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Post-Implementation Review of the Single Use Carrier Bag Charge in Wales

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[1] Minor amendments were made to the labelling of figures on pages 35, 36 and 40 and the reference to the methodology section on page 33 on 27/09/2016.

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Glossary of acronyms

Acronym	Definition
CE	Central Estimate
CO_2	Carbon Dioxide
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
LCA	Life Cycle Assessment
LDPE	Low Density Polyethylene
MRF	Materials Recovery Facility
PP	Polypropylene
RIA	Regulatory Impact Assessment
RF	Reference Flow
SOx	Sulphur Oxides
SO_2	Sulphur Dioxide
SUCB	Single Use Carrier Bag
WLGA	Welsh Local Government Association
WRAP	Waste and Resource Action Programme

Reporting conventions

Percentages (%) are used where the base size is greater than 30; whereas the actual number (N) is used where base sizes are smaller than 30, since percentages based on such small numbers are not considered to be valid.

The survey questionnaires contained routing, whereby some questions were asked of subsets of respondents depending on their answers to previous questions. Therefore, the numbers of responses for which the findings are reported vary by question. Base sizes are therefore reported for all findings.

Where percentages presented in tables do not sum to 100%, this is due either to computer rounding or to the fact that for some questions, respondents were able to choose multiple response categories.

1 Introduction / Background

1.1 Wales was the first country in the UK to introduce a Single Use Carrier Bag (SUCB) Charge in order to reduce consumption and the associated environmental impacts of SUCB production, use and disposal. The SUCB Charge (Wales) Regulations 2010 introduced a minimum charge of 5 pence for each SUCB. Since October 2011 the charge has been levied at the point of sale, both in store and for distance selling methods, i.e. internet, telephone, mail order etc. The charge applies to a range of places where goods are sold including supermarkets, greengrocers, corner shops, clothing shops, pharmacies, cinemas, market stalls, hotels and takeaway restaurants. The law also applies to sales from places outside Wales if the goods are delivered in Wales.[1]

1.2 The objectives of the SUCB charge were to substantially decrease the number of carrier bags consumed in Wales in order to reduce their adverse effects on the environment by:

- encouraging a shift in consumer behaviour away from SUCBs to re-usable alternatives
- reducing the resources used in the production of single use bags
- preventing waste
- improving local environment quality by reducing the effects of litter from SUCBs.[2]

1.3 All single use bags whether made of paper, plastic, part plastic, recycled or degradable plastic are covered by the charge. However, the charge does not apply to SUCBs used for promotional items and free items such as samples, leaflets and catalogues. Bags for life made from thick plastic, cloth, jute, cotton and hessian are not covered as they are designed to be re-used.[2]

1.4 The regulations require sellers that employ 10 or more staff and who charge for SUCBs to keep a record of scheme administration for each financial year.3 The records must include:

- the number of SUCBs charged for
- the total amount received when charging for SUCBs
- the net proceeds of the charge (after the deduction of VAT and reasonable costs)

[1] Further information can be accessed via the Welsh Government's Carrier Bag Charge for Wales's website. Available at: www.carrierbagchargewales.gov.uk

[2] Welsh Government (2011) *Explanatory Memorandum to the Single Use Carrier Bags Charge (Wales) (Amendment) Regulations 2011*. [Online]. Available at: www.assembly.wales/sub-ld8664-em-e.pdf

[3] Welsh Government (2010) *The Single Use Carrier Bags Charge (Wales) Regulations 2010*. [Online]. Available at: http://www.legislation.gov.uk/wsi/2010/2880/contents/made

- where the net proceeds were allocated.

1.5 Retailers are responsible for the distribution of the proceeds. The Regulations do not specify where the proceeds of the charge should go. However, Welsh Government has developed a voluntary agreement on the use of the net proceeds and this sets out the following principles:

- the net proceeds are donated to good causes, which where possible will benefit Wales
- the net proceeds will provide additional support to good causes over and above any existing arrangements
- where retailers have more than 10 full-time employees, a copy of, or a link to their record (containing the information outlined in paragraph 1.4) will be provided to the Welsh Government when published for monitoring purposes
- where retailers have fewer than 10 full-time employees, a statement will be made outlining the name of the good cause(s) to which the money has been donated.[4]

Project aims

1.6 The aim of this project was to conduct a post-implementation review of the SUCB charge implemented in Wales in 2011.

1.7 The first stage of the project was to conduct a literature and data review. The purpose of this stage was to identify what data were already available for an evaluation of the SUCB policy, to ascertain what additional data were required, and the approaches to obtaining these data to enable a robust evaluation of the SUCB policy to be made.

1.8 The project objectives were to assess the following:

- the impact the charge has had on the consumption of SUCBs and the associated behaviour of consumers in Wales
- the impact the charge has had on businesses in Wales
- the extent to which the voluntary agreement with retailers has succeeded in encouraging the donation of the net proceeds of the charge to good causes
- the extent to which the charge has reduced littering of SUCB

[4] Further information can be accessed via the Welsh Government's Carrier Bag Charge for Wales's website. Available at: www.carrierbagchargewales.gov.uk

2 Methodology

2.1 The Magenta book from HM Treasury[5] has guided our approach to the policy evaluation.

Literature review

2.2 A review of international literature was carried out with a focus on the effectiveness of carrier bag charging schemes to reduce the consumption of SUCBs. The review included peer reviewed academic papers, policy documents and other (e.g. media) reports, reporting empirical data, detailed original analysis and/or commentary on pre-existing empirical data. It considered impacts on consumers, businesses and government. Over 120 sources were identified through searches of bibliographic databases, internet searches and a call for evidence. A summary of the literature review findings is presented in Section 3, and the full literature review is available in Appendix 1.

Retailer survey

2.3 A survey of 504 retailers in Wales was undertaken by telephone between 18th February and 9th March 2015. All of the retailers included within the survey issued SUCBs to their customers.

2.4 The survey sampling frame was initially generated by selecting all retail businesses falling within the UK Standard Industrial Classification of Economic Activities (SIC) Division 47 (Retail), which includes both food and drink retailers and non-food and drink retailers. In addition, takeaways (i.e. businesses falling within UK SIC Division 56.10/3) were included because they were identified by Welsh Government as an additional subsector of particular interest. The sample provider was Experian.6

2.5 The sample frame was narrowed to focus only on single site retailers or, in the case of retail chains, Head Offices only (i.e. to avoid interviewing multiple retailers from a single chain). Table 2.1 summarises the characteristics of the sample frame according to retail sub-sector and company size (number of employees). The effective sample frame comprised 6,442 retailers in Wales.

[5] HM Treasury (2011). *The Magenta Book*. [Online]. Available at: https://www.gov.uk/government/publications/the-magenta-book

[6] Experian is a leading global information services company, providing data and analytical tools to clients around the world. Their national business database records four million limited and non-limited active UK businesses with over five million contact names.

Table 2.1: Total Sample Universe: Retailers

Number of Retailers

Sector	Number of Employees			
	1-5	6-10	11+	Total
A - Takeaway	1,403	248	77	1,728
B - Food and Drink Retail	815	154	74	1,043
C - Non-food and drink retail	2,958	491	222	3,671
Total	5,176	893	373	6,442

Source: Experian

2.6 Quota controls were set on business size (number of employees) and region in order to reflect the known profile of the sampling frame:

- The regional quota used a proportionate approach, based on the incidence of retailers across regional groupings of local authorities in Wales (see Table 2.2 below). In order to ensure that the sample was as representative as possible, the distribution of interviews by individual local authority area was also monitored during fieldwork, even though no attempt would be made to analyse at the local authority area level due to small numbers per individual authority.
- Disproportionate quota controls were applied for 'size of business' to enable robust sub-group analysis for larger retailers, which were defined as those with 11+ employees (see Table 2.3 below).

Table 2.2: Quotas for Region

Region	Percentage of retailers in Region	Survey Quota
	%*	N
North (Anglesey, Conwy, Denbighshire, Flintshire, Gwynedd, Wrexham)	25	123
Mid & West (Carmarthenshire, Ceredigion, Pembrokeshire, Powys)	22	111
West / South Wales (Swansea, Neath Port Talbot, Bridgend, The Vale of Glamorgan, Rhondda Cynon Taff)	26	128
South East Wales (Blaenau Gwent, Caerphilly, Cardiff, Merthyr Tydfil, Monmouthshire, Newport, Torfaen)	28	138
Total	101	500

* Where percentages do not sum to 100% this is due to rounding

Table 2.3: Quotas for company size (number of employees)

Number of Employees	Percentage of retailers in Wales	Number of retailers in Wales	Disproportionate Survey Quota
	%	N	N
1 to 10	92	462	400
11+	8	38	100
Total	100	500	500

2.7 Interviews were offered on the basis of equality in both English and Welsh (with 1% of respondents opting to respond in Welsh).

2.8 It was often necessary to make several calls to an organisation to establish the best person to speak to, and arrange a convenient time for the interview.

2.9 While not specifically excluded, none of the major supermarket chains were included in the interviewed sample, with the approach being to use bag use data collected by WRAP as part of a voluntary agreement on bag use by the seven leading supermarkets across the UK.7 In addition, representatives from the major supermarket chains were invited to attend a focus group (see 2.24 below).

2.10 The survey had a dual role both to supply key data for the economic model, and to gauge opinion among retailers on a number of topics of interest to policy (such as the impact of the charge on littering or satisfaction with the charge). The early part of the questionnaire was designed around a series of question 'loops', according to the range of bags retailers provided to their customers. For each type of bag, retailers were asked about the numbers supplied, the charge to customers and the impact of the charge. The latter part of the questionnaire turned to attitudes to the charge, addressing a number of key topics of interest to policy.

2.11 A copy of the survey questionnaire is provided in Appendix 2.

2.12 For analysis purposes, the data was re-weighted by company size to ensure that the overall results, for the sample as a whole, reflect the known profile of retailers in Wales.

Consumer survey

2.13 A survey of 1,011 Welsh consumers was undertaken by telephone between 2nd and 30th March 2015. All respondents had undertaken a shop – whether food or non-food based – in the previous month.

[7] WRAP webpage, 'WRAP publishes new carrier bag use figures'. Last updated 15th July 2014. Available at: http://www.wrap.org.uk/content/wrap-publishes-new-carrier-bag-use-figures-0

2.14 The sample frame was all individuals in Wales living in private residences with a telephone landline. The sample was purchased from UK Changes.

2.15 The survey was conducted using Random Digit Dialling (RDD) sampling, where numbers within the sample were called at random. Quotas were set on age, gender and region (North Wales, Mid & West Wales, South West Wales and South East Wales); according to the known profile of consumers in Wales (see Table 2.4). As with the survey of retailers, in order to ensure that the sample was as representative as possible, the distribution of interviews by individual local authority area was also monitored during fieldwork, even though no attempt would be made to analyse at the local authority area level due to small numbers per individual authority.

2.16 When undertaking a telephone survey of the general population living in private residences in Wales, it is not possible to randomly select a sample with a known probability. The survey did not therefore have a statistically robust 'probability sample'. For a 'probability sample', the responding unit - the household or person within the household - is chosen at random. Therefore, each member of the study population has a known chance of being selected and a statistically representative sample will be achieved.

2.17 However, the sampling method chosen for this Study followed the most robust methods possible for a telephone survey given the cost constraints of the Study, i.e. Random Digit Dialling was used but quotas were applied and the sample was then weighted post-survey to ensure that the final sample profile matched the known profile of the population of Wales according to age, gender and region.

2.18 The sample was therefore a 'non-probability', purposive sample so that although the use of RDD would improve the likelihood of achieving a representative sample, the application of quotas was likely to mean that the sample slightly over-represented population sub-groups that were more readily accessible. In this kind of quota sampling, representativeness is defined as achieving a sample that matches the population on a relatively small number of known population characteristics which in this case were age, gender and region.

Table 2.4: Consumer survey target quotas

Region	Percentage of consumers
	%*
North Wales	23
Mid & West Wales	17
South West Wales	29
South East Wales	32
Total	101
Gender	**Percentage of consumers**
	%
Men	49
Women	51
Total	100
Age group	**Percentage of consumers**
	%
16 to 34 years	29
35 to 54 years	33
55+ years	38
Total	100

* Where percentages do not sum to 100% this is due to rounding

Source: 2011 Census Data

2.19 All results are subject to margins of error - a sample has been surveyed (not the entire population). With a 'probability' sample, there is a known probability that we have accurately represented the true population and we are therefore able to estimate confidence intervals for our estimates. When interpreting the findings derived from a 'non-probability' sample, we were unable to depend on the rationale of probability theory; for a quota sample, it is assumed that a sample that is representative according to known population characteristics (age, gender and region) is also representative according to other unknown characteristics - which for this survey are attitudes and behaviours in relation to SUCBs. Whether the reported attitudes and behaviours are representative of the 'true population' will depend on how true this assumption is.

2.20 A number of studies have compared results obtained from quota surveys with those from random probability surveys and other trusted data sources. The overwhelming message from these studies is that data from quota and random probability samples are, in the main, comparable: most comparisons reported in the referenced studies showed either no differences or small differences between sample types. These studies present evidence suggesting that the number of significant differences arising from comparisons between probability sample

results and quota sample results are in line with chance expectation. While some real differences were found, most observed differences were not large enough to be of major practical concern given the purposes of the surveys.8

2.21 In order to test whether, for example, the differences between estimates derived from the survey are statistically significant, we created 'pseudo confidence intervals' based on the assumption that our sample is a simple random sample. These statistical tests were undertaken at the 95% confidence level to ensure that the result could not happen by chance more than five times out of 100. However, because we know that our sample is not entirely random, we also know that the margin of error we are assuming is, in reality, likely to be an underestimation so a small number of the differences we are reporting as significant may not be significant.

2.22 Interviews were offered on the basis of equality in both English and Welsh (with 2% of respondents opting for the latter).

2.23 A copy of the survey questionnaire is provided in Appendix 3.

Retailer focus group

2.24 Representatives of retailers and retail trade associations were invited to attend a focus group held in Cardiff to discuss the impact of the SUCB policy on their organisations and/or members. The focus group was held on 23rd April 2015. Five organisations attended the focus group.

2.25 Trade associations invited to attend were those whose members would potentially have been impacted by the charge. An email was sent to the trade associations identified from business directories and online searches, inviting them to attend the focus group.

2.26 The themes discussed at the focus group were:

- top of mind thoughts about the SUCB policy
- type of SUCBs and bags for life offered before charge was introduced in 2011
- type of SUCBs and bags for life offered after the introduction of the charge

[8] Both the text of the paragraph and the following references are taken from: Scottish Government (2011) *Technical Report of the Scottish Environmental Attitudes and Behaviours Survey 2008*. [Online]. Available at: http://www.gov.scot/Publications/2009/03/25155151/6.
For example:

- Moser, C. and Stuart, A. (1953) 'An experimental study of quota sampling.' *Journal of the Royal Statistical Society*, Series A, Vol. 116 No. 4.
- Stephenson, C., B. (1979) 'Probability sampling with quotas: wan experiment.' *Public Opinion Quarterly*, Vol. 43, No 4.
- Marsh, C. and Scarbrough, E. (1990) 'Testing nine hypotheses about quota sampling.' *Journal of the Market Research Society*, Vol. 32 No.4.
- Orton, S. (1994) 'Evidence of efficiency of quota samples.' *Survey Methods Newsletter*, Vol. 15, No 1
- Groves, R. et al. (2004) *Survey Methodology*. New York: Wiley.
- Myant, K. and Hope, S. (2006) 'A comparison of quota and random samples for measuring sport participation.' *Research report for the Scottish Executive*.

- change in sale of bags
- administration of the charge
- reporting methods
- non-compliance with the voluntary agreement
- consumer feedback
- donations to good causes
- any other comments.

2.27 A further five organisations were unable to attend the focus group on the day and these were offered individual semi-structured discussions over the telephone covering the same themes discussed at the focus group in an attempt to capture their feedback on the SUCB charge.

2.28 Retailers and trade associations were offered the opportunity to participate in the focus group in English or Welsh.

The Views of Suppliers

2.29 Respondents to the survey of retailers were asked to name their SUCB suppliers. To understand the impact of the SUCB policy in Wales, organisations were identified from the top 10 most common suppliers identified by the retailers. Five of the top 10 organisations were contacted for detailed qualitative feedback on the impact of the charge. These suppliers ranged from a manufacturer of paper and plastic bags, specialist packaging suppliers, cash and carry and catering suppliers.

2.30 All five organisations were contacted via email and/or telephone to invite them to participate in a structured discussion by telephone covering the following topics:

- Overview of the business :
    - size, location, the geographic area serviced by their business etc.
- Type of bags manufactured and/or supplied:
    - SUCB – plastic, biodegradable, paper etc.
    - Bags for life – thick plastic, canvas, jute, etc.
- How the bags they manufactured/supplied had changed since the charge was introduced in 2011.
- How their business had changed since the introduction of the charge.

