging scheme that will yield marked environmental benefits is not straightforward. Schemes of particular relevance with sufficient evidence available are summarised in the table on the following page.

Summary Experience of International Schemes

The Scheme	Positive Impacts	Negative Impacts
Eire (2002): HK$1.5 equivalent consumer charge, collected by the Government. Objective: to reduce littering from plastic bags.	Initial 94% reduction in plastic bag use, since reduced to 75%.	Substantial increase in pre-packaging of fresh foods and switching to paper shopping bags. 77% increase in bin liners.
Taiwan, China (2002): consumer charge chosen and retained by retailer (typically HK$0.23-0.69). Part of a wider waste reduction initiative.	68% reduction in plastic bag use.	Switching to paper and alternative shopping bags. Initial ban on thin plastic bags withdrawn from restaurants with a storefront following increase in total plastic use and compliance problems.
Denmark (1994): supplier levy of HK$12.50 equivalent per kg paper bags and HK$27.5 plastic bags, mostly passed on to retailers. Collected by Government. Objective: increase green taxes, reduce direct taxes.	60% initial reduction in bag use, though with some slight increase since.	Retailers have passed the charge on to consumers, often at a rate in excess of the tax, thereby making a profit on the sale of shopping bags. Subsequent lack of incentive on the part of the retailer to engage in shopping bag reduction initiatives.
Australia (2003): voluntary initiative with targets for reducing bag use and increasing recycling by 50% respectively, requiring 90% compliance from supermarkets.	Falls in bag use by up to 45% at participating retailers and increased recycling by up to 14%.	Consumer behaviour not thought to have altered. Very limited take-up from the non-supermarket retailer sector who are not required to comply.

The international evidence suggests that the largest reductions in bag use can be made by directly targeting customers, though this could also lead to the greatest unintended consequences if the schemes are not carefully designed and tested beforehand. In particular, the need to control switching to alternative bag types is of paramount importance: in Eire it has been estimated that this switching resulted in an increase in bag weight by up to 11 times per bag, an increase in bulk by up to 18 times and a cost multiplier of up to 13 times. Such multiples, combined with problems in landfill, highlight the adverse environmental consequences of switching and reinforce the necessity of setting firm environmental objectives[4]. The international examples also point to the likelihood of a slight rebound in bag use following the initial reduction, problems in inducing participation for voluntary schemes, the probability of evasion and the advantages of phasing implementation to encourage compliance and ease teething problems.

Initiatives in Hong Kong

Shopping is much more of a daily habit in Hong Kong with the abundance of street markets, low car ownership, crowded living space and hygiene concerns all affecting the high levels of plastic shopping bag use. Indeed, daily bag use per capita in Hong Kong is over three times greater than it was in Ireland and Australia prior to the introduction of their schemes, and 20% greater than in Taiwan. These factors and resulting high demand, combined with the large proportion of independent traders in the retail sector, pose particular problems for the imposition of a plastic shopping bag PRS. In contrast to European countries for example, according to the Landfill Survey almost 60% of the plastic shopping bags disposed at landfill came originally from the independent retail sector including market stalls; just 20% came from supermarkets and convenience stores, and 6% from bakeries.

[4] The possibility of unintended negative environmental consequences were quoted as one of the contributing factors causing the Scottish Executive to withdraw its proposed plastic bag charging scheme because the net environmental benefit could not be proved.

Despite this, the plastic bag reduction schemes already undertaken in Hong Kong have tended to focus on the larger retail chains. In recent years, some 17 separate initiatives have been pursued by a variety of stakeholders but they have generally only been introduced by individual chains and on a temporary basis with no official monitoring to evaluate impacts. While these schemes may have succeeded in reducing store-specific plastic shopping bag use, their uncoordinated and unilateral approach would appear to have had limited impacts on the waste steam. However, these initiatives have succeeded in raising awareness, culminating in 2006 with the introduction of No Plastic Bag Day (NPBD), co-organized by major green groups and supported by the EPD. The initiative had 39 participating retailers by November 2006 and an average of 51% of respondents to Green Student Council surveys claimed to be developing the habit of not using plastic bags or bringing their own bags when shopping on NPBD. According to EPD more than 10 major retail chains have continued campaign in 2007, with two chains turning the event into a weekly one.

EPD's Voluntary Agreement on Plastic Bag Reduction, also introduced in 2006, was implemented to formalise and extend some of the unilateral initiatives already being pursued by individual retailers. Ten major retail chains have so far joined, pledging to reduce their handing out of 'free at the point of sale' plastic shopping bags by over 120 million bags a year (a reduction rate of about 15%). The scheme has shown considerable success to date with major supermarket chains apparently successfully reducing their combined handouts of plastic shopping bags between April and December 2006 by some 110 million compared with the same period in 2004 (a reduction rate of 23% to 26%). Overall, chains are reporting reductions of 7% to 32% after controlling for increases in outlet numbers. Such reductions highlight a public willingness to reduce plastic bag consumption and both schemes have helped raise awareness of the issues involved, although the extent to which they may have altered long-term consumer behaviour remains unclear.

The View-Seeking Exercise

The view-seeking exercise, designed in co-operation with EPD and conducted by the consultant throughout summer 2006, consisted of a series of structured interviews with six manufacturers, traders and retailers associations; thirteen individual manufacturers and traders; and fifteen individual retailer chains. The exercise also included an independent retailer survey comprising 99 interviews and a postal survey of larger retailer chains that received 25 responses (including the 15 already mentioned). In terms of coverage, the respondents comprised 4% of retailer outlets and 14% of retailer employment.

In order to best inform the impact assessment, a scheme involving both a consumer charge and a supplier levy was adopted as a reference case upon which the views of stakeholders were sought. This scheme entailed a supplier levy of $12.50 per kg, or roughly 5 cents per bag, at the point of production or import and a $0.50 consumer charge per bag at the point of sale. The supplier levy would be collected by the Government and the consumer charge would be retained by the retailers. Any bag made wholly or partly of plastic would be included in the scheme but bags used for the carrying of fresh food would be exempt from the consumer charge.

The view-seeking exercise identified an appreciation of the waste problem and a willingness to make a contribution to solutions among those who responded. However, the respective levies were expected to come at a high cost to producers, retailers and Government in terms of implementation, compliance and enforcement. Stakeholders thought that evasion would be common and loopholes would be exploited wherever possible.

The supplier levy was not perceived to address what the respondents considered to be the root cause of the problem: consumer behaviour. Manufacturers were concerned that interest in implementing a supplier levy demonstrated a lack of understanding about the impact of plastic bags in the waste stream compared with alternative packaging options. Manufacturers reported selling plastic bags to retailers at a median price of some 14 to 21 cents for t-shirt and die cut bags respectively, such that a 5 cent per bag levy would significantly increase production costs. Small

manufacturers and traders expected to lose business as a result of this cost increase and there is a view that few small companies would survive.

The consumer charge was expected to do more to reduce indiscriminate plastic bag use with four out of five retailers believing that fewer shopping bags would be consumed. However, actual in-store supply was rarely anticipated to fall by more than 20% and switching to alternative bag provision was expected to be widespread: 84% of large chains thought they might switch to providing alternative bags to consumers. There was a broad consensus among large retail chains that, despite likely implementation difficulties in the independent sector, any scheme should be applied universally and should not just target large retailers. In general, costs to retailers were expected to increase, sales fall and profits fall. The majority of retailers thus thought that some retention of the consumer charge would be appropriate to cover costs, although none wanted to appear to be benefiting from its implementation.

Impact Assessment on the Reference Case

Drawing on the international evidence, experience of past schemes in Hong Kong and stakeholder inputs[5], the impact assessment estimated the potential impact of implementing the reference case scheme on plastic bag stakeholders and the waste stream. Key to the assessment was the issue of switching, i.e. how consumers and retailers might react when confronted with a change in relative prices between bag types (whether they would continue using plastic shopping bags, decide not to use a bag at all, or switch to laminated paper bags, paper bags, non-woven bags, long term bags or trash bags). The switching assumptions were derived with reference to customer shopping patterns and potential behaviour in ten discrete retail sectors, reflecting the likelihood that consumers would respond differently when buying a newspaper as to when shopping for fashion items for example. Given the crucial importance of the potential switching to the overall impact assessment results, as highlighted by the international case studies, the impact assessment also included alternative high and low switching scenarios to test for sensitivity.

The combination of the two levies under the reference case was anticipated to reduce plastic shopping bag use by some 44% and all bag use by some 23%. However, since alternative bag types are both bulkier and heavier than plastic bags, switching was expected to increase the overall weight of bag waste to landfill by some 24% and volume of bag waste to landfill by some 123%. Even under the low switching scenario, volume of bag waste to landfill was still anticipated to rise by some 90%. Government net revenues from the 5 cent supplier levy after accounting for enforcement, compliance and collection costs were anticipated to total almost $860m, retailer revenues from the retained consumer charge (less the supplier levy passed on by manufacturers) were anticipated to total almost $2.2bn (before exemptions, non-compliance and administration) and consumers were anticipated to have to pay a total of just over $3bn before exemptions ($0.50 for every plastic bag plus half the cost to retailers of buying alternative bags, passed on to consumers through implicit increases in good prices). The anticipated 35% contraction in the plastic shopping bag use was estimated to reduce the manufacturing and import market by almost $570m and the entire re-export market of some $1.7bn was anticipated to be lost, although the actual value added[6] of this sector to Hong Kong is minimal.

Key results taken forward from the impact assessment include:

- The reference case succeeded in significantly reducing plastic shopping bag use, and bag use in general, but switching to alternative bags was anticipated to result in a negative net environmental impact.

[5] Including a public opinion survey carried out by the Government's Central Policy Unit in January 2006.

[6] Value Added is defined as "gross output minus intermediate consumption", it is one of the two measures used in compiling GDP in Hong Kong

- The incentive to reduce plastic bag use comes through the consumer charge. The supplier levy does not affect habits unless passed on to consumers and therefore has little effect on indiscriminate plastic shopping bag use.
- An intensive advertising and promotional campaign will be required to educate stakeholders about the potentially harmful effects of switching to bags that are commonly perceived to be more environmentally friendly and to increase compliance from retailers.

Developing Potential Plastic Shopping Bag Reduction Schemes for Hong Kong

Drawing on these key results, two additional alternative plastic shopping bag charging schemes were developed. These schemes, the reference case and an option to continue with the existing voluntary initiatives[7] were then both qualitatively and quantitatively[8] appraised so far as the evidence from the reference case permitted, under the assumption that it would form part of a wider initiative and that it would be underpinned by an intensive education and promotional campaign. Summary results from this assessment are shown on the following page.

The assessment suggests that continuation of existing voluntary schemes can achieve some but rather limited reductions plastic shopping bag use and small reductions in overall waste. However, given its voluntary nature, retailer participation will be limited and consumers are not presented with a direct incentive to alter their behaviour. Such an incentive is evident under Options 2, 3 and 4, but each is not without its disadvantages. Option 2 is inefficient since it includes both a consumer charge and a supplier levy to no additional positive effect and is therefore not recommended. Differences between Options 3 and 4 then reflect a trade off between equity and efficiency. Option 3 would be the more equitable arrangement and has the greater impact on plastic shopping bag use since it targets all retailers, but it still results in substantial increases in bag weight and bag bulk to landfill, whilst imposing onerous monitoring and enforcement requirements on Government.

Option 4 is the most cost effective option since it allows the PRS to target 20% of plastic shopping bag use for the cost of monitoring just 3% of retail outlets. However, the imposition of such a scheme would likely have significant competition implications and might mis-label stores as being the worst offenders when in reality these sectors account for just one fifth of plastic shopping bag use and are presently leading the way on EPD's voluntary initiative. The oligopolistic nature of the convenience store market in Hong Kong also greatly increases the risks associated with switching under such a targeted scheme. To this end, a sensitivity test was conducted on Option 4 to consider the impacts of switching being higher, a likely possibility. A test was also conducted to determine the outcome if there were no switching. This outcome is not considered a possibility under the scheme as defined, but provides a useful test for consideration, if all bags not just plastic, were included in the scheme, for example. Under higher switching, there was a 1% increase in wet bag weight and 16% increase in bag bulk to landfill. Under the no switching test, the comparable impact was a reduction of 6% in wet bag weight and 3% in bag bulk to landfill.

[7] Option 1 assumes continuation of all existing voluntary initiatives, including NPBD and the newspaper initiative as well as EPD's voluntary initiative. Continuation of NPBD and the newspaper initiative is also assumed as part of Option 4 but their effects are expected to be dwarfed by the charge in Options 2 and 3.

[8] The quantitative assessment undertaken for Option 1 differs slightly in methodology from that undertaken for Options 2, 3 and 4. For Option 1, actual reductions in numbers of plastic shopping bags are estimated and subtracted from the total estimates by sector based on the landfill survey. For Options 2, 3 and 4, expected percentage reductions and switching assumptions are applied to the landfill survey estimates. Since the landfill survey estimates for the supermarket and convenience store sector are much higher than retailer estimates, the quantitative comparison may under-represent the plastic shopping bag reductions and consequent weight and bulk implications of Option 1 compared to Option 4.

Comparative Scheme Assessment, Summary Results

Option 1: Continuation of the Existing Voluntary Schemes			
% Change in Plastic Shopping Bag Use	-3%	% Change in All Bag Use	-2%
% Change in Wet Bag Weight to Landfill	-2%	% Change in Bag Bulk to Landfill	-2%
Loss of Market Sales to Manufacturers	$32m	Impact on Retailer Revenues	Negative
Cost to Consumers	$0m	Government IRR	N/A
Advantages		Disadvantages	
Some reductions in plastic bag use at participating stores, with minimal government involvement or resources. Minimal disruption for consumers, manufacturers and retailers. More scheme ownership and 'buy-in' from retailers. No incentive to switch to alternative bags means a clear environmental benefit from reduced bag use, weight and bulk		Unlikely to achieve the objective of significantly reducing indiscriminate plastic shopping bag use since little incentive for consumers to change their behaviour – a mandatory consumer charge could probably achieve more. Limited store involvement and little incentive for more stores to join in.	
Option 2: The Reference Case - Supplier Levy (Government collects Revenues) & Consumer Charge at all stores (Retailers retain Revenues)			
% Change in Plastic Shopping Bag Use	-44%	% Change in All Bag Use	-23%
% Change in Wet Bag Weight to Landfill	24%	% Change in Bag Bulk to Landfill	123%
Loss of Market Sales to Manufacturers	$569m	Impact on Retailer Revenues	$2.2bn
Cost to Consumers	$3bn	Government IRR	236%
Advantages		Disadvantages	
Incentives for consumers to reduce indiscriminate bag use. Substantial Government revenues that could potentially be used to fund environmental activities.		Substantial switching; the scheme does not emphasise that 'no-bag' is the most desirable outcome. Supplier levy does not tackle consumer behaviour but wipes out the re-export market. Substantial impact on smaller manufacturers, particularly if they cannot pass the increased cost on to retailers. Onerous implementation and enforcement requirements of supplier levy and compliance requirements for consumer charge increases costs of implementation. Unclear message from Government: revenue raising or economic disincentive?	
Option 3: Consumer Charge Only at all Stores. Government Collects the Revenue rather than it being Retained by Retailers			
% Change in Plastic Shopping Bag Use	-44%	% Change in All Bag Use	-23%
% Change in Wet Bag Weight to Landfill	24%	% Change in Bag Bulk to Landfill	123%
Loss of Market Sales to Manufacturers	$569m	Impact on Retailer Revenues	Negative
Cost to Consumers	$3bn	Government IRR	377%
Advantages		Disadvantages	
Incentives for consumers to reduce indiscriminate bag use. Clear and easily understood message. Substantial Government revenues that could potentially be used to fund environmental activities.		Substantial switching; the scheme does not emphasise that 'no-bag' is the most desirable outcome. Still some impact on smaller manufacturers but less than under a supplier levy. Onerous enforcement, monitoring and compliance requirements and costs of implementing the consumer charge at some 55,000 retail outlets. Unclear message from Government: revenue raising or economic disincentive?	
Option 4: Consumer Charge Only at Supermarket & Convenience Stores (S&C). Government Collects the Revenues			
% Change in Plastic Shopping Bag Use	-11%	% Change in All Bag Use	-7%
% Change in Wet Bag Weight to Landfill	-2%	% Change in Bag Bulk to Landfill	7%
Loss of Market Sales to Manufacturers	$141m	Impact on Retailer Revenues	Negative
Cost to Consumers	$0.4bn	Government IRR	935%
Advantages		Disadvantages	
Incentives for consumers to reduce indiscriminate bag use. Costs to Government are exceeded by collection; implementation to fewer outlets reduces costs of enforcement, monitoring and compliance. Generates Government revenues that could potentially be used for environmental activities. Reduced negative impacts on consumers, retailers and manufacturers.		Some switching; the scheme does not emphasise that 'no-bag' is the most desirable outcome. Limited store involvement diminishes overall impact. Attract anti-competitive criticisms and protests from S&C that are presently leading the way on the voluntary initiatives. Defining which outlets are to be included within the S&C sector will be difficult and possibly contentious. A targeted charge creates incentives for chains to switch to providing alternative bags free at the point of sale so as to not lose market share to competitors that are not required to charge. Switching within the S&C sector will therefore likely be higher than under Options 1-3. Retailers are against targeted schemes which affect competition between stores.	

Table Note:
Measured by wet weight, the impacts of Option 1 and Option 4 on the overall waste stream to landfill are similar: MSW falls by 0.09% and 0.14% respectively and total waste falls by 0.05% and 0.07%. Options 2 and 3 increase MSW by 1.33% and total waste by 0.71%. For bulk, only the indicative impact on MSW can be estimated since current total waste disposal by volume is not reported. MSW to landfill decreases by 0.003% under Option 1 but increases by 0.282% for Options 2 and 3, and by 0.015% for Option 4.

Conclusions and the Way Forward

All options would likely achieve reductions in indiscriminate plastic shopping bag use to a greater or lesser extent. Options 2 and 3, which include a mandatory charging scheme at all retail outlets, would significantly reduce plastic shopping bag use and thus achieve the Government's policy objective. Under Options 1 and 4 the reduction is substantially less, although Option 4 achieves much more than Option 1.

However, reductions in plastic shopping bag use do not necessarily have positive environmental impacts. Plastic shopping bags account for less than 2% of Hong Kong waste sent to landfill and less by bulk. A reduction in indiscriminate plastic shopping bag use could therefore have only a very small positive effect on total waste but there is potential for negative overall impacts if implementing a charging scheme induces switching to heavier or bulkier alternatives that are similarly disposed. Indeed, bag bulk to landfill is anticipated to increase under all of the charging schemes, reflecting the impact of switching to alternatives. Moreover, Options 2 and 3, which fulfil the objective of significantly reducing indiscriminate plastic shopping bag use, increase the amount of plastic bag waste to landfill quite substantially. In terms of significant waste reductions therefore, none of the four options yielded demonstrable environmental benefit.

The introduction of a plastic shopping bag charging scheme may provide a shock factor, thus raising environmental awareness, but such an outcome is not measurable and policy requires a stronger basis for justification. To engender support the Government would also need to reassure the public that funds are being used to further environmental objectives rather than just being subsumed into general Government revenues.

In the absence of clear evidence on the net environmental benefits of any of the charging schemes, the consultants suggest that the Government continue with its voluntary initiative but invest further resources in actively promoting and managing it to increase participation and harness the strength of stakeholder goodwill identified during the view-seeking exercise. Adopting the holistic approach to Hong Kong's waste problems advocated in the Policy Framework, the Government is also encouraged to consider broadening the scope of the proposed PRS, possibly to include alternative bags or packaging, so as to incorporate more of the waste stream. Resources could also be invested to engage with retailers and manufactures in efforts to kick-start Hong Kong's recycling sector, building on the support and interest revealed in the view seeking exercise.

Acknowledging that all the charging schemes analysed have shortcomings, then should the Government and public consultation process decide to press ahead with implementing a mandatory plastic shopping bag charging scheme then there appear to be merits in introducing a scheme in phases. Such phasing could entail enhancing the voluntary scheme as far as possible before establishing a charging scheme first at selected retailers, then broadening its coverage to all stores. A phased approach would allow the Government to monitor stakeholder responses and waste arisings closely and undertake a full review, preferably after 6 – 12 months, once consumer behaviour has adjusted following the anticipated initial 'shock effect' of introducing the scheme. The review process should analyse both the scheme's effectiveness and its wider implications, particularly the impact of any switching that occurs. Should significant switching arise then the Government may seek to remove the scheme or expand its scope to include alternative shopping bags, thereby reinforcing the desirability of the no-bag outcome.

Ultimately, to change consumer behaviour and reduce indiscriminate shopping bag use will require a change in public mindset, particularly in their attitude toward such environmental issues as waste and waste disposal. To that end, comprehensive marketing, improvements in education and awareness are pre-requisites for success.

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1 INTRODUCTION

1.1 Study Objectives and Scope

GHK (Hong Kong) Ltd. was commissioned by the Environmental Protection Department (EPD) to carry out the *Assessment of the Benefits and Effects of the Plastic Shopping Bag Charging Scheme* (the Study). The Study commenced on 5 December 2005 with the intention of developing plastic shopping bag charging scheme proposals for public consultation.

The primary objective of the Study is to reduce the "indiscriminate use of plastic shopping bags" in Hong Kong, as spelled out in the Policy Framework for the Management of Municipal Waste (2005-2014). The scope of the Study is to appraise potential plastic bag reduction initiatives within the remit that "retailers shall be required to charge consumers who request a plastic shopping bag". This report presents the final comparative evaluation of potential scheme impacts with reference to what is considered practical and achievable in Hong Kong.

At the heart of the Study is an impact assessment that evaluates the impacts of potential charging schemes on key stakeholders including consumers, retailers, manufacturers, traders and the Government; although not a full environmental cost benefit analysis, evidence is incorporated from major international environmental studies and impact on the waste stream forms a key element of the analysis. The assessment is made on the basis of evidence drawn from prior plastic bag reduction initiatives in Hong Kong, experiences from international schemes and stakeholder consultation. Importantly, the objective is to reduce plastic shopping bag use and bag use generally, but not to eliminate the use of plastic shopping bags, nor affect other forms of plastic or other types of waste. Moreover, all schemes use financial incentives, rather than direct regulation, in line with the Government's general policy of applying the polluter pays principle whenever appropriate.

1.2 Report Structure

This report opens with a discussion of the policy context, the size of the plastic shopping bag problem and the legacy of initiatives undertaken to date to reduce indiscriminate use in Hong Kong. Section Three then reviews the available evidence from international bag reduction schemes before presenting a description of the scheme which was used during a stakeholder view-seeking exercise. Views on this scheme, containing elements from a number of different international approaches, were used to formulate a reference case impact evaluation, as presented in Section Four. Drawing on the response received, the results of the impact assessment, the international case studies, experiences of initiatives already attempted and under guidance from EPD, potential plastic shopping bag charging schemes are developed[1] that may be more appropriate to the specific characteristics of Hong Kong. These are assessed against the reference case in Section Five, as are additional scheme elements that could be incorporated into a wider waste action plan for Hong Kong. Section Six concludes and makes suggestions for the public consultation exercise.

[1] Scheme development was specifically limited by EPD to schemes that charged for plastic shopping bags only.

2 BACKGROUND AND SCENE SETTING

2.1 Policy Context

The EPD's *A Policy Framework for the Management of Municipal Solid Waste (2005-2014)* sets out how the Hong Kong Government aims to measure and implement municipal solid waste (MSW) controls on the proviso that future sustainability requires schemes to be economically, financially and environmentally sound.

MSW management is a top priority policy issue. In its 2005 report on progress towards a first sustainable development strategy, the Sustainable Development Council formalised a set of recommendations for the promotion of sustainable practices in MSW management. These Government objectives were to include a review of the current waste management mechanism, the further promotion of MSW recovery and recycling, the introduction of legislation for producer responsibility schemes (PRS) and MSW charges, and the identification of alternative forms of waste treatment. Based on these objectives, the Policy Framework sets three main waste management targets:

- To reduce the amount of MSW generated in Hong Kong by 1% per annum up to the year 2014, based on the 2003 levels
- To increase the recovery rate of MSW from 34% in 1998 to 45% by 2009 and 50% by 2014
- To reduce the total MSW disposed of at landfills to less than 25% by 2014

The Government's strategy for achieving these targets, in line with international best practice, follows the waste hierarchy - the guiding principle for managing MSW worldwide since its introduction in 1975. It advocates the preference for waste avoidance and minimisation, followed by reuse, recovery and recycling, and finally disposal if all other alternatives have been exhausted. To implement this hierarchy, the Policy Framework proposes three policy tools to be supported by public education initiatives and partnerships with the business community such as the WasteWi$e initiative. These tools comprise:

- Waste charging (the polluter pays principle)
- Producer responsibility schemes (PRS)
- Longer term ban on biodegradable waste being sent to landfill

A prime thrust of EPD's policy direction is the polluter pays principle, whereby the cost of controlling environmental pollution should be borne by the polluter rather than imposed on society as a whole. As the Policy Framework points out, "the true cost of our consumption-led lifestyle, particularly the significant environmental cost, is not reflected to each individual." Consequently, the Hong Kong Government "propose[s] to impose a direct and explicit charge on each individual for the amount of waste one discards." A first step in this direction was the introduction of a construction waste disposal charging scheme in 2005 but EPD intends to follow this up in 2007 by introducing three pieces of PRS legislation to cover plastic shopping bags, tyres and electrical equipment. Of these, the plastic shopping bags PRS will be the first to be implemented, setting the scene for future legislation, raising public awareness of the impact of wastefulness and encouraging personal responsibility.