Economic Evaluation

2.31 The production and disposal of single use carrier bags are a source of pollutant emissions to air, waste water, solid waste and litter. These negative effects have associated costs for society: for example, air pollutants have detrimental impacts on human health, which in turn create additional costs of treatment incurred by health services. Prior to the legislation introducing the SUCB charge in 2011, the

majority of SUCBs used by Welsh shoppers were provided free of charge. As such, the price (or lack of price in this respect) of a SUCB did not reflect the negative environmental and social costs associated with their production and disposal.

2.32 In economics, impacts that are associated with producing or consuming a product which are not captured by its price are known as 'externalities' (or effects that are external to the price). These externalities create problems for society because consumers do not face an 'appropriate' signal or price which reflects these costs, leading to an 'over-supply' of the negative impact.

2.33 In this case where a SUCB is provided for free, this price does not reflect the environmental and social costs associated with its production and disposal. As such, the price paid by the consumer is below the level it would be if these effects were appropriately captured. Given that the price is lower than it should be, it is assumed in economic theory that consumers use more SUCBs than they would otherwise have done, delivering a larger amount of the associated negative environmental and social effects (the 'externality').

2.34 Economic theory would suggest that if SUCBs are provided for free, demand will be above the 'optimal level' (i.e. the level of demand at which the price comprehensively reflects all costs associated with production and consumption of an SUCB). The implementation of the 5 pence charge therefore aimed to capture at least some of the negative environmental and social cost in the charge, and thus influence consumer behaviour such that consumption levels would be more reflective of the true costs of SUCB production and disposal.

2.35 To support the implementation of the 5 pence charge, the Welsh Assembly Government undertook a RIA[9] in 2011. The RIA estimated that implementation of the 5p charging scheme could lead to a reduction in SUCB use by an estimated 59% relative to the baseline level of use of 445 million SUCBs per annum, with a 170% increase in demand for bags for life over a 15-year period. The RIA estimated that this could provide a net benefit of between £27.9 million and £32.3 million per year as a result of reduced environmental costs and increased social benefits via charitable donations.

2.36 The purpose of this evaluation was to review the impact of the charge over the time period from October 2011 to January 2015. The evaluation sought to review the effectiveness of the policy in achieving the anticipated and desired outcomes. To do so, this evaluation estimated and compared the benefits of the policy with the costs.

2.37 To be able to evaluate the policy, given the lack of available data around bag usage, a model was built to depict the number of bags (and different types of bag)

[9] Welsh Government (2010) *Regulatory Impact Assessment on the proposals to introduce a single use carrier bags charge*. [Online]. Available at: http://gov.wales/topics/environmentcountryside/epq/waste_recycling/substance/carrierbags/regulatory-impact-assessment/?lang=en

in circulation in each year over the evaluation period. The evaluation model was developed with data collated from the literature review and from the retail and consumer surveys. More specifically, data were collected in the retailer survey regarding the number of different bags distributed in 2015. These were combined with information (also from the retailer survey) regarding how the numbers of bags distributed had changed annually since 2011, to define the number (and type) of bags in circulation in each year of the evaluation period.

2.38 To assess the 'net' or additional impact of the policy, these data needed to be compared to a counterfactual scenario: i.e. an estimate of the number of bags that would have been issued if the charge had not been introduced. Given that the counterfactual is a hypothetical scenario, no data readily existed that could be used to define this scenario. As such, the counterfactual was also modelled for the purposes of the evaluation.

2.39 The counterfactual took the same starting point in terms of the number and split of bags as the 'with policy' scenario in 2011. To forecast forward, data published by the Office for National Statistics[10] depicting the change in the value of goods sold were used as a proxy for the growth rate of bags year on year. Given that the data expressed the value of goods sold in monetary terms (as opposed to volume terms), it was necessary to adjust the growth rates taken from these data to exclude the impacts of inflation between years. Using these data assumes that changes in the retail value of goods (in constant prices) correspond to changes in the physical volume of goods, which in turn reflect changes in the demand for bags. In the absence of historical datasets for carrier bag consumption against which to compare, this methodology for forecasting the baseline was considered a reasonable proxy approach to take.

2.40 The timeframe across which costs and benefits have been assessed runs from October 2011 (implementation of the 5 pence charge) through to the end of 2014: inclusively a period of 3.33 years.

2.41 The key impact categories included in the evaluation are as follows:

- Administrative burden and enforcement costs – the annual costs incurred by Welsh Government, local authorities and retailers associated with ongoing administration and enforcement action
- Environmental damages – environmental impact categories valued under this category are carbon impacts (global warming potential), air quality (sulphur oxides, damage to human health and infrastructure) and littering costs (which are valued via a proxy of the time taken to clear up littered products within the environment)

[10] Office for National Statistics webpage, 'Time series explorer'. Available from: http://www.ons.gov.uk/ons/datasets-and-tables/data-selector.html?cdid=J467&dataset=drsi&table-id=4 [Accessed on 27/04/2015]

- Waste management costs - costs associated with dealing with the quantities of SUCB waste arising. Unit costs developed are based on gate fees so reflect recycling and disposal values only
- Donations to good causes – valuation of the additional donations to good causes raised as a result of the 5 pence charge on SUCBs
- Consumer Impact – net impact of the additional utility11 gained by consumers in shifting to re-usable bags minus the utility lost via reduced amenity of SUCBs.

2.42 In order to quantify the change in these variables and value them in economic terms, several assumptions were made.12 Where possible, consistency has been maintained with the original RIA methodology in order to allow the most direct comparison.[13]

2.43 To calculate the net benefit of the policy, the results for the counterfactual scenario have been subtracted from the results for the policy as implemented in practice, in order to provide the net additional impact of the policy.

2.44 Using data collated in the retailer survey, additional high and low impact scenarios were generated for sensitivity analysis. Sensitivity analysis is a tool used to explore the nature, type and size of uncertainty around 'medium' quantitative estimates of impacts. These additional scenarios demonstrate outputs with varied assumptions in order to test the variability of the model and therefore the robustness of the outputs generated. The high and low impact scenarios addressed a key uncertainty for this model which related to the number of bags of different types in circulation; this uncertainty is particularly important for the results, since this assumption is integral to the most important impacts calculated in the analysis (including both donations to good causes and environmental impacts).

2.45 More information on bag demand profiles (estimated bag consumption) is available in the detailed analysis section (see paragraph reference 4.30). It is important to note that, as a result of this fundamental variation in bag demand, each scenario (high, low, and medium impact) comprises both an observed level of bag demand and accompanying counterfactual because, due to the way in which bag numbers have been back calculated, each scenario reflects a potential different starting position. Appendix 4 presents the analysis conducted, outlining the key sensitivities involved in generating the model outputs.

[11] Utility in this case refers to the value that a consumer places on using a particular bag based on for example its convenience, strength or attractiveness, and is theorised to define consumers' purchasing decisions. For example, if a bag is more attractive and has the potential to be re-usable then consumers may feel it provides them with greater utility and thus they may value it more highly.

[12] Detailed methodological notes can be found in Appendix 4.

[13] However, as this is an evaluation piece, values have been adjusted for inflation and real benefits have been summed across the timeframe to represent a total observed impact, unlike in the earlier RIA which assessed average annual net impacts (total impact divided by the number of years appraised).

2.46 This evaluation sought to quantify the impacts of the charge on the following:

- consumers;
- retailers;
- suppliers of SUCBs;
- Welsh Government and the public sector;
- donations to good causes; and
- the environment.

2.47 For each, the costs and benefits of the charge have been identified using both quantitative and qualitative methodologies. The findings of these are discussed in detail in Sections 4 to 10 below.

3 Findings – Literature Review

3.1 The literature review identified that:

- Carrier bag charging schemes can substantially reduce the consumption of SUCBs. A reduction of 50% to 95% can be achieved in the short-term. Less is known about the long-term effectiveness of these schemes, but the evidence suggests that a charge may need to be increased after a number of years to retain its effectiveness.
- A range of approaches have been used to minimise the consumption of SUCBs, including bans, charges and levies. The limited empirical evidence available suggests that the popularity of carrier bag charges among consumers tends to increase once they have been implemented and their expected benefits (e.g. reduced litter) are observed in practice. The popularity of charging schemes is also associated with the proceeds being donated to charity rather than kept by retailers or collected by government. This evidence highlights the importance of communicating the specifics of schemes to the public in order to maximise their acceptance.
- Bag re-use, bag abstention (i.e. not using a bag at all) and bag optimisation (i.e. filling bags until they are almost full) have been observed in a number of studies, but there is no clear evidence in the research literature of positive spill over to other associated waste reduction or pro-environmental behaviours.
- There has only been a small increase in bin-liner sales in Wales compared with the overall reduction in SUCB use. However, there has been a large increase in bags for life sales equating to about a third of the overall reduction in SUCBs.[14]
- The impacts of carrier bag charging schemes on litter are more difficult to assess due to a lack of systematic empirical evidence. However in 2013, Keep Wales Tidy reported a marginal decrease of carrier bags in litter since the Welsh SUCB charge was introduced.[15]
- Retailers tend to express positive opinions about bag charging, once initial fears about potential negative impacts, for example shoplifting, are not realised and benefits are experienced. Indeed, the responses from the British Retail Consortium and Association of Convenience Stores to the Defra Environment Audit Committee expressed disappointment that their members were to be exempt from charging under the proposed scheme for England. However, evidence suggests that there are differences between retailer categories with some, for example takeaways and clothing shops, reporting more difficulties such as customer annoyance and loss of advertising opportunities.

[14] WRAP (2013) Effect of charging for carrier bags or bin-bags in Wales [Online] Available from: http://www.wrap.org.uk/node/18514

[15] Keep Wales Tidy (2013). Written evidence on the sustainability of measures to reduce the use of plastic shopping bags submitted to the House of Commons Environmental Audit Committee.

3.2 Overall, the availability and quality of evidence to determine the wider impacts of SUCB charging schemes is poor. Many studies do not use representative samples or comparator groups, fail to report response rates and other methodological information, and/or rely on self-reported behaviours (which tend to over-state bag reuse) rather than behavioural observations or other objective measures.

3.3 An assessment of the evidence identified in the literature review was carried out to determine the additional research required to conduct a robust evaluation of the SUCB charge for Wales. This highlighted that quantitative information was available for many impacts of the SUCB charge, and this is summarised in Table 3.1. Note that a Red Amber Green (RAG) scoring system is used, where red denotes that information is not available, amber denotes that information is partially available, and green that the information is available.

Table 3.1: Availability of data from the literature review

Input data required	Data in existing literature review	Is data available for Wales?	Year for which data is available
Impacts to manufacturing industry			
Revenue (after SUCB charge)	No	-	-
Revenue (before SUCB charge)	No	-	-
Response to loss of Welsh market for manufacturing SUCBs	No	-	-
Impacts on retailers			
Cost per bag purchased (excl VAT), before and after charge introduced	Yes	No	Prices available online
Carrier bags sold after SUCB charge	Partial – supermarkets only	Yes	Data available from 2010
Carrier bags sold before SUCB charge	Partial – supermarkets only	Yes	Data available from 2010.
% retailer revenue reduced as a result of "small basket effects" whereby SUCB charge puts off "small basket" customers from shopping.	No	-	-
Other impacts to retailers arising from the need to buy and store fewer bags.	No	-	-
% revenue reduced by shoplifting	Limited data	Limited	2012
Change in demand for heavy duty plastic bags (quantitative)	Limited data	Yes	2013

Input data required	Data in existing literature review	Is data available for Wales?	Year for which data is available
Change in demand for bin liners (quantitative)	Limited data	Yes	2013
Charitable donations			
Charitable contribution per bag sold	Limited data	For some retailers in Wales	2013/14
Change in other charitable contributions after SUCB charge	Limited data	For some retailers in Wales	2013/14
Type of charity to which donations were made	Limited data	For some retailers in Wales	2013/14
Costs to national and local government			
Administrative costs for implementation/ enforcement for Welsh Government	No	-	-
Administrative costs for implementation/ enforcement for local government	No	-	-
Waste stream impacts			
Weight per bag	Yes, quantitative	-	Various
% of SUCBs reused	Limited data	Yes	2012
% of SUCBs recycled	Limited data	Yes	2012
% of SUCBs to landfill	Limited data	Yes	2012
Quantity of additional bags bought by the public to replace carrier bags previously used for holding sports kits, sandwiches, various wastes etc.	Limited data	Yes	2012
Costs for waste management			
Recycling cost per bag - recyclate revenue per bag	Yes	No – UK wide	Current prices available
Landfill cost per tonne	Landfill tax rates, and WRAP Gate fee reports	Yes	Various
Cost for clearing up bag litter	No		
Environmental and health impacts			
CO_2 per bag	Yes	N/A	Various
Shadow price of carbon	Yes	N/A	2013
Admissions due to E. Coli, salmonella and campylobacter bacteria related to bag reuse (qualitative)	Yes, quantitative	Yes	2013
Change in behaviour relating to other natural resource use (not SUCB) (qualitative)	Limited data	Yes	2012
Littering of carrier bags	Limited data	Yes	2013/14

4 Findings – Impact on Consumers

4.1 As noted in Section 2, a survey of 1,010 consumers living in Wales was undertaken in March of 2015.

4.2 As a basis for understanding bag use across a range of different shopping types, the consumer survey first established the proportion of consumers who had undertaken a range of shopping types within the one-month reference period (see Table 4.1 below). For example, 81% of consumers reported having undertaken a large food shop in store at a supermarket in the previous month. The following subsections report the findings for each shopping type separately.

Table 4.1: How many times had consumers done various shopping activities in the previous month?

Shopping activity	Percentage of consumers who had done this shopping activity	Average number of shops per month[16]
	%	N
A large food shop in store at a supermarket	81	3.7
A smaller 'top up' shop in store for food items	89	7.1
A large food shop online	12	2.4
Bought non-food items on the high street	66	3.2
Bought non-food items at a retail park/out of town shopping centre	48	2.2
Collected food from a takeaway/restaurant	56	2.6

Base: 1,010 consumers in Wales, March 2015

The Use of SUCBs for Food Shopping

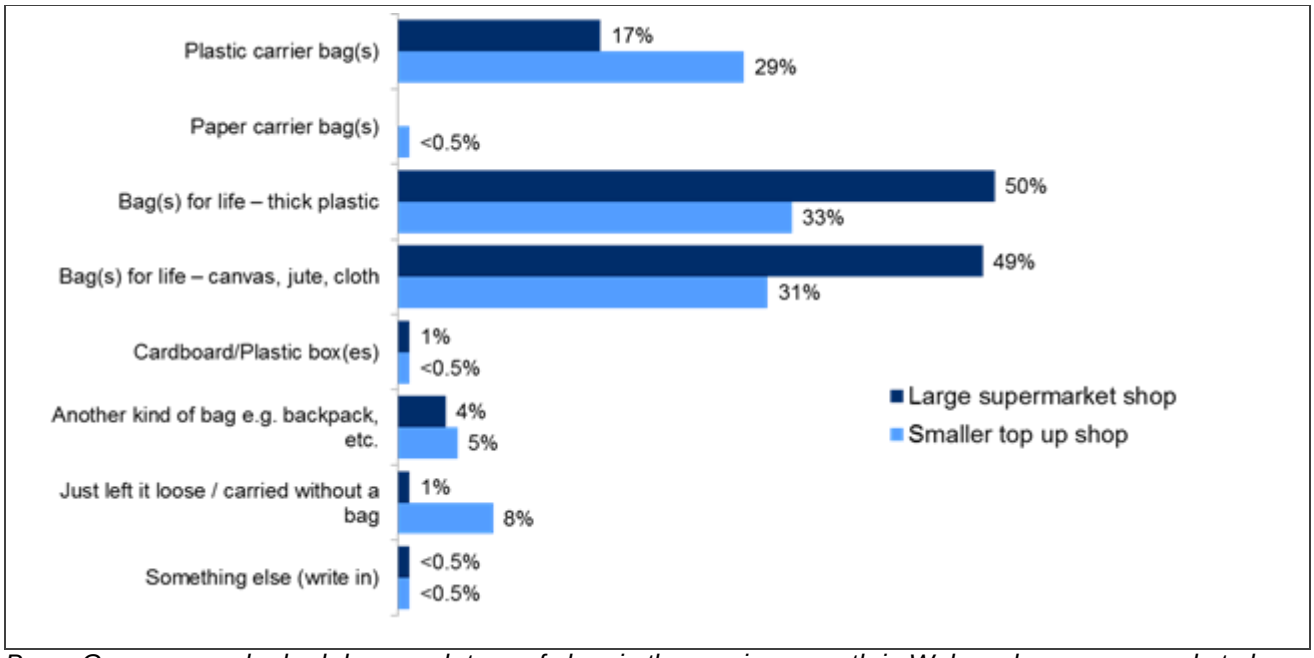
4.3 As noted above, 81% of consumers reported having undertaken a large food shop in-store at a supermarket in the previous month. Among those consumers who had done a large food shop in store at a supermarket, the average number of such visits was 3.7 per month (i.e. just under one per week).

4.4 On their most recent large in-store food shop, 17% of consumers reported using a plastic SUCB, 50% a thick plastic 'bag for life' and 49% a canvas, jute or cloth bag

[16] The averages presented here are among those consumers who have done each shop in the previous month, not all consumers overall.