2.2 The Plastic Shopping Bag Problem

2.2.1 The Growing Waste Problem

In 2005, some 6,450,000 tonnes of waste were disposed of at landfills in Hong Kong. Fifty-three percent of this was municipal solid waste (MSW): some 3,420,000 tonnes or 9,377 tonnes every day. The remaining 47% comes from construction and special wastes.

Since 1996, MSW generation has grown at an average of more than 3% per year, over three times the rate of population growth. By 2005 this figure had reached 6.01 million tonnes. This equates to 16,470 tonnes of MSW generated every day or 2.37kg for every man, woman and child in Hong Kong. Almost three quarters of all this MSW disposed of at landfill comes from domestic waste. However, only 14% of domestic waste is recovered, in sharp contrast to recovery rates of 60% to 70% for commercial and industrial waste[2].

The current annual cost of MSW management comes to nearly $1.2 billion, and is paid for out of the public purse. Should the current disposal trends continue then Hong Kong's landfills will be full by 2015 rather than lasting until 2020 as they were designed for. Extending the lifespans of these landfills from between five and fifteen years has been estimated to cost $8.3 billion[3].

Paper and plastics respectively comprise 26% and 19% of all MSW disposed of at landfill by weight[4]. According to the Policy Framework, these proportions "reflect our particular lifestyle choices that place a premium on convenience and attach inappropriate and inadequate costs to the impacts of these materials."

2.2.2 Shopping Bags in the Waste Stream

Plastic Shopping Bags

According to the Policy Framework, around a thousand tonnes of plastic bags are disposed of every day in Hong Kong, accounting for 11% of all MSW sent to landfill by wet weight. However, this definition of plastic bags includes all types of plastic bags, including trash bags and packaging bags, not just plastic shopping bags. To provide greater accuracy, a special ad-hoc survey of plastic shopping bags in the waste stream was conducted by EPD between 24th October and 16th December 2005 at waste facilities, hereafter called the 'Landfill Survey'. A total of 142 samples across 6 sampling sites were collected. From the survey it was estimated that more than 23 million plastic shopping bags are sent to landfill every day in Hong Kong[5]. This is more than three bags per person per day.

The Landfill Survey also enabled a breakdown to be made of plastic bags in the waste stream by source. As shown below, over half of plastic shopping bags disposed every day at landfill are the red, white or other non-branded shopping bags that come from the independent retail sector, including wet markets and small

[2] Recovery rates quoted in A Policy Framework for the Management of Municipal Solid Waste (2005-2014), EPD.

[3] Landfill costs quoted in A Policy Framework for the Management of Municipal Solid Waste (2005-2014), EPD.

[4] Monitoring of Solid Waste in Hong Kong, Waste Statistics for 2005, EPD.

[5] The margins of error of this estimate are about plus/minus 1.7 million bags.

retail shops. Supermarkets, convenience stores and bakeries are the next largest contributors[6].

Table 2-1: A Breakdown of Plastic Bags in the Waste Stream, by number

Source	2005 Consumption (millions)			
	Existing Per Day	Existing Per Year	Plastic Shopping Bags	Plastic Bags
Newspapers	0.8	298	3%	3%
Supermarkets	3.5	1,267	15%	12%
Bakery Shops	1.4	527	6%	5%
Fast Food/Restaurants	1.1	387	4%	4%
Medicare, drugs	0.5	195	2%	2%
Convenience Stores	1.4	499	6%	5%
Books, Stationery, Gifts	0.2	61	1%	1%
Fashion, Footwear	0.3	106	1%	1%
Electric/Dept/Home Acc	0.5	196	2%	2%
Red/White/Others non branded	14.0	5,114	59%	46%
Subtotal	**23.7**	**8,651**	**100%**	**79%**
Small no handle bags and coloured bags	1.81	660		6%
Rubbish bags	4.66	1,701		15%
Total	**30.17**	**11,012**		**100%**

Source: The Landfill Survey, EPD

The characteristics of plastic shopping bags used in Hong Kong vary by type, material properties, thickness and application. These dimensions have relevance in helping to determine the type of bags causing the most problems in the disposal or recycling system and also those generating the most significant volumes. For example, high-density polythene (HDPE) bags are normally thin, light and less expensive. According to the waste composition survey these account for as much as 80%[7] of all plastic shopping bags in circulation – a key consideration given that their relative thinness limits their potential for significant reuse[8]. By contrast, low-density polythene (LDPE), and linear low-density polythene (LLDPE) plastic bags are normally thicker (from 0.1mm and above), heavier, more expensive, and are commonly provided at department stores and boutique-style shops. These comprise the remainder of the plastic shopping bag market but are more suitable for multi-use. See Annex A for pictures of the range of bags in everyday use in Hong Kong.

The Use of Alternative Shopping Bags

Very little is presently known about the use of alternatives to plastic shopping bags in Hong Kong. Such bags (comprising paper bags, laminated bags, non-woven bags or alternative multi-use or permanent bags) did not form part of the Landfill Survey and are not separately identified in EPD's annual waste statistic

[6] There is a considerable discrepancy between the number of plastic shopping bags disposed according to the Landfill Survey and data on plastic shopping bags provided by retailers in the supermarket and convenience store sectors. Data from retailers for other sectors is not available so it is not clear whether this trend applies to all sectors or is specific to supermarkets and convenience stores. The discrepancy could reflect differences in the timing of data collection, retailers under-reporting the number of bags provided and the landfill survey over-estimating the numbers disposed each day.

[7] EPD Plastic Bag Charging Scheme Proposed Definition of "Plastic Shopping Bag" Dec 05

[8] HDPE t-shirt type bags, as used by major supermarkets, are only about 15 microns thick according to The Hong Kong Packaging Institute.

publications. However, anecdotal evidence from consumer and retailer surveys suggests them to be relatively prevalent:

- The view-seeking exercise conducted as part of this study found that 38% of independent retailer respondents and 42% of major chain respondents also provided paper bags.
- Two surveys conducted by the Democratic Alliance for the Betterment and Progress of Hong Kong found that about 25% of respondents bring re-usable bags when shopping; another 42% sometimes do.

Relative Bag Weight and Bulk

Data from samples of clean plastic shopping bags collected from retailers and Landfill Survey show that the average weight of a dry plastic shopping bag is 4.0 grams and 13.3 grams for a wet one disposed of at landfill. By wet weight, plastic shopping bags therefore account for some 315 tonnes per day: 3.4% of landfilled MSW or 1.8% of all waste to landfill. By dry weight the figures are: 96 tonnes, 1.0% of MSW or 0.5% of waste to landfill[9]. Other non-shopping bags by wet weight weigh 6.4g and rubbish bags 43.0g.

Alternative bag types were not considered as part of the Landfill Survey so data on absolute weight and bulk in Hong Kong are not available. However, international sources provide plastic-alternative ratios that can be used to provide indicative relative weights and bulks. For example, the Scottish Impact Assessment reports that basic paper bags weigh six times as much as lightweight plastic bags, more complicated paper bags used in the fashion sector (a good proxy for laminated paper bags in Hong Kong) weigh 15 times as much and non-woven bags over 16 times as much. Evidence on the impact of the Irish plastic bag consumer charge has shown retailers switching from plastic bags to comparable paper bags that weigh between 3 and 11 times more.

EPD does not publish waste disposal data by bulk, a more direct measure of landfill capacity, but indicative calculations based on the Landfill Survey suggest plastic shopping bags account for 352m^3 per day or 0.45% of MSW by wet weight and just 107m^3 per day or 0.14% of MSW by dry weight[10]. By comparison, a Carrefour supermarket chain study reports that a single paper bag produces 2.7 times as much solid waste as the equivalent plastic bag[11]. This figure is supported by evidence from the California Environmental Protection Agency that reports the density of paper bags in the waste stream to be 3.1 times that of plastic trash bags[12]. In other words, paper bags take up about three times as much space in a landfill as their equivalent weight in plastic.

[9] Waste is generally wet when weighed at landfill so wet weight is the standard measure. However, plastic is non-soluble so just considering wet weight could overstate the problem.

[10] Plastic shopping bags are not soluble so it is likely that the overall volume/bulk would be closer to the dry weight proportion

[11] "Évaluation des impacts environnementaux des sacs de caisse Carrefour. Analyse du cycle de vie de sacs de caisse en plastique, papier et matériau biodegradable." Report prepared for Carrefour by Ecobilan, February 2004. www.ademe.fr/htdocs/actualite/rapport_carrefour_post_revue_critique_v4.pdf

[12] Cascadia Consulting Group, 2006. "Detailed Characterization of Construction and Demolition Waste". A report for the California Environmental Protection Agency.

2.2.3 So why are Plastic Shopping Bags a Problem?

International schemes to reduce plastic bag use have arisen from concerns over the effect of such bags on litter, the waste stream and on resource consumption. In Hong Kong, the most important of these is considered to be the waste stream. EPD advise that litter on land is not perceived to be a significant problem; there are more concerns over marine litter[13]. The vast majority of plastic bags consumed in Hong Kong are imported so local resource use during production is not an issue.

By targeting plastic shopping bags for its first application of PRS legislation, the Hong Kong Government is not suggesting that plastic shopping bags are a problem per se. Neither is the Government suggesting that they are better or worse than other bags provided free at the point of sale. The problem, according to the Policy Framework, is the indiscriminate use of such bags: "excessive consumption [of plastic shopping bags] burdens our landfills and wastes resources that can have other uses". The implication is that society could be doing more to reduce unnecessary consumption and increase re-use and recycling. Once landfilled, plastic bags cause dioxene emissions that can end up in the food-cycle and take between 20 and 1000 years to decompose[14].

However, reducing the use of plastic shopping bags does not automatically confer environmental benefits since consumers still require a means to transport their goods home and alternative bag types are not necessarily any better for the environment, despite widespread public opinion to the contrary. An independent review for the Carrefour supermarket chain in France used lifecycle analysis to trace the relative environmental impacts of a typical HDPE lightweight bag, a reusable LDPE bag and a paper bag from production to disposal. The study found paper bags to have a more severe environmental impact in seven out of the eight impact categories – the exception being risk of litter. Paper bags were found to be particularly harmful with respect to eutrophication of water bodies, water consumption, greenhouse gas emissions and production of solid waste[15]. Even non-woven bags, which are commonly marketed as being 'environmental', are only more environmentally friendly if they are used at least as many times than as their relative increase in weight and bulk over conventional shopping bags, and often include such features as metal eyelets which make them difficult to recycle.

Neither are degradable bags necessarily the answer. One major Hong Kong retailer had a scheme adding 30% photo-degradable additives to its bags but it was discouraged by Government as it caused difficulty at landfill sites[16]. Such bioerodable bags create difficulties if mixed in with conventional plastic bags for recycling. When the idea of a plastic bag levy was first raised, several major retailers were all quoted as supporting the replacement of plastic bags with biodegradable bags[17], and yet biodegradable wastes create LFG (malodorous and

[13] International Coastal Cleanup 2005 noted that plastic bags ranked second [16.4%] in the top ten marine debris collected along the coastlines in 2004, although this ranking is highly volatile with bags not ranking at all the following year. http://www.civic-exchange.org/publications/2005/icc2005-E.pdf

[14] Evidence compiled during the international case studies. Please see WP2 for reference.

[15] The French disposal methods in the Carrefour study assume that 45% of paper bags are recycled, 25% are incinerated and 26% landfilled. There is little evidence of plastic bag recycling in Hong Kong but 60% of waste produced in the SAR is sent to landfill, so the waste disposal implications of alternative bags may be greater in Hong Kong than in the Carrefour study.

[16] Source: The Hong Kong Packaging Institute

[17] Wang J.L.Y. (2004) HKU MSc Environmental Management Thesis

potentially explosive), leachate (highly polluting and contaminates water supplies if not properly controlled for at landfill), decomposes at a non-homogenous rate (creating stability problems) and may soon be banned from landfill altogether under future EPD plans. The difficulties of combining plastics and degradable plastics in the waste stream suggests that partial switching to degradable plastic bags could lead to higher costs and difficulties in waste separation and disposal.

The proposal for the PRS for plastic shopping bags is therefore to encourage more environmentally responsible behaviour through direct polluter pays charges for an item where habit and social norm have resulted in what is considered to be wasteful and excessive use. However, reducing the indiscriminate use of plastic shopping bags therefore will only truly achieve environmental gains if switching to alternative bags distributed free at the point of sale is limited and consumers either reuse long term bags many times or use no bag at all.

2.3 Initiatives Adopted in Hong Kong

2.3.1 Past Schemes

Despite this, the plastic bag reduction schemes already undertaken in Hong Kong have tended to focus on the larger retail chains. In recent years, some 17 separate initiatives have been pursued by a variety of stakeholders but they have generally only been introduced by individual chains and on a temporary basis with no official monitoring to evaluate impacts. While these schemes may have succeeded in reducing store-specific plastic shopping bag use, their uncoordinated and unilateral approach would appear to have had limited impacts on the waste steam. However, these initiatives have succeeded in raising awareness, culminating in 2006 with the introduction of No Plastic Bag Day (NPBD), co-organized by major green groups and supported by the EPD. The initiative had 39 participating retailers by November 2006 and an average of 51% of respondents to Green Student Council surveys claimed to be developing the habit of not using plastic bags or bringing their own bags when shopping on NPBD. According to EPD more than 10 major retail chains have decided to continue the campaign in 2007, with two chains turning the event into a weekly one.

EPD's Voluntary Agreement on Plastic Bag Reduction, also introduced in 2006, was implemented to formalise and extend some of the unilateral initiatives already being pursued by individual retailers. Ten major retail chains have so far joined, pledging to reduce their handing out of 'free at the point of sale' plastic shopping bags by over 120 million bags a year (a reduction rate of about 15%). The scheme has shown considerable success to date with major supermarket chains apparently successfully reducing their combined handouts of plastic shopping bags between April and December 2006 by some 110 million compared with the same period in 2004 (a reduction rate of 23% to 26%). Overall, chains are reporting reductions of 7% to 32% after controlling for increases in outlet numbers. Such reductions highlight a public willingness to reduce plastic bag consumption and both schemes have helped raise awareness of the issues involved, although the extent to which they may have altered long-term consumer behaviour remains unclear.

Some 17 separate initiatives have already been pursued in Hong Kong as a variety of stakeholders (including the public sector, green groups, business associations and individual retailers) have attempted to reduce plastic bag consumption in the region since 1994. However, these schemes have tended to be somewhat ad hoc and uncoordinated; they have generally only been introduced by individual chains and on a temporary basis with no official monitoring to evaluate impacts. While these schemes may have succeeded in reducing store-specific plastic shopping

bag use and raising awareness, their unilateral approach would appear to have had limited impacts on the waste steam.

Information provided by some retailers during the view seeking process indicated extensive experience of pursuing reductions in the free distribution of plastic shopping bags over many years. Supermarkets in particular have had experience of cash back schemes, 'bring your own bag' campaigns, in-store collection activities, other marketing initiatives including lucky draws and special discounts, as well as staff training and public communication campaigns.

During 2006 efforts have been stepped up again through initiatives undertaken by EPD, Green Groups and retailers. Two such initiatives on which there is useful documented impact evidence are described below.

2.3.2 No Plastic Bag Day

The first No Plastic Bag Day took place on April 15 2006. Organised by the Green Student Council (GSC), 14 retailers accounting for 1,200 premises took part. The response was positive with the two largest retailers, Welcome and PARKnSHOP, reporting that about 80% of shoppers either brought their own bags or agreed to make a 50 cent voluntary donation to charity if they still required a bag. The Council claim that the first event resulted in a 70% reduction in plastic bag use at participating stores and raised HK$120,000 for Oxfam.

After the success of this initial trial, the initiative was made a monthly event from June 2006 with the support of EPD; the first Tuesday of every month has since been designated No Plastic Bag Day. Over 2,000 stores participated in June, and the 7-Eleven chain, which operates over 700 outlets in Hong Kong, agreed to join in July. By November 2006 there were 39 participating retailers, and a GSC survey[18] claimed that public awareness of the day had risen to over 60%; 56% of consumers no longer require a bag on the day and 66% claimed to be developing the habit of not using a bag. However, support for making the scheme a daily event remained low at just 11%. In addition, evidence from the view seeking exercise reports that misconceptions remain, with anecdotal evidence suggesting that one retailer was simply providing non-woven bags to consumers on NPBD rather than plastic bags. Unless the bag is reused many times, such switching could lead to less desirable environmental outcomes.

Organisers report that bag use has fallen considerably on these days. GSC have said that China Resources Vanguard claims to have reduced bag provision by 10 million bags and A1 Bakery report saving over $1,000 in administrative expenses in response to a fall in bag use of over 6,000. According to EPD more than 10 major retail chains have decided to continue the campaign in 2007, with two chains turning the event into a weekly one.

2.3.3 EPD's Voluntary Initiative

EPD has initiated a Voluntary Agreement on Plastic Bag Reduction to formalise and extend some of the unilateral initiatives already being pursued by individual retailers. Ten major retail chains have so far signed up and EPD is also promoting the Voluntary Agreement to other retailers. The current signatories comprise:

- A-1 Bakery
- Manning

[18] GSC Press Release, 9/11/2006.

- China Resources Vanguard
- Circle K
- City Super
- DCH Food Marts
- PARKnSHOP
- Pricerite
- Wellcome
- Watson's

Together, these retail chains pledged to reduce their handing out of 'free at the point of sale' plastic shopping bags by over 120 million bags a year (a reduction rate of some 10% to 20%) and to implement a series of measures to reduce the distribution of plastic shopping bags including the offering of incentives or rebates for consumers who do not need plastic bags, the installation of signage to encourage consumers to use reusable shopping bags, the asking of asking each and every consumer if they need plastic bags and the provision of training to frontline staff.

The scheme has shown considerable success to date with major supermarket chains apparently successfully reducing their combined handouts of plastic shopping bags between April and December 2006 by some 110 million compared with the same period in 2004 (a reduction rate of 23% to 26%). Overall, chains are reporting reductions of 7% to 32% after controlling for increases in outlet numbers. Stores are also reporting increased sales of "environmental bags", although no precise definition is provided.

2.3.4 Can more be achieved through legislation?

The above schemes have highlighted a public willingness to reduce plastic bag consumption and helped raise awareness of the issues involved. However, plastic bag use is a social norm that will inevitably take time, and perhaps direct financial incentives, to change.

Shopping is much more of a daily habit in Hong Kong with plastic shopping bag use seemingly an integral element given the abundance of street markets, low car ownership and hygiene concerns that cause consumers to want food to be well packaged and separated from other items. A public opinion survey conducted by the Central Policy Unit[19] found that some 77% of the population had been shopping on the previous day with supermarkets, convenience stores, and bakeries/cake shops all receiving custom from at least a quarter of the population. Of those who went shopping, almost 89% collected at least one plastic bag with overall collection averaging approximately three plastic shopping bags per day[20]. These bags are then frequently reused with over 96% of respondents saying that they reuse plastic shopping bags in their daily lives. Of those that reuse the bags, 96% of respondents reuse them as refuse bags and 53% as shopping bags.

The requirement of voluntary initiative signatories to ask consumers whether they need a bag is likely to reduce consumption to an extent but habit and convenience, both with respect to use and re-use, will encourage the continued accumulation of

[19] The Central Policy Unit (CPU) survey comprised some 1,203 completed telephone interviews with members of the public conducted between 05 and 09 January 2006.

[20] Given that three bags per day are disposed at landfill, this figure seems low. The opinion survey has an adequate sample size for reliable results but is limited by the fact that it probably under-sampled maids, who undertake much of the shopping. In addition, by taking a week's shopping, the survey has not captured shopping during a holiday time (weekends and holidays together account for about one-third of the total). Also the public opinion survey is based on recollection of those interviewed, which is inherently subject to error. In contrast, the landfill survey was based on a physical count.

plastic shopping bags on daily shopping trips. To that end, though public surveys show general support for a legislated charge (only one in ten respondents to the CPU survey thought that there was no scope for reducing their usage of plastic bags), that just 11% of respondents in the GSC survey favoured extending no plastic bag day to every day suggests that habits have yet to really adapt. By contrast, according to the CPU survey 71% of the respondents considered that a charge of just 10 cents per bag would be sufficient to reduce plastic shopping bag use.

3 INTERNATIONAL EXPERIENCE

3.1 International Overview

More than 10 countries have already implemented schemes to reduce plastic bag use, ranging from outright bans to specification controls, levies imposed on bag suppliers and charges imposed on consumer consumption. Each scheme is different and responds to the particular concerns of the country. For example, outright bans are popular in the developing world where littering and drain congestion can cause flooding. By contrast, schemes in the developed world have tended to evolve out of concerns about MSW growth and the associated management costs, pressures on landfill, meeting environmental targets and the requirement to act as good environmental custodians. Case studies and investigations were conducted into eight schemes with findings presented in Table 3-1. Key features include:

- All but one of the eight selected schemes were implemented on or after 2002; and the bill proposing a scheme in Scotland has since been withdrawn
- Four of the eight schemes quote litter as either the main or one of the main objectives of the scheme; others focus on the reduction of waste per se or the costs of disposal
- Three of the schemes have a supplier levy. None of these also have a compulsory consumer charge but in two there is widespread charging of consumers
- Two of the schemes have compulsory consumer charges but only in Eire is the amount specified

However, there so far exists little by way of overall scheme impact assessments, either because they are too recent, or because the monitoring and evaluation was only narrowly drawn: looking at the reduction in plastic bag use alone hardly constitutes adequate evaluation evidence. A number of sound predictive impact assessments have been completed looking at the attributes of alternative options upfront but detailed impact assessments looking at the results of a scheme in progress have yet to be undertaken. Of the evidence that is available, it is clear that the introduction of a charging scheme that will yield marked environmental benefits is not straightforward.

3.2 Schemes of Particular Relevance

3.2.1 Explicit Consumer Charges in Eire and Taiwan

There are currently only two consumer charge based schemes implemented sufficiently long ago to demonstrate impacts with relatively robust outcome data – Eire[21] and Taiwan, both implemented 2002. Both of these countries adopted a consumer charge. Eire's $1.5 HKD equivalent consumer charge (collected by the Government) is reported[22] to have resulted in an initial 94% reduction in use, which

[21] The PlasTax was implemented in the Republic of Ireland, known as Eire.

[22] McDonnell, Simon 2005. Written evidence submitted to Environment and Rural Development Committee of the Scottish Parliament during its examination of a proposed plastic bag levy for Scotland. Response by Simon McDonnell The Department of Planning and Environmental Policy, University

is since believed to have settled down to about 75%[23], and Taiwan's flexible charging regime (retailers must apply a charge but the level is determined and retained by them - average $0.23-0.69) has resulted in a 68% reduction in plastic shopping bag numbers but due to switching to paper bags only a 57% reduction in all shopping bags[24].

Switching was not deemed to be a policy concern in Eire where litter reduction was the policy target rather than volume of waste to landfill. However, the charge has resulted in increased pre-packaging of fresh foods and substantial switching to paper bag provision in the non-food sector. The UK Packaging and Industrial Films Association has estimated that such switching has resulted in a weight multiplier 3 to 11 times greater than that for plastic bags, a bulk multiplier 3 to 18 times and a cost multiplier 4 to 13 times higher, which has subsequently been passed on to the customer. In addition, a study undertaken for the Australian scheme reports that bin liner consumption increased 77% following the introduction of the PlasTax in Eire[25].

In Taiwan, the scheme also included a complete ban on plastic bags of less than 60 microns in thickness but this resulted in both widespread non-compliance and an increase in total plastic used due to the greater production of thicker plastic bags, especially in the restaurants-with-a-storefront sector. Such unintended consequences, combined with an increase in use of paper bags, led the Authority to conclude that the policy had only been partially successful and would require further stakeholder consultation and policy amendments. Restaurants and takeaways have recently been exempted from the scheme.

3.2.2 The Danish Supplier Levy

The Danish Scheme on both paper and plastic bags was introduced in 1994 as part of a larger adjustment of the Danish tax system to reduce direct taxation and increase 'green taxes'. The adjustment was both fiscally and environmentally founded. The reason for introducing the tax on bags was to reduce waste and ensure adoption of the polluter pays principle. Producers and importers of bags are required to pay a tax to the Government based on the weight of bags (of over 5 litres capacity) sold. There is no requirement for retailers to pass the charge on to customers; many do, but some still give away bags free. The tax rates were raised in 1998 to the current level of 10 DKK ($12.5 HKD) per kg paper bags and 22 DKK ($27.5 HKD) per kg plastic bags. It seems there was a 60% reduction in the use of bags initially but this has slightly increased in recent years. The retail businesses, mainly supermarkets, have used the tax to justify charging a price for the bags, which exceeds the tax by five times or more. Bags are now a commodity on which the supermarkets profits are relatively high. It is questionable therefore whether the supermarkets have any incentive to participate in plastic bag reduction initiatives in this case.

College Dublin. Referenced in – "Plastic Bags Policy in Eire and Australia", Rebecca Lamb and Merrill Thompson. Scottish Parliament Information Centre (SPICe) Briefing 05/53, September 2005.

[23] Telephone conversation with the UK Packaging and Industrial Films Association , on 27/07/06

[24] EPA Taiwan 2006

[25] "Plastic Shopping Bags – Analysis of Levies and Environmental Impacts". December 2002. Nolan-ITU Pty Ltd for the Department of the Environment and Heritage

3.2.3 The Australian Voluntary Initiative

The Australian voluntary scheme is similar to the current voluntary initiative being operated by EPD in Hong Kong in that it is a retailer owned scheme responding to a Government challenge, and that participation is dominated by the larger stores.

The initiative came into operation in 2003 in response to concerns about littering and the environmental impacts of single use plastic shopping bags in Australia. An ex-ante impact assessment[26] indicated that a legislated 25 cent ($HK 1.50) levy was likely to achieve the best environmental outcomes in terms of energy use and reduction in litter (in both respects about 50% greater than the benefits of a voluntary scheme) but the Government responded to retailer pressure and agreed to see what could be achieved through a voluntary approach first. Ministers challenged retailers to reduce the provision of HDPE bags by 50% and to increase HDPE recycling to 50%. The subsequent Australian Retailers Association Code of Practice required 90% participation of group 1 (supermarket) retailers; non-supermarket retailers were not required to commit to the entire code but were encouraged to "apply best endeavors" and 25% participation was targeted. Ministers noted that underperformance could lead to the imposition of mandatory legislation.

The Code has not been independently and comprehensively evaluated in terms of its impact on the environment, but evidence from the Australian Retail Association suggests that supermarket retailers have achieved a 45% reduction in HDPE provision between December 2002 and December 2005, and an increase in the recycling rate to 14%[27]. However, the report concludes that "despite these major achievements, the majority of consumers have yet to alter their behaviour." In addition, only 4% of Group II signatories had joined the scheme. An assessment conducted by NGO Ark Planet suggested that the impulse buying that characterizes the non-supermarket sector meant that consumers would be less likely to have their re-usable bag with them when they make purchases, and so limiting retailer interest in participating.

3.2.4 The Withdrawal of the Scottish Proposal

A bill for the introduction of a plastic bag tax in Scotland akin to the scheme in Eire was recently withdrawn following concerns on the possible environmental effects, particularly the likelihood of switching to paper and other plastic shopping bag alternatives. The Scottish Parliament's final report on the Bill concluded that "there are a number of unintended consequences that appear likely to be connected with using the proposed levy … the net environmental impact of the proposed levy is an issue of considerable dispute."[28]

The independent Extended Impact Assessment[29] on the proposal concluded that a 10p (HK$1.50) consumer charge on plastic but not paper bags, covering all businesses, would induce sufficient switching to increase waste to landfill by 5,409 tonnes, or 0.26% of Scotland's total waste; polyethene consumption would fall by

[26] Plastic Shopping Bags – Analysis of Levies and Environmental Impacts December 2002 Nolan-ITU Pty Ltd for the Department of the Environment and Heritage

[27] http://www.ephc.gov.au/pdf/Plastic_Bags/ANRA_Report_to_EPHC_Chair_22_May_2006

[28] Scottish Parliament Paper 642, Volume 1. Environment and Rural Development Committee Report

[29] "Proposed Plastic Bag Levy – Extended Impact Assessment Final Report, Volume 1 Main Report." Scottish Executive 2005. AET Technology.

3,484 tonnes but paper consumption was expected to increase by 8,893 tonnes. Conversely, including paper bags in the charge at all outlets was anticipated to reduce waste arisings by 4,993 tonnes, or 0.24%. Moreover, if implemented, the inclusion of paper in the charging mechanism was estimated to have caused a reduction in water consumption, greenhouse gas emissions, water body eutrophication and the production of solid waste – all major environmental concerns of paper bag use as cited in Section 2.2.3. Indeed, scenarios that included paper in the charge improved the environmental situation by between 30% and 70% over the base case, depending on whether the scenario excluded SMEs and charities or included all businesses. However, the environmental benefits across all indicators of a levy never exceed 1% when compared to overall environmental activities in Scotland and Ministers have decided to continue with voluntary initiatives for now.

3.3 Lessons Learnt

Lessons from international experience are rather difficult to identify clearly since schemes vary considerably in terms of the type of bags charged (plastic/paper); rate and measure (weight or per bag); method of implementation (voluntary/compulsory); collection mechanism and use of funds. However, the evidence suggests that the largest reductions in bag use can be made by directly targeting customers, though this can also lead to the greatest unintended consequences if the schemes are not carefully designed and tested beforehand. In addition, the evidence suggests that local factors are important and that implementation and appropriate consideration for individual jurisdiction is critical.

Nevertheless, specific considerations arising from the international examples with reference to the imposition of a scheme in Hong Kong include:

- Voluntary initiatives result in less participation, both from retailers and consumers
- The existence of a J-curve effect whereby plastic bag use falls dramatically initially but then rebounds to an extent
- The inclusion of just plastic bags in the scheme can have adverse environmental consequences through switching to paper bags and increased pre-packaging, which can increase total volume of waste to landfill
- The need for an education and awareness campaign to build public understanding of scheme objectives is critical
- Retention of the charge by retailers has been used in some cases to boost profits rather than induce a fall in usage
- The banning of thin bags can have unintended consequences through switching to thicker bags than would otherwise be necessary
- Evasion and non compliance issues during implementation
- The schemes should be seen to be part of a range of initiatives aimed at environmental improvement and waste reduction
- Phasing of implementation with grace periods can help encourage compliance and ease teething problems.
- Period of voluntary effort prior to introducing legislation should targets not be met can result in stronger stakeholder ownership of the scheme
- Need for a strong political champion helps give the necessary publicity profile to the scheme and secures ongoing political commitment in the face of any short term adverse effects

Table 3-1: Summary of International Experience

Country/ Start Date	Objective Bag Use/ Capita/ Day	Supplier Levy	Consumer Charge ($HK)	Collection Mechanism	Use of Funds	Impact on Use of Plastic Bags	Overall Impact Assessment Undertaken?	Other Measures	Other Comments
Eire 2002	Litter 0.9/ capita/day	No	$1.4 HKD	Value Added Tax System	Environment Fund	94% Reduction (2005)	Upfront 1999	Introduction coincided with Eire's Waste Strategy. Accompanied by 6 month lead in publicity campaign.	Low cost and initially high impact but according to UK manufacturer/retailer sources there has been significant switching and initial reduction has decreased to approx 70%.
Taiwan 2002	Wider package to reduce plastic waste 2.5/ capita/day	No	No amount specified $0.23-$0.69	Not collected	Retailer decision	68% plastic bags 57% all bags including paper (2005)	Monitoring by Government only	Part of wider policy package to reduce plastic waste. Phased introduction and ameliorative measures for manufacturing and employment.	Ban on thin bags but may have encouraged thicker bags than necessary. Very significant inspection/ enforcement costs. Recently exempted restaurants/take-aways due to compliance problems and separated plastic tableware from plastic bag initiative
Malta 2005	Reduce plastic bags in the waste stream 0.4/ capita/day	$1.3 HKD or $0.22 HKD for degradable. Bio-degradable excluded.	Widespread charging voluntarily by retailers	Value Added Tax System	Management of solid waste by the Government	No official data available as yet	Survey work in progress	Provision of multi-use bags by Government for sale by retailers.	Speedy implementation/low cost with single policy focus. Possibly inadequate buy in by stakeholders has limited impact.
South Africa 2003	Litter. 1/ capita/day	$0.04 HKD	Approx.$0.17 HKD Voluntary. Only about 30 large retailers actively participate – approx 50% bags covered.	Only Supplier levy collected by Customs and Excise	Admin Costs and contribution to Not for Profit JV Co	No official data available as yet	Upfront only 2000	Thin bag ban and compulsory bag specification. Memo of Agreement with Stakeholders Wider environmental initiatives through JV Co.	Very wide ranging in scope, complex and costly. Concerns over impact on local manufacturing led to some adjustments. Consumer charge voluntary so low participation by retailers.

Country/ Start Date	Objective Bag Use/ Capita/ Day	Supplier Levy	Consumer Charge ($HK)	Collection Mechanism	Use of Funds	Impact on Use of Plastic Bags	Overall Impact Assessment Undertaken?	Other Measures	Other Comments
Denmark 1994	Reduce waste and "polluter to pay"	$12.5 HKD per kilo for paper bags and $27.5 HKD for plastic	Widespread charging by retailers up to five times the level of tax. Bags are a good on which retailers make profits.	Collected as a tax by the Government	General tax revenue	60% reduction initially but has increased again subsequently.		Part of a raft of green taxes	Encouraged switching from paper to lighter plastic bags as tax on weight.
Australia 2003	Litter. 6.9 billion bags / 1 per person per day.		Voluntary	None		45% at end 2005 for Group One Retailers against a 50% target	Option Analysis 2002 and again in 2006.	Wide range of retailer/consumer focused actions through the Voluntary Code. Led by the Australian Retail Management Association.	Retailer led. Some difficulty initially in involving smaller retailers.
San Francisco 2005	Waste Disposal Costs. 0.2 per person per day.		Voluntary Agreement	None			Upfront impact assessment of potential charge 2005 – results not made public – and it was decided to pursue a voluntary scheme initially	Wide range of retailer/consumer focused actions through the Voluntary Code. City agreed to establish kerbside recycling.	To be reviewed in December 2006 with an understanding that the charge could be introduced if not enough progress made.
Scotland Not implemented	Litter and reduction in resource use. 0.4-0.6 per person per day.		$1.4 HKD	To be collected by Local Government			Upfront Impact Assessment 2005		After exhaustive investigation proposal dismissed in September 2006 because of concerns about switching and adverse effects on the waste stream.

4 THE REFERENCE CASE

4.1 Defining a Reference Case for Initial Assessment

Stakeholder inputs into the study came from two separate surveys: a public opinion survey carried out by the Central Policy Unit of the HKSAR Government in January 2006 and a bespoke view-seeking exercise designed in co-operation with EPD and conducted by the consultants with prominent stakeholders throughout the summer 2006. The view-seeking exercise sought to identify stakeholder groups who would be affected by the imposition of a plastic shopping bag charging scheme, to seek the views of representatives of those stakeholder groups on the scheme and to collect relevant data to contribute to the impact assessment. To that end, a hybrid scheme involving both a consumer charge and a supplier levy was adopted as a reference case upon which views were sought.

The supplier levy entailed a charge of $12.50 per kg, or roughly 5 cents per bag, at the point of production or import – enough to at least cover the costs to Government of implementing and enforcing the scheme and disposing of the remaining plastic shopping bags at landfills. The consumer charge comprised a payment of HK$0.50 per bag at the point of sale, intended to affect consumer behaviour so that fewer bags are demanded[30]. The supplier levy would form part of Government revenue and the consumer charge would be retained by the retailer. Both elements would be introduced through mandatory PRS's by legislation as spelled out in the Policy Framework.

The supplier levy would be charged on all plastic shopping bags which are either manufactured in Hong Kong or imported into Hong Kong for local use. Plastic bags for export or re-export would not be subject to the levy. There would be no other exemptions from the supplier levy which would be applied to all bags intended for carrying goods, and which contain plastic. In line with Customs and Excise Department definitions and procedures, the levy would be incurred the moment at which the consignment of plastic shopping bags is removed from a factory or warehouse or importing conveyance for local use. Each producer or importer would be required to register with the EPD and the levy would be paid in advance by means of a permit application on each consignment of plastic shopping bags imported into Hong Kong or, for those manufactured in Hong Kong, released by the manufacturer into the Hong Kong market for local consumption. All movements of plastic bag shipments into, out of and within Hong Kong from warehouse to customer would require a permit.

Certain exemptions were allowed from the consumer charge, the main ones relating bags used for carrying fresh or cooked foods which are not already contained in other plastic bags or other packing materials. The scheme would be legislated by Government with EPD responsible for promotion, advertising, implementation, management of monitoring

[30] International experience suggests that consumer charges in the range of HK$0.50-1.50 equivalent per plastic shopping bag affect behaviour most. The CPU survey indicates strong support for the scheme by members of the Hong Kong public but their willingness to be charged suggests that lower charges, below HK$0.30, would be expected. In order to balance public acceptance of the charge level with impact on behaviour, a charge of HK$0.50 per plastic shopping bag seemed to be appropriate to meet Government objectives. Under the reference case, the charge accrues to retailers and so retailers are allowed some discretion in the approach to charging. Accordingly, the reference case requires that minimum charge of $0.50 be applied by all retailers per requested bag at the point of sale.

systems, collection and enforcement of the supplier levy, monitoring and enforcement of the consumer charge, and determining and executing penalties for non-compliance.

4.1.1 Definition of a Plastic Shopping Bag

The scheme is to cover plastic shopping bags as per EPD's proposed definition[31]: "a bag made wholly or partly from plastic or plastic film provided to the customer for carrying or packing of the purchased goods or products at the point of sale".

Qualifying bags will contain any type of plastic materials, including high or low density polyethylene, linear low density polyethylene, polypropylene, polyvinyl chloride or other plastic materials. All bag designs are included in the scheme, irrespective of size, shape or thickness, whether printed or not, with or without gussets. For the avoidance of doubt, degradable bags that include any element of plastic are included.

4.2 Results from the View-Seeking Exercise

The view-seeking exercise consisted of a series of structured interviews (face to face, phone and email) with six manufacturers, traders and retailers associations; thirteen individual manufacturers and traders; and fifteen individual retailers. The exercise also included an independent retailer survey comprising 99 interviews and a postal survey of larger retailer chains that received 25 responses (including the 15 already mentioned)[32]. In terms of coverage, the respondents comprised 4% of retailer outputs and 14% of retailer employment.

4.2.1 Views on the Supplier Levy

The majority view across all the stakeholder sectors was that the supplier levy would do little to alleviate the problem in terms of changing consumer behaviour, which should be the ultimate aim. Furthermore, it was commonly believed that such a charge would present a considerable administrative burden for manufacturers and the Government, would increase costs through the supply chain and could put small local manufacturers out of business.

Other comments related to implementation. If the levy was based on weight, this could encourage an increased use of thinner, lighter bags, which cannot be reused. Significant problems with implementation were noted including definitions, the ability to distinguish between shipments at the border, high possibility of evasion and the onerous nature of the permit system. Exporters commented that they would immediately reroute exports through Southern China Ports. The proposed 'no exemption' policy was generally supported on the grounds of easing implementation but there were still thought to be considerable difficulties in identification and opportunities for evasion.

The retail chain survey identified the price at which retailers buy their bags from manufacturers and/or wholesalers. The mean price varied from 20 cents for t-shirt bags to 35 cents for die cut bags and the median price from 14 cents to 21 cents respectively[33]. A five cent levy per bag would therefore be expected to considerably increase the current cost of bag production[34] and manufacturers said they would seek to pass on as much of

[31] EPD Plastic Bag Charging Scheme – Proposed Definition of "Plastic Shopping Bag" December 2005

[32] As per EPD instructions, views were not sought from consumers or green groups as part of this Study.

[33] The median price might more accurately reflect bag price as it corrects for outliers.

[34] Note that manufacturers were also asked to provide bag costs but almost all manufacturers were found to produce such a large range of bags, covering all sectors and both national and international markets, that

this cost as possible to retailers, who might then in turn seek to pass it on to consumers. The majority of independent retailers (68%) agreed that they would absorb all of any increase in the cost of bags on the basis they expected it to be minor, but only a third of large retailers thought that they could afford to absorb any such cost increase. Small manufacturers and traders expected to lose business as a result of the levy and there is a view that few small companies will survive; many already claimed to be struggling given high oil prices and low profit margins and statistics show the industry to have halved in terms of employment and establishments in Hong Kong since 1995[35].

Stakeholders were consulted as to what they thought the Government should do with funds raised from the levy once collected. All respondents believed that any funds raised by the levy should primarily be used for environmental purposes. Retailers tended to prioritise the funding of education and publicity initiatives whereas manufacturers tended to focus on the development of more environmentally friendly packaging and recycling methods. There was little support for using the funds to cover the administrative costs of the scheme.

4.2.2 Views on the Consumer Charge

In general there was more understanding of the purpose of a consumer charge since respondents believed it to be more directed at the root cause of the problem: consumer behaviour. However, again there were reservations about the impact on retailers with both small and large retailers believing the scheme would be more onerous for them to implement. Furthermore, retailers were worried about a decline in the perceived level of service to customers resulting in a loss of custom for those who comply with the scheme. Large retailers who are already taking action generally feel strongly that the current voluntary initiatives should be allowed to run their course as they have not yet been given a chance to demonstrate their effectiveness.

There was also a broad consensus that, despite the likely implementation difficulties in the independent sector, any scheme should be applied universally and should not just target large retailers. Only one retailer interviewed thought it may be better to target the larger companies. Generally it was acknowledged implementation and compliance issues generate a 'no win' situation: a legislated scheme will be difficult to execute and enforce in the independent sector, while it will be equally difficult to involve the small trader in a voluntary scheme. Under a legislated scheme, large retailers voiced concerns that they would lose out to the small retailers since the larger retailers are more likely to comply, take a proactive lead, be inspected and face expensive legal action for any failures. Equally, small traders felt the main burden would fall on them.

The consultation showed general support for the proposed exemptions on hygiene grounds, although it was acknowledged that considerable difficulties in implementation could arise, particularly in stores which sell both exempted and non-exempted goods, including supermarkets. Regarding use of the funds, the views broadly followed those on the supplier levy with retailers favouring education and publicity while manufacturers favoured research and development and recycling. However, whilst retailers did not want to be seen as benefiting through retention of the charge, a majority seemed to feel that some retention was appropriate to cover costs.

results were hard to generalise. Price ranges of 2 cents to $4 were quoted depending on material, design, thickness etc. One manufacturer that produced a smaller range quoted an average price of 2.5 cents per bag.

[35] Source: C&SD Employment and Vacancy Statistics.

Regarding the anticipated impact of the charge, both independent and retail chain respondents overwhelmingly agreed that a consumer charge would reduce use of shopping bags, although the majority of retailers anticipated the reduction to be less than 40%. Larger retailers were particularly sceptical with five of six responding chains believing that the reduction would be 20% or less. Both independent and chain retailers believed it likely that consumers would use more re-usable bags but views were more mixed about potential consumer switching to trash and storage bags with retail chains predicting this would be more likely at 52% and 72% respectively in comparison to 35% and 47% for independents. Moreover, 84% of large chains thought they might switch to providing alternative bags for customers (42% saying multi-use, 16% paper and 21% remained unsure) compared with just 30% of independent stores. It was the general view of the manufacturers that significant switching would occur. Costs to retailers were generally expected to increase and profits fall.

4.2.3 View-Seeking Conclusions

The consultations identified an appreciation of the waste problem and a willingness to make a contribution to solutions amongst those who responded. However, there was some scepticism towards the reference case scheme adopted for the view-seeking exercise. The supplier levy was less well received than the consumer levy as it was not perceived to address what the respondents considered to be the root cause of the problem: consumer behaviour. Furthermore, manufacturers were concerned that interest in implementing a levy demonstrated a lack of understanding about the impact of plastic bags in the waste stream compared with alternative packaging options.

The consumer charge was expected to do more to reduce indiscriminate plastic bag use with four out of five retailers believing that fewer shopping bags would be consumed. However, actual in-store supply was rarely anticipated to fall by more than 20%.

The respective levies were also expected to come at a high cost to producers, retailers and Government in terms of implementation, compliance and enforcement. Stakeholders thought that evasion will be common and loopholes would be exploited wherever possible.

4.3 Impact Assessment Methodology

The impact assessment attempts to trace the effects of the scheme on plastic bag stakeholders. It has gathered together the available evidence on Hong Kong experiences to date, international examples, the plastic bag (including shopping bags) market in Hong Kong and the view-seeking exercise. Potential impacts on plastic bag stakeholders are identified should the reference case scheme be implemented. Potential impacts on the waste stream are gauged against the base case presented in Table 2-1[36].

The impact on both stakeholders and the waste stream in general will reflect the choices that retailers and consumers make when confronted with a change in relative prices between the differing bag types. The estimated take-up of alternative bag types is based on 'assumed percentage reductions', namely the percentage of plastic shopping bags that consumers continue to use and the percentages that are switched for laminated paper bags, paper bags, non-woven bags, no bag or use of a long term bag, such as a handbag or rucksack. Additional switching is then estimated for the percentage increase in demand for rubbish bags and the percentage increase in demand for small/ no handle

[36] For the purpose of transparency and simplicity, macro-economic parameters such as population, and economic output are held constant.

bags. A similar methodology was used in studies for Australia, South Africa and Scotland[37].

Based on the switching assumptions the assessment provides estimates of the potential impact of the proposed scheme on both weight to landfill and bulk to landfill. In addition, impacts are considered with respect to final stakeholder groups comprising consumers, suppliers (including retailers) and the government.

4.3.1 Switching Assumptions

The driving factor in the impact assessment is the likelihood of the scheme inducing a switch from the consumption of plastic shopping bags to no bag or alternatives to plastic shopping bags. However, the international evidence on this matter is limited and represents countries with very different retail bases and shopping patterns to Hong Kong and as such is only used as reference. Furthermore, the CPU opinion survey was not sufficiently detailed to reveal consumer preferences. The evaluation model therefore utilises a three pronged approach by first subdividing the market into ten individual retail sector bundles, each of which would be expected to display different propensities to switch. Stakeholder views inform likely switching within each sector and high/low switching scenarios are incorporated to test for result sensitivity to the assumptions.

The assumptions on switching are made primarily with reference to customer shopping patterns and potential behaviour in the respective sector bundles as derived from the view seeking exercise. Relevant considerations include:

- The nature of product – higher quality, fashion items are more likely to switch to higher quality alternatives such as laminated paper
- The likely proportion of exempted goods – the more exempted goods, the less the induced change in consumer behaviour
- The value of the purchase – the more valuable an item, the more likely the switch to higher quality alternatives
- The transaction size – if there is no alternative provided, a consumer may need to purchase a shopping bag in order to transport the goods. The smaller the transaction the more expensive the relative cost of the bag so single items may be carried by other means
- Retailer concerns regarding shoplifting – shopping bags provide proof of purchase for returns as well as for retail security
- Likely compliance levels – compliance is anticipated to vary proportionally with the probability of a retailer being checked

The most sensitive assumptions are for the sectors which distribute the highest proportion of plastic shopping bags. By far the largest category, with more than half of all plastic shopping bags, is non-branded bags which represents the large number of small shops and market traders in Hong Kong. Ranked second is supermarkets. Wider variations in switching assumptions are used for these two sectors in the high and low switching scenarios to test the impact of more/ less switching. The rationale for the switching assumptions is set out in Table 4.1.

[37] See “Plastic Shopping Bags - Analysis of Levies and Environmental Impacts” for Australia, “Socio-Economic Impact of the Proposed Plastic Bag Regulations” for South Africa and “Proposed Plastic Bag Levy – Extended Impact Assessment” report for Scotland.

Table 4-1: Key Switching Assumptions for the Reference Case and Rationale

Newspapers	Continue Using Plastic Bag 2%	No Bag 98%
In this sector, there is already an EPD voluntary initiative underway. However, view-seeking indicated that there is always a residual of customers who want to take a newspaper in a plastic bag and even with print quality improving there are wet days when a bag becomes a "must". However switching in this case will be minimal and use of customer's own bag is more likely than in other cases.		
Supermarkets	Continue Plastic Bag Use 50%	No Bag 35%
This is one of the sectors where the view seeking exercise suggested that a 50% reduction might indeed be achievable based on experience to date with at least a 20% reduction already achieved by selected participants in the voluntary scheme and more possibility of home delivery (57% of the retail chain survey respondents thought this would increase). However, approximately 20% of business is fresh food which is exempt and there may be some degree of 'stretching the rules'. Switching will likely be primarily to multi-use non woven bags.		
Bakery Shops	Continue Plastic Bag Use 90%	No Bag 5%
The bulk of purchases will be exempt but there may be more efficient use of bags as a result of education i.e. less double packing. There could be some replacement with small thin paper bags.		
Fastfood/ Restaurants	Continue Plastic Bag Use 60%	No Bag 10%
It is assumed the reduction will be limited by the often wet and liquid nature of the product. It is also assumed the rules can be easily stretched by placing one fresh item such as a biscuit in a plastic bag. There is potential for some replacement with paper bags and switching to new forms of packaging could also be expected such as carry trays/foils. This type of switching has not been included in this analysis.		
Medicare Drugs	Continue Plastic Bag Use 40%	No Bag 30%
It is assumed that there is good potential to achieve a reduction in this sector where many transactions involve one or two small, cheap items easily fitted into a handbag. However, these small items equally lend themselves to the use of small paper bags and more expensive luxury items are likely to attract the use of laminated paper and non woven bags. Concern about theft could be a factor in this sector.		
Convenience Stores	Continue Plastic Bag Use 40%	No Bag 50%
This sector is similar to supermarkets in its potential for reduction with a number of stores already actively involved in reduction initiatives. However, the nature of the transactions with, predominantly one or two cheap items, also lend themselves to more use of small thin paper bags.		
Books, Stationery, Gifts	Continue Plastic Bag Use 50%	No Bag 10%
There is potential in this sector for a large reduction in plastic bag use but also significant switching resulting in minimal no-bag. The small stationery, books and gift items will lend themselves to small paper bags whereas larger books and gift items are likely to switch equally to laminated paper and non woven bags to avoid concerns of damage to the goods. Discussions with one bookseller indicated significant switching to non woven bags on 'No Plastic Bag Day' of almost to 100%.		
Fashion, Footwear	Continue Plastic Bag Use 10%	No Bag 10%
Again it is assumed that there is potential in this sector for a considerable reduction in plastic bag use but not in overall bag use. The fashion sector already uses a significant		

proportion of paper and non woven bags and this is likely to grow given the customer's desire to protect more expensive items which they may need to return to the store and the retailer's desire to safeguard against theft.		
Electric/Dept/Home Acc	Continue Plastic Bag Use 40%	No Bag 10%
This sector is a mixed picture as small hardware items could easily be carried in customers' own bags or in a small paper bag, but bulkier and more expensive purchases (which again the customer may need to return to the store) will require a bag of some sort. The cost of the bag is also a smaller percentage of the item value.		
Non Branded Bags	Continue Plastic Bag Use 60%	No Bag 25%
These bags are predominantly used by the independent small trader sector. There is potential for significant reductions for cheaper items and limited potential for switching given the high cost of alternative bags relative to transaction size: 70% of respondents to the independent retailer survey said they would not switch to other types of bags. This sector also includes goods sold at fresh food and wet markets, so many bags would remain exempt. Also potential for non-compliance given the absolute number of traders in Hong Kong with street stalls.		
Rubbish Bags	Increase from Supermarkets 10%	From non branded 5%
It is assumed that a proportion of supermarket and non branded bags (as these are the most suitable type) will be replaced by trash bags purchased by customers. 35% of small retailers and 52% of large retailers surveyed thought the sales of rubbish bags would increase. The equivalent figures for growth in storage bag use were 47% and 70%. Re-use of plastic shopping bags for refuse was cited by 95% of respondents in the CPU Survey. Some manufacturers noted an increase in the demand for rubbish bags in Hong Kong in 2006, citing the voluntary scheme and no plastic bag day as possible reasons why.		