(see Figure 4.1 below). For smaller 'top up' shops, plastic SUCBs were used by almost one in three consumers (29%), and similar proportions reported using a thick plastic 'bag for life' (33%) and a canvas, jute or cloth bag (31%).

Figure 4.1: What type of bag did consumers report using the last time they a) went to the supermarket to do a large food shop and b) did a smaller food shop?



Base: Consumers who had done each type of shop in the previous month in Wales – large supermarket shop (817); smaller top up shop (889), March 2015

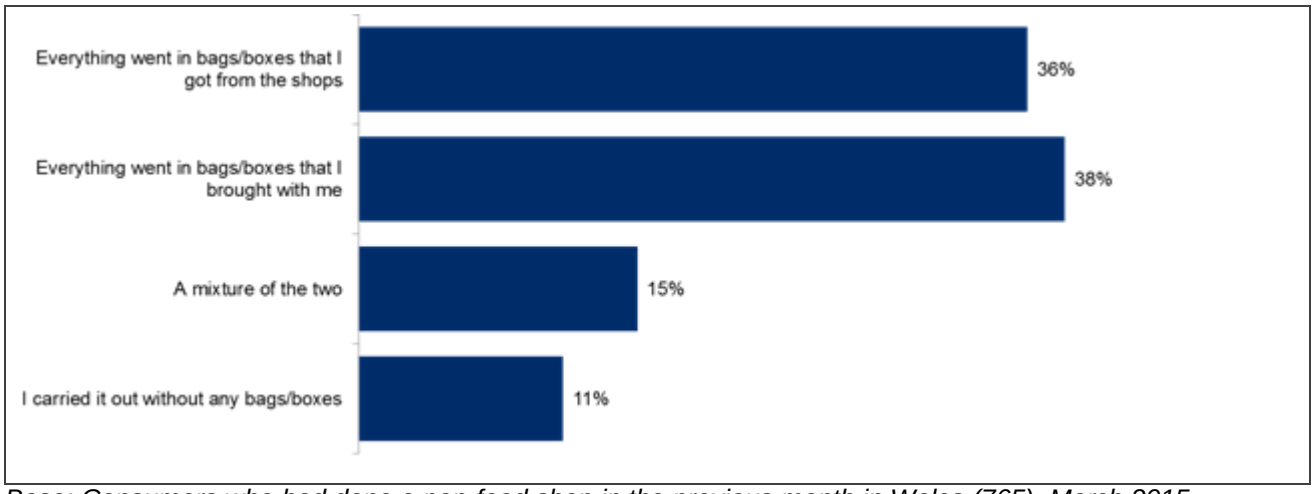
4.5 Among consumers who did a large food shop online, almost two-thirds (63%) reported that they were given the option, when placing their order, to have the food delivered with or without carrier bags. When given this option, half of consumers (50%) reported ordering the delivery with bags and the other half (50%) without bags.

The Use of SUCBs for Non-food Shopping

4.6 Overall, bag re-use was less prevalent for non-food shops than for food shops (Figure 4.2). On their last non-food shop, around one in three consumers in Wales (36%) reported only using bags they purchased from the shop, compared with a similar proportion (38%) who used bags that they had brought with them.[17] A further 15% of consumers brought some of their own bags but supplemented these by purchasing bags from the shop.

[17] The question did not distinguish between SUCBs and bags for life.

Figure 4.2: How did consumers report bringing their shopping home the last time they went shopping for something other than food?



Base: Consumers who had done a non-food shop in the previous month in Wales (765), March 2015

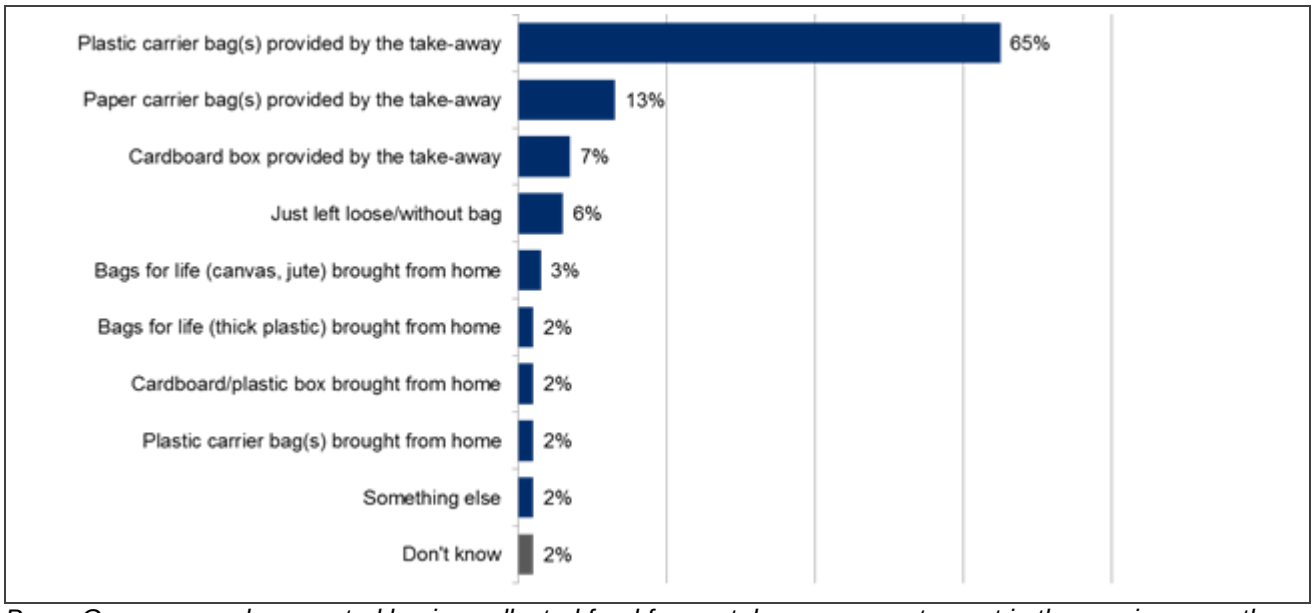
4.7 A greater proportion of consumers reported that they bought a bag from the shop when undertaking a shop at a retail park (41%) compared with a high street shop (31%) (table not shown).

The Use of SUCBs for Takeaways

4.8 Among respondents who had collected a takeaway in the previous month, close to two-thirds of consumers (65%) used a plastic SUCB provided by the takeaway and 13% a paper SUCB provided by the takeaway (see Figure 4.3 below).

4.9 The topic of 'bags for life' being used for takeaways was discussed at the Retailer Focus Group. Participants pointed out that hessian bags do not suit the product as hot food can leave a smell and mess in bags, limiting their reuse. It was pointed out by participants that a trade association for takeaways looked at a specific bag for life with a lining to keep it clean, but that the costs were found to be prohibitive. In addition, it was pointed out that buying a takeaway is often a last minute decision, so customers would not necessarily have bags for life with them.

Figure 4.3: In what type of bag did consumers report bringing their order home the last time they collected food from a takeaway or restaurant?



Base: Consumers who reported having collected food from a takeaway or restaurant in the previous month (566), March 2015

Consumer attitude to the charge

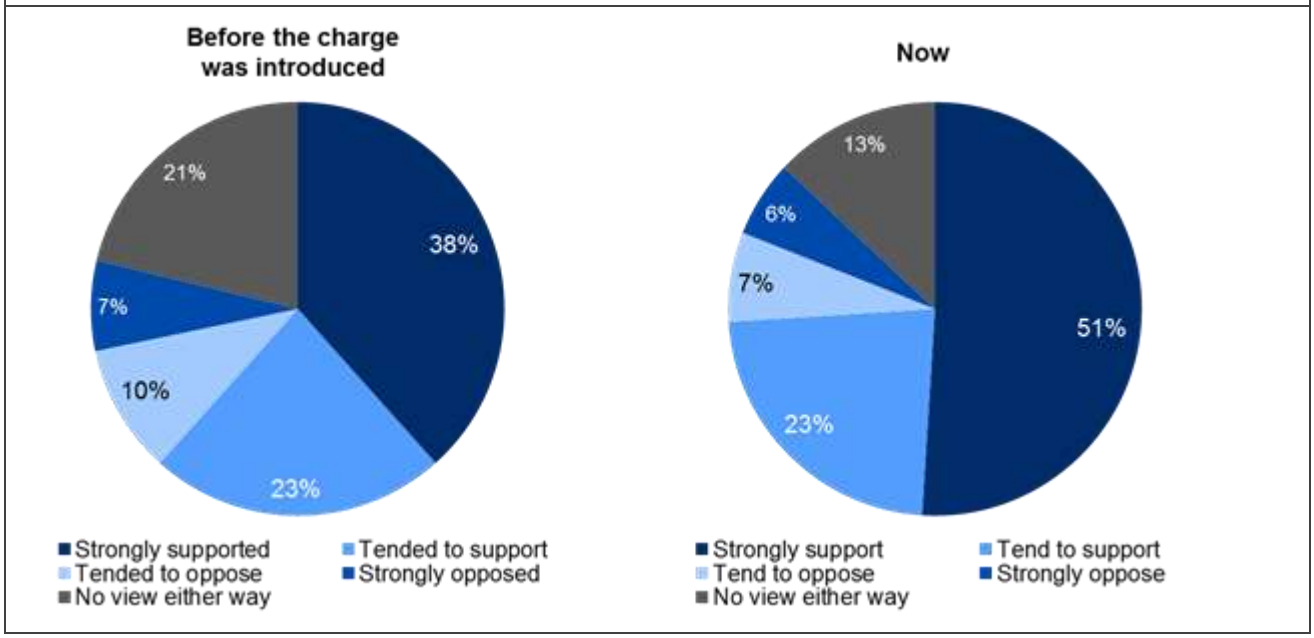
4.10 The findings of this Study suggest that support for the charge had increased since it was introduced, with just over three out of every five (61%) consumers interviewed reporting that they had been in support of the charge prior to its introduction and 74% reporting that they supported it at time of interview (see Figure 4.4 below). It should be noted that this finding relies on consumers having an accurate recollection of their own pre-charge attitude and that, in addition, it is possible that the question may have suffered from some level of 'social desirability bias',[18] where consumers' current attitudes may colour their recollection of their past attitude.

[18] Social desirability bias describes the tendency of survey respondents to answer questions in a manner that will be viewed favourably by others. It can take the form of the over-reporting of perceived 'good behaviour' or the under-reporting of perceived 'bad' or undesirable behaviour.

Figure 4.4: Consumer attitude towards the charge: before and after introduction

Q13a. Thinking back to before the 5p charge was introduced, to what extent would you say that you supported or opposed it? Would you say that you…?

Q13b. Using the same scale, how do you feel about it now?



Base: 1,011 Consumers in Wales, March 2015

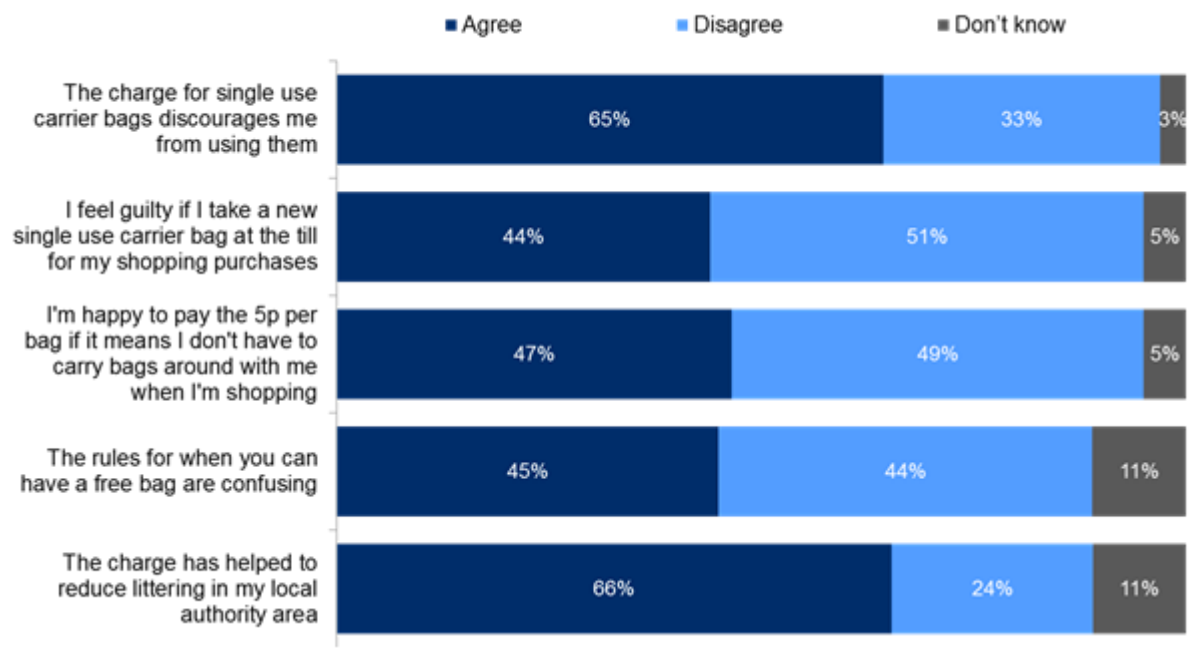
4.11 Almost two out of every three consumers (65%) interviewed agreed with the statement '*the charge for single use carrier bags discourages me from using them*' (see Figure 4.5 below), while a similar proportion (66%) agreed with the statement '*the charge has helped to reduce littering in my local authority area*'. Nearly half of consumers (45%) agreed with the statement '*the rules for when you can have a free bag are confusing*'.

4.12 Some of these attitudinal statements can, however, be compared against a study undertaken by Exodus in Wales in 2012[19] (tables not shown). These comparisons suggest that there had been no significant change in attitudes over the three years from 2012 to 2015 - there are some minor differences in results but these are within the margin of error. For example, the 2012 study found that 68% of consumers agreed that the charge discouraged them from using SUCBs, a figure that is not significantly different to the 65% found by this Study in 2015. Likewise, the 2012 study found that 41% of respondents agreed that they felt guilty if they took a new SUCB at the till, a figure that is not significantly different to the 44% found by this Study in 2015.

[19] *Consumer behavioural study on the use and re-use of carrier bags 2012*, prepared by Exodus Research on behalf of Zero Waste Scotland and the Welsh Government (2012)

Figure 4.5: Attitudes towards the charge

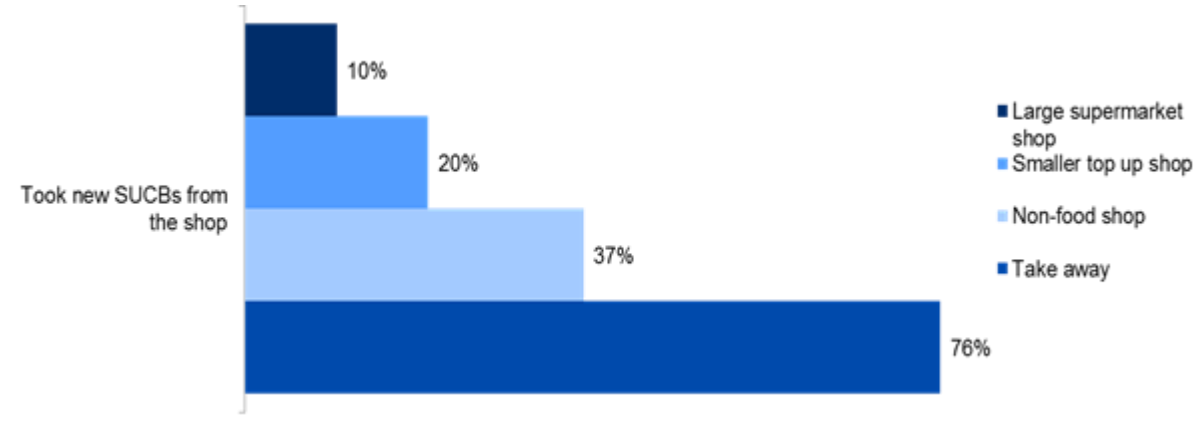
Q14. To what extent would you say you agree or disagree with the following statements?



Base: 1,011 Consumers in Wales, March 2015

4.13 The results of the consumer survey demonstrate that bag use varied by shopping type (Figure 4.6). For example, one in 10 of those consumers (10%) who had undertaken a large food shop in store bought a new SUCB, compared with 20% of those who had done a smaller top up shop, 37% who had done a non-food shop and 76% of those who had collected a takeaway.

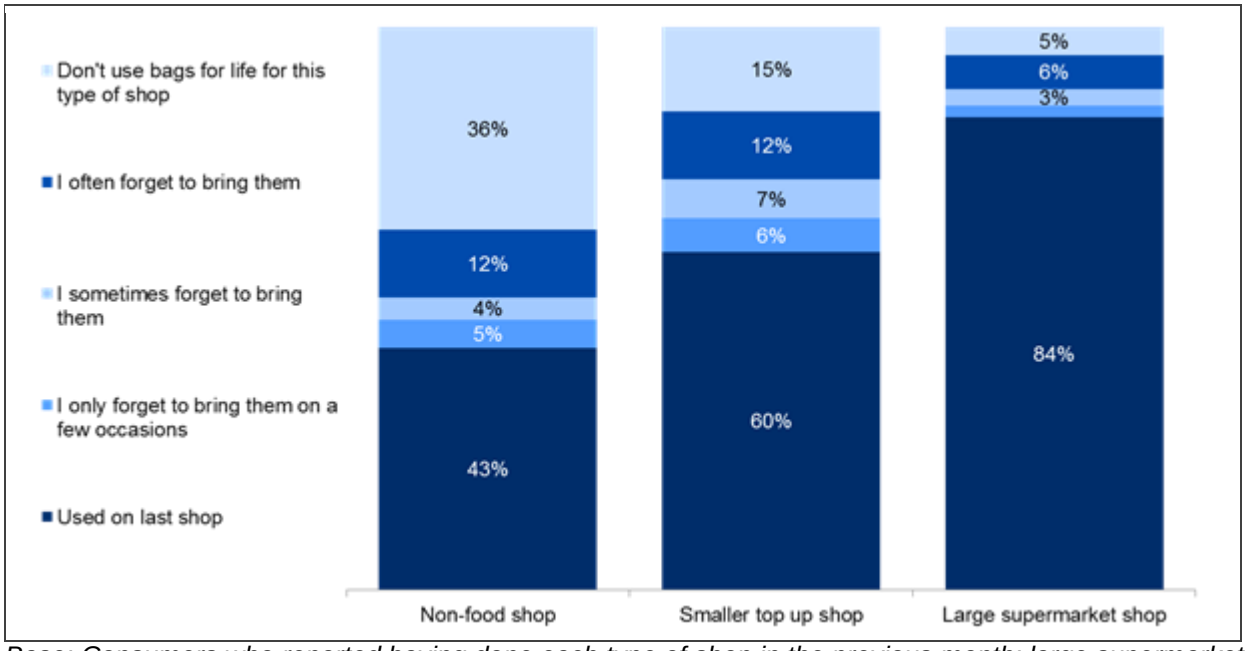
Figure 4.6: The proportion of consumers who reported purchasing a SUCB by type of shop



Base: Consumers who reported having done each type of shop in the previous month: large supermarket shop (817); smaller top up shop (889), non-food shop (765); Takeaway (566), March 2015

4.14 Turning to the use of bags for life (see Figure 4.7 below), just over four in five (84%) consumers who had done a large food shop in store reported using a bag for life. One in 20 (5%) said that they did not use bags for life for this type of shop and 11% reported having bags for life at home but said that they tended to forget them when doing a large food shop in store. For smaller 'top up' food shops, the proportion of consumers who reported using a bag for life on their last shop was three in five (60%), and for non-food shops it was close to two in five (43%).

Figure 4.7: The proportion of consumers who reported using a bag for life by type of shop



Base: Consumers who reported having done each type of shop in the previous month: large supermarket shop (816); smaller top up shop (889); non-food shops (765), March 2015

This graph combines results from different questions to present bag for life re-use across the different shopping types.

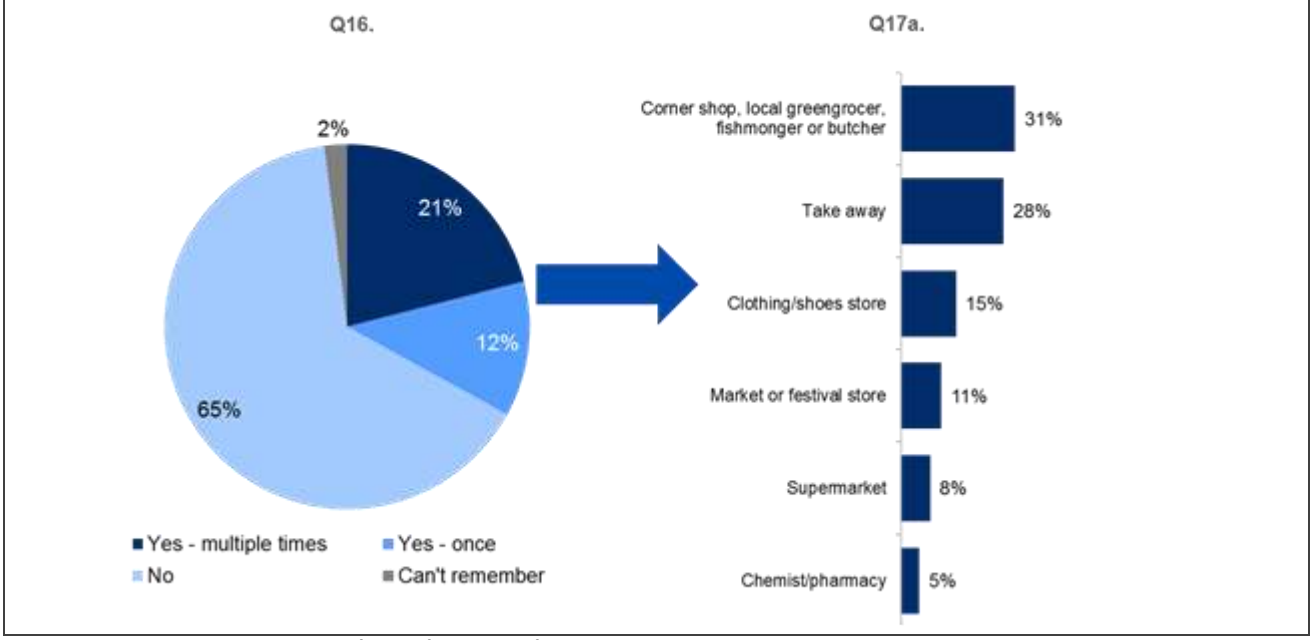
To what extent were consumers charged for SUCBs?

4.15 One in three consumers (33%) reported that they had been given a carrier bag in Wales without being charged for it during the previous year (Figure 4.8). Of the 337 consumers who were not charged, 31% reported that this happened at a corner shop, local greengrocer, butcher or fishmonger, 28% at a takeaway and 15% at a clothing or shoe shop. When asked, none of the respondents said that they had reported the incident.

Figure 4.8: To what extent and for which types of shops did consumers report not being charged for SUCBs?

Q16. Over the last year, do you remember visiting any shops in Wales where you were given a carrier bag but were not charged for it? This could be any type of shop, including supermarkets, high street shops, market or festival stalls, takeaways and food outlets.

Q17a. Was it any of the following types of shop(s), or another type?



Q16 Base: 1,011 Consumers in Wales, March 2015
Q17a Base: Consumers who reported being given a carrier bag in Wales but not charged for it (337), March 2015

Bag re-use and disposal

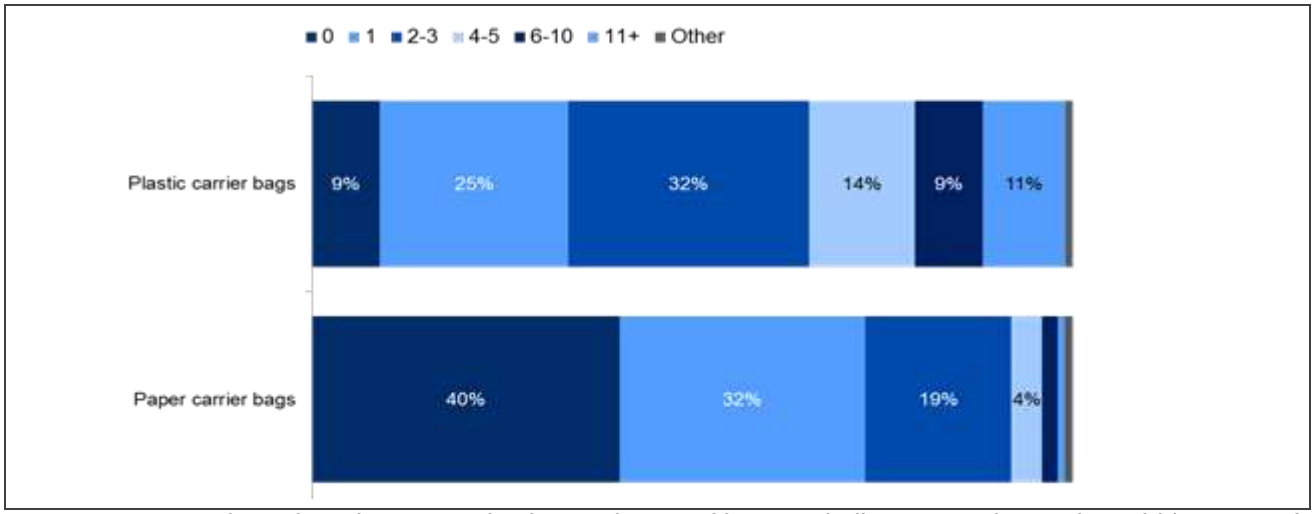
4.16 One in four (25%) consumers reported that they typically re-used plastic SUCBs once, and almost one in three (32%) re-used them 2-3 times (Figure 4.9). Close to one in 10 (11%) reported that they re-used them 11 or more times. Consumers who used plastic SUCBs reported re-using them on average at least 3.6 times.[20] However, these figures highlight a limitation of this Study: the largest category that consumers could report was 11+ times. This category was chosen in acknowledgement of the fact that consumers would be unlikely to be able to accurately estimate the number of occasions on which they had used individual SUCBs once they had used them in excess of 10 times. However, with no maximum to the range, the figure of 11 was used to calculate the average number of times bags were re-used, which means that the estimate is an underestimation. However, the extent to which the figure is an underestimation is likely to be relatively limited in the case of plastic bags (where a small proportion – 11% - chose the 11+ category) and extremely limited in the case of paper bags (where

[20] This average calculation is based only on those who use this bag type, i.e. excluding anyone who says they do not use it. It also uses mid-points where a data range is given e.g. 4-5 and the mid-point for the top category of 11+ is taken to be 11).

only 1% chose this category). Therefore, the impact on the overall average calculation is likely to be small.

4.17 In contrast, re-use of paper SUCBs was reported to be less common – among those who had used/received them, two in five (40%) said that they never re-used them, while almost one in three (32%) said that they had been re-used once. Consumers who used paper SUCBs reported re-using them on average at least 1.3 times.

Figure 4.9: How many times did consumers typically report re-using SUCBs before disposal?



Base: Consumers in Wales who reported using each type of bag, excluding respondents who said 'never use' or 'don't know' – plastic carrier bags (825); paper carrier bags (420), March 2015

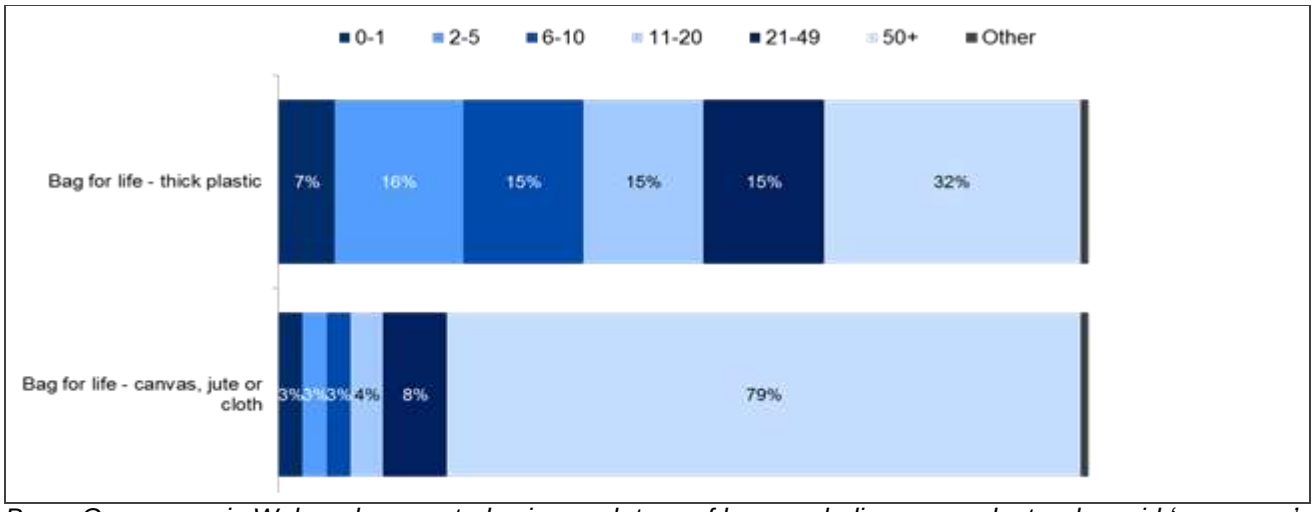
4.18 Bags for life were reportedly re-used more often than SUCBs (Figure 4.10). Around one in three consumers (32%) reported that they had re-used thick plastic bags for life 50+ times, and over three-quarters (76%) reported that they had re-used a canvas, jute or cloth bag 50+ times. The average number of re-uses was 25.5 for thick plastic bags for life and 43.6 for canvas, jute or cloth bags for life. However, these figures highlight a limitation of this Study: the largest category that consumers could report was 50+ times. This category was chosen in acknowledgement of the fact that consumers would be unlikely to be able to accurately estimate the number of occasions on which they had used their bags once they had used them in excess of 50 times. However, with no maximum to the range, the figure of 50 was used to calculate the average number of times bags were re-used, which means that the estimate is an underestimation. Unlike for SUCBs, where the margin of the underestimation is likely to be very small (given the small proportion of responses falling into the top category), here the underestimation is likely to be large because of the higher proportion of responses in the top 50+ category. This is especially the case for canvas, jute or cloth bags for life.

4.19 To bring re-usable bags below the global warming potential of SUCBs, the Environment Agency's Life Cycle Assessment (LCA) (2011)[21] found that compared with standard SUCB High Density Polyethylene(HDPE) bags (containing no recycled content) thick plastic bags for life (low density polyethylene (LDPE)) needed to be re-used four times, non-woven polypropylene bags 11 times and cotton bags 131 times .

4.20 This Study is able to conclude, based on the self-reported behaviour found in the consumer survey, that thick plastic 'bags for life' were being re-used on average on at least twice the number of occasions required to offset the global warming potential of SUCBs.

4.21 On the basis of the consumer survey findings, the authors estimate that canvas, jute or cloth bags for life were being re-used on average at least 43.6 times. The most direct comparator within the Environment Agency's study was cotton bags, which need to be used significantly more than this (131 times) to offset the global warming potential of SUCBs but, as noted above, the average estimation for this Study is known to be an underestimation.

Figure 4.10: How many times did consumers typically report re-using bags for life before disposal?



Base: Consumers in Wales who reported using each type of bag, excluding respondents who said 'never use' or 'don't know' – Bags for life – thick plastic (848); bags for life – canvas, jute, cotton (773), March 2015

4.22 The way in which consumers disposed of their bags varied according to the type of bag (Figure 4.11). Seven in 10 consumers (70%) who used/received paper SUCBs reported recycling them. A total of 44% of those who used plastic SUCBs reported recycling them, whilst a similar proportion (43%) said that they put plastic

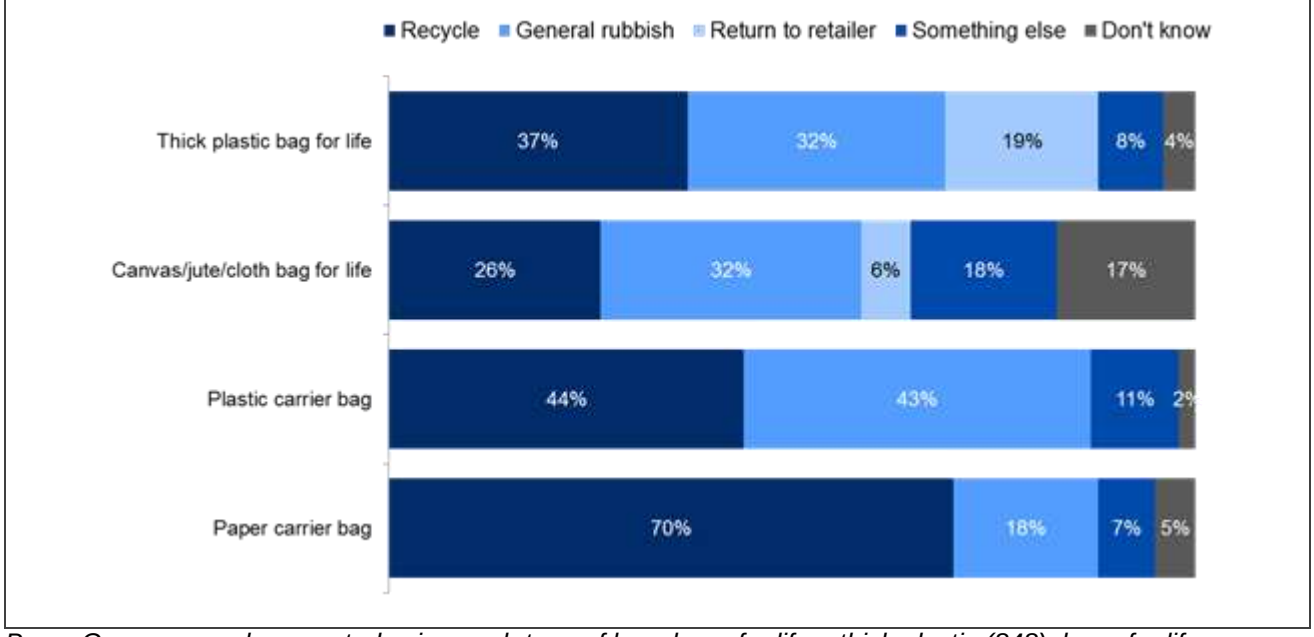
[21] Environment Agency (2011) *Life cycle assessment of supermarket carrier bags: a review of the bags available in 2006.* [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291023/scho0711buan-e-e.pdf

carrier bags in the general rubbish - this may be due to the fact that plastic bags are not accepted by many kerbside recycling schemes.