4.3.2 Other Assumptions

Weight and Density Ratios

The analysis draws on international comparisons of relative shopping bag weights and densities to develop appropriate ratios for Hong Kong where the average weight of a plastic shopping bag is only 13 grams (wet) and 4 grams (dry). Since the moisture content of bags disposed at landfill is not known, dry and wet ratios are assumed constant for the purpose of the analysis[38]. Where consumers switch to bin liners, it would be expected that these would be to small refuse sacks rather than large black sacks. Large bin liners weigh 1.9 times lightweight plastic shopping bags so a conservative ratio of 1.5 is adopted here[39].

Table 4-2: Weight and Bulk Ratios

Ratio	Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Rubbish Bags	No handle bags
Wet weight	1	15	6	10	1.5	1
Dry weight	1	15	6	10	1.5	1
Bulk	1	3	3	5	1	1

[38] Alternative bags such as paper are soluble and as such would be expected to weigh more when wet than non-soluble plastic bags, but absolute weights are not known so the ratio is conservatively maintained.

[39] Ratio taken from "Proposed Plastic Bag Levy – Extended Impact Assessment Final Report, Volume 1 Main Report." Scottish Executive 2005. AET Technology.

Use of Non Woven Bags

As per the Carrefour study[40], it is assumed that a typical non-woven bag is used 20 times before replacement. While capable of withstanding significantly more trips, the increased availability of these bags if distributed or sold widely is likely to reduce re-use.

Phasing of Costs and Benefits

The scheme is assumed to be introduced two years after the marketing and awareness campaign commences. In actual implementation the impact of any scheme may see substantial reductions as people are averse to paying for something that was previously distributed freely, though use is likely to rebound slightly as habits adapt, giving a typical 'J-curve' effect. However, the scheme also includes a comprehensive education and awareness campaign and a budget for marketing, which aims to mitigate this effect such that the reduction in plastic bag use is long term. Impacts over time are assessed for the first ten years after implementation. Consumer responses are measured in the first year of implementation and taken as constant over this time period.

For the financial impact on Government, the analysis calculates a Net Present Value (NPV) and Internal Rate of Return (IRR) of the various cost and revenue implications. The social discount rate is assumed to be 4% in line with Government guidelines.

4.4 Impact Assessment Results[41]

4.4.1 Impact on Bag Usage

Table 4-3 shows the anticipated impact on plastic bag use (including plastic shopping bags) and alternatives under the three scenarios.

Table 4-3: Impact on Number of Bags

		Switching Scenarios		
	Existing Situation	Base Case	High Levels of Switching	Low Levels of Switching
Nos Plastic Shopping Bags				
Shopping bags / person / day	3.4	1.9	1.3	2.5
Shopping bags / day (Million)	23.7	13.2	8.9	17.5
Shopping bags / year (Million)	8,651	4,812	3,265	6,379
% Change in Plastic Shopping Bags	*na*	*-44%*	*-62%*	*-26%*
Nos Plastic Bags				
All Plastic bags / person / day	4.3	2.8	2.2	3.4
All Plastic bags / day (Million)	30.2	19.7	15.4	23.9
All Plastic bags / year (Million)	11,012	7,173	5,627	8,741
% Change in Plastic Bags	*na*	*-35%*	*-49%*	*-21%*
Nos Plastic Bags/ Alternatives				
Shopping bags / person / day	4.3	3.3	3.0	3.8
Shopping bags / day (Million)	30.2	23.3	21.0	26.7
Shopping bags / year (Million)	11,012	8,494	7,648	9,731
% Change in Bags	*na*	*-23%*	*-31%*	*-12%*

Under the base case scenario, the number of plastic shopping bags per day/capita falls from 3.4 to 1.9 and the total number disposed of to landfill per day from 23.7 million to 13.2 million: a 44% decrease in the number of plastic shopping bags. The high and low scenarios switching give reductions of 62% and 26% respectively.

[40] "Évaluation des impacts environnementaux des sacs de caisse Carrefour. Analyse du cycle de vie de sacs de caisse en plastique, papier et matériau biodegradable." Report prepared for Carrefour by Ecobilan, February 2004. www.ademe.fr/htdocs/actualite/rapport_carrefour_post_revue_critique_v4.pdf

[41] Complete sources, assumptions, inputs and results can be found in Annex E to WP4.

Including all types of plastic bags (rubbish bags and other small no handle bags etc), the scenarios show a lesser fall of 35%, 49% and 21%. Including all types of bags (alternatives as well as plastic bags) the reduction is less still: 22%, 31% and 12%.

4.4.2 Impact on Waste to Landfill

Table 4-4 shows the estimated impact of the scheme on the waste stream under the different scenarios. The base case scenario assumes a 24% increase in weight to landfill. High levels of switching could increase weight by 43%; low levels by 20%. The estimated change in bulk provides a more relevant picture of potential impacts at landfill and the scenarios assume increases in bag bulk by magnitudes of 123%, 206% and 90% respectively. These results are consistent with the assumed decline in bag numbers since the assessment assumes that consumers will switch to heavier and bulkier alternatives if provided. For a 'win win' situation in terms of both reduced plastic shopping bag use and less waste to landfill, the charging scheme needs to encourage consumers to switch to 'no bag' rather than to alternatives.

Table 4-4: Impact on Waste to Landfill

		Switching Scenarios		
	Existing Situation	Base Case	High Levels of Switching	Low Levels of Switching
Dry weight (tonnes / year)	58,700	73,342	84,861	71,099
Wet weight (tonnes / year) indicative[1]	193,065	*238,713*	*276,635*	*231,331*
% Change in Weight	na	24%	43%	20%
Bulk (m3 / year)[2]	65,222	145,752	199,667	123,749
% Change in Bulk	*na*	123%	206%	90%

Notes:

[1] Wet weights of alternatives are indicative only, based on the relative dry weights since the moisture content is not knov

[2] Bulk is based on dry weight and density assumptions to provide broad results. In practise the wet bulk will differ based on moisture content and will affect compaction at the landfill

4.4.3 Impact on Consumers

Consumers are expected to incur costs, both directly from the purchase of plastic bags and indirectly through an increase in general store prices to pay for the 'free at point of sale' provision of alternative bags. This figure is anticipated to total some $3 billion before exemptions and non-compliance, neither of which can be estimated in advance. Note that the hidden charges consumers currently pay for plastic bags or other types of carrier are not known. Inconvenience and loss of utility will also be a factor.

Table 4-5: Estimated Financial Impact on Consumers

			Base Case	High Levels of Switching	Low Levels of Switching
		% passed on	$ Million	$ Million	$ Million
Impact on Consumers					
Cost of plastic bags	0.5	100%	2,406	1,633	3,190
Cost of alternatives passed on by retailers/ bought					
Laminated paper	3	50%	190	209	171
Paper	1	50%	419	728	236
Non woven bags	3.5	50%	44	74	36
Rubbish bags	minimal				
Total			**3,058**	**2,644**	**3,633**

Please note that numbers are rounded for presentational ease.

4.4.4 Impact on Manufacturers, Traders and Intermediaries

According to the C&SD Employment and Vacancy statistics, the plastic bag manufacturing sector in Hong Kong comprises 190 establishments and some 500 persons. There are less than 20 medium to large sized bag manufacturers, some of which only have a very limited presence in Hong Kong as production takes place in China where an estimated further 110,000 persons are employed. The Hong Kong market is more important to small and medium sized manufacturers since the larger manufacturers will also export globally. Only the smaller manufacturers actually produce in Hong Kong.

The base case scenario estimates a 35% reduction in the number of plastic bags consumed in Hong Kong, allowing for switching and incremental increases in supply of other types of carrier bags. Since the majority of bags are imported, this reduction reflects the decrease in the number of plastic bags to the Hong Kong market, whether produced domestically or imported. In a total market estimated to be worth more than $1.6 billion, the indicative loss of sales is estimated at $569m under the base case, assuming that all bags cost the same and are equally affected by the reduction in demand. The key point is that irrespective of the actual figure, the expected loss of sales would dwarf the current value of Hong Kong production. Moreover, this loss would be expected to fall disproportionately on the smaller manufacturers as these are the firms that tend to produce in Hong Kong and will be less able to diversify their product range or switch to exports. Many would be driven out of the market with the remainder of the impact to be shared proportionately between the larger and the medium sized manufacturers.

Table 4-6: Potential Value of the Loss of Sales to the Hong Kong Market

		Value HK$ million
Value of Plastic Bag Imports into Hong Kong		1,638
Value of Plastic Bag Produced in Hong Kong		158
Less Value of Plastic Bags Exported		165
Total Hong Kong Market Value		1,631
Hong Kong Re-Export Market		1,724
	Percentage of Market Lost	**Value of Loss, HK$ million**
Loss of sales under base case	35%	569
Loss of sales under high switching scenario	49%	798
Loss of sales under low switching scenario	21%	336
Loss of re-export market	100%	1724

Please note that numbers are rounded for presentational ease.

Hong Kong port is also used for re-exporting plastic bags produced in China. The value of this re-export market is larger than the entire Hong Kong plastic bag market, although the 'value-added' of re-exports to Hong Kong's economy is minimal[42]. The supplier levy would affect all bags imported into Hong Kong, including those destined for re-exports. It is anticipated that traders would respond by quickly re-routing their exports to go through Mainland ports so as to avoid the levy and the market would be lost.

4.4.5 Impact on Retailers

If no alternative is offered and customers pay for bags (assuming compliance and accounting for the fall in demand) then the retailer is better off by 45 cents per bag (50 cent charge minus the 5 cent charge passed on by suppliers) less administration costs. Under the base case scenario, some 4.8 billion plastic shopping bags are still expected to

[42] Value added is one of the methods used to compile GDP and is measured as gross output minus intermediate consumption.

be consumed. At 45 cents per bag this gives around HK$2.2 billion, less exemptions, non-compliance and administration costs.

The implication is that financially some retailers would be better off, though retailers themselves were not convinced: in the view-seeking exercise 45% of independent retailers and 71% of chains expected profits to fall. Additional chain concerns focussed on the need to keep records, the time taken in asking customers whether they wanted a bag (70%) and the loss of advertising opportunities (50%). Some 78% of the retailer chains considered that their costs would increase (largely as a result of switching and/or administration costs) and only 11% considered their costs would decrease (presumably as a result of supplying fewer bags, as found by A1 Bakery on No Plastic Bag Day).

Enforcement within the independent retailer sector will be difficult given the number of outlets so retailers selling more homogeneous products may start to compete for custom on the basis of convenience through non-compliance. Some 70% of independent retailers suggested that they would not switch to other bags[43].

4.4.6 Impact on Government Finances

The impact on Government finances includes both the costs and revenues of the scheme compared with the current situation[44]. Costs include the incremental costs of implementing the scheme and the incremental changes to costs of the expected increase in waste to landfill and littering as a result of the scheme. Implementation costs and staffing requirements are detailed below in Table 4-7. Inspection of Hong Kong's 54,960 retail establishments is costed to be undertaken by a sample of 9 inspectors doing an average of 5 inspections per day over 240 days to cover a 20% sample each year, allowing for report writing and administrative activity as well as enforcement activity. Similarly, inspection for the supplier levy has been costed to involve 4 inspectors (shift operation) based at each of the 4 border crossings, 8 staff to cover sea and air consignments (required but very limited given the meagre volume) and 4 to inspect local suppliers, plus 4 staff to provide cover and undertake special "blitz" operations.

Table 4-7: Implementation Costs and Staffing

Activity	Cost HK$ million	FTE Staff Numbers
Supplier Levy Administration	$3.9	5.02
Supplier Levy Inspection and Enforcement	$21.1	38.12
Consumer Charge Inspection and Enforcement	$4.1	11.17
Prosecution and Legal Proceedings	$1.0	2.07
Marketing, Monitoring and Research	$1.9	2.02
Total Staff and On Costs	**$32.2**	**58.40**
Other Departmental/Central Costs at 30%	$9.6	-
Capital Costs and Other Non Recurrent Expenditure at 10%	$3.2	-
Public Awareness/Communications Campaign at 10%	$3.2	-
Total Administration Cost	**$48.2**	**-**

Table 4-8 shows the overall financial return to Government assuming that enforcement and compliance measures yield an 80% collection rate for the supplier levy. Revenues per year come to approximately $357 million – considerably higher than the estimated costs even allowing for costs of waste disposal at landfill and marine litter collection. Under the base case scenario, the NPV of the policy to Government is estimated at $859

[43] This is only partially explained by the exemptions for fresh food; 16 of the 99 respondents would be exempt under the scheme.

[44] The 'current situation' is taken to be the end of 2005 so as to fit with the results of the Landfill Survey.

million, representing an internal rate of return (IRR) of 236%, and under all cases the IRR is highly positive. High levels of switching reduce the amount of levy that accrues to Government and the reverse is true if there are lower levels of switching.

Table 4-8: Impact on Government Finances, Returns to Government

	Base Case	High Levels of Switching	Low Levels of Switching
Net Present Value @ 4%	859	225	1,133
IRR	236%	101%	279%

4.5 Key Results to Take Forward

- The supplier levy does not affect habits unless passed on to consumers. It therefore has little effect on indiscriminate plastic shopping bag use and should be removed from the scheme.
- The consumer charge does provide correct incentives to alter consumer behaviour. However, retailers and consumers may switch to alternative bags. Switching may have negative environmental impacts in terms of weight and bulk to landfill.
- Any scheme needs to emphasise that no bag is the preferred outcome.
- An intensive advertising and promotional campaign will be required to educate stakeholders about the potentially harmful effects of switching to bags that are commonly perceived to be more environmentally friendly and to increase compliance from retailers.
- Achieving significant reductions in indiscriminate plastic bag use will require participation from the independent retailer sector[45]. However, the number of independent outlets makes implementation difficult and costly.
- The need for any charging scheme to be part of a wider waste initiative with demonstrable positive environmental outcomes.

[45] The independent sector accounts for 59% of plastic shopping bags disposed at landfill according to the Landfill Survey.

5 DEVELOPMENT OF POTENTIAL SCHEMES FOR HONG KONG

5.1 A Plastic Shopping Bag Charging Scheme as part of a Wider Waste Management Plan

Government policy, international evidence and stakeholder consultation highlights the need for a comprehensive approach to waste management – one that attempts to deal with such holistic issues of personal responsibility and specific material-based initiatives, of which the proposed plastic shopping bag scheme is one.

This Chapter draws on the problems highlighted with the reference case scheme to develop alternative approaches for a plastic bag charging scheme[46], including the option to continue with the present voluntary initiative. Each option is qualitatively and quantitatively appraised[47] so far as the evidence from the reference case permits, under the assumption that any scheme would form part of a wider initiative, and particularly that a comprehensive education and awareness campaign is undertaken, not only to underpin the objectives of a scheme but to improve general appreciation of waste management issues and encourage environmentally sound practices. Additional scheme considerations including the use of any revenues raised and the potential to jump-start recycling in Hong Kong, are also included.

5.2 Objectives of a Plastic Shopping Bag Charging Scheme

Government waste management policy emphasises adherence to the internationally adopted waste hierarchy. Within the context of a plastic shopping bag charging scheme, this hierarchy advocates that appropriate initiatives should seek to:

- Provide incentives to avoid or minimise plastic shopping bag use – “avoidance and minimization”
- Emphasise the reuse of bags and their recycling – “reuse, recovery and recycle”
- Provide incentives to discourage switching to alternatives that may have less desirable outcomes – “reduce bulk and disposal”

5.3 Potential Solutions

The issues highlighted in the reference case impact assessment, combined with the experiences of past schemes in Hong Kong, insights from international examples, and with respect to the objective stated above, provide useful guidance in the formulation of schemes for further consideration. As per the reference case, all these options assume the inclusion of any bag made wholly or partly of plastic, the exemption of bags for the carrying of fresh food and the adoption of an intensive public awareness, education and promotional campaign. Specific characteristics that differ between the schemes are:

[46] Scheme development was specifically limited by EPD to schemes that charge for plastic shopping bags only.

[47] The quantitative assessment undertaken for Option 1 differs slightly in methodology from that undertaken for Options 2, 3 and 4. For Option 1, actual reductions in numbers of plastic shopping bags are estimated and subtracted from the total estimates by sector based on the landfill survey. For Options 2, 3 and 4, expected percentage reductions and switching assumptions are applied to the landfill survey estimates. Since the landfill survey estimates for the supermarket and convenience store sector are much higher than retailer estimates, the quantitative comparison may under-represent the plastic shopping bag reductions and consequent weight and bulk implications of Option 1 compared to Option 4.

Option 1: Continuation of the existing voluntary initiatives

Option 2: The Reference Case – combined 5 cent supplier levy and 50 cent consumer charge. Retailers to collect and retain the revenue

Option 3: A 50 cent consumer charge for plastic shopping bags provided at all retail outlets. Government to collect the revenue from retailers

Option 4: A 50 cent consumer charge for plastic shopping bags provided at supermarkets and convenience stores only (S&C). Government to collect the revenue from retailers

5.4 Comparative Scheme Assessments

5.4.1 Scope of the Comparative Scheme Assessment

The assessment of alternative schemes is based on evidence collected throughout the study including Hong Kong evidence, international experience and the view seeking exercise. However, since the view seeking exercise was specifically tailored to the Reference Case scheme, evidence from this source on alternative schemes is more limited[48].

5.4.2 Impact on the Number of Plastic Shopping Bags Used

Estimated impact on the number of plastic shopping bags and other bags used are presented in Table 5-1[49].

All of the options are expected to reduce the number of plastic shopping bags consumed. The schemes vary considerably; none of the schemes are expected to achieve a 50% reduction. The largest impact results from the consumer charge on plastic shopping bags provided at all retail outlets in Options 2 and 3, which is estimated to reduce plastic shopping bag use by 44%. This impact is four times the effect of just implementing a consumer charge at supermarkets and convenience stores and almost fifteen times the estimated impact of continuing with the present voluntary initiative. The impacts are less when considered as part of all plastic bag consumption and if the numbers of alternative bags used are included.

Table 5-1: Impacts of Scheme Options on Number of Bags Used

		Switching Scenarios			
	Existing Situation	Option 1	Option 2	Option 3	Option 4
Nos Plastic Shopping Bags					
Shopping bags / person / day	3.4	3.3	1.9	1.9	3.0
Shopping bags / day (Million)	23.7	23.1	13.2	13.2	21.1
Shopping bags / year (Million)	8,651	8,432	4,812	4,812	7,696
% Change in Plastic Shopping Bags	*na*	*-3%*	*-44%*	*-44%*	*-11%*
Nos Plastic Bags					
All Plastic bags / person / day	4.3	4.2	2.8	2.8	3.9
All Plastic bags / day (Million)	30.2	29.6	19.7	19.7	27.6
All Plastic bags / year (Million)	11,012	10,795	7,174	7,174	10,058
% Change in Plastic Bags	*na*	*-2%*	*-35%*	*-35%*	*-9%*
Nos Plastic Bags/ Alternatives					
All Plastic bags / person / day	4.3	4.2	3.3	3.3	4.0
All Plastic bags / day (Million)	30.2	29.6	23.3	23.3	28.0
All Plastic bags / year (Million)	11,012	10,795	8,495	8,495	10,206
% Change in Plastic Bags	*na*	*-2%*	*-23%*	*-23%*	*-7%*

[48] These alternative schemes draw on the evidence collected for the analysis of the Reference Case charging scheme. However, they were not explicitly considered in the view-seeking exercise, nor were the stakeholder impacts of plastic bag alternatives part of the original study scope.

[49] See Annex B for detailed tables providing assumptions and workings for the comparative assessment.

5.4.3 Impact on Waste to Landfill

Translating these reductions in plastic shopping bag and other bag use into overall impacts on waste to landfill, none of the options yield demonstrable reductions in overall waste – see Table 5-2. In fact, Options 2 and 3 are estimated to increase the weight and bulk to landfill quite substantially. Only the voluntary initiative, Option 1, is estimated to yield concurrent reductions in the weight and volume of bag waste to landfill, though the actual magnitude of these reductions is limited. Option 4 yields similar reductions in weight but induced switching to alternatives is still estimated to increase bag bulk to landfill.

Table 5-2: Impact on Waste to Landfill[50]

		Switching Scenarios			
	Existing Situation	Option 1	Option 2	Option 3	Option 4
Dry weight (tonnes / year)	58,700	57,813	73,342	73,342	57,418
Wet weight (tonnes / year) indicative	193,065	*190,146*	*238,713*	*238,713*	*188,422*
% Change in Wet Bag Weight	na	-2%	24%	24%	-2%
Bulk (m3 / year)	65,222	64,236	145,752	145,752	69,568
% Change in Bag Bulk	*na*	-2%	123%	123%	7%

The issue of switching from plastic shopping bags to some alternative is key to the analysis and ultimately the overall impact of any scheme, particularly in terms of impact on waste generation and disposal. Estimates of switching are informed by the limited international experience but given the very different shopping habits and lifestyle in Hong Kong, estimates are mainly informed by the view seeking exercise.

5.4.4 Financial Impact on Manufacturers, Traders and Intermediaries

The impact on manufacturers traders and intermediaries is closely linked to the impact on the number of plastic shopping bags consumed, the level of switching and to what alternatives. Continuation of the Voluntary Scheme will likely have least impact since the reduction is lowest – only 5% of plastic shopping bags and 4% of all plastic bags. This amounts to some $65 million loss of sales compared to $569 under Schemes 2 and 3 and some $147 million under Scheme 4. Only under Scheme 2 would re-exports be affected, an estimated loss of some $1.7 billion a year. Similarly, the impact on local smaller manufacturers is likely to highest under Scheme 2 where they are the hardest hit by a supplier levy. Under other schemes manufacturers and intermediaries are affected by the loss of market demand, some of which may be compensated by a switch to alternatives, rather than a direct tax on producers.

5.4.5 Financial Impact on Retailers

The impact on retailers under the Schemes varies quite considerably. Under Scheme 1, the Voluntary initiative, the impact is almost entirely on those participating retailers with others only affected by potential changes in consumer behaviour. Participating retailers are affected by the cost of administering the Scheme but may also benefit from good publicity and reduced cost of providing bags, as long as alternatives are not provided. Under Scheme 2, where the retailer keeps the difference between the supplier levy (assumed to be passed on) and the 50 cents consumer charge less costs, the retailer is comparatively better off by an estimated $2.2 billion, less exemptions, non-compliance and administration costs.

[50] Measured by wet weight, the impacts of Option 1 and Option 4 on the overall waste stream to landfill are similar: MSW falls by 0.09% and 0.14% respectively and total waste falls by 0.05% and 0.07%. Options 2 and 3 increase MSW by 1.33% and total waste by 0.71%. For bulk, only the indicative impact on MSW can be estimated since current total waste disposal by volume is not reported. MSW to landfill decreases by 0.003% under Option 1 but increases by 0.282% for Options 2 and 3, and by 0.015% for Option 4.

Under Schemes 3 and 4, receipts from the consumer charge would be collected from retailers by the Government. The net impact on retailers would therefore be expected to be negative since they will have to absorb the net costs incurred in implementing the Scheme. Net costs to retailers under Schemes 3 and 4 include the cost of administering the Scheme, less savings in providing free plastic shopping bags, plus costs of providing alternatives, if any; the overall effect is expected to be negative. Retailers may seek to pass on these increased costs to consumers in the form of increased shop prices, resulting in minor, one-off inflationary implications.

5.4.6 Financial Impact on Consumers

The direct cost of the Voluntary Scheme to consumers is nil. There may be some indirect effects if retailers pass on either the cost or savings of the scheme to their customers. The overall cost under Schemes 2 and 3 amount to an estimated $3 billion a year before exemptions and non-compliance, plus unquantified costs of inconvenience. Under Scheme 4, where the implementation is limited to the supermarket and convenience sector, the impact is much lower at just under $0.5 billion. Impacts are summarised in Table 5.3.