Figure 4.11: How did consumers report disposing of different types of bag?

Q8a/b. When a [BAG TYPE] wears out or gets old, what do you do with it?

Q10a/b. What do you do with a [BAG TYPE] when you dispose of it?



Base: Consumers who reported using each type of bag: bags for life – thick plastic (848); bags for life – canvas, jute, cloth (773); plastic carrier bags (825); paper carrier bags (420), March 2015

4.23 It had been theorised that SUCBs were being re-used as bin liners and for other purposes. The survey therefore explored whether consumers had found themselves buying, or buying more of, any other types of bags since the charge was introduced. Over half (56%) of respondents reported that they had not either bought or bought more of any other type of bag (see Figure 4.12 below). However, 43% of respondents reported that they had bought or bought more of other types of bag, with canvas, jute or cotton bags for life being bought by 62%, thick plastic bags for life purchased by 60% and bin liners by 1%.

4.24 WRAP conducted research (published in 2013)[22] to assess the effect of charging for carrier bags on bin-bag sales in Wales. The study found that from the introduction of the SUCB charge in October 2011 to the end of the study in June 2013, there was an increase in the sales of pedal-bin and swing-bin liners in Wales compared to the data for Great Britain as a whole. This suggests that some people in Wales were using SUCBs as bin liners prior to the charge being introduced. The study reported that in 2012, the uplift in pedal-bin and swing-bin liners sold in the seven grocery retailers that provided data for the report, was

[22] WRAP webpage. 'Effect of charging for carrier bags on bin-bag sales in Wales'. Available at: http://www.wrap.org.uk/node/18514

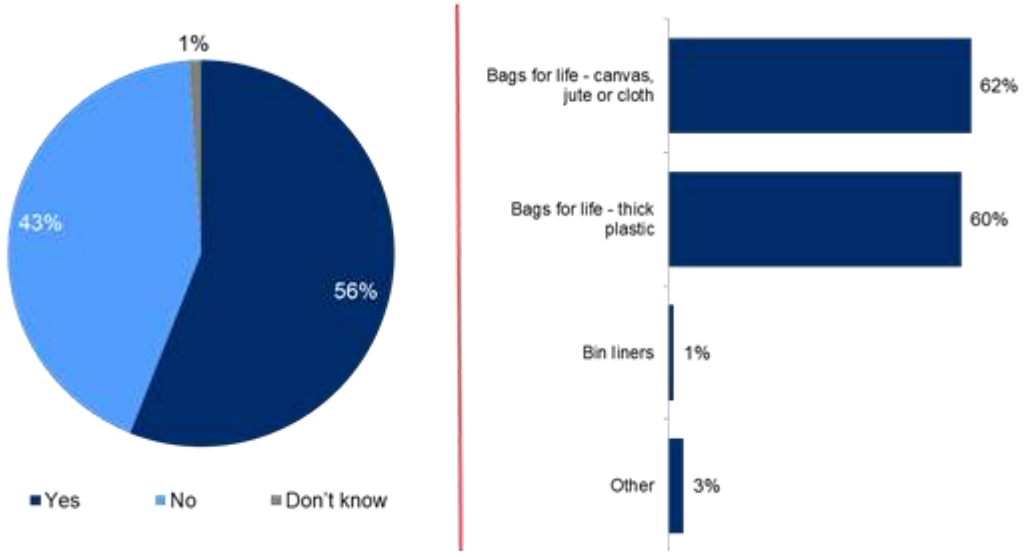
around 4% (by number or weight) of the reduction in SUCBs. However, the study also reports that if other changes in SUCB usage were included (i.e. those associated with approximately 20% of the grocery retail market and other non-grocery sectors not covered by the Study), the uplift in sales would have been comparatively smaller. No increase was found for other types of bin bags, including refuse bags and nappy sacks.

4.25 It is not possible to directly compare the results of this Study to those of the WRAP report, as the estimates provided by this Study are based on self-reported information about consumer behaviour and the WRAP study is based on bag sales information from retailers. However, the authors feel it is safe to conclude that both studies found a limited impact on bin liner sales.

Figure 4.12: The impact of the charge on consumer purchase of other types of bag

Q12a. Since the charge for carrier bags was introduced, have you found yourself buying, or buying more of, any other types of bags?

Q12b. Which bags do you buy more of since the introduction of the carrier bag charge?



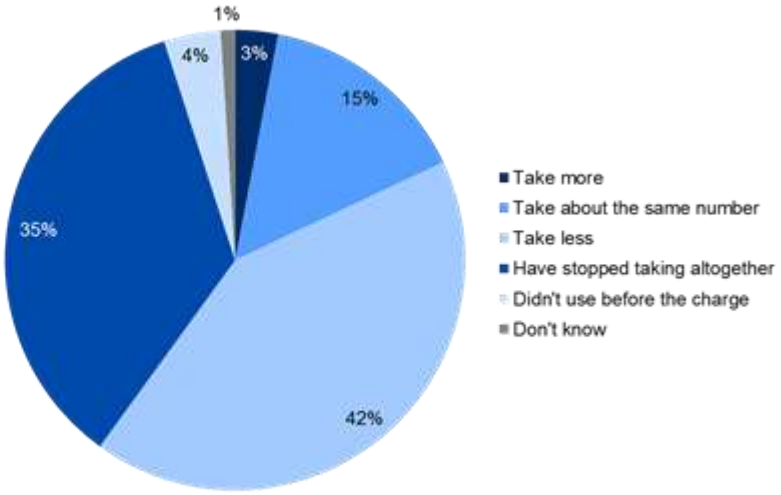
Q12a Base: 1,011 consumers in Wales, March 2015
Q12b Base: Consumers who reported buying, or buying more of, other types of bags in response to the charge (567), March 2015

The impact of the SUCB charge on SUCB purchase

4.26 The survey demonstrated the impact of the charge on SUCB use for food shopping (Figure 4.13). Over one-third of consumers (35%) reported that they had stopped taking SUCBs altogether since the charge was introduced and a further 42% of consumers reported that they took fewer SUCBs than before the charge was introduced.

Figure 4.13 What impact has the charge had on the number of SUCBs taken by consumers when buying their main food shop?

Q11. Since 2011, shops in Wales have been required to charge 5p per bag to customers that want or need a single use carrier bag. Thinking about your main food shopping, how has the number of single use carrier bags that you take from the supermarket changed as a result? Do you…?



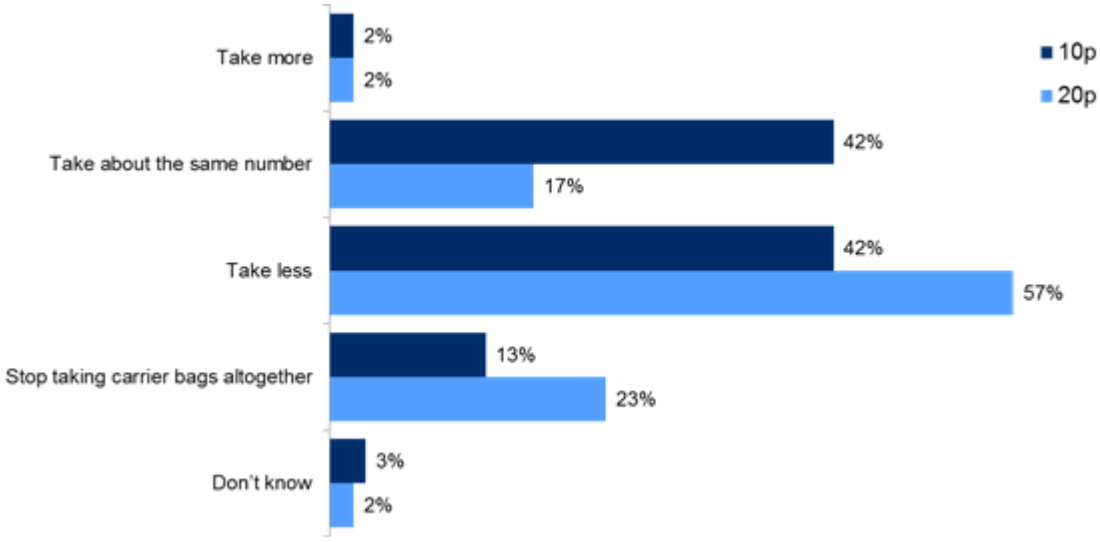
Base: 1,011 consumers in Wales, March 2015

The possible impact of increasing the SUCB charge

4.27 The survey explored the potential impact of increasing the level of the charge to 10 pence per bag and to 20 pence per bag. Only respondents who reported still using SUCBs were asked the question, and the question was randomised so that half of the respondents were asked about an increase to 10 pence and half about an increase to 20 pence. The results show that both increases would be likely to have an impact on SUCB purchase (Figure 4.14). With an increased charge of 10 pence, 42% of respondents reported that they would buy fewer SUCBs and 13% said that they would stop buying SUCBs altogether. With a 20 pence charge, 57% of respondents said that they would buy fewer SUCBs and 23% said that they would stop buying SUCBs altogether.

Figure 4.14 What might the impact be of increasing the bag charge?

Q15a. We are interested in finding out what kind of impact it would have on the amount of single use carrier bags people would buy if the charge was increased. If the carrier bag charge was increased to [10/20p], would you be likely to buy more, fewer or about the same amount of bags when you do your main food shop?



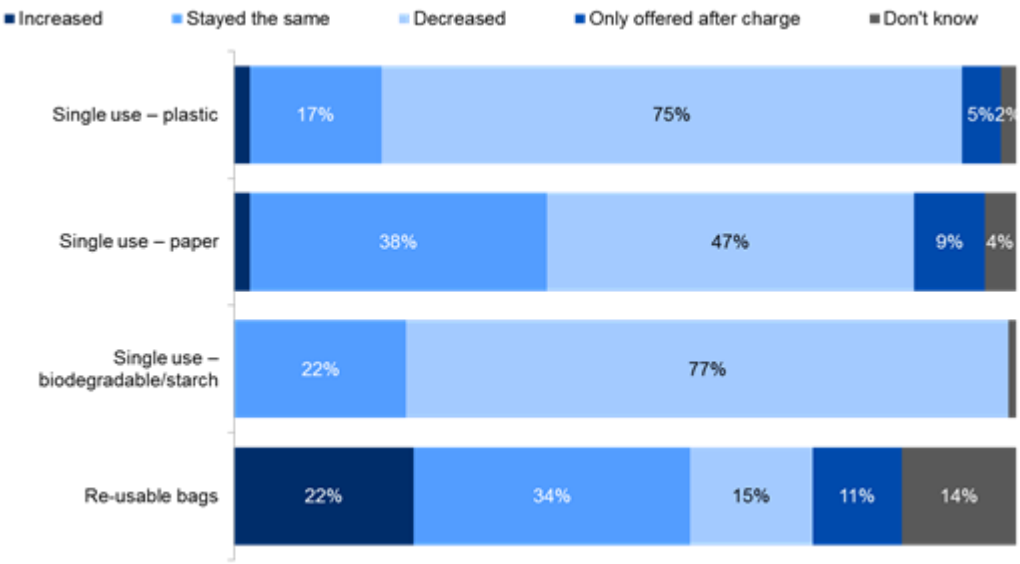
Base: Consumers who had not stopped taking SUCBs altogether when doing a large food shop (605), split into two samples – Sample X testing 10 pence (299) and Sample Y testing 20 pence (306), March 2015

4.28 The majority of retailers issuing SUCBs to their customers in Wales reported that the charge had led to a decrease in the number they needed to provide (Figure 4.15). Three-quarters (75%) of those who issued single use plastic bags reported a decrease since the charge was introduced, as did 77% of retailers who issued single use biodegradable/starch bags and 47% of retailers who issued single use paper bags. A small number of retailers reported that the charge had led to an increase in the number of SUCBs they issue to customers: the actual numbers were five retailers who issued plastic bags and two retailers who issued paper bags; there was no pattern in terms of the kind of retailer reporting an increase.

4.29 The reduction in the use of SUCBs reported above was supported by the findings from the retailer focus group, with all of the participants reporting a considerable decline in the number of SUCBs provided after the charge was introduced. There was general agreement among participants that the number of SUCBs issued had decreased and the figures quoted were between an estimated 85% and 96%. However, some retailers felt that, following the initial reduction in SUCB use since the charge was introduced in 2011, there had been a slight increase in more recent years.

Figure 4.15 Impact of the charge on the number of bags issued to customers

Q4. How has the amount of [ADD BAG TYPE] that your business provides to customers in Wales changed since the introduction of the charge in 2011? Would you say it has…?



Base: Retailers offering each type of SUCB to customers: plastic bags (427); paper bags (109); biodegradable/starch (40); re-usable bags (35), February/March 2015

Economic Evaluation

Impacts on bag demand

4.30 The key determinant of the success or failure of the policy was always going to be the extent to which the 5 pence charge was a sufficient incentive to change consumer behaviour and shift demand away from SUCBs to re-usable alternatives. Therefore, the key aim of this evaluation was to gather primary information on bag demand profiles (estimated bag consumption) across the evaluation period with particular reference to how demand is estimated to have shifted as a result of the policy.

4.31 As noted in the methodology section (see Section 2 above), modelling was required based on primary information (new evidence gathered specifically for this project via surveys) to develop bag demand profiles for the evaluation. Specifically, the bag demand profiles developed were based on the results of the retailer survey. Data collected included the estimated number of bags issued[24] by each retailer, split by type of bag and by retailer size (number of employees). These figures per retailer type and size were then multiplied by the number of retailers in Wales to provide an estimate of the total number of bags issued within the Welsh economy within the time-frame of the evaluation.

[24] Retailers were asked to estimate the approximate number of bags issued against a set of pre-coded ranges.

4.32 For chain supermarkets, a slightly different strategy was employed. To avoid the risk that chain retailers could be double counted by the survey, only one shop for a given retail chain was surveyed. In addition, questions were phrased specifically to ask about the number of bags sold across all shops within the chain in Wales. The primary data gathered through the survey was combined with WRAP (carrier bag) data available for the period 2011 to 2013[24] from seven of the leading supermarket chains that were not included in the survey. The two datasets were combined as a direct sum of the bag numbers estimated from the retailer survey plus the bag numbers for supermarkets from the WRAP data. Although the final figures do not therefore include all large supermarkets, the approach taken in combining the two datasets was the best available solution that would provide a best estimate of bag use in Wales, albeit it is likely to represent a slight underestimation of bag sales. It should be noted that this underestimation will be reflected, in turn, in a slight underestimation of the charitable donations and environmental benefits generated as a result of the policy's implementation.

4.33 To assess changes in bag demand between October 2011 and January 2015, retailers were asked the extent to which the number of bags issued had increased or decreased since the charge was introduced. Retailers were asked to estimate the magnitude of the change against a set of pre-coded ranges. The highest and lowest values for the ranges were used to develop scenarios of bag demand ranging from high to low plus a medium 'best estimate' figure. Scenarios reflecting high, medium and low estimates of bag demand (based on modelling separate scenarios reflecting the upper and lower ranges for the variables used in the calculation), and counterfactual (business as usual (BAU)) (estimated as explained in Paragraph 2.38) scenarios are presented in Figures 4.16a to Figure 4.16d, below.

4.34 Figures 4.16a to 4.16d show the demand profiles for 2011 to 2015 (calendar years) for a range of bag types and shows that SUCB bag usage is significantly lower than the counterfactual or BAU scenario (for the figures, please see Appendix 5). Although the results indicate that SUCB use increased between 2012 and 2015 (this can also be seen in Figure 4.17), the results also show that the demand for bags for life (plastic and fabric) has increased compared to the counterfactual or BAU scenario. Please note that for bags for life, there is less divergence across the low, medium and high scenarios i.e. the lines appear close together; this is because there was less variation for bags for life than for SUCBs when retailers were asked to estimate the change over time in the numbers of bags used.