5.4.7 Financial Impact on Government Finances

Government financial impact includes revenues from the potential scheme options as well as the costs of implementation and the incremental costs of waste clean up and disposal compared to the counterfactual – taken as the end 2005 situation. Government revenues could be quite considerable. Scheme receipts from the Reference Case came from the 5 cent supplier levy and amounted to $241 million per annum. In Options 3 and 4, the consumer charge is 50 cents per bag and subsequent scheme receipts could total $2.4 billion per annum if applied to all outlets (Option 3) or $430 million per annum if just applied to supermarkets and convenience stores (Option 4).

Administrative costs vary depending on the number of outlets included and the degree of inspection. For example, comparing Options 3 and 4:

- EPD's rough estimate of manpower resources for Option 4 required three teams of two inspectors visiting all 1,700 supermarkets and convenience stores[51] twice a year. Although feasible for Option 4, using the same inspection method to inspect all 54,960 retail outlets in Hong Kong (as would be necessary under Option 3) would require 88 inspection teams and cost some $71 million annually[52].
- By contrast, the inspection method proposed by the consultants for administering the consumer charge across all outlets under the reference case (Option 2), involving inspection of a 20% sample each year would require just 9 inspectors and cost $4.1 million.
- EPD also proposed that administering the scheme and collecting the revenues from the supermarket and convenience store sector would cost approximately $3,533 per store. Using the same approach to administer and collect from all outlets in Hong Kong would therefore cost $194 million[53].

[51] Census and Statistics Department, Employment and Vacancies Statistics 2005.

[52] See Annex C for workings.

[53] See Annex C for workings. Although just a linear extrapolation, it could be argued that this figure considerably underestimates likely collection costs since collecting from just 1,700 clearly marked supermarkets and convenience stores would be significantly more straightforward a task than collecting from each and every independent retailer.

Anticipated financial implications on Government, before exemptions, non-compliance and assuming 80% successful levy collection are presented in Table 5-3.

Table 5-3: Impact Government and Consumer Finances

		Switching Scenarios			
	Existing Situation	Option 1	Option 2	Option 3	Option 4
Impact on Government Revenue					
Net Present Value @ 4% ($ Million)	na	(8.6)	859	11,851	3,118
IRR	na	na	236%	377%	935%
Direct Impact on Consumer Expenditure					
Cost of Plastic Bag Consumer Charge ($ Million)	na	-	2,406	2,406	429
Cost of Alternatives ($ Million)	na	-	627	627	54
Total Cost	na	-	3,033	3,033	483

The net present value (NPV) and financial rate of return (FIRR) provide a measure of the scheme's financial efficiency to Government[54]. On this basis, Option 4 presents a much more cost effective method of reducing plastic shopping bag use. This is because the supermarkets and convenience stores combined account for 20% of all plastic bag disposal according to the landfill survey but just 3% of retail outlets. Such a scheme would therefore allow Government to target a fifth of plastic shopping bags at a relatively lower cost, including implementation, enforcement, compliance and monitoring.

5.5 Advantages and Disadvantages of Alternative Schemes

Key advantages and disadvantages of each potential scheme are set out in Table 5-4. None of the schemes stand out as the overall "winner" in recommending policy direction. Each scheme has pros and cons. However, none of the schemes show demonstrable environmental benefits.

Table 5-4: Qualitative Advantages and Disadvantages to the Alternative Schemes

	Advantages	Disadvantages
Option 1: Continuation of the existing voluntary initiatives	Some reductions in plastic bag use at participating stores, with minimal government involvement or resources. Minimal disruption for consumers, manufacturers and retailers. More scheme ownership and 'buy-in' from retailers. No incentive to switch to alternative bags means a clear environmental benefit from reduced bag use, weight and bulk	Unlikely to achieve the objective of significantly reducing indiscriminate plastic shopping bag use since little incentive for consumers to change their behaviour – a mandatory consumer charge could probably achieve more. Limited store involvement and little incentive for more stores to join in.

[54] Includes administrative costs of monitoring, prosecution, operating costs, capital costs and a public awareness and education campaign, as well as assuming an 80% collection rate for the supplier levy and consumer charge, where applicable.

Option 2: The Reference Case	Incentives for consumers to reduce indiscriminate bag use. Substantial Government revenues that could potentially be used to fund environmental activities.	Substantial switching; the scheme does not emphasise that 'no-bag' is the most desirable outcome. Supplier levy does not tackle consumer behaviour but wipes out the re-export market. Substantial impact on smaller manufacturers, particularly if they cannot pass the increased cost on to retailers. Onerous implementation and enforcement requirements of supplier levy and compliance requirements for consumer charge increases costs of implementation. Unclear message from Government: revenue raising or economic disincentive?
Option 3: A charge at all outlets for plastic shopping bags	Incentives for consumers to reduce indiscriminate bag use. Clear and easily understood message. Substantial Government revenues that could potentially be used to fund environmental activities.	Substantial switching; the scheme does not emphasise that 'no-bag' is the most desirable outcome. Still some impact on smaller manufacturers but less than under a supplier levy. Onerous enforcement, monitoring and compliance requirements and costs of implementing the consumer charge at some 55,000 retail outlets. Unclear message from Government: revenue raising or economic disincentive?
Option 4: A charge at just supermarkets and convenience stores for plastic shopping bags	Incentives for consumers to reduce indiscriminate bag use. Costs to Government are exceeded by collection; implementation to fewer outlets reduces costs of enforcement, monitoring and compliance. Generates Government revenues that could potentially be used for environmental activities. Reduced negative impacts on consumers, retailers and manufacturers.	Some switching; the scheme does not emphasise that 'no-bag' is the most desirable outcome. Limited store involvement diminishes overall impact. Attract anti-competitive criticisms and protests from S&C that are presently leading the way on the voluntary initiatives. Defining which outlets are to be included within the S&C sector will be difficult and possibly contentious. A targeted charge creates incentives for chains to switch to providing alternative bags free at the point of sale so as to not lose market share to competitors that are not required to charge. Switching within the S&C sector will therefore likely be higher than under Options 1-3. Retailers are against targeted schemes which affect competition between stores.

Reducing indiscriminate shopping bag use through voluntary measures has merits in being simple and cheap to implement, as well as having "buy in" from retailers and less incentive for switching to bulkier alternatives. Relative to the reductions in plastic shopping bag use it is also the most likely to yield benefits in terms of reductions in the waste stream. However the overall reduction in plastic shopping bag use will likely be less than a Government imposed charging scheme – some 3% compared to 11% for Scheme 4. Recognising this limitation, the current voluntary scheme could be augmented to try to improve the achieved reduction and given more time to work, in which case Option 1 is the way forward.

If Government considers that the anticipated reductions under a voluntary scheme are not sufficient and a financial incentive is necessary then Option 2, 3 or 4 include charging schemes albeit with different levels of impact; 2 and 3 being having much higher impact on plastic shopping bag reduction than 4 but both have resultant much larger negative impacts on the waste stream. Option 2 is inefficient since it includes a supplier levy to no marginal effect on bag use, though the levy does raise revenue to Government. In Options 3 and 4, the consumer charge is to be collected by Government. Differences between Options 3 and 4 represent a trade off between equity and efficiency – targeting all retailers would be the most equitable arrangement, and the one preferred by retailers according to the results of the view-seeking exercise, but the nature of the Hong Kong retail sector, particularly the large number of independent retailers, would make targeting of just one or two retail sectors more cost-effective but bring other disadvantages.

A scheme that charges for shopping bag provision from just supermarkets and convenience stores would likely have significant competition implications and would create distortionary market conditions. Impacts are likely to be particularly complicated in the convenience store sector that is dominated by just two retail chains that sell almost identical products and compete directly with each other for customers. The interviews in the view-seeking exercise emphasised that convenience stores would see not charging for bags as giving them a competitive edge and thus a way to gain market share. A clear first-mover advantage therefore arises, as the first chain to offer alternative bags free at the point of charge could quickly take market-share from its competitor. If this situation arose, chains reported in the view-seeking exercise that they would also provide free alternatives so as to avoid losing customers. Moreover, if these chains were to start providing paper bags then it would not be on a store by store basis but across all stores. On this basis, switching could be considerable. To this end, a sensitivity test was conducted on Option 4 to consider the impacts of switching being higher, a likely possibility. A test was also conducted to determine the outcome if there were no switching. This outcome is not considered a possibility under the scheme as defined, but provides a useful test for consideration, if all bags not just plastic, were included in the scheme, for example. Under higher switching, there was a 1% increase in wet bag weight and 16% increase in bag bulk to landfill. Under the no switching test, the comparable impact was a reduction of 6% in wet bag weight and 3% in bag bulk to landfill[55]. Furthermore, it potentially sends a mixed policy message that these retailers are the worst offenders when in fact they are presently leading the way on EPD's voluntary initiative.

On the other hand, it could be argued that starting with supermarkets and convenience stores would enable Government to implement something quickly but give time to develop the most efficient methods of scheme administration before introducing a charge to all retailers at a later stage. A commitment to universal application would likely be required for any sector targeted scheme to gain acceptance and be successfully implemented. Implementation of a targeted scheme could raise public awareness and possibly yield reductions in the independent sector even without a charge being implemented but it could also prove counter productive if the perception is that supermarkets and convenience stores are the "worst offenders". Getting the right message across to retailers, manufacturers and the public is critical, particularly given the current misconceptions. With 97% of retail establishments in Hong Kong employing less than ten people, effective and practical means of enforcement for the entire retail sector will be problematic whenever it is implemented and thus allowing time to develop the right approach could have benefits.

[55] Switching assumptions for these two sensitivity tests are provided in Tables B21 and B22 of Annex B.

5.6 Additional scheme considerations

5.6.1 Monitoring, Evaluation and Review

Effective monitoring, evaluation and review will be critical to determine whether the scheme is achieving its pre-defined objectives and to monitor the potential occurrence of any unforeseen or harmful side-effects. The more rigorous and frequent the monitoring, the earlier any shortcomings in scheme design, implementation or outcomes can be identified and adjustments be made.

Key to this process will be the ex-ante specification of clear and measurable targets and a commitment to a comprehensive review within a set time frame. A review should preferably take place no longer than two years after implementation, by which time the initial shock factor impacts will have levelled out and longer term impacts will become apparent. Consideration will need to be given to the practicality of collecting the necessary data, particularly the willingness of stakeholders to participate. In the case of a voluntary scheme retailers may need to take more direct ownership of data collection and reporting as is the case with the Australian Retail Association. Though burdensome, retailers may still view these tasks as preferable to the legislated consumer charge.

Suggested targets and monitoring mechanisms are outlined below including both policy objectives and service targets. It is to be expected that policy objectives can be set up-front but that service targets may take a few months before appropriate indicators become apparent.

Table 5-5: Policy Targets and Monitoring Mechanisms

Policy targets to be achieved within a set time frame	Possible Monitoring Mechanisms	Possible Frequencies
1. Target reduction in plastic bags to landfill 2. No growth in quantities of other bags in landfill.	a) Landfill Survey b) EPD Waste Disposal Figures	Annually
1. Target reduction in marine litter	Marine Department Service Figures	Annually
1. Target reduction in plastic bags issued by specific retail sectors	a) Data collection from retailers b) Amount of charge collected	Quarterly
1. Target public acceptance and support	Consumer Survey	Annually

Table 5-6: Service Targets and Monitoring Mechanisms

Service Target	Possible Monitoring Mechanisms	Possible Frequencies
Completed retail inspections	Service statistics	Monthly
Retailers found not-complying	Service statistics	Monthly
Stakeholder complaints	Service statistics	Monthly
Number of penalties and appeals	Service statistics	Monthly

Any scheme implementation will not be without risk. Potential risk areas are detailed below, along with potential remedial actions and monitoring sources.

Table 5-7: Potential Scheme Risks

Risk	Response	Monitoring

Less than anticipated reductions in plastic bag use because: i) Consumers unwilling to pay charge ii) Charge evasion by retailers	i) Increase supporting activities such as education and publicity ii) Step up inspection activity and retailer liaison	Annual Landfill Survey Annual Consumer Survey Retailers Figures Retailers Inspection Reporting monthly
Less than anticipated reductions in MSW because: i) Switching to alternative bags ii) Compensatory increases in other packaging	i) Consider scheme expansion to include alternatives ii) Implementation of a wider packaging initiative	Annual Landfill Survey
J-curve effect with bag use plateauing or rising again after initial reductions.	Ongoing publicity and education campaign Effective relationships with retailers	Annual Landfill Survey
Adverse stakeholder impacts. For example. scheme exceeds Government budgetary provision due to additional efforts required	Consider amendments to scheme or ameliorative measures	Ongoing stakeholder liaison structures

5.6.2 Use of the funds accruing to Government

The international case studies show that charging schemes are more acceptable to the community if a significant proportion of the revenue raised is directed towards environmental measures rather than kept by retailers or subsumed into Government finances. This has been the case in Eire, South Africa, Kenya and was proposed in Scotland before the Bill was removed. Consumer charges in Taiwan are retained by the retailer although some retailers have been donating the revenue to environmental initiatives. The voluntary retailer agreement in San Francisco requires each participating supermarket to commit $100,000 to underwrite the education campaign ran by the local Department of the Environment.

This finding is supported by results from the view-seeking exercise: all stakeholders gave priority to the application of any funds raised for environmental purposes. Retailers tended to prioritise education and publicity first followed by recycling initiatives, whereas manufacturers tended to focus on the development of more environmentally friendly packaging/technology together with recycling. There seemed to be little support for Government using the funds to cover scheme administrative costs, even if many retailers admitted that that is what they would use some of the funds for if they accrued to them. What would seem important for all stakeholders are high levels of transparency in the application of any funds raised or savings made through reduced levels of waste going to landfill.

Given the potential size of the Government surplus identified in the comparative impact assessment there are likely to be significant funds available for environmental purposes even after the Government has covered its costs. However, in Hong Kong direct hypothecation of revenues is not allowed under the Public Finance Ordinance and thus an alternative mechanism will need to be found if revenues are to be ring-fenced in anyway to fulfil the objective of transparency in use of the funds. In Eire the surplus was used to promote research and development into waste prevention and reduction, to support products that are less environmentally harmful than other products in the same class and to assist producer initiatives designed to prevent or reduce waste. Such schemes seem equally relevant to the Hong Kong situation.

There is also the question of the appropriate mechanism for management of the funds. Three potential options present themselves: management by EPD to spend directly on

related initiatives or subsidise existing activities; establishment of a new fund/body to administer the resources and a 'middle way' whereby EPD would allocate the funds to relevant existing environmental charities/initiatives such as the Environment and Conservation Fund. The view-seeking process indicated the latter two options are likely to be the most widely accepted approach and that involvement of stakeholders in the fund allocation process would further engender support for the Scheme. However it should be noted that these options will also involve additional administrative costs themselves. These options for fund application have not been explored in detail as part of the current study. As the decisions about management/allocation of the funds could have a significant impact on the stakeholders 'buy-in' to the scheme; it is recommended that the Government explore these matters further with stakeholders prior to implementation.

5.6.3 Recycling Initiatives

Hong Kong is more dependent on landfill than its Asian neighbours: 40% of Hong Kong MSW is presently recycled and the rest sent to landfill. By comparison, Tokyo, Taipei and Singapore all landfill less than 10% of their waste, the remainder either being recycled and composted or incinerated. Furthermore, this figure of 40% hides considerable variation within the waste streams with commercial and industry recovery rates being much higher whilst Hong Kong recycles just 12% of domestic waste[56].

Recycling of plastic and plastic bags is more limited. The view-seeking exercise included contacting 69 collectors and recyclers – some 30% of the companies listed by EPD as service providers for recycling plastic (including plastic bags) in Hong Kong. Of these, many were found to have recently switched from recycling plastic bags to other goods such as waste metals, citing high costs and low returns. Only 25 of the 69 contacted remained in the business and were able to provide useful information but less than 10 of these focused on plastics and even fewer on plastic bags. Collection was then found to vary significantly between respondents: at the bulk end of the market, ten respondents collected over ten tonnes of plastic bags per month; at the low end, four firms collected less than 200kg per month. Few respondents had regular clients and only two collected regularly from recycle bins.

Plastic recycling in Hong Kong thus appears to be in its infancy but is already facing considerable constraints in the shape of high land and labour costs, low density and bulk that requires high collection and storage costs, the mixing of different resin types that makes reprocessing difficult and its contaminated nature, particularly when mixed with domestic waste, which increases cleaning costs and decreases the market value of recovered plastic waste. Recycling of plastic waste in Hong Kong is thus apparently limited to clean scraps and rejects from manufacturing sources[57].

The Policy Framework states the Government's "intention to promote the local recycling industry and jump-start a 'circular economy'… [including] allocating suitable land resources, encouraging research and development, introducing environmental legislation and providing effective support measures." Recycling promotional initiatives already up and running in Hong Kong include a source separation of domestic waste pilot, launched in 2005 and now understood to comprise some 430 plus housing estates, with the aim of increasing the domestic waste recovery rate to 20% by 2007. Of direct relevance to a potential charging scheme, however, is the Policy Framework's statement that "PRS initiatives will need to be supported by a network of regional and district recycling centres." It is to the funding of such initiatives that revenues collected under a charging

[56] The Policy Framework

[57] Waste Reduction and Recycling Fact Sheet, June 2004, EPD

scheme could be directed – a much needed step if persuasive incentives for local recycling are ever to materialise given that 90% of recovered waste currently has to be exported for recycling[58].

[58] The Policy Framework

6 SUMMARY AND CONCLUSIONS

6.1 Summary

The proposal for the PRS for plastic shopping bags is to encourage more environmentally responsible behaviour through direct polluter pays charges for an item where habit and social norm have resulted in what is considered to be wasteful and excessive use. The PRS for plastic shopping bags is intended to be the first of many and part of the wider municipal solid waste management strategy for Hong Kong.

The potential impacts of a plastic shopping bag charging scheme are both wide ranging and complex. It is clear that charging for plastic shopping bags at the point of sale will reduce their consumption. However, any charging scheme needs to create the right incentive structure, through emphasizing the superior environmental outcome of "no bag or long term bag" rather than creating incentives for consumers and retailers to switch to heavier and bulkier alternatives.

Plastic shopping bags account for just an estimated 1.8% of the waste stream by wet weight and less by bulk. Any plastic bag charging scheme would therefore have little positive effect on the overall weight of waste to landfill but there is potential for negative impacts if heavier or bulkier alternatives are adopted and similarly disposed.

The overall potential impact of a charging scheme in Hong Kong is further constrained by the SAR's daily shopping habits, high prevalence of small independent retailers, fresh food culture and low car ownership. Since independent retailers account for some 59% of total bags disposed of at landfill, then any significant reduction in indiscriminate plastic shopping bag use will rely heavily on their participation and compliance.

6.2 Advantages and Disadvantages of Potential Schemes

Continuation of the existing voluntary scheme, a Reference Case and two additional schemes have been considered in this Study in light of international experience in similar charging schemes, the plastic shopping bag market in Hong Kong and a comprehensive view seeking exercise. The additional schemes were developed following the view-seeking exercise and using the views and information gathered as far as possible. However, additional schemes were developed within the remit that "retailers shall be required to charge consumers who request a plastic shopping bag". The key advantages and disadvantages of all four Schemes are summarized below.

There are definite merits of any scheme being voluntary in terms of ease in implementation, costs and retailer goodwill. Moreover, this is the only scheme that does not create incentives for switching so reductions in plastic shopping bag use translate into concurrent reductions in bag waste to landfill in terms of both weight and bulk. However, the initiative provides little incentive for consumers to alter their behaviour with plastic shopping bags use likely to fall by just 3% and use of all plastic bags by just 2%. A voluntary scheme is unlikely to achieve much greater reductions in the use of plastic shopping bags given limited retailer participation, but scope exists to increase impacts through greater liaison between Government and the retailer associations.

The Reference Case scheme has the merit of considerably reducing indiscriminate plastic shopping bag use, by an estimated 44%. However, the scheme does not provide the right incentive to encourage "no bag" and consequently there are several drawbacks.

There are likely to be serious implications of switching to heavier, bulkier alternatives such as paper, leading to an estimated 24% increase in the weight of shopping bags to landfill and some 123% increase in bag bulk. Other disadvantages include the high implementation costs particularly for enforcement and compliance of the supplier levy, and although limited, there will likely be job losses in Hong Kong and trade re-routed as a result or the need to register all imports. Moreover, the strength of Government receipts could blur public understanding of the scheme's objectives, namely the imposition of an economic incentive to change consumer behaviour rather than raise revenue.

A consumer charge alone, with Government collecting the funds rather than retailers, has the same merits and impacts of the reference case scheme in changing consumer behaviour to reduce indiscriminate use of plastic shopping bags by 44% but also increasing the plastic bag waste stream by 24% in weight and 123% in bulk. This scheme is less likely have a negative impact on jobs, no impact on trade re-routing and could raise considerable funds for environmental activities. However, it too has major implementation difficulties given the number of retail outlets and the consequently high costs to Government of monitoring, collection, compliance and enforcement. Receipts are still anticipated to substantially outweigh expenditures though, even more so than under Option 2, potentially leading to public concerns that Government is more interested in raising revenue than affecting consumer behaviour.

Implementation of a consumer charge in just the supermarket and convenience stores sector would be more cost-effective, given that the two sectors combined account for 20% of all plastic shopping bags disposed of at landfill but just 3% of retailer outlets. However, its overall impact in terms of plastic shopping bag reduction will necessarily be less than for schemes which target all retailers: only about 11% compared to 44%. That said, the Option does succeed in reducing bag weight to landfill marginally, but bag bulk still increases, albeit only 7% compared to 123% under the Reference Case. A major criticism of the scheme would be that it potentially sends a mixed policy message that these retailers are the "worst offenders" (when in fact they are presently doing the most to reduce bag use through the voluntary initiative), rather than focusing on the consumer needing to change his/her behaviour and the "non-branded sector" which accounts for by far the majority share of plastic bags. This could be mitigated through careful marketing and commitment to introducing a charge to all retailers at a later stage. This scheme does provide funds for the implementation of environmental activities if revenues can be ring-fenced and the administrative costs of implementation to Government are considerably lower than if all retail outlets were to be included. Resistance to implementation from those targeted could be substantial with legitimate claims to anti-competitive policy and protests from the main players in the voluntary scheme. The oligopolistic nature of the convenience store sector will also likely affect incentives to switch with retailer chains potentially deciding to compete over alternative bag provision so as to improve customer service and shield their customers from the charge.

6.3 The Way Forward

All options would likely achieve reductions in indiscriminate plastic shopping bag use to a greater or lesser extent. However, reductions in plastic shopping bag use do not necessarily have positive environmental impacts. Plastic shopping bags account for less than 2% of Hong Kong waste sent to landfill and less by bulk. A reduction in indiscriminate plastic shopping bag use could therefore have only a very small positive effect on total waste but there is potential for negative overall impacts if implementing a charging scheme induces switching to heavier or bulkier alternatives that are similarly disposed. Indeed, bag bulk to landfill is anticipated to increase under all of the charging schemes, reflecting the impact of switching to alternatives. Moreover, Options 2 and 3,

which fulfil the objective of significantly reducing indiscriminate plastic shopping bag use, increase the amount of plastic bag waste to landfill quite substantially. In terms of significant waste reductions therefore, none of the four options yielded demonstrable environmental benefit.

The introduction of a plastic shopping bag charging scheme may provide a shock factor, thus raising environmental awareness, but such an outcome is not measurable and policy requires a stronger basis for justification. To engender support the Government would also need to reassure the public that funds are being used to further environmental objectives rather than just being subsumed into general Government revenues.

In the absence of clear evidence on the net environmental benefits of any of the charging schemes, the consultants suggest that the Government continue with its voluntary initiative but invest further resources in actively promoting and managing it to increase participation and harness the strength of stakeholder goodwill identified during the view-seeking exercise. Adopting the holistic approach to Hong Kong's waste problems advocated in the Policy Framework, the Government is also encouraged to consider broadening the scope of the proposed PRS, possibly to include alternative bags or packaging, so as to incorporate more of the waste stream. Resources could also be invested to engage with retailers and manufactures in efforts to kick-start Hong Kong's recycling sector, building on the support and interest revealed in the view seeking exercise.

Acknowledging that all the charging schemes analysed have shortcomings, then should the Government and public consultation process decide to press ahead with implementing a mandatory plastic shopping bag charging scheme then there appear to be merits in introducing a scheme in phases. Such phasing could entail enhancing the voluntary scheme as far as possible before establishing a charging scheme first at selected retailers, then broadening its coverage to all stores. A phased approach would allow the Government to monitor stakeholder responses and waste arisings closely and undertake a full review, preferably after 6 – 12 months, once consumer behaviour has adjusted following the anticipated initial 'shock effect' of introducing the scheme. The review process should analyse both the scheme's effectiveness and its wider implications, particularly the impact of any switching that occurs. Should significant switching arise then the Government may seek to remove the scheme or expand its scope to include alternative shopping bags, thereby reinforcing the desirability of the no-bag outcome.

Ultimately, to change consumer behaviour and reduce indiscriminate shopping bag use will require a change in public mindset, particularly in their attitude toward such environmental issues as waste and waste disposal. To that end, comprehensive marketing, improvements in education and awareness are pre-requisites for success.