[24] WRAP webpage. 'Effect of charging for carrier bags on bin-bag sales in Wales'. Available at; http://www.wrap.org.uk/node/18514

Figure 4.16a: Estimated demand profiles, trends from 2011 and 2015 by bag type: Single Use Carrier Bags - Plastic

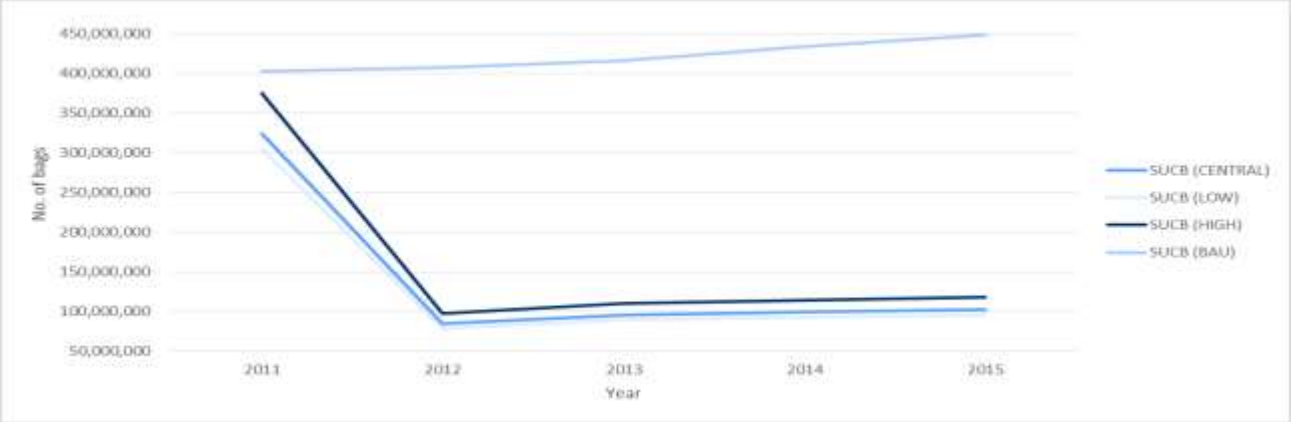


Figure 4.16b: Estimated demand profiles, trends from 2011 and 2015 by bag type: Single Use Carrier Bags - Paper

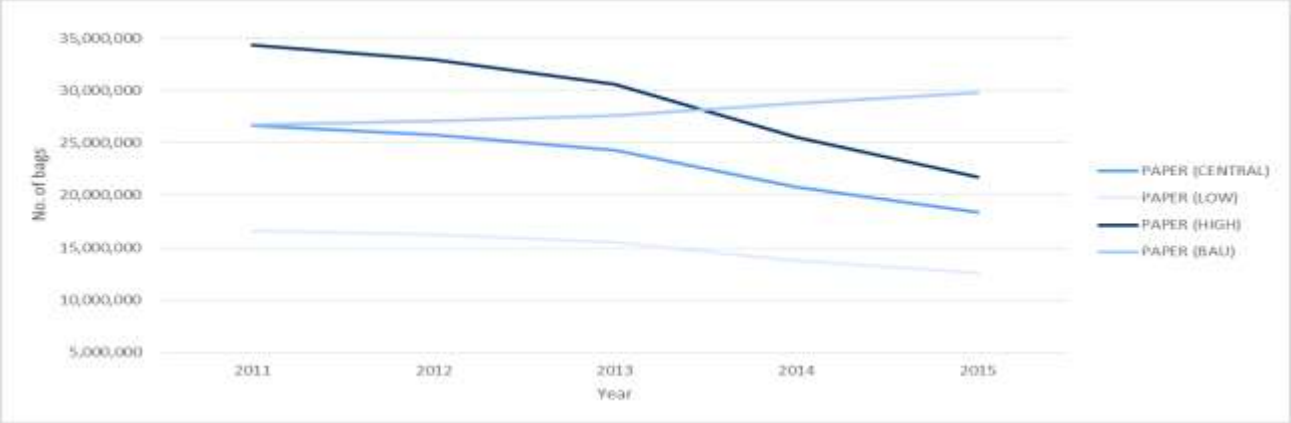


Figure 4.16c: Estimated demand profiles, trends from 2011 and 2015 by bag type: Bags for Life - High Density Plastic Bags

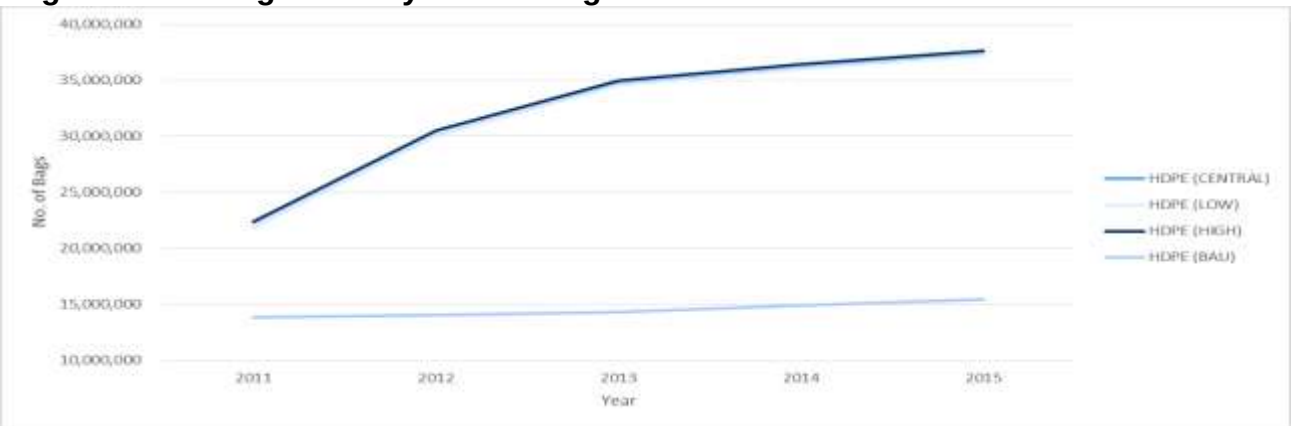
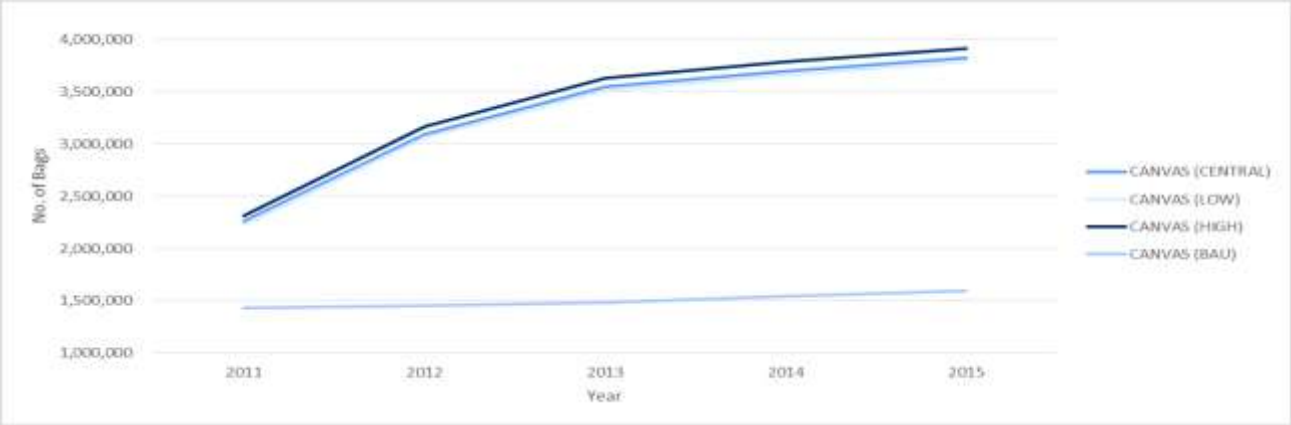
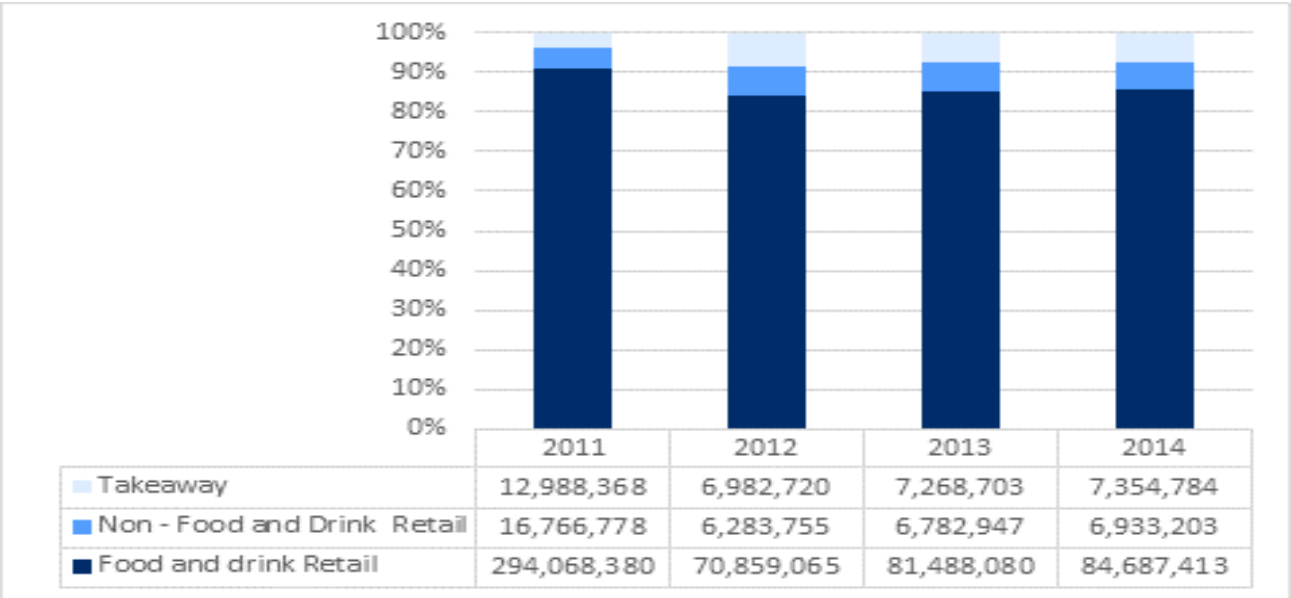


Figure 4.16d: Estimated demand profiles, trends from 2011 and 2015 by bag type: Bags for Life - Canvas Bags



4.35 Estimated changes in bag demand are presented by sector (food and drink, non-food and drink and takeaways) between 2011 and 2014 in Figure 4.17 below. The graph shows that the food and drink sector is responsible for most of the bags issued across all years of the evaluation, with the annual share ranging from a high of 91% in 2011 to a low of 85% in 2012. The majority of the food and drink retail bags were issued by supermarkets. The remaining bags issued were split fairly equally between the non-food and drink and takeaway sectors.

Figure 4.17: Estimated SUCB demand by sector between 2011 and 2014[26]



	2011	2012	2013	2014
Takeaway	12,988,368	6,982,720	7,268,703	7,354,784
Non - Food and Drink Retail	16,766,778	6,283,755	6,782,947	6,933,203
Food and drink Retail	294,068,380	70,859,065	81,488,080	84,687,413

[26] Note: Bag demand for 2011 appears significantly higher than other years because 2011 figures represent a full year of estimated bag demand, including the period before the policy was implemented. This figure presents annual data based on the results of the retail survey and WRAP supermarket data for SUCBs. Fieldwork was completed in early 2015, and thus no full year's worth of data was available for 2015.

4.36 The results of the bag demand profile modelling shown in Figure 4.16a to Figure 4.16d, above, demonstrate that in all cases the 5 pence charge (i.e. fiscal element of the policy) has had the desired effect on bag demand (for the figures please see Appendix 5). In the case of the overall best estimate (medium) scenario developed as part of this Study, it is estimated that from a starting point of 375 million carrier bags (all types) in 2011 (which includes data for the period before the charge was introduced in October 2011), the consumption of all bag types reduced by 57% between October 2011 to January 2015. It should be noted that the total reduction is likely to be higher as the baseline figure for 2011 is likely to be an underestimation because the figure relates to the full calendar year but the charge was introduced in October 2011. The results also show an estimated reduction of 70% in the consumption of SUCBs (the key target for this policy) between October 2011 and January 2015 (Figure 4.16a to Figure 4.16d). In comparison, the RIA estimated a baseline figure of 445 million SUCBs per annum and modelled an estimated reduction of 59% over a 15-year period.

4.37 The reduction in demand estimated above will have led, in turn, to reductions in the negative environmental and social effects associated with the production and consumption of SUCBs.

4.38 The reduction in the use of SUCBs of 70% estimated by this Study for the period of October 2011 to January 2015, is significantly higher than the estimate of 59% the RIA estimated might take place over a 15-year period. Therefore, it would appear that the Welsh implementation has been more effective than expected in changing consumption habits.

4.39 It is important to highlight that although based on new primary research in the form of the retailer survey, the estimates presented in Figures 4.16a to d are still only modelled estimates derived from a sample of retailers. Therefore, the figures provided are representative only of the estimated range of impacts with central 'best estimate' figures utilised to conduct the impact analysis. Therefore although bag demand profiles provide the range of estimates for overall impacts variables, such as price per bag and number of re-uses are maintained as central estimates across all three scenarios. These variable factors are later sensitivity tested however to ascertain the impact of their variability on the overall results of the evaluation.

Impact on consumer utility and expenditure

4.40 The RIA estimated the value of potential consumer benefits to be between £21 million and £32 million per annum.

4.41 This evaluation has estimated the net effect on consumers of the SUCB charge. Two impacts on consumers are assumed to result from the implementation of the 5 pence charge: the increase in expenditure on bags (whether SUCBs or bags for life) by consumers, and the change in overall utility derived by consumers from using bags (i.e. the value that a consumer places on using a particular type of

bag, for example, based on its convenience, strength or attractiveness). For example, a consumer may value a textile bag above that of a single use plastic bag due to the aesthetic look and the potential to use it in multiple circumstances. These impacts may represent an overall benefit or cost depending on the sum of the impacts across all individual consumers, taking into account the modelled shifts in demand for different bag types over time.

4.42 In terms of expenditure, the implementation of the 5 pence charge and shifting between bag types was expected to have an impact on spending by consumers on bags. Firstly, where consumers continue to use SUCBs, they would have to pay 5 pence for each bag. Secondly, where consumers shifted from SUCBs to re-usable bags, they would have to pay the price of a re-usable bag. The net impact will be the sum of the total spent on bags under the 'with charge' scenario (taking into account shifting between bag types), compared with the total spent on bags under the counterfactual (i.e. no charge introduced).

4.43 Even though a change in expenditure represents a real impact on consumers, these monetary flows act as transfer payments[26] shifting money between economic operators[27] rather than creating additional value: for example, where consumers were charged 5 pence for a SUCB, this is a cost to the consumer of 5 pence but provides additional revenue to good causes of up to 5 pence. However, because the economic evaluation has been undertaken from the perspective of society as a whole, these effects are considered to cancel each other out without generating additional value, so are not included in the final net impact.

4.44 The introduction of the SUCB charge was intended to provide an incentive to switch to use re-useable bags. However, these incentives relate only to the scenario where the 5 pence charge has been implemented and not to the counterfactual 'without charge' scenario.

4.45 In order to calculate the magnitude of the incentive to consumers, we can look at the number of times, on average, consumers reported re-using bags for life of various kinds. For example, the survey data demonstrated that on average bags for life were re-used at least 14 times more than SUCBs. It is therefore inferred that one bag for life replaces the need to buy (at least) 14 SUCBs. Once the 5 pence charge was implemented, there was therefore a significant incentive arising from switching to using one bag for life in the place of 14 SUCBs (assuming the carrying capacity is the same). The difference between the cost of a single bag for life and the cost of 14 SUCBs (at a price of 5 pence each) is therefore estimated to be at least 43 pence per additional average re-usable bag bought (i.e. the 70

[26] Transfer payments being the movement of money between people and businesses without any additional value (as either money or products) being generated. So for example, moving 5 pence from the consumers' pocket to a charitable organisation is only a transfer unless that 5 pence is used to generate greater than 5 pence in value for the economy via the NGO's activities.

[27] Economic operators being all actors within the economy, including consumers, businesses, third sector organisations and government agencies.

pence cost of 14 SUCBs minus the 28 pence average cost of a bag for life). This is based on the average cost of a bag for life purchased, which has been weighted in line with the proportional split of bag for life type and price. It is worth repeating that the way this Study asked respondents to record the number of times bags for life of different kinds were re-used included a final range of 'over (e.g. 50 times)', so that the incentive for switching to bags for life is likely to be an underestimation. However, the fact remains that a net incentive exists for consumers to switch to re-useable bags.

4.46 However, in exploring the element of consumer benefits, this Study has revealed the complexity of consumer behaviour, which was also noted in the original RIA. Some consumers reported that they continued to use SUCBs after the introduction of the charge, even when it was more financially beneficial to use re-usable bag types. Hence, the decision of which bag type to use was clearly not purely a financial one. Consumers may forget to take their bags shopping or may also take into account the utility or value they gained from using different bag types,[28] comparing this value to the price of each type of bag in order to select the best option for them in a given situation. Further information on the approach to monetising the value of utility is provided in Appendix 4.