ANNEX A – EVERYDAY BAG TYPES USED IN HONG KONG

T-shirt bags  (1)	**T-shirt bags on rolls**  (2)	**Flat bags**  (3)
Flat bags on rolls  (4)	**Die cut handle bags**  (5)	**Soft loop handle bags**  (6)
String handle bags  (7)	**Draw string handle bags**  (8)	**Draw tape handle bags**  (9)
Patch handle bags  (10)	**Rigid handle bags**  (11)	**Tube handle bags**  (12)

ANNEX B – DETAILED IMPACT ASSESSMENT

Tables B1 – B4: Comparative Scheme Assessment Inputs and Assumptions

Notes:

1. Option 1 includes continuation of all existing voluntary initiatives, including No Plastic Bag Day, the Newspaper Initiative and EPD's Voluntary Agreement.
2. Switching from convenience stores in Option 4 is the mid-point between two possible scenarios, reflecting the oligopolistic nature of the market.
3. Please note that all numbers are rounded for presentational ease.

Table B-1: Option 1 - Continuation of Voluntary Initiative Inputs and Assumptions

Key Data and Assumptions	2005 Consumption		Switching Assumptions							
	Plastic Shopping Bags	Plastic Bags	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags
	%	%								
Newspapers	3%	3%	95%	0%	0%	0%	95%	5%	0%	0%
Supermarkets	15%	12%	89%	0%	0%	0%	89%	11%	0%	0%
Bakery Shops	6%	5%	100%	0%	0%	0%	100%	0%	0%	0%
Fast Food/Restaurants	4%	4%	100%	0%	0%	0%	100%	0%	0%	0%
Medicare, drugs	2%	2%	89%	0%	0%	0%	89%	11%	0%	0%
Convenience Stores	6%	5%	93%	0%	0%	0%	93%	7%	0%	0%
Books, Stationery, Gifts	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Fashion, Footwear	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Electric/Dept/Home Acc	2%	2%	100%	0%	0%	0%	100%	0%	0%	0%
Red/White/Others non branded	59%	46%	100%	0%	0%	0%	100%	0%	0%	0%
Subtotal	**100%**	**79%**	**97%**	**0%**	**0%**	**0%**	**97%**	**3%**	**0%**	**0%**
Small no handle bags and coloured bags		6%	100%	0%	0%	0%	100%	0%	0%	0%
Rubbish bags		15%	100%	0%	0%	0%	100%	0%	0%	0%
Total		**100%**	**98%**	**0%**	**0%**	**0%**	**98%**	**2%**	**0%**	**0%**

Table B-2: Option 2 - Reference Case Inputs and Assumptions

Key Data and Assumptions	2005 Consumption		Switching Assumptions							
	Plastic Shopping Bags	Plastic Bags	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags
	%	%								
Newspapers	3%	3%	2%	0%	0%	0%	2%	98%	0%	0%
Supermarkets	15%	12%	50%	0%	0%	15%	65%	35%	10%	0%
Bakery Shops	6%	5%	90%	0%	5%	0%	95%	5%	0%	0%
Fast Food/Restaurants	4%	4%	60%	5%	25%	0%	90%	10%	0%	0%
Medicare, drugs	2%	2%	40%	10%	10%	10%	70%	30%	0%	0%
Convenience Stores	6%	5%	40%	0%	10%	0%	50%	50%	0%	0%
Books, Stationery, Gifts	1%	1%	50%	10%	20%	10%	90%	10%	0%	0%
Fashion, Footwear	1%	1%	10%	40%	30%	10%	90%	10%	0%	0%
Electric/Dept/Home Acc	2%	2%	40%	20%	20%	10%	90%	10%	0%	0%
Red/White/Others non branded	59%	46%	60%	0%	10%	5%	75%	25%	5%	0%
Subtotal	**100%**	**79%**	**56%**	**1%**	**9%**	**6%**	**72%**	**28%**	**4%**	**0%**
Small no handle bags and coloured bags		6%	100%	0%	0%	0%	100%	0%	0%	0%
Rubbish bags		15%	100%	0%	0%	0%	100%	0%	0%	0%
Total		**100%**	**65%**	**1%**	**7%**	**5%**	**78%**	**22%**	**3%**	**0%**

Table B-3: Option 3 - Consumer Charge on all Plastic Shopping Bags, Collected by Government, Inputs and Assumptions

Key Data and Assumptions	2005 Consumption		Switching Assumptions							
	Plastic Shopping Bags	Plastic Bags	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags
	%	%								
Newspapers	3%	3%	2%	0%	0%	0%	2%	98%	0%	0%
Supermarkets	15%	12%	50%	0%	0%	15%	65%	35%	10%	0%
Bakery Shops	6%	5%	90%	0%	5%	0%	95%	5%	0%	0%
Fast Food/Restaurants	4%	4%	60%	5%	25%	0%	90%	10%	0%	0%
Medicare, drugs	2%	2%	40%	10%	10%	10%	70%	30%	0%	0%
Convenience Stores	6%	5%	40%	0%	10%	0%	50%	50%	0%	0%
Books, Stationery, Gifts	1%	1%	50%	10%	20%	10%	90%	10%	0%	0%
Fashion, Footwear	1%	1%	10%	40%	30%	10%	90%	10%	0%	0%
Electric/Dept/Home Acc	2%	2%	40%	20%	20%	10%	90%	10%	0%	0%
Red/White/Others non branded	59%	46%	60%	0%	10%	5%	75%	25%	5%	0%
Subtotal	**100%**	**79%**	**56%**	**1%**	**9%**	**6%**	**72%**	**28%**	**4%**	**0%**
Small no handle bags and coloured bags		6%	100%	0%	0%	0%	100%	0%	0%	0%
Rubbish bags		15%	100%	0%	0%	0%	100%	0%	0%	0%
Total		**100%**	**65%**	**1%**	**7%**	**5%**	**78%**	**22%**	**3%**	**0%**

Table B-4: Option 4 - Consumer Charge on all Plastic Shopping Bags, Supermarkets and Convenience Stores, Collected by Government, Inputs and Assumptions

Key Data and Assumptions	2005 Consumption		Switching Assumptions							
	Plastic Shopping Bags	Plastic Bags	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags
	%	%								
Newspapers	3%	3%	95%	0%	0%	0%	95%	5%	0%	0%
Supermarkets	15%	12%	50%	0%	0%	15%	65%	35%	5%	0%
Bakery Shops	6%	5%	98%	0%	0%	0%	98%	2%	0%	0%
Fast Food/Restaurants	4%	4%	100%	0%	0%	0%	100%	0%	0%	0%
Medicare, drugs	2%	2%	89%	0%	0%	0%	89%	11%	0%	0%
Convenience Stores	6%	5%	45%	0%	15%	0%	60%	40%	0%	0%
Books, Stationery, Gifts	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Fashion, Footwear	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Electric/Dept/Home Acc	2%	2%	100%	0%	0%	0%	100%	0%	0%	0%
Red/White/Others non branded	59%	46%	100%	0%	0%	0%	100%	0%	0%	0%
Subtotal	**100%**	**79%**	**89%**	**0%**	**1%**	**2%**	**92%**	**8%**	**1%**	**0%**
Small no handle bags and coloured bags		6%	100%	0%	0%	0%	100%	0%	0%	0%
Rubbish bags		15%	100%	0%	0%	0%	100%	0%	0%	0%
Total		**100%**	**91%**	**0%**	**1%**	**2%**	**94%**	**6%**	**1%**	**0%**

Tables B5 – B9: Impact on Number of Plastic Bags and Alternatives

Notes:

1. Note that all numbers are rounded for presentational ease.
2. Non-woven bags are assumed to be used 20 times.

Table B-5: Option 1 - Continuation of Voluntary Initiative, Impact on Number of Plastic Bags and Alternatives

Impact - Number of Bags (Million)	**2005**	**2005**	**Switching - Numbers of Bags/ alternative Packaging**								
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags Provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Nos Bags/ Packaging alternative
Number of times used						*20*					
Newspapers	0.8	298	283	-	-	-	283	15	-	-	283
Supermarkets	3.5	1,267	1,125	-	-	-	1,125	142	-	-	1,125
Bakery Shops	1.4	527	525	-	-	-	525	3	-	-	525
Fast Food/Restaurants	1.1	387	387	-	-	-	387	-	-	-	387
Medicare, drugs	0.5	195	173	-	-	-	173	22	-	-	173
Convenience Stores	1.4	499	462	-	-	-	462	37	-	-	462
Books, Stationery, Gifts	0.2	61	61	-	-	-	61	-	-	-	61
Fashion, Footwear	0.3	106	106	-	-	-	106	-	-	-	106
Electric/Dept/Home Acc	0.5	196	196	-	-	-	196	-	-	-	196
Red/White/Others non branded	14.0	5,114	5,114	-	-	-	5,114	-	-	-	5,114
Subtotal	**23.7**	**8,651**	**8,432**	**-**	**-**	**-**	**8,432**	**218**	**-**	**-**	**8,432**
% of Plastic Shopping Bags		100%	97%	0%	0%	0%	97%	3%	0%	0%	97%
Small no handle bags and coloured bags	1.81	660	660	-	-	-	660	-	-	-	660
Rubbish bags	4.66	1,701	1,701	-	-	-	1,701	-	-	-	1,701
Total	**30.17**	**11,013**	**10,795**	**-**	**-**	**-**	**10,795**	**218**	**-**	**-**	**10,795**
% Plastic Bags		100%	98%	0%	0%	0%	98%	2%	0%	0%	98%

Table B-6: Option 2 - Reference Case, Impact on Number of Plastic Bags and Alternatives

Impact - Number of Bags (Million)	2005	2005	Switching - Numbers of Bags/ alternative Packaging								
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags Provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Nos Bags/ Packaging alternative
Number of times used						*20*					
Newspapers	0.8	298	6	-	-	-	6	292	-	-	6
Supermarkets	3.5	1,267	634	-	-	10	643	444	127	-	770
Bakery Shops	1.4	527	475	-	26	-	501	26	-	-	501
Fast Food/Restaurants	1.1	387	232	19	97	-	348	39	-	-	348
Medicare, drugs	0.5	195	78	19	19	1	118	58	-	-	118
Convenience Stores	1.4	499	200	-	50	-	250	250	-	-	250
Books, Stationery, Gifts	0.2	61	30	6	12	0	49	6	-	-	49
Fashion, Footwear	0.3	106	11	43	32	1	86	11	-	-	86
Electric/Dept/Home Acc	0.5	196	78	39	39	1	157	20	-	-	157
Red/White/Others non branded	14.0	5,114	3,069	-	511	13	3,593	1,279	256	-	3,848
Subtotal	**23.7**	**8,651**	**4,812**	**127**	**787**	**25**	**5,750**	**2,424**	**382**	**-**	**6,133**
% of Plastic Shopping Bags		100%	56%	1%	9%	0%	66%	28%	4%	0%	71%
Small no handle bags and coloured bags	1.81	660	660	-	-	-	660	-	-	-	660
Rubbish bags	4.66	1,701	1,701	-	-	-	1,701	-	-	-	1,701
Total	**30.17**	**11,013**	**7,174**	**127**	**787**	**25**	**8,112**	**2,424**	**382**	**-**	**8,495**
% Plastic Bags		100%	65%	1%	7%	0%	74%	22%	3%	0%	77%

Table B-7: Option 3 - Consumer Charge on all Plastic Shopping Bags, Collected by Government, Impact on Number of Plastic Bags and Alternatives

Impact - Number of Bags (Million)	**2005**	**2005**	**Switching - Numbers of Bags/ alternative Packaging**								
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags Provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Nos Bags/ Packaging alternative
Number of times used						*20*					
Newspapers	0.8	298	6	-	-	-	6	292	-	-	6
Supermarkets	3.5	1,267	634	-	-	10	643	444	127	-	770
Bakery Shops	1.4	527	475	-	26	-	501	26	-	-	501
Fast Food/Restaurants	1.1	387	232	19	97	-	348	39	-	-	348
Medicare, drugs	0.5	195	78	19	19	1	118	58	-	-	118
Convenience Stores	1.4	499	200	-	50	-	250	250	-	-	250
Books, Stationery, Gifts	0.2	61	30	6	12	0	49	6	-	-	49
Fashion, Footwear	0.3	106	11	43	32	1	86	11	-	-	86
Electric/Dept/Home Acc	0.5	196	78	39	39	1	157	20	-	-	157
Red/White/Others non branded	14.0	5,114	3,069	-	511	13	3,593	1,279	256	-	3,848
Subtotal	**23.7**	**8,651**	**4,812**	**127**	**787**	**25**	**5,750**	**2,424**	**382**	**-**	**6,133**
% of Plastic Shopping Bags		100%	56%	1%	9%	0%	66%	28%	4%	0%	71%
Small no handle bags and coloured bags	1.81	660	660	-	-	-	660	-	-	-	660
Rubbish bags	4.66	1,701	1,701	-	-	-	1,701	-	-	-	1,701
Total	**30.17**	**11,013**	**7,174**	**127**	**787**	**25**	**8,112**	**2,424**	**382**	**-**	**8,495**
% Plastic Bags		100%	65%	1%	7%	0%	74%	22%	3%	0%	77%

Table B-8: Option 4 - Consumer Charge on all Plastic Shopping Bags, Supermarkets and Convenience Stores, Collected by Government, Impact on Number of Plastic Bags and Alternatives

Impact - Number of Bags (Million)	**2005**	**2005**	**Switching - Numbers of Bags/ alternative Packaging**								
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags Provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Nos Bags/ Packaging alternative
Number of times used						*20*					
Newspapers	0.8	298	283	-	-	-	283	15	-	-	283
Supermarkets	3.5	1,267	634	-	-	9.51	643	444	63	-	707
Bakery Shops	1.4	527	517	-	-	-	517	11	-	-	517
Fast Food/Restaurants	1.1	387	387	-	-	-	387	-	-	-	387
Medicare, drugs	0.5	195	173	-	-	-	173	21	-	-	173
Convenience Stores	1.4	499	225	-	75	-	300	200	-	-	300
Books, Stationery, Gifts	0.2	61	61	-	-	-	61	-	-	-	61
Fashion, Footwear	0.3	106	106	-	-	-	106	-	-	-	106
Electric/Dept/Home Acc	0.5	196	196	-	-	-	196	-	-	-	196
Red/White/Others non branded	14.0	5,114	5,114	-	-	-	5,114	-	-	-	5,114
Subtotal	**23.7**	**8,651**	**7,696**	**-**	**75**	**10**	**7,780**	**690**	**63**	**-**	**7,843**
% of Plastic Shopping Bags		100%	89%	0%	1%	0%	90%	8%	1%	0%	91%
Small no handle bags and coloured bags	1.81	660	660	-	-	-	660	-	-	-	660
Rubbish bags	4.66	1,701	1,701	-	-	-	1,701	-	-	-	1,701
Total	**30.17**	**11,013**	**10,058**	**-**	**75**	**10**	**10,142**	**690**	**63**	**-**	**10,206**
% Plastic Bags		100%	91%	0%	1%	0%	92%	6%	1%	0%	93%

Tables B9 – B12: Impact on Dry Weight to Landfill

Notes:

1. Note that all numbers are rounded for presentational ease.
2. Dry weights are calculated by multiplying the number of bags disposed of each year by their dry weight, given by the top row in the table.
3. Note that the rubbish bag calculations are based on two different weights. Firstly, weight of existing rubbish bags in the waste stream comes from the Landfill Survey. This estimated rubbish bags to weigh 43.04g by wet weight. The ratio of wet to dry for rubbish bags is then assumed to be same as for plastic shopping bags so this 43.04g is multiplied by 4.06g and divided by 13.37g to arrive at the estimated dry weight of 13.07g per rubbish bag. However, switching from plastic shopping bags to plastic rubbish bags is assumed to take place on the basis that the rubbish bags are used as substitute trash bags. To that end, it would be assumed that switching would be to the smaller type or rubbish bag rather than to these larger bags. Smaller rubbish bags are assumed to 1.5 times the weight of standard plastic shopping bags hence the weight given along the top row of 6.09 for any increase in rubbish bag demand.

Table B-9: Option 1: Continuation of Voluntary Initiative, Impact on Dry Weight to Landfill

Impact - Dry Weight Bags (Tonnes)			**Switching - Numbers of Bags/ alternative Packaging**									
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Providing bag/ packaging alternative	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Weight Bags/ Packaging alternative	% of Original
Weight grammes		*4*	*4*	*61*	*24*	*41*		*0*	*6*	*2*		
Newspapers	3.3	1,211	1,151	-	-	-	1,151	-	-	-	1,151	95%
Supermarkets	14.1	5,146	4,569	-	-	-	4,569	-	-	-	4,569	89%
Bakery Shops	5.9	2,141	2,131	-	-	-	2,131	-	-	-	2,131	100%
Fast Food/Restaurants	4.3	1,570	1,570	-	-	-	1,570	-	-	-	1,570	100%
Medicare, drugs	2.2	791	703	-	-	-	703	-	-	-	703	89%
Convenience Stores	5.6	2,028	1,876	-	-	-	1,876	-	-	-	1,876	93%
Books, Stationery, Gifts	0.7	246	246	-	-	-	246	-	-	-	246	100%
Fashion, Footwear	1.2	432	432	-	-	-	432	-	-	-	432	100%
Electric/Dept/Home Acc	2.2	794	794	-	-	-	794	-	-	-	794	100%
Red/White/Others non branded	56.9	20,764	20,764	-	-	-	20,764	-	-	-	20,764	100%
Subtotal	**96.2**	**35,122**	**34,236**	**-**	**-**	**-**	**34,236**	**-**	**-**	**-**	**34,236**	**97%**
% of Plastic Shopping Bags		100%	97%	0%	0%	0%	97%	0%	0%	0%	97%	
Small no handle bags and coloured bags	3.7	1,340	1,340	-	-	-	1,340	-	-	-	1,340	
Rubbish bags	60.9	22,237	22,237	-	-	-	22,237	-	-	-	22,237	
Total	**160.8**	**58,700**	**57,813**	**-**	**-**	**-**	**57,813**	**-**	**-**	**-**	**57,813**	98%
% Plastic Bags		100%	98%	0%	0%	0%	98%	0%	0%	0%	98%	

Table B-10: Option 2 - Reference Case, Impact on Dry Weight to Landfill

Impact - Dry Weight Bags (Tonnes)			Switching - Numbers of Bags/ alternative Packaging									
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Providing bag/ packaging alternative	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Weight Bags/ Packaging alternative	% of Original
Weight grammes		*4*	*4*	*61*	*24*	*41*		*0*	*6*	*2*		
Newspapers	3.3	1,211	24	-	-	-	24	-	-	-	24	2%
Supermarkets	14.1	5,146	2,573	-	-	386	2,959	-	772	-	3,731	73%
Bakery Shops	5.9	2,141	1,927	-	642	-	2,570	-	-	-	2,570	120%
Fast Food/Restaurants	4.3	1,570	942	1,177	2,355	-	4,474	-	-	-	4,474	285%
Medicare, drugs	2.2	791	316	1,186	475	40	2,017	-	-	-	2,017	255%
Convenience Stores	5.6	2,028	811	-	1,217	-	2,028	-	-	-	2,028	100%
Books, Stationery, Gifts	0.7	246	123	369	296	12	800	-	-	-	800	325%
Fashion, Footwear	1.2	432	43	2,594	778	22	3,437	-	-	-	3,437	795%
Electric/Dept/Home Acc	2.2	794	318	2,381	953	40	3,691	-	-	-	3,691	465%
Red/White/Others non branded	56.9	20,764	12,458	-	12,458	519	25,436	-	1,557	-	26,993	130%
Subtotal	**96.2**	**35,122**	**19,536**	**7,709**	**19,173**	**1,018**	**47,435**	**-**	**2,329**	**-**	**49,764**	**142%**
% of Plastic Shopping Bags		100%	56%	22%	55%	3%	135%	0%	7%	0%	142%	
Small no handle bags and coloured bags	3.7	1,340	1,340	-	-	-	1,340	-	-	-	1,340	
Rubbish bags	60.9	22,237	22,237	-	-	-	22,237	-	-	-	22,237	
Total	**160.8**	**58,700**	**43,113**	**7,709**	**19,173**	**1,018**	**71,012**	**-**	**2,329**	**-**	**73,342**	125%
% Plastic Bags		100%	73%	13%	33%	2%	121%	0%	4%	0%	125%	

Table B-11: Option 3 - Consumer Charge on all Plastic Shopping Bags, Collected by Government, Impact on Dry Weight to Landfill

Impact - Dry Weight Bags (Tonnes)			**Switching - Numbers of Bags/ alternative Packaging**									
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Providing bag/ packaging alternative	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Weight Bags/ Packaging alternative	% of Original
Weight grammes		*4*	*4*	*61*	*24*	*41*		*0*	*6*	*2*		
Newspapers	3.3	1,211	24	-	-	-	24	-	-	-	24	2%
Supermarkets	14.1	5,146	2,573	-	-	386	2,959	-	772	-	3,731	73%
Bakery Shops	5.9	2,141	1,927	-	642	-	2,570	-	-	-	2,570	120%
Fast Food/Restaurants	4.3	1,570	942	1,177	2,355	-	4,474	-	-	-	4,474	285%
Medicare, drugs	2.2	791	316	1,186	475	40	2,017	-	-	-	2,017	255%
Convenience Stores	5.6	2,028	811	-	1,217	-	2,028	-	-	-	2,028	100%
Books, Stationery, Gifts	0.7	246	123	369	296	12	800	-	-	-	800	325%
Fashion, Footwear	1.2	432	43	2,594	778	22	3,437	-	-	-	3,437	795%
Electric/Dept/Home Acc	2.2	794	318	2,381	953	40	3,691	-	-	-	3,691	465%
Red/White/Others non branded	56.9	20,764	12,458	-	12,458	519	25,436	-	1,557	-	26,993	130%
Subtotal	**96.2**	**35,122**	**19,536**	**7,709**	**19,173**	**1,018**	**47,435**	**-**	**2,329**	**-**	**49,764**	**142%**
% of Plastic Shopping Bags		100%	56%	22%	55%	3%	135%	0%	7%	0%	142%	
Small no handle bags and coloured bags	3.7	1,340	1,340	-	-	-	1,340	-	-	-	1,340	
Rubbish bags	60.9	22,237	22,237	-	-	-	22,237	-	-	-	22,237	
Total	**160.8**	**58,700**	**43,113**	**7,709**	**19,173**	**1,018**	**71,012**	**-**	**2,329**	**-**	**73,342**	125%
% Plastic Bags		100%	73%	13%	33%	2%	121%	0%	4%	0%	125%	

Table B-12: Option 4 - Consumer Charge on all Plastic Shopping Bags, Supermarkets and Convenience Stores, Collected by Government, Impact on Dry Weight to Landfill

Impact - Dry Weight Bags (Tonnes)			**Switching - Numbers of Bags/ alternative Packaging**									
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Providing bag/ packaging alternative	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Weight Bags/ Packaging alternative	% of Original
Weight grammes		*4*	*4*	*61*	*24*	*41*		*0*	*6*	*2*		
Newspapers	3.3	1,211	1,151	-	-	-	1,151	-	-	-	1,151	95%
Supermarkets	14.1	5,146	2,573	-	-	386	2,959	-	386	-	3,345	65%
Bakery Shops	5.9	2,141	2,098	-	-	-	2,098	-	-	-	2,098	98%
Fast Food/Restaurants	4.3	1,570	1,570	-	-	-	1,570	-	-	-	1,570	100%
Medicare, drugs	2.2	791	704	-	-	-	704	-	-	-	704	89%
Convenience Stores	5.6	2,028	912	-	1,825	-	2,737	-	-	-	2,737	135%
Books, Stationery, Gifts	0.7	246	246	-	-	-	246	-	-	-	246	100%
Fashion, Footwear	1.2	432	432	-	-	-	432	-	-	-	432	100%
Electric/Dept/Home Acc	2.2	794	794	-	-	-	794	-	-	-	794	100%
Red/White/Others non branded	56.9	20,764	20,764	-	-	-	20,764	-	-	-	20,764	100%
Subtotal	**96.2**	**35,122**	**31,244**	**-**	**1,825**	**386**	**33,455**	**-**	**386**	**-**	**33,841**	**96%**
% of Plastic Shopping Bags		100%	89%	0%	5%	1%	95%	0%	1%	0%	96%	
Small no handle bags and coloured bags	3.7	1,340	1,340	-	-	-	1,340	-	-	-	1,340	
Rubbish bags	60.9	22,237	22,237	-	-	-	22,237	-	-	-	22,237	
Total	**160.8**	**58,700**	**54,821**	**-**	**1,825**	**386**	**57,032**	**-**	**386**	**-**	**57,418**	98%
% Plastic Bags		100%	93%	0%	3%	1%	97%	0%	1%	0%	98%	

Tables B-13 – B16: Impact on Bulk to Landfill

Notes:

1. Note that all numbers are rounded for presentational ease.

2. Bulk refers to the volume of waste being sent to landfill, measured in cubic metres. Bulk is calculated on the basis of material density, which provides the best measure of bulk given that compaction will occur at landfill. The density of a material is calculated by dividing its weight by its volume ($denisty = weight/volume$). The bulk (volume) of waste to waste to landfill is therefore calculated by dividing the total dry weight by the material density ($volume = weight/density$). The density of plastic is 0.9g/cm^3. To calculate the volume of plastic bags being sent to landfill, it is therefore necessary to divide the dry weight of plastic bags by 0.9. Dividing a number by 0.9 is equivalent to multiplying that number by 1.11, as shown: $volume = weight/0.9 = (1/0.9) \times weight = 1.11 \times weight$. This number of 1.11 is the Bulk to weight ratio on the first row of the above table; it is the number by which the weight has to be multiplied to get the bulk. This methodology was also adopted by a study into waste stream composition in California (footnote 10 on page 5 of the DFR). This study found that the bulk to weight ratio of paper bags was 3.09 times the bulk to weight ratio of plastic shopping bags. The consultants have therefore assumed that a paper bag requires three times its equivalent weight in plastic bags. The bulk to weight ratio for paper bags is therefore three times the bulk to weight ratio of plastic bags:

$$ratio(paper) = 3 \times ratio(plastic) = 3 \times (weight/0.9) = (3/0.9) \times weight = 3.33 \times weight$$

3. It should be noted that the analysis conservatively assumes that the bulk to weight ratio of laminated paper bags to plastic bags is the same as that of paper bags to plastic bags. This multiplier of 3 is used because no direct evidence on laminated paper bag bulk exists. However, evidence from the Californian study suggests that bulk to weight ratios of magazines/catalogues and phone books/directories (both of which are comparable materials to laminated paper bags) to plastic bags of 10.4 and 7.1 respectively. This implies that a ratio of 3 might underestimate the true impact of laminated paper bags on bag bulk to landfill.

Table B-13: Option 1 - Continuation of Voluntary Initiative, Impact on Bulk to Landfill

Impact - Bulk (m3)			**Switching - Numbers of Bags/ alternative Packaging**									
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Providing bag/ packaging alternative	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Weight Bags/ Packaging alternative	% of Original
Bulk to weight ratio		*1.11*	*1.11*	*3.33*	*3.33*	*5.56*		-	*1.11*	*1.11*		
Newspapers	3.7	1,346	1,278	-	-	-	1,278	-	-	-	1,278	95%
Supermarkets	15.7	5,717	5,077	-	-	-	5,077	-	-	-	5,077	89%
Bakery Shops	6.5	2,379	2,368	-	-	-	2,368	-	-	-	2,368	100%
Fast Food/Restaurants	4.8	1,744	1,744	-	-	-	1,744	-	-	-	1,744	100%
Medicare, drugs	2.4	879	781	-	-	-	781	-	-	-	781	89%
Convenience Stores	6.2	2,253	2,085	-	-	-	2,085	-	-	-	2,085	93%
Books, Stationery, Gifts	0.7	274	274	-	-	-	274	-	-	-	274	100%
Fashion, Footwear	1.3	480	480	-	-	-	480	-	-	-	480	100%
Electric/Dept/Home Acc	2.4	882	882	-	-	-	882	-	-	-	882	100%
Red/White/Others non branded	63.2	23,071	23,071	-	-	-	23,071	-	-	-	23,071	100%
Subtotal	**106.9**	**39,025**	**38,040**	**-**	**-**	**-**	**38,040**	**-**	**-**	**-**	**38,040**	**97%**
% of Plastic Shopping Bags		100%	97%	0%	0%	0%	97%	0%	0%	0%	97%	
Small no handle bags and coloured bags	4.1	1,489	1,489	-	-	-	1,489	-	-	-	1,489	
Rubbish bags	67.7	24,708	24,708	-	-	-	24,708	-	-	-	24,708	
Total	**178.7**	**65,222**	**64,236**	**-**	**-**	**-**	**64,236**	**-**	**-**	**-**	**64,236**	98%
% Plastic Bags		100%	98%	0%	0%	0%	98%	0%	0%	0%	98%	

Table B-14: Option 2 - Reference Case, Impact on Bulk to Landfill

Impact - Bulk (m3)			**Switching - Numbers of Bags/ alternative Packaging**									
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Providing bag/ packaging alternative	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Weight Bags/ Packaging alternative	% of Original
Bulk to weight ratio		*1.11*	*1.11*	*3.33*	*3.33*	*5.56*		-	*1.11*	*1.11*		
Newspapers	3.7	1,346	27	-	-	-	27	-	-	-	27	2%
Supermarkets	15.7	5,717	2,859	-	-	2,144	5,003	-	858	-	5,860	103%
Bakery Shops	6.5	2,379	2,141	-	2,141	-	4,283	-	-	-	4,283	180%
Fast Food/Restaurants	4.8	1,744	1,047	3,925	7,850	-	12,821	-	-	-	12,821	735%
Medicare, drugs	2.4	879	352	3,955	1,582	220	6,108	-	-	-	6,108	695%
Convenience Stores	6.2	2,253	901	-	4,055	-	4,956	-	-	-	4,956	220%
Books, Stationery, Gifts	0.7	274	137	1,231	985	68	2,422	-	-	-	2,422	885%
Fashion, Footwear	1.3	480	48	8,647	2,594	120	11,409	-	-	-	11,409	2375%
Electric/Dept/Home Acc	2.4	882	353	7,938	3,175	220	11,686	-	-	-	11,686	1325%
Red/White/Others non branded	63.2	23,071	13,842	-	41,527	2,884	58,254	-	1,730	-	59,984	260%
Subtotal	**106.9**	**39,025**	**21,706**	**25,695**	**63,909**	**5,657**	**116,968**	**-**	**2,588**	**-**	**119,555**	**306%**
% of Plastic Shopping Bags		100%	56%	66%	164%	14%	300%	0%	7%	0%	306%	
Small no handle bags and coloured bags	4.1	1,489	1,489	-	-	-	1,489	-	-	-	1,489	
Rubbish bags	67.7	24,708	24,708	-	-	-	24,708	-	-	-	24,708	
Total	**178.7**	**65,222**	**47,903**	**25,695**	**63,909**	**5,657**	**143,165**	**-**	**2,588**	**-**	**145,752**	223%
% Plastic Bags		100%	73%	39%	98%	9%	220%	0%	4%	0%	223%	

Table B-15: Option 3 - Consumer Charge on all Plastic Shopping Bags, Collected by Government, Impact on Bulk to Landfill

Impact - Bulk (m3)			**Switching - Numbers of Bags/ alternative Packaging**									
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Providing bag/ packaging alternative	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Weight Bags/ Packaging alternative	% of Original
Bulk to weight ratio		*1.11*	*1.11*	*3.33*	*3.33*	*5.56*		-	*1.11*	*1.11*		
Newspapers	3.7	1,346	27	-	-	-	27	-	-	-	27	2%
Supermarkets	15.7	5,717	2,859	-	-	2,144	5,003	-	858	-	5,860	103%
Bakery Shops	6.5	2,379	2,141	-	2,141	-	4,283	-	-	-	4,283	180%
Fast Food/Restaurants	4.8	1,744	1,047	3,925	7,850	-	12,821	-	-	-	12,821	735%
Medicare, drugs	2.4	879	352	3,955	1,582	220	6,108	-	-	-	6,108	695%
Convenience Stores	6.2	2,253	901	-	4,055	-	4,956	-	-	-	4,956	220%
Books, Stationery, Gifts	0.7	274	137	1,231	985	68	2,422	-	-	-	2,422	885%
Fashion, Footwear	1.3	480	48	8,647	2,594	120	11,409	-	-	-	11,409	2375%
Electric/Dept/Home Acc	2.4	882	353	7,938	3,175	220	11,686	-	-	-	11,686	1325%
Red/White/Others non branded	63.2	23,071	13,842	-	41,527	2,884	58,254	-	1,730	-	59,984	260%
Subtotal	**106.9**	**39,025**	**21,706**	**25,695**	**63,909**	**5,657**	**116,968**	**-**	**2,588**	**-**	**119,555**	**306%**
% of Plastic Shopping Bags		100%	56%	66%	164%	14%	300%	0%	7%	0%	306%	
Small no handle bags and coloured bags	4.1	1,489	1,489	-	-	-	1,489	-	-	-	1,489	
Rubbish bags	67.7	24,708	24,708	-	-	-	24,708	-	-	-	24,708	
Total	**178.7**	**65,222**	**47,903**	**25,695**	**63,909**	**5,657**	**143,165**	**-**	**2,588**	**-**	**145,752**	223%
% Plastic Bags		100%	73%	39%	98%	9%	220%	0%	4%	0%	223%	

Table B-16: Option 4 - Consumer Charge on all Plastic Shopping Bags, Supermarkets and Convenience Stores, Collected by Government, Impact on Bulk to Landfill

Impact - Bulk (m3)			**Switching - Numbers of Bags/ alternative Packaging**									
	Existing Per Day	Existing Per Year	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Providing bag/ packaging alternative	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags	Total Weight Bags/ Packaging alternative	% of Original
Bulk to weight ratio		*1.11*	*1.11*	*8.89*	*3.33*	*5.56*		-	*1.11*	*1.11*		
Newspapers	3.7	1,346	1,278	-	-	-	1,278	-	-	-	1,278	95%
Supermarkets	15.7	5,717	2,859	-	-	2,144	5,003	-	429	-	5,431	95%
Bakery Shops	6.5	2,379	2,332	-	-	-	2,332	-	-	-	2,332	98%
Fast Food/Restaurants	4.8	1,744	1,744	-	-	-	1,744	-	-	-	1,744	100%
Medicare, drugs	2.4	879	782	-	-	-	782	-	-	-	782	89%
Convenience Stores	6.2	2,253	1,014	-	6,083	-	7,096	-	-	-	7,096	315%
Books, Stationery, Gifts	0.7	274	274	-	-	-	274	-	-	-	274	100%
Fashion, Footwear	1.3	480	480	-	-	-	480	-	-	-	480	100%
Electric/Dept/Home Acc	2.4	882	882	-	-	-	882	-	-	-	882	100%
Red/White/Others non branded	63.2	23,071	23,071	-	-	-	23,071	-	-	-	23,071	100%
Subtotal	**106.9**	**39,025**	**34,716**	**-**	**6,083**	**2,144**	**42,942**	**-**	**429**	**-**	**43,371**	**111%**
% of Plastic Shopping Bags		100%	89%	0%	16%	5%	110%	0%	1%	0%	111%	
Small no handle bags and coloured bags	4.1	1,489	1,489	-	-	-	1,489	-	-	-	1,489	
Rubbish bags	67.7	24,708	24,708	-	-	-	24,708	-	-	-	24,708	
Total	**178.7**	**65,222**	**60,913**	**-**	**6,083**	**2,144**	**69,139**	**-**	**429**	**-**	**69,568**	107%
% Plastic Bags		100%	93%	0%	9%	3%	106%	0%	1%	0%	107%	

Tables B-17 – B20: Impact on Government Finances

Notes:

1. Note that all numbers are rounded for presentational ease.

2. According to the Marine Department, its litter collection contract costs approximately $2.5 M per annum plus a further $2.5M in Departmental staffing: a total of $5 M per annum. 11,700 tonnes of waste were collected in 2005 and plastic bags comprise approximately 16% of this waste. This would mean approximately 144 million bags per annum (assuming a wet weight of 13g per bag) are presently collected by the Marine Department at a total cost of $800,000 ($5m times 16%). This equates to 0.007 cents for every bag consumed in Hong Kong. This figure is multiplied by the existing number of bags per year to calculate costs foregone and by the new number of bags per year to calculate the new costs.

3. Net Present Value (NPV) is calculated by discounting annual net revenues by the preferred Government real discount rate of 4%. Annual net revenues are calculated by subtracting total costs from total revenues after adjusting levy/consumer charge receipts for an assumed collection success rate of 80%. The resulting stream of net annual revenues is shown in the second from bottom row. The NPV of this revenue stream is then calculated as follows, where AR are the annual net revenues and r is the discount rate:

4. $$NPV = AR_0 + AR_1/(1+r) + AR_2/(1+r)^2 + AR_3/(1+r)^3 + \ldots + AR_{10}/(1+r)^{10}$$

5. The Internal Rate of Return (IRR) is the discount rate,(r) at which the NPV in above equation equals 0. Intuitively, any IRR greater than the chosen discount rate of 4% is financially viable.

6. The revenues from the consumer charge are the expected revenues before exemptions. Likely exemptions cannot be estimated in advance so this figure should be seen as an upper bound.

Table B-17: Option 1 - Continuation of Voluntary Initiative, Impact on Government Finances ($ Million)

				Year											
				-1	0	1	2	3	4	5	6	7	8	9	10
Expenditure															
Scheme				40%	20%										
SL Administration						-	-	-	-	-	-	-	-	-	-
SL Inspection and Enforcement						-	-	-	-	-	-	-	-	-	-
CC Inspection and Enforcement						-	-	-	-	-	-	-	-	-	-
CC Registration and Collection						-	-	-	-	-	-	-	-	-	-
Prosecution and Legal						-	-	-	-	-	-	-	-	-	-
Marketing, Monitoring and Research						1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Subtotal Staff and On Cost						1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Other Departmental/Central Costs	30%					0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Recurrent	10%					0.195	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Education and Awareness /Marketing	10%					0.195	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Govt scheme cost						**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**
Landfill and Littering Cost - all Plastic Bags and Alternatives						0.7									
Collection, transfer and disposal	600	Tonne				114.1	114.1	114.1	114.1	114.1	114.1	114.1	114.1	114.1	114.1
Marine litter	7.2647E-05	bag				0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cost of litter, collection, transfer, disposal						**114.9**	**114.9**	**114.9**	**114.9**	**114.9**	**114.9**	**114.9**	**114.9**	**114.9**	**114.9**
Total Cost				**-**	**-**	**117.8**	**117.8**	**117.8**	**117.8**	**117.8**	**117.8**	**117.8**	**117.8**	**117.8**	**117.8**
Revenue/ Costs Foregone															
Supplier Levy						-	-	-	-	-	-	-	-	-	-
Consumer Charge						-	-	-	-	-	-	-	-	-	-
No Levy collection, transfer and disposa	600	Tonne				115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8
No Levy marine litter	7.2647E-05	bag				0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total Revenues				**-**	**-**	**116.6**	**116.6**	**116.6**	**116.6**	**116.6**	**116.6**	**116.6**	**116.6**	**116.6**	**116.6**
				-	-	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)
Costs and revenues															
Net Present Value															
Discounted at	8%	($6.63)													
Discounted at	4%	($8.65)													
IRR	n/a														

Table B-18: Option 2 - Reference Case, Impact on Government Finances ($ Million)

				Year -1	0	1	2	3	4	5	6	7	8	9	10
Expenditure															
Scheme				40%	20%										
SL Administration						3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
SL Inspection and Enforcement						21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1
CC Inspection and Enforcement						4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
CC Registration and Collection						-	-	-	-	-	-	-	-	-	-
Prosecution and Legal						1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Marketing, Monitoring and Research						1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Subtotal Staff and On Cost						32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2
Other Departmental/Central Costs	30%					9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Recurrent	10%					3.215	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Education and Awareness /Marketing	10%			12.9	6.4	3.215	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Govt scheme cost				**12.9**	**6.4**	**48.2**	**48.2**	**48.2**	**48.2**	**48.2**	**48.2**	**48.2**	**48.2**	**48.2**	**48.2**
Landfill and Littering Cost - all Plastic Bags and Alternatives						11.2									
Collection, transfer and disposal	600	Tonne				143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2
Marine litter	7.2647E-05	bag				0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cost of litter, collection, transfer, disposal						**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**
Total Cost				**12.9**	**6.4**	**192.1**	**192.1**	**192.1**	**192.1**	**192.1**	**192.1**	**192.1**	**192.1**	**192.1**	**192.1**
Revenue/ Costs Foregone															
Supplier Levy						240.6	240.6	240.6	240.6	240.6	240.6	240.6	240.6	240.6	240.6
Consumer Charge						-	-	-	-	-	-	-	-	-	-
No Levy collection, transfer and disposa	600	Tonne				115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8
No Levy marine litter	7.2647E-05	bag				0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total Revenues				**-**	**-**	**357.2**	**357.2**	**357.2**	**357.2**	**357.2**	**357.2**	**357.2**	**357.2**	**357.2**	**357.2**
Costs and revenues				(12.9)	(6.4)	165.1	165.1	165.1	165.1	165.1	165.1	165.1	165.1	165.1	165.1
Assuming all supplier levy collected															
Net Present Value															
Discounted at	8%	$932.65													
Discounted at	4%	$1,220.14													
IRR		291%													
Assuming portion of supplier levy collected															
Proportion of Supplier Levy collected															
0%	4%	(584.0)		(12.9)	(6.4)	(75.4)	(75.4)	(75.4)	(75.4)	(75.4)	(75.4)	(75.4)	(75.4)	(75.4)	(75.4)
80%	4%	$859.31		(12.9)	(6.4)	117.0	117.0	117.0	117.0	117.0	117.0	117.0	117.0	117.0	117.0
IRR		236%													

Table B-19: Option 3 - Consumer Charge on all Plastic Shopping Bags, Collected by Government, Impact on Government Finances ($ Million)

				Year											
				-1	0	1	2	3	4	5	6	7	8	9	10
Expenditure															
Scheme				40%	20%										
SL Administration						-	-	-	-	-	-	-	-	-	-
SL Inspection and Enforcement						-	-	-	-	-	-	-	-	-	-
CC Inspection and Enforcement						4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
CC Registration and Collection						194.2	194.2	194.2	194.2	194.2	194.2	194.2	194.2	194.2	194.2
Prosecution and Legal						1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Marketing, Monitoring and Research						1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Subtotal Staff and On Cost						201.2	201.2	201.2	201.2	201.2	201.2	201.2	201.2	201.2	201.2
Other Departmental/Central Costs	30%					60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4
Recurrent	10%					20.124	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1
Education and Awareness /Marketing	10%			80.5	40.2	20.124	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1
Govt scheme cost				**80.5**	**40.2**	**301.9**	**301.9**	**301.9**	**301.9**	**301.9**	**301.9**	**301.9**	**301.9**	**301.9**	**301.9**
Landfill and Littering Cost - all Plastic Bags and Alternatives						70.2									
Collection, transfer and disposal	600	Tonne				143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2
Marine litter	7.2647E-05	bag				0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cost of litter, collection, transfer, disposal						**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**	**143.8**
Total Cost				**80.5**	**40.2**	**445.7**	**445.7**	**445.7**	**445.7**	**445.7**	**445.7**	**445.7**	**445.7**	**445.7**	**445.7**
Revenue/ Costs Foregone															
Supplier Levy						-	-	-	-	-	-	-	-	-	-
Consumer Charge						2,405.9	2,405.9	2,405.9	2,405.9	2,405.9	2,405.9	2,405.9	2,405.9	2,405.9	2,405.9
No Levy collection, transfer and disposa	600	Tonne				115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8
No Levy marine litter	7.2647E-05	bag				0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total Revenues				**-**	**-**	**2,522.5**	**2,522.5**	**2,522.5**	**2,522.5**	**2,522.5**	**2,522.5**	**2,522.5**	**2,522.5**	**2,522.5**	**2,522.5**
Costs and revenues				(80.5)	(40.2)	2,076.8	2,076.8	2,076.8	2,076.8	2,076.8	2,076.8	2,076.8	2,076.8	2,076.8	2,076.8
Assuming all consumer charge collected															
Net Present Value															
Discounted at		8%	$11,838.39												
Discounted at		4%	$15,459.25												
IRR			438%												
Assuming portion of consumer charge collected															
Proportion of consumer charge collected															
0%		4%	(2,582.2)	(80.5)	(40.2)	(329.1)	(329.1)	(329.1)	(329.1)	(329.1)	(329.1)	(329.1)	(329.1)	(329.1)	(329.1)
80%		4%	$11,850.95	(80.5)	(40.2)	1,595.6	1,595.6	1,595.6	1,595.6	1,595.6	1,595.6	1,595.6	1,595.6	1,595.6	1,595.6
IRR			377%												

Table B-20: Option 4 - Consumer Charge on all Plastic Shopping Bags, Supermarkets and Convenience Stores, Collected by Government, Impact on Government Finances ($ Million)

				Year											
				-1	0	1	2	3	4	5	6	7	8	9	10
Expenditure															
Scheme				40%	20%										
SL Administration						-	-	-	-	-	-	-	-	-	-
SL Inspection and Enforcement						-	-	-	-	-	-	-	-	-	-
CC Inspection and Enforcement						1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
CC Registration and Collection						6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Prosecution and Legal						1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Marketing, Monitoring and Research						1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Subtotal Staff and On Cost						10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
Other Departmental/Central Costs	30%					3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Recurrent	10%					1.028	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Education and Awareness /Marketing	10%			4.1	2.1	1.028	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Govt scheme cost				**4.1**	**2.1**	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**
Landfill and Littering Cost - all Plastic Bags and Alternatives						3.6									
Collection, transfer and disposal	600	Tonne				113.1	113.1	113.1	113.1	113.1	113.1	113.1	113.1	113.1	113.1
Marine litter	7.2647E-05	bag				0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Cost of litter, collection, transfer, disposal						**113.8**	**113.8**	**113.8**	**113.8**	**113.8**	**113.8**	**113.8**	**113.8**	**113.8**	**113.8**
Total Cost				**4.1**	**2.1**	**129.2**	**129.2**	**129.2**	**129.2**	**129.2**	**129.2**	**129.2**	**129.2**	**129.2**	**129.2**
Revenue/ Costs Foregone															
Supplier Levy						-	-	-	-	-	-	-	-	-	-
Consumer Charge						429.2	429.2	429.2	429.2	429.2	429.2	429.2	429.2	429.2	429.2
No Levy collection, transfer and disposa	600	Tonne				115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8	115.8
No Levy marine litter	7.2647E-05	bag				0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total Revenues				**-**	**-**	**545.8**	**545.8**	**545.8**	**545.8**	**545.8**	**545.8**	**545.8**	**545.8**	**545.8**	**545.8**
Costs and revenues				(4.1)	(2.1)	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6
Assuming all consumer charge collected															
Net Present Value															
Discounted at		8%	$2,391.24												
Discounted at		4%	$3,118.46												
IRR			935%												
Assuming portion of consumer charge collected															
Proportion of consumer charge collected															
0%		4%	3,118.5	(4.1)	(2.1)	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6
80%		4%	$3,118.46	(4.1)	(2.1)	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6	416.6
IRR			935%												

Tables B-21 – B22: Input Assumptions for the Sensitivity Test on Option 4

Table B-21: Option 4 - Consumer Charge on all Plastic Shopping Bags, Supermarkets and Convenience Stores, Collected by Government, Inputs and Assumptions for the High Switching Sensitivity Test

Key Data and Assumptions	2005 Consumption		Switching Assumptions							
	Plastic Shopping Bags	Plastic Bags	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags
	%	%								
Newspapers	3%	3%	95%	0%	0%	0%	95%	5%	0%	0%
Supermarkets	15%	12%	50%	0%	0%	15%	65%	35%	5%	0%
Bakery Shops	6%	5%	98%	0%	0%	0%	98%	2%	0%	0%
Fast Food/Restaurants	4%	4%	100%	0%	0%	0%	100%	0%	0%	0%
Medicare, drugs	2%	2%	89%	0%	0%	0%	89%	11%	0%	0%
Convenience Stores	6%	5%	45%	0%	30%	0%	75%	25%	0%	0%
Books, Stationery, Gifts	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Fashion, Footwear	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Electric/Dept/Home Acc	2%	2%	100%	0%	0%	0%	100%	0%	0%	0%
Red/White/Others non branded	59%	46%	100%	0%	0%	0%	100%	0%	0%	0%
Subtotal	**100%**	**79%**	**89%**	**0%**	**2%**	**2%**	**93%**	**7%**	**1%**	**0%**
Small no handle bags and coloured bags		6%	100%	0%	0%	0%	100%	0%	0%	0%
Rubbish bags		15%	100%	0%	0%	0%	100%	0%	0%	0%
Total		**100%**	**91%**	**0%**	**1%**	**2%**	**94%**	**6%**	**1%**	**0%**

Table B-21: Option 4 - Consumer Charge on all Plastic Shopping Bags, Supermarkets and Convenience Stores, Collected by Government, Inputs and Assumptions for the Low Switching Sensitivity Test

Key Data and Assumptions	2005 Consumption		Switching Assumptions							
	Plastic Shopping Bags	Plastic Bags	Continue Plastic Bag	Laminated Paper Bags	Paper Bags	Non Woven Bags	Bags provided	No bag/ Long term bag	Increase in Rubbish Bags	Increase in small no handle bags
	%	%								
Newspapers	3%	3%	95%	0%	0%	0%	95%	5%	0%	0%
Supermarkets	15%	12%	50%	0%	0%	15%	65%	35%	5%	0%
Bakery Shops	6%	5%	98%	0%	0%	0%	98%	2%	0%	0%
Fast Food/Restaurants	4%	4%	100%	0%	0%	0%	100%	0%	0%	0%
Medicare, drugs	2%	2%	89%	0%	0%	0%	89%	11%	0%	0%
Convenience Stores	6%	5%	45%	0%	0%	0%	45%	55%	0%	0%
Books, Stationery, Gifts	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Fashion, Footwear	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Electric/Dept/Home Acc	2%	2%	100%	0%	0%	0%	100%	0%	0%	0%
Red/White/Others non branded	59%	46%	100%	0%	0%	0%	100%	0%	0%	0%
Subtotal	**100%**	**79%**	**89%**	**0%**	**0%**	**2%**	**91%**	**9%**	**1%**	**0%**
Small no handle bags and coloured bags		6%	100%	0%	0%	0%	100%	0%	0%	0%
Rubbish bags		15%	100%	0%	0%	0%	100%	0%	0%	0%
Total		**100%**	**91%**	**0%**	**0%**	**2%**	**93%**	**7%**	**1%**	**0%**

ANNEX C – CONSUMER CHARGE IMPLEMENTATION COSTINGS

C.1 EPD's Inspection Costings

The S&C sector comprises some 1,700 outlets. Under Option 4, EPD proposed to carry out proactive compliance/monitoring at every outlet each year, including follow-up inspections for public-reported cases. EPD therefore presumed that each outlet would be inspected twice a year on average.