4.47 The net impact of the charge on consumers depended on the net change in expenditure and the net change in utility, summed across all consumers, between the 'with charge' and 'without charge' (i.e. counterfactual) scenarios. As an illustration, based on bag demand profiles for 2014, it is estimated that consumers paid a total of £17 million for carrier bags (with £6 million of this going to charity) versus a cost of approximately £4.5 million if no charge was in place; an overall shift of £12.5 million. Therefore consumers would have to gain a net improvement in utility from the switch to re-usable bags valued at least £12.5 million in order for the net impact on consumers to be positive. The results presented in Figures 4.18 and 4.19 illustrate an estimated cumulative net benefit to the population[29] of between £0.5 million (high scenario) and £4.1 million (low scenario) for the period October 2011 to January 2015 as a result of some consumers using fewer SUCBs. These net benefits to consumers represent only the change in utility value to consumers (expenditure has been excluded as it is a transfer between economic operators)[26] [27] and, in order to act as a direct comparator, have been estimated based on methodologies developed for the RIA.[30] The RIA method

[28] That is the value that a consumer places on using a particular bag, for example, based on its convenience (having to remember it for every shop), strength or attractiveness.

[29] Taking into account the fact that some consumers still pay the charge and use SUCBs.

[30] Welsh Government (2010) *Regulatory Impact Assessment on the proposals to introduce a single use carrier bags charge*. [Online]. Available at: http://gov.wales/topics/environmentcountryside/epq/waste_recycling/substance/carrierbags/regulatory-impact-assessment/?lang=en

estimates the utility benefit associated with the combined effects of SUCB reduction and switching to bags for life.

Figure 4.18: Annual net costs or benefits associated with the change in consumer utility with the introduction of the charge

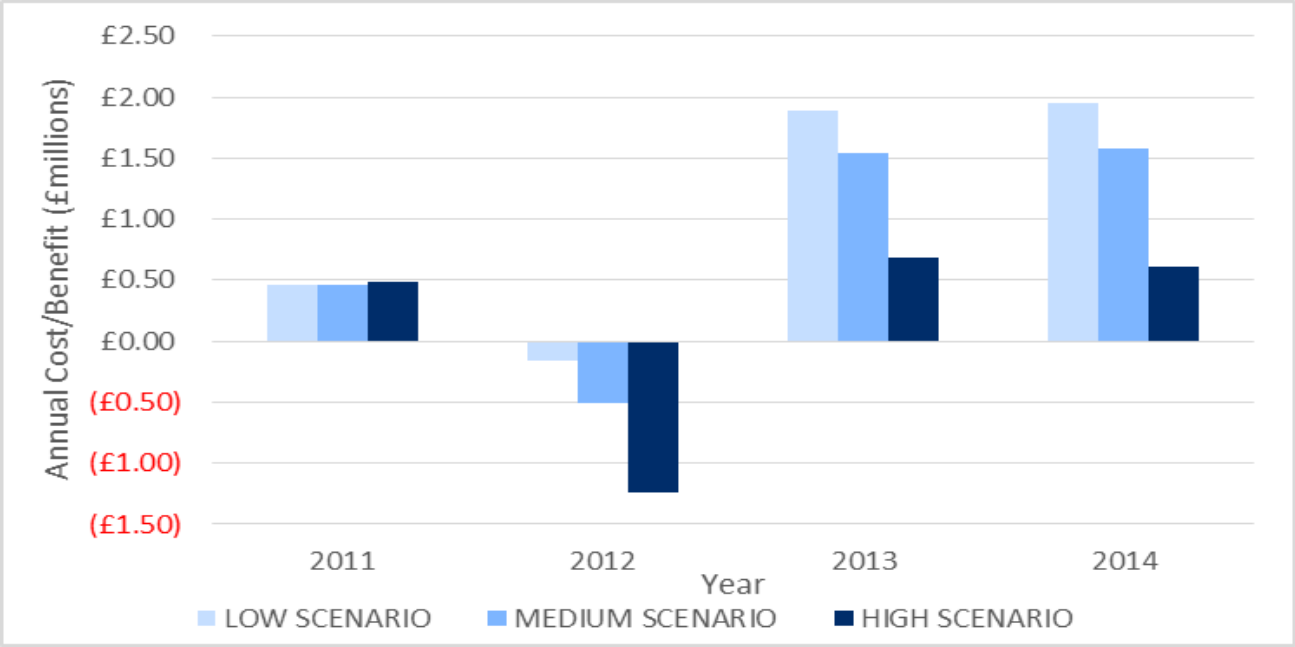
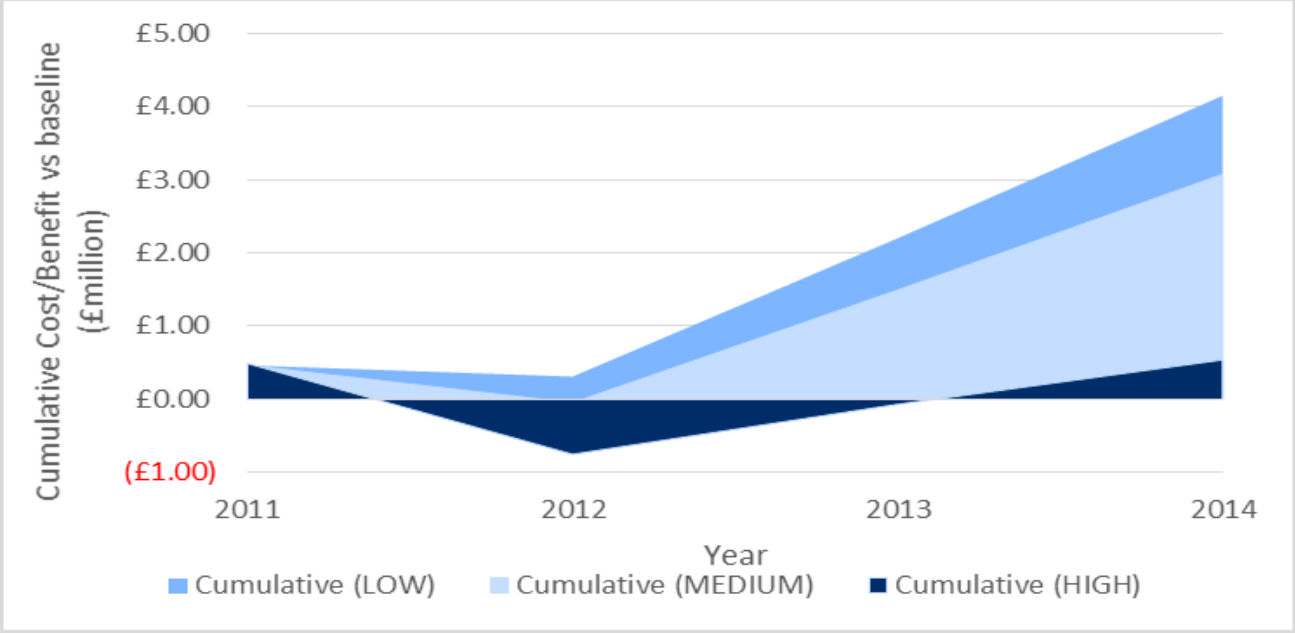


Figure 4.19: Cumulative consumer utility costs and benefits versus the baseline (no charge implementation) as a result of policy implementation



4.48 In conducting this analysis, various assumptions were made regarding consumer behaviour e.g number of times on average each bag type is re-used and the relative lifetime cost differential (difference in the cost of bags taking into account the number of re-uses) between bag types, and as such this analysis is sensitive

to variations in these factors . As such, variables that influence this have been sensitivity tested to establish how they may alter the outcomes of the impact analysis for this measure. Further details of the sensitivity analysis[31] are presented in Appendix 4.

4.49 However, even though the overall monetary value of the net impact on consumers is sensitive and difficult to quantify, it is an important effect since as noted above, the RIA[32] estimated the value of this benefit to be between £21 million and £32 million per annum. This evaluation suggests that the RIA estimate of potential consumer benefits may have been an overestimation however, estimating annual impacts for 2013 and 2014 of around £1.5 million.

4.50 The difference between the net impacts estimated in the RIA and in this Study arises due to two factors: firstly, differences in the price assumed for bags for life and secondly, differences in the estimated uptake of bags for life.

4.51 In the RIA, the average cost per bag for life was estimated to be 16 pence per bag versus a figure 28 pence per bag estimated by this Study (calculated average of reported bag sales). This difference means that although the extent to which bags were re-used assumed by the RIA and as reported by this Study was found to be similar (ratio of one SUCB to 14 re-usable bags), the benefits to consumers per bag for life bought are significantly lower in this Study, resulting in the reduced overall positive impact.

4.52 A difference in the rate of uptake and substitution also explains the net loss of utility in 2012 as modelled for this Study. As can be seen in Figures 4.18 and 4.19, as consumers shifted rapidly away from SUCBs in the 2011 and 2012 period, uptake in demand of bags for life developed more slowly. The benefits accrued from greater bag for life use therefore only begin to outweigh the lost utility from reducing demand for SUCBs from 2013 onwards.

4.53 As a result of the reduced net impact on consumers estimated for this Study, when the negative impacts of lost consumer convenience in reduced SUCB use are subtracted, the net impact on consumers has been estimated to be of a lower order than initially projected in the RIA.

4.54 However although differing in magnitude, the overall direction of the estimated benefit is the same in both the RIA and this Study.

4.55 In order to test whether the charge had the effect of increasing consumer knowledge and understanding of the rationale for the charge, the evaluation assessed how the demand for bags has developed over the period. Where consumers better understood the environmental and social costs associated with

[31] Sensitivity analysis is detailed in section 2.44

[32] Welsh Government (2010) *Regulatory Impact Assessment on the proposals to introduce a single use carrier bags charge*. [Online]. Available at: http://gov.wales/topics/environmentcountryside/epq/waste_recycling/substance/carrierbags/regulatory-impact-assessment/?lang=en

using SUCBs, the authors theorised that this would translate into a sustained trend in reducing SUCB sales (or at least a growth rate that is below that anticipated in the counterfactual scenario) over the evaluation period. It was theorised that consumers would respond instantly to a change in price, but that changes in behaviour (in response to greater knowledge) may take more time to materialise. As such, any change in bag demand after the first few months could be attributed to changing knowledge rather than a fiscal signal.

4.56 As discussed previously, following the introduction of the charge in October 2011 and the initial substantial drop in bag demand, there was a growth in SUCB sales over the following years from 2012 to 2014. This is the opposite of what we would expect if the theory set out in Paragraph 4.54 was correct. The growth rate of demand for bags after the first year under the 'with charge' scenario was estimated to be 14% above that of the counterfactual sales volume growth of 2%. Although the evaluation only represents three years of data, if this trend in familiarisation with the charge were to continue then the benefits of the policy in reducing SUCB use could be gradually eroded, as the difference in the demand for bags narrows between the 'with charge' and counterfactual scenario. However, as this happens at least the 5 pence charge now applied to bag purchases should, to some extent, cover the externalities associated with the environmental damages caused by the production and consumption of SUCBs.

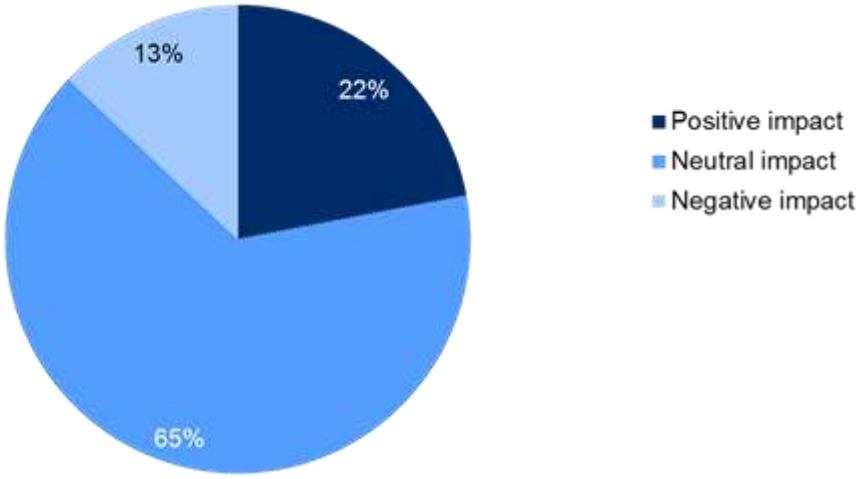
5 Findings – Impacts on Retailers

5.1 Almost two in three retailers issuing SUCBs to consumers in Wales that took part in the survey (65%), said that the charge has had a neutral impact on their business (Figure 5.1). Just over one in five retailers (22%) said that the charge has had a positive impact, while 13% said the charge has had a negative impact.

5.2 There are some differences in the reported impact of the charge across retailers. For example, a greater proportion of retailers with a turnover of more than £200,000 per annum reported that the charge had a positive impact (31%), compared with those with a turnover of less than £200,000 per annum (16%). By contrast, there was little variation in opinion by the retail sector, with the balance of positive/negative responses similar across food and drink retailers, non-food and drink retailers and takeaways.

Figure 5.1: What impact do retailers say the charge has had on them, overall?

Q16. Taking everything into account, which of the following would you say best describes the impact on the business of charging for all single use carrier bags?



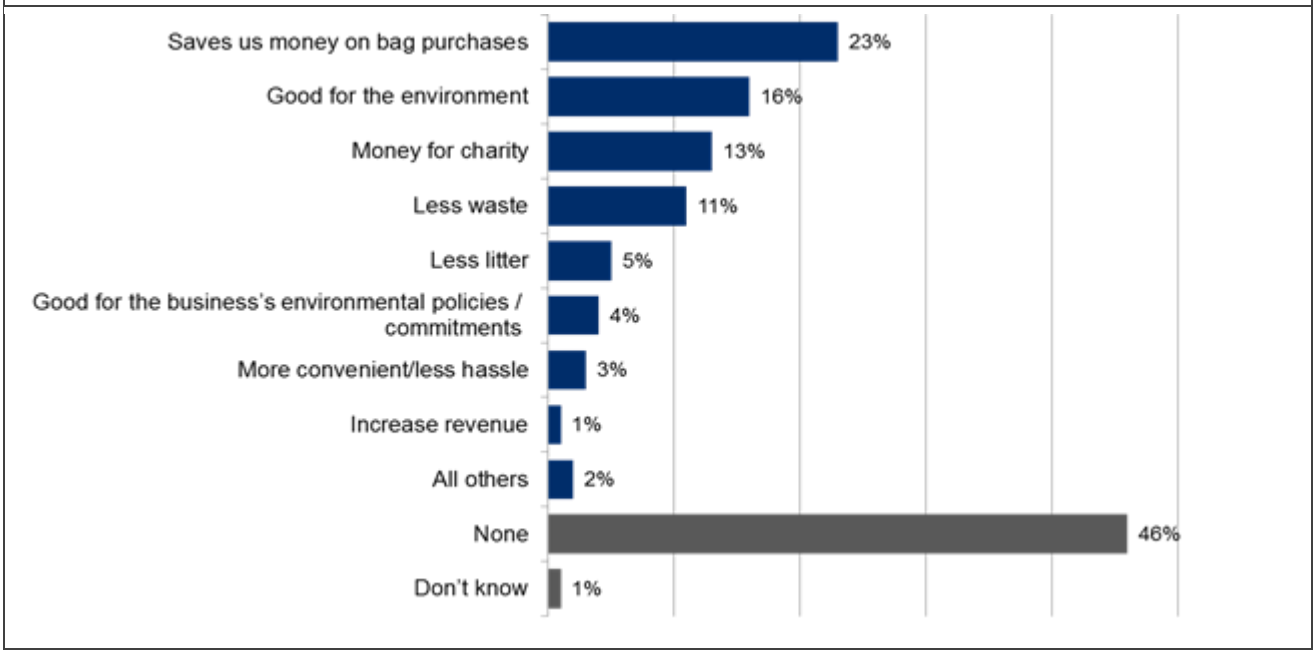
Base: All retailers issuing SUCBs (504), February/March 2015

5.3 Feedback about the SUCB charge received via the retailer focus group was generally positive, with many reporting that business costs had reduced as a result of the charge as fewer bags were being purchased. An example of this was where previously they would have purchased a range of different bag sizes, they now felt able to limit the different sizes of their bags to one or two. It was also noted that there was a difference of opinion regarding the quality of bags with one attendee saying the quality and size have remained the same, before and after the charge, whilst another highlighted that a better quality of bag was now supplied, as the retailer believed that customers expected a better quality bag as they were now paying for it.

5.4 Turning to the perceived benefits and disadvantages of the charge to retailers, survey respondents were initially asked about these unprompted and in both cases the most commonly cited response was 'none' – 46% of retailers reported that they experienced no benefits to their business (Figure 5.2), while 59% reported that they experienced no disadvantages to the business (Figure 5.3). This reflects the response reported above in Figure 5.1, where retailers reported the charge having a largely neutral impact.

Figure 5.2: What are the perceived benefits of the charge?