Inspections would be carried out by teams comprising either 1 SEPI and 1 EPI or 2 EPIs. These teams would inspect 8 outlets per day, three days a week, covering a total of 1,248 retail outlets per team each year. To make 3,400 inspections a year would therefore require 2.7 teams, which EPD rounded up to 3 teams with 2 SEPIs and 4 EPIs. Annual wage costs total $560,976 per SEPI and $351,156 per EPI. Total annual inspection costs for Option 4 would therefore equal:

Staff	Wage Costs	Number Required	Total Costs ($)
SEPI	560,976	2	1,121,952
EPI	351,156	4	1,404,624
Total			2,526,576

Assuming one SEPI for every three EPI as per EPD's breakdown for two teams, then inspecting all 54,960 retail outlets in Hong Kong (under Option 3) would require 88 (109,920 total inspections divided by 1,248 inspections per team) with 44 SEPIs and 132 EPIs. Annual staffing costs would therefore cost some $71 million:

Staff	Wage Costs	Number Required	Total Costs ($)
SEPI	560,976	44	24,682,944
EPI	351,156	132	46,352,592
Total			71,035,536

C.2 EPD's Administration and Collection Costings

For Option 4, EPD estimated that 5.2 full time equivalent staff would be required to provide professional support for implementing and overseeing the scheme, including annual registration and collection of the levy. Administration and collection under Option 4 would therefore cost EPD some $6 million per year, or $3,533 per outlet. If the same support team was used for administering and collecting the levy from all the 55,000 retail outlets in Hong Kong then total costs would comprise some $194 million per annum:

Staff	Wage Costs	Number Required	Total Costs ($)
PEPO	1,788,948	0.2	357,790
SEPO	1,413,936	1	1,413,936
EOP	1,013,916	2	2,027,832
TA	1,102,992	2	2,205,984
Total Cost			6,005,542
Cost Per Outlet			3,533
Total Number of Outlets Under Option 3			54,960
Total Staff Costs for Admin/Collection at all Outlets			194,155,627

Although just a linear extrapolation, it could be argued that this figure considerably underestimates likely collection costs since collecting from just 1,700 clearly marked supermarkets and convenience stores would be significantly more straightforward a task than collecting from each and every independent retailer.

ANNEX D – RESPONSE TO COMMENTS

EPD's comments on the first draft of the DFR, submitted 4 December 2006, were received on 19 December 2006. Comments were also received at a meeting on 18 December 2006. The full Response to Comments table is provided below.

Comment	Response
1. <u>Section 2: Background and Scene Setting</u>	
1.1 Section 2.1, last paragraph –	
(a) The 3rd line, should a definite article "the" be added before "society"?	No, the line reads as intended.
(b) The 8th line, "construction waste charges" should read as "construction waste disposal charging scheme".	Incorporated.
1.2 Section 2.2.1	
(a) 1st paragraph – Add "some" before "6,450,000.	Incorporated.
(b) 2nd paragraph – Please quote the source of waste information as footnote.	Incorporated.
(c) 3rd paragraph – Add "current" before "annual cost". It seems to me that the current management costs for MSW only is around $740M. The consultants should check and clarify accordingly. Please also quote the sources of cost information in this paragraph as footnote.	Incorporated. Page 26 of the Policy Framework states annual MSW management costs of $1.2bn. Incorporated.
1.3 Section 2.2.2	
(a) First paragraph, the 2nd sentence – add "plastic shopping bags," after "including".	Text amended.
(b) First paragraph, the 3rd sentence – "plastic bags" should read as "plastic shopping bags". Add "at waste facilities" after "16 December 2005" and "hereafter" before "called the 'Landfill Survey' respectively".	Incorporated.
(c) Second paragraph, 2nd sentence – add "including wet markets and small retail shops" after "independent retail sector".	Incorporated.
(d) Table 2-1 – add "by number" after "millions".	Incorporated.
(e) Third paragraph	
i. 4th sentence – delete the statement "According to the waste composition survey this account for as much as 80% of all plastic shopping bags in circulation" as no such information was collected from the waste survey.	This line was accepted in Working Paper 1 and is sourced to EPD.

ii. 6th sentence – delete "comprise the reminder of the plastic shopping bag market but".	Noted.
iii. Add "According to the view-seeking exercise, HDPE and LDPE plastic shopping bags are the most commonly used plastic shopping bags in Hong Kong" as the second last sentence of this paragraph.	The consultants have some concerns in generalising and extrapolating the results of the view-seeking exercise in this way.
(f) Last paragraph – I am not aware that the Carrefour report was mentioned in the draft WP4. The consultants should also mention any useful findings of this report in detail in the WP4 for reference purpose.	Noted.
1.4 Section 2.2.3, 4th paragraph, 2nd sentence – should "bioerodable" be read as "biodegradable"?	Bioerodable is the correct terminology.
1.5 Section 2.3.1, 2nd paragraph, last sentence – should "communications" be read as "communication"?	Incorporated.
1.6 Section 2.3.2	
(a) 1st paragraph – "ParknShop" should read as PARKnSHOP".	Incorporated.
(b) 2nd paragraph, last sentence – replace "several" by "many".	Noted.
(c) 3rd paragraph, 1st sentence – should the verb "report" be read as "reported"? Please also incorporate update information on NPBD in 2007 from EPD's recent press release on 5 December 2006: http://www.info.gov.hk/gia/general/200612/05/P200612050212.htm	Report is the correct tense since the reporting remains ongoing. Relevant information from the updated press release has been incorporated.
1.7 Section 2.3.3.	
(a) 2nd paragraph – "a reduction rate of some 15% to 20%" should read "a reduction rate of 10% to 20%".	Incorporated.
(b) 3rd paragraph, 2nd sentence – "same period last year" should read "same period in 2004".	Incorporated.
1.8 Section 2.3.4	
(a) 2nd paragraph – would the consultant please clarify the meaning of the last statement "all receiving custom from at least a quarter of the population" in the second sentence?	To receive custom means to receive regular patronage of a particular shop or restaurant, and is therefore the correct word for this context.
(b) 3rd paragraph – add a last sentence "However, this level of charge has been proved not effective in reducing use of plastic bags as demonstrated by10 cents rebate (per $25 dollars purchase without using plastic bag) scheme offered by major supermarkets voluntarily for years.".	Schemes already attempted in Hong Kong have been considered in section 2.3.1. However, these schemes have not been officially monitored or evaluated so effectiveness cannot be judged.
2 Section 3: International Experience	

2.1 Section 3.2.1 – Should "Ireland" be used instead of "Eire"? If not, please add footnote to explain.	Footnote added.
2.2 Section 3.2.4, first paragraph – should "[and that]" in the 2nd sentence be deleted or not?	Text amended
2.3 Table 3.1 - Should "Ireland" be used instead of "Eire"? If not, please add footnote to explain.	See earlier footnote. The text now solely refers to Eire rather than Ireland.
3. The Reference Case	
3.1 Section 4.1.1, 2nd paragraph, last second sentence – should "unprinted" be read as "printed"?	Incorporated.
3.2 Section 4.2.1, 3rd paragraph – the mean price and median price of bags seem to be on the low side. Please see EPD's separate comment on consultants R-t-C on draft WP4 on the same issue. The consultants could find price information of common plastic shopping bags from local manufacturer's website for reference: http://www.polybag.com.hk/main/default.asp	The prices are those quoted by retailers during the view-seeking exercise and are supported by the relevant manufacturer interviews.
3.3 Section 4.2.2 (a) 1st paragraph, 3rd sentence – should the word "custom" be read as "customers"?	Custom is the correct word. See the above definition.
(b) 4th paragraph, 3rd sentence – the statement in this sentence are impacts on consumers (as referred to Table 4-3 in draft WP4) which are different from impacts on retailers (as referred to Table 4-4 in draft WP4) as far as switching to other bags are concerned. Please clarify.	The text has been clarified.
(c) 4th paragraph, last 2nd sentence – the general view of manufacturers that significant switching would occur is in doubt because of the lack of solid evidence. The consultants should quote plastic bag information provided by the manufacturers to support their views.	Since no scheme has so far been implemented, there is no evidence to support the opinions of any of the stakeholders. Manufacturers were found to produce a wide range of bags for a vast array of sectors and markets. They have seen how the market has so far responded to many exogenous and endogenous shocks and as such are just as qualified to express an opinion about likely impacts.
3.4 Section 4.2.3, 2nd paragraph, last sentence – it seems that the statement contradicts to the survey results obtained from the NPBD campaign, which showed that on average over 40% reduction in plastic shopping bags was achieved on NPBDs. Please refer to GSC's reports at its website for details: http://www.gsc.org.hk/gsc/public/plasticbags/2006_npbd2/20061109_PC/20061109_Report.pdf	The results of No Plastic Bag Day have already been discussed in section 2.3.2. This section is concerned solely with the results of the view-seeking exercise. Contradictions between different information sources are to be expected and are taken into consideration for the impact assessment.
3.5 Section 4.3	

(a) 1st paragraph – should "Table 2-1" be read as "Table 4-1"?	Table 2-1 is the correct table.
(b) 2nd paragraph, last sentence – please provide sources of information of studies for Australia, South Africa and Scotland as footnote.	Incorporated.
3.6 Section 4.3.1	
(a) 1st paragraph – "CPU consumer survey" should read as "CPU opinion survey".	Incorporated.
(b) Table 4-1 – "no bag day" should read as "no plastic bag day" in the last sentence of the switching assumption for rubbish bags.	Incorporated.
3.7 Section 4.3.2	
(a) Table 4-2, the first four types of bags refer to "shopping bags" which should be specified clearly in the Table.	Incorporated.
(b) 2nd paragraph - Please provide the source of the Carrefour study as a footnote. Has the consultants assessed that if any findings of this study apply to Hong Kong condition?	Incorporated.
3.8 Section 4.4.	
(a) The consultants need to review and revise the impact assessment results in this section and Tables 4-3, 4-4, 4-5, 4-6, 4-7 and 4-8 taking into account of EPD comments on consultants' R-t-C on draft WP4 and EPD's latest comments on the revised Annex E provided via e-mail and at the meeting between EPD and GHK on 18 December 2006 respectively	Incorporated.
(b) Table 4-5 – the summation of figures in column amounts to 3,059 rather than 3,058. Please check and correct as necessary.	The numbers have been rounded for presentational ease. A footnote has been incorporated to explain this.
(c) Table 4-6 – the value of re-exports which has similar value of total Hong Kong market value has not been considered. The consultants need to check and include this in the Table. Moreover, should the values of loss in the last column be "570", "799" and "343" respectively? Please check and clarify.	The table and text has been amended to include data on re-exports. The numbers have been rounded for presentational ease. A footnote has been incorporated to explain this.
(d) Section 4.4.5 – should the word "custom" in the last paragraph be read as "customers"?	Custom is the correct word. See the above definition
(e) Section 4.4.6	
(a) 1st paragraph, 2nd sentence – should the word "Table 4-10" be read as	Incorporated.

"Table 4-7"?	
(b) 2nd paragraph, 1st sentence – should the word "Table 4-11" be read as "Table 4-8"?	Incorporated.
(f) Table 4-8 – The net present values of returns to Government seem to be on the high side. The consultants need to review, re-check and clarify taking into account EPD's comments on the Annex E of draft WP4 and DFR's comparative scheme assessment inputs and outputs provided via e-mail and at the meeting between EPD and GHK on 18 December respectively.	Marine litter collection costs have been amended.
3.9 Section 4.5, first bullet point – Add a full stop after "plastic shopping bag use" and add a third sentence "It also has very significant impact on plastic bag trade in Hong Kong and" after "It therefore has little effect ….shopping bag use." and before "and should be removed from the scheme".	Incorporated.
4. Section 3: Development of Potential Schemes For Hong Kong	
4.1 Section 5.3 – Option 4B is on charging scheme for all shopping bags which is outside the scope of the Study, it should not be considered as an option under the Study and should be removed from the DFR.	Noted. Option 4B removed from the DFR.
4.2 Section 5.4, 1st paragraph – As Option 4B is not an option under the scope of the Study, the last second sentence should be deleted.	Incorporated.
4.3 Table 5.1	
(a) Options 2 and 3 - Should the switching mentioned in the last column be initiated by the retailers rather than by the consumers?	Incorporated.
(b) "Option 4A" should now read "Option 4". Please replace "selected outlets" by "supermarkets and convenience stores (S&C)".	Incorporated.
(c) Option 4B is outside the scope of the Study and should not be included.	Noted. The reference to 4B has been removed.
4.4 Section 5.4.1	
(a) 1st paragraph – "Table 5-1" should read as "Table 5-2". Review and revise the contents of Table 5-1 to also include the following advantages and disadvantages for different Options in Table 5-1 in addition to those already mentioned:	Reference to table corrected. Advantages and disadvantages included where not already considered.
(b) 2nd paragraph – As Option 4B should not be included as an Option, this paragraph needs to be rewritten.	Noted. References to 4B have been removed.

(c) Table 5-2 – The consultants need to review and revise the figures in the Table taking into account of EPD's comments on the comparative scheme assessment inputs and outputs provided via e-mail and at the meeting between EPD and GHK on 18 December. Moreover, "Option 4A" should now read "Option 4" and Option 4B should not be included.	Incorporated.
(d) 3rd paragraph – Add "per annum" each after "$241 million", "$2.4 billion" and "$416 million" respectively.	Incorporated.
(e) 4th paragraph –	
i. Should "very" be read as "vary" in the 1st sentence?	Incorporated.
ii. 1st bullet point - Replace "EPD originally proposed costings of Option 4" by "EPD's rough estimate of manpower resources for Option 4". Add "(i.e. Option 3)" after "54,960 retail outlets in Hong Kong". Add "each year" after "$95 million" and illustrate with calculations how the amount of $95 million is calculated. The consultants should also mention administrative costs required for the registration, checking/auditing of returns and collection of consumer levy from the supermarkets and convenience stores in this bullet point. The consultants should elaborate how the consumer charge from retailers is to be collected by the Government and advise the assumptions in estimating the government scheme cost for Option 4 either in Table 19 of the "Comparative Scheme Assessment Inputs and Outputs" of the DFR or in the WP4.	Incorporated. Calculations now provided in the annex.
iii. 2nd bullet point – Add "administering the consumer charge (collected and retained by retailers) in" after "by the consultants for" and add "(i.e. Option 2)" after "reference case".	Incorporated.
iv. 3rd bullet – Add "(i.e. Option 3)" after "from all outlets in Hong Kong". The consultants should illustrate with calculations how the amount of $5,333 per store and total cost of $194 million are calculated.	Incorporated. Calculations now provided in the annex.
v. Table 5-3 – The consultants need to review and revise the figures on impact on Government Revenue taking into account of EPD's comments on the comparative scheme assessment inputs and outputs provided via e-mail and at the meeting between EPD and GHK on 18 December. Moreover, "Option 4A" should read "Option 4" and Option 4B should not be included. Please also provide calculations as footnote of the Table for the direct impact on consumer expenditure under Option 4 as it has not been provided in earlier sections.	Incorporated. Calculations now provided in the annex.
vi. 6th paragraph, 2nd sentence – Add "are the most heavy plastic shopping bag users and they" before "account for 20%".	The independent retailer sector is the heaviest user of plastic shopping bags.

4.5 Section 5.5	
(a) Section 5.5.1, 2nd paragraph, last 2nd sentence – Add ", say through the Hong Kong Retail Management Association" after "data collection and reporting"	The Australian approach has been led by the Australian Retail Association. It is not known how a similar approach might be dealt with by the retail sector in Hong Kong and the consultant has concerns about defining such roles and responsibilities at this early stage.
(b) Table 5-4 –	
i. Delete "b) monthly" in the last column of the first row.	Incorporated.
ii. Change frequency for both (a) and (b) to "quarterly" in the last column of the third row.	Incorporated.
(c) Table 5-6 – Delete "monthly waste disposal figures" in the last column of second row.	Incorporated.
(d) Section 5.5.2	
i. 1st paragraph – Delete "San Francisco" as there is currently no plastic bag charging scheme. What is the scheme in Kenya? Has it been implemented?	Reference corrected.
ii. 4th paragraph – Add "environmental funds such as the 'Environment and Conservation Fund' and" after "relevant existing" in the first sentence and add "within the Government and" before "with stakeholders" in the last sentence.	Incorporated.
(e) Section 5.5.7	
i. 3rd paragraph – Should the word "makes" in the 3rd line be deleted?	Incorporated.
ii. 4th paragraph – Should '[including]' in the 2nd line be deleted? Also replace "400" in the 7th line by "430".	[including] is grammatically appropriate. Change incorporated.
5. <u>Section 4: Summary and Conclusions</u>	
5.1 Section 6.1	
(a) Replace "waste management plan" by "municipal solid waste management strategy for Hong Kong" in the last sentence.	Incorporated.
(b) 3rd paragraph – the consultants should illustrate by calculation how the 1.8% is derived?	Explanation of the 1.8% is provided in Section 2.2.2.
5.2 Section 6.2	
(a) 1st paragraph – replace "Five" by "Four" and "public consultation" by "Government's consideration" respectively in the 1st sentence.	Incorporated. It is anticipated that these potential schemes are next to be presented for public consultation.
(b) 2nd paragraph, 2nd sentence – Replace "However" by "Whilst a voluntary approach is favoured by manufacturers and retailers".	Those retailers currently engaged in the voluntary scheme expressed a clear preference for its continuation.
(c) 3rd paragraph – Add a sentence "There is also unclear message as to whether the Government wants to increase revenue or to impose an economic incentive for changing the consumer's behaviour." at the end.	Incorporated.
(d) 5th paragraph – Add a sentence "On the other hand, they are the most heavy	The independent retailer sector is the highest known user of plastic shopping

plastic shopping bag users known in the retail sector." before "This could be mitigated through …….". (e) 6th paragraph – Delete the whole paragraph as consumer charge on all shopping bags is not considered an option under the Study. (f) 7th paragraph – Add a sentence at the end "Having said the short-comings, a phased approach has the advantage that it enable reviews to be conducted to investigate if a wider scheme in future is feasible and beneficial to the Hong Kong environment and society as a whole. (g) What is the consultants' recommended preferred scheme from amongst the four identified options?	bags. Noted. Paragraph removed. Incorporated. The consultants do not feel in a position to recommend any of the four remaining schemes without first having the opportunity to consult relevant stakeholders again on the S&C scheme – targeting just this scheme creates a different incentive structure about which no evidence so far exists. Without further consultation, S&C retailer responses cannot be anticipated with any degree of confidence. In the absence of any evidence the consultants would recommend that the Government either continue with the voluntary scheme or that they broaden the scope to consider charges on all shopping bags since these are the only two options that the consultant can be relatively sure will not result in negative environmental consequences.
6. Other General Comment 6.1 The consultants should include the Tables on Comparative Scheme Assessment Inputs and Outputs (assumptions should also be provided as footnotes in the Table as appropriate) in the DFR as an Annex for completeness and reference purposes.	Incorporated.

EPD's comments on the revised DFR, submitted 05/01/2007, were received by the consultant on 25/01/2007. Suggested text revisions have been incorporated as appropriate. This R-t-C table concerns the general issues raised by EPD regarding content rather than actual text.

Comment	**Response**
1. <u>Section 2: The Plastic Shopping Bag Problem</u>	
1.1 Subsection 2.2.2, Relative Bag Weight and Bulk: Suggested text amendments.	Incorporated
1.2 Subsection 2.2.3, 1st paragraph: How about concern on resources consumption of non-renewable fossil fuel in general?	This point is addressed in the third paragraph with results from the Carrefour study.

1.3 Subsection 2.2.3, 2nd paragraph: Should it be dioxin? Please also provide source of information as footnote.	Information taken from a speech given by the Maltese Environment Minister, and identified during the international case studies.
1.4 Subsection 2.2.3, 4th paragraph: Why this term is used? Is it a common term for the bags that Consultants are referring to?	Bioerodable bags are a subset of biodegradable bags. Bioerodable is the terminology used to describe bags made from synthetic plastics, but with additives so that they erode. The term is correct in this context.
1.5 Subsection 2.3.2, 3rd paragraph: Please update this last sentence taking into account of EPD's press release on this subject: http://www.info.gov.hk/gia/general/200612/05/P200612050212.htm	Additional text has been incorporated concerning store take up and frequency of NPBD to match the text in the ES.
2. Section 3: International Plastic Bag Reduction Schemes	
2.1 Suggested text amendments in table	Incorporated
3. Section 4: The Reference Case	
3.1 Suggested text amendments in Table 4.3.	Incorporated
3.2 Subsection 4.4.3: EPD: Should the cost of plastic bags to consumers be lower if exemptions to the consumer charge are taken into account?	Text added to clarify that results are before exemptions and non-compliance.
4. Section 5: Development of Potential Plastic Bag Reduction Schemes for Hong Kong	
4.1 Subsection 5.4.5: Would the Consultants consider rewriting the last sentence to give a clearer message. Please also elaborate the meaning of inflationary implications as footnote as appropriate.	Text amended to clarify meaning.
4.2 Subsection 5.5: Suggested amendments to table.	Advantages and disadvantages in table amended in line with ES.
5. Section 6: Conclusions and the Way Forward	
5.1 Suggested text amendments to the conclusion	Text amended in line with ES.

EPD's comments on the second revised DFR, submitted 09/03/2007, were received by the consultant on 04/04/2007 and incorporated into the final document where appropriate.

Comment	Response
1. <u>Section 5: Development of Potential Plastic Bag Reduction Schemes for Hong Kong</u>	
1.1 Table 5-2 – (a) The figures "24%" of % change in weight in the second and third columns for Option 2 and Option 3 do not tally with the calculated figure I Tables B-10 and B-11. They must be tally with each other. Please clarify. (b) To avoid misleading the readers, the descriptions "% Change in Weight" and "% Change in Bulk" should be re-written as "% Change in Bag Weight" and "% Change in Bag Bulk".	The figures in Table 5.2 are for increases in wet weight. The numbers in tables B10 and B11 are for dry weight. 'Wet weight' has been added to the appropriate row in table 5.2 for clarification. Incorporated.
1.2 Table 5-3 – (a) The title of the Table is "Impact (on?) Government and Consumer Finances", but no information on consumer finances is included. (b) The figures on NPV of Options 2 and 3 do not tally with the calculated figures in Table B-18 and B-19. They must be tally with each other. Please clarify.	Consumer finances results incorporated into table. The numbers tally with those in the Tables B18 and B19. The appropriate cell to look at in Tables B17-B20 is the cell one row up from the bottom, assuming 80% of the levy/charge is collected and a discount rate of 4%.
1.3 Table 5-4 – (a) the font size of words in the last sentence in the second column of first row (Option1) seems larger than the rest. Please rectify. (b) the last second statement in the second column of the last row (Option 4) seems to suggest that the Consultants have pre-assumed that the S&C sector will switch which may not be the case. EPD is of the view that evidence is needed to provide support to this presumption after this Option is implemented.	Font size rectified. The assumptions are based on results of the view-seeking exercise which identified that convenience stores in particular would have added incentives to switch to the provision of alternative bags in order to protect market share. This discussion is continued at length in the penultimate paragraph of this section.
1.4 Section 5.5, last second paragraph – As regards, the sensitivity test for Option 4, the Consultants should also provide the switching assumptions under the high and zero switching scenarios in the Annex B for easy reference. To avoid misleading the readers, the changes in "wet weight", "bulk" etc. should be rewritten as "wet bag weight" and "bag bulk" etc. These descriptions should be	Incorporated.

used throughout the whole document (as well as the WP4 and ES) and whenever changes in "weight" and "bulk" to landfills under various Options are mentioned.	
2. <u>Section 6: Conclusions and the Way Forward</u> 2.1 Section 6.2 – (a) Third paragraph – same comment in (4) above. (b) 5th paragraph – same comments in (4) above. As regards the third sentence, the description "more than doubling under the Reference Case" is not accurate. Should it be described as "about 123% under the Reference Case" to tally with the Table B-14 as far as the % change in bag bulk is concerned?	Incorporated Incorporated
3. <u>Annex B: Detailed Impact Assessment</u> 3.1 Table B17 – (a) Notes, paragraph 3, last sentence – should "are" in between "annual net revenues" and "r is the discount rate" be read as "and"? Please also delete one of the colons after "is the discount rate". (b) As Option 1 is concerned with continuation of voluntary initiative without any supplier levy, why "suppler levy" is still mentioned in the Table under "Costs and revenues" and "Assuming portion of supplier levy collected"? Would the consultants please carefully review and revise it as necessary. 3.2 Table B-20 – As Option 4 is concerned with consumer charge only, why "suppler levy" is still mentioned in the Table under "Costs and revenues" and "Assuming portion of supplier levy (?) collected"? Should "supplier levy" be described as "consumer charge" instead? Would the consultants please carefully review and revise it as necessary.	Incorporated Line item removed. Incorporated
4. <u>Annex D: Response to Comments</u> 4.1 Annex D – It is noted that EPD's comments provided on 4 and 19 December 2006 and Consultants' R-t-C provided on the DFR had not been included. Please include them as part of Annex D for completeness	Incorporated