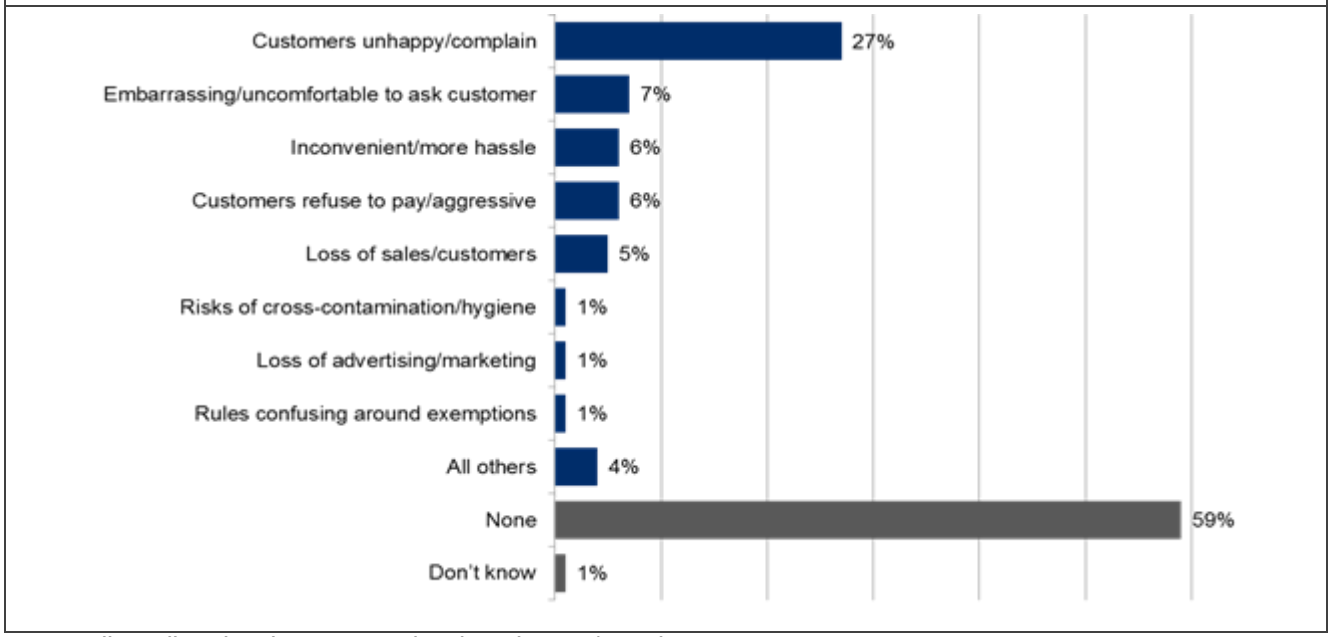
Q17. In what ways, if any, would you say the charge has benefited the business?



Base: All retailers issuing SUCBs (504), Feb/March 2015

Figure 5.3: What are the perceived disadvantages of the charge? (unprompted)

Q18. In what ways, if any, would you say the charge has been a disadvantage to your business?



Base: All retailers issuing SUCBs (504), February/March 2015

5.5 When asked, unprompted, about the benefits of the charge, the answer given by the greatest proportion of retailers (23%) was that it saved them money on bag purchases, followed by those who said it was good for the environment (16%) and generated money for charity (13%). Just over one in 10 (11%) identified the benefit of less waste and one in 20 (5%) cited less litter.

5.6 Turning to the disadvantages, the most common issue related to customer unhappiness/complaints – cited by 27% of retailers issuing SUCBs in Wales. Aside from this issue, the remainder of the disadvantages that were identified were raised by 7% or less of respondents.

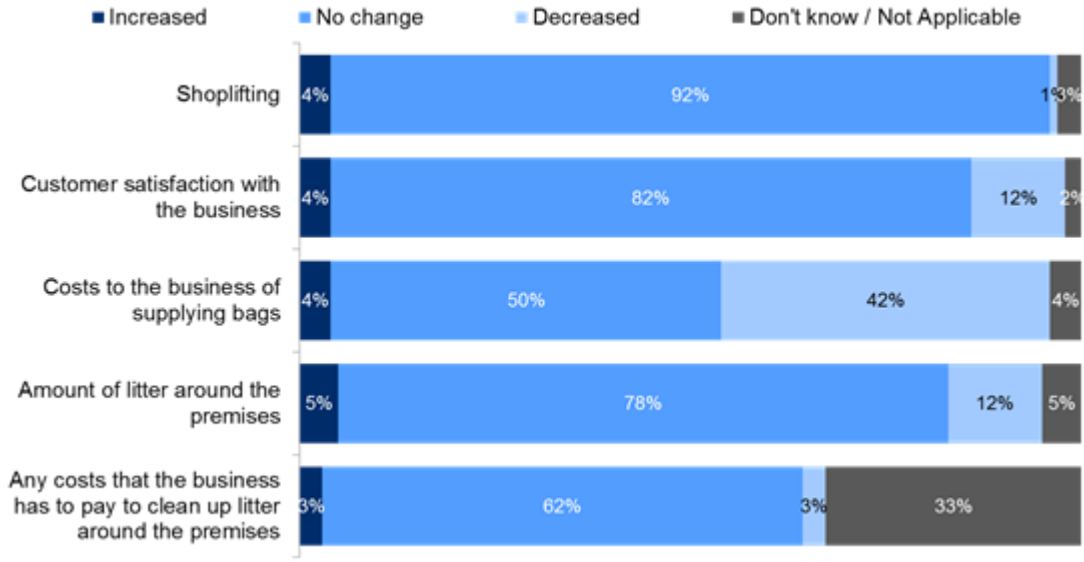
5.7 The survey also explored five issues by directly prompting them – shoplifting, customer satisfaction, the cost of supplying bags, litter and any costs the retailer has to pay in respect of cleaning up litter around their premises.

5.8 The results (Figure 5.4) largely confirm the neutral or slightly positive impact of the charge. For example, 92% of retailers said that the introduction of the charge had no impact on levels of shoplifting (versus 4% who reported that it had led to an increase, 1% who said it has led to a decrease, and 3% that didn't know). On the subject of litter, around four in five (78%) reported no change, 12% a decrease, 5% an increase and 5% that didn't know. The most positive impact on retailers issuing SUCBs is in respect of the cost of supplying bags - 42% reported that the cost had decreased since the introduction of the charge (versus 4% who said that the cost had increased, 50% who said that there had been no impact and a further 4% that didn't know).

5.9 The issue of shoplifting was raised in the retailer focus group. Retailers recalled that in the past, if someone walked into a shop with a bag for life they would assume there was the possibility that they could be a shoplifter. As a result of the charge this type of identification has become increasingly difficult.

Figure 5.4: What impact has the charge had on key issues?

Q19.Thinking about the impact that the introduction of the bag charge in 2011 has had, would you say it caused an increase, decrease or has had no impact on …



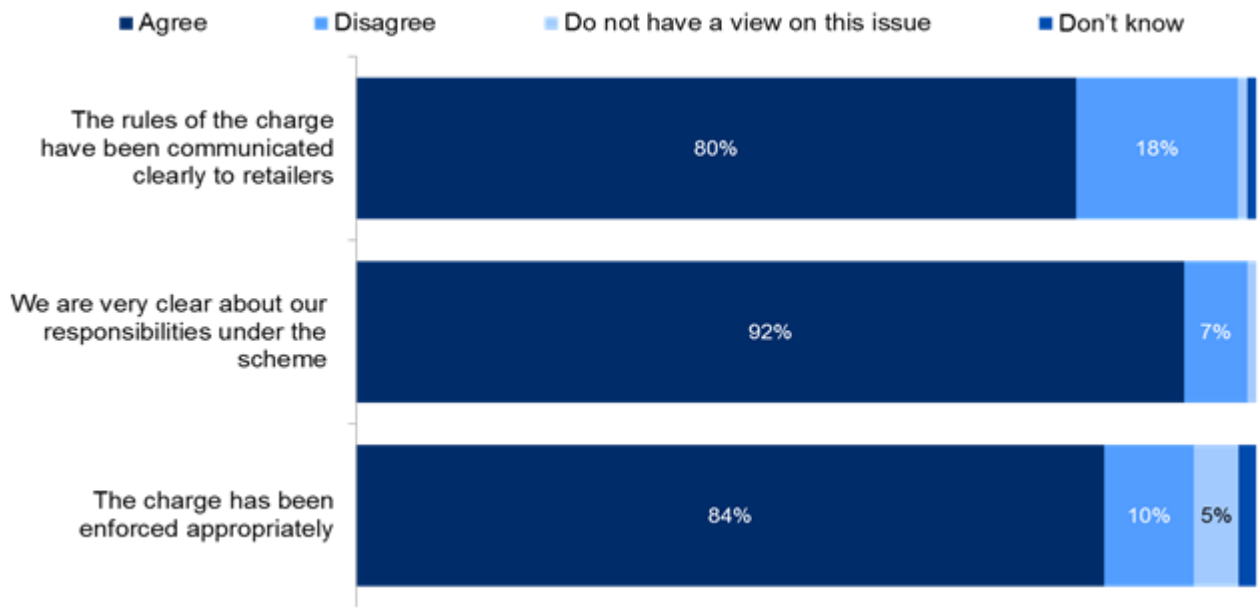
Base: All retailers issuing SUCBs (504), February/March 2015

5.10 The research suggests the charge has been well administered (Figure 5.5). For example, four in five retailers issuing SUCBs (80%) agreed with the statement '*the rules of the charge have been communicated clearly to retailers*', compared with 18% who disagreed (whilst the other 2% of respondents did not have a view on this issue or didn't know). Furthermore, over nine in 10 (92%) agreed with the statement '*we are very clear about our responsibilities under the scheme*'. Retailers issuing SUCBs in Wales also appear comfortable with the enforcement regime – over four in five (84%) agreed with the statement '*the charge has been enforced appropriately*'.

5.11 Results from the retailer focus group also supported this; the group reported that the SUCB charge awareness campaign was consistent across all types of goods and shops, with a consistent marketing approach. Therefore, consumers understood what was happening and were prepared before the charge was introduced. Feedback from the focus group highlighted that some shops continue to display the posters as a reminder for tourists visiting Wales.

Figure 5.5: What impact has the charge had on key issues?

Q19.Thinking about the impact that the introduction of the bag charge in 2011 has had, would you say it caused an increase, decrease or has had no impact on …



Base: All retailers issuing SUCBs (504), February/March 2015

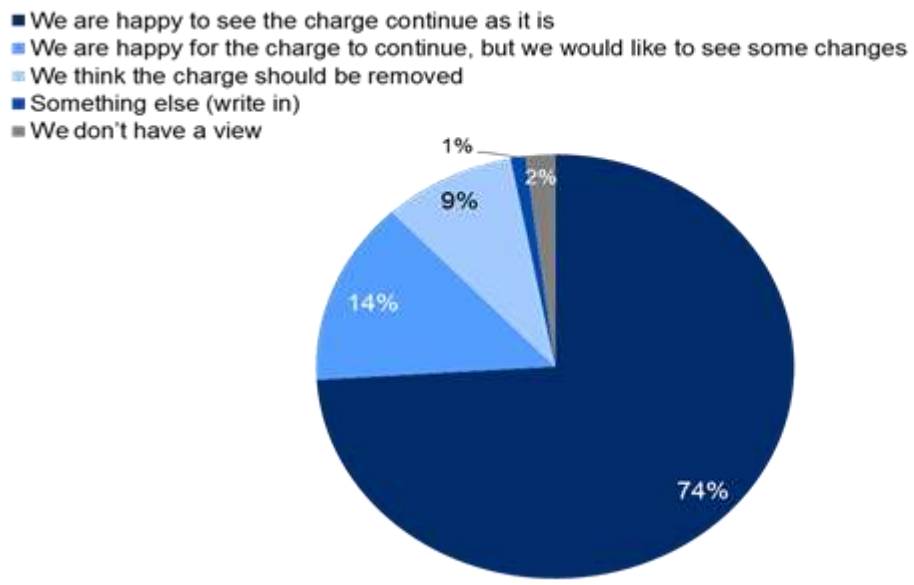
5.12 Retailers reported spending relatively little time administering the charge in the past year. Over half (58%) said that they had spent no additional time administering the charge over the past year, while a further 27% said that they have spent one day or less.

5.13 It is worth noting that retailers who attended the focus group stated that the importance of staff training should not be underestimated, as they have the responsibility to communicate the charge to customers. It was identified that initially there had been some staff reluctance to promote the scheme.

5.14 With regards to the charge moving forward, the majority of retailers issuing SUCBs in Wales – close to three-quarters (74%) – said that they were happy to see the charge continue as it is (Figure 5.6). A further 14% said that they were happy but would like to see some changes, while around one in 10 (9%) said that the charge should be removed.

Figure 5.6: What do retailers think about the charge going forward?

Q23. Thinking about the charge going forward, which of the following statements is closest to your view?



Base: All retailers issuing SUCBs (504), Feb/March 2015

5.15 Among those retailers who agreed that that they were '*…happy for the charge to continue, but would like to see some changes*', the most requested change was for additional exemptions for certain kinds of retailers (cited by 45% of this group). Other propositions included charging for only plastic SUCBs (18%), providing more information for retailers (15%) and more information for consumers (10%).

Economic Evaluation

5.16 The implementation of the policy has had three key impacts on the balance sheet of retailers: changes (likely increases) in revenues associated with bag sales (now including SUCBs sold with a 5 pence charge), changes in costs of purchasing bags from wholesalers, and the cost of charitable donations. However, these financial flows act as transfer payments redistributing money between economic operators: for example, where a consumer now pays 5 pence for a SUCB, this is a cost to the consumer of 5 pence and a benefit to the retailer of 5 pence. Hence given this economic evaluation has been undertaken from the perspective of society as a whole, these effects were considered to cancel out without generating additional value or an overall net effect to the economy or society, and so have not been taken into account.

5.17 Additional costs to retailers associated with the administration of the charge have been captured within this evaluation. These administrative costs arise from the requirement of firms to implement additional data capture systems and staff time to record bag sales information.

5.18 An estimate of this additional cost to retailers has been made based on estimated staff time spent on specific bag reporting tasks as recorded through the retailer survey. From this survey, it was apparent that the majority of retailers spent less than a day of staff time implementing the charge per year. The average figures per sector and company size ranged from 0.16 to 0.84 days per year. When this is scaled to the population of retailers in Wales, and assuming an average daily income of retail workers of £65 (ONS AWE data)[33]), total administrative costs of the charge have been estimated to be less than £0.18 million per annum.

5.19 In comparison to the RIA this is significantly lower than the anticipated cost to retailers, which was initially estimated to be in excess of £0.9 million per year. Although there is some additional pressure put on retailers in terms of administration, it is likely that systems used by retailers have been installed in a manner that efficiently records and captures the carrier bag sales data as required by the regulation to minimise the impact.

[33] Office of National Statistics average weekly earnings data: Available from: www.ons.gov.uk/ons/rel/lms/labour-market-statistics/april-2015/dataset--earnings.html

6 Findings – Impacts on Suppliers of SUCBs

6.1 All of the organisations that provided feedback were suppliers of bags and did not directly manufacture the bags, though some did offer personalised design and printing services. A bag manufacturer was contacted but would not provide any feedback citing commercial sensitivities.

6.2 Most of the organisations supplied bags to all of the UK and only one organisation supplied bags to customers in Wales only.

6.3 All organisations noticed a change in the number of SUCBs purchased since the charge was introduced. One organisation stated that they had noticed a drop in printed SUCBs specifically, as retailers were seen to be purchasing plain bags to further reduce costs.

6.4 Prior to the charge being introduced one organisation reported some confusion around the types of bags to which the charge would apply, and believed that the charge was being applied to polythene bags only. As a result some clients, who thought the charge would not apply to paper bags, not only spent money on purchasing paper bags but also incurred further expenditure by using the opportunity to invest in printing new designs on their bags.

6.5 The one organisation that only supplied SUCBs in Wales described the impact on the number of SUCBs sold as 'devastating'. Despite this initial reaction, the organisation diversified their product range. Prior to the charge, SUCBs accounted for 25% of their sales and now it is approximately 2%. The organisation stated that the SUCB charge has had an impact on their turnover, however they reported no jobs had been lost.

6.6 It was noted by one organisation that the retailers are very concerned with the image of their businesses and their advertising on printed bags is very important.

6.7 Most of the organisations already supplied bags for life such as jute, cotton or non-woven bags before the introduction of the charge and some have noticed an increase in demand across the UK, which has not affected the high demand for SUCBs outside Wales. Another organisation found that it had limited demand due to larger food retailers offering bags for life at relatively low prices.

6.8 The results of this qualitative feedback suggest that businesses in Wales involved in the supply of SUCBs have been impacted by the charge. However, further research is required to gain additional feedback from the sector.

Economic evaluation

6.9 Impacts on business arise at a series of levels through the supply chain:

- Changes in costs and revenues to manufacturers of different types of bag: those dealing exclusively with SUCBs and paper carrier bags would see a

loss of trade, whilst those dealing exclusively in bags for life made of plastic or cotton would see trade increase.

- Changes in costs and revenues of wholesalers: these are considered likely to be less sensitive than manufacturers as they will naturally stock a wider range of products.

6.10 In common with the impacts for retailers, many of the effects on manufacturers and wholesalers associated with the policy act as transfer payments, redistributing money between economic operators. Again, given the economic evaluation is undertaken from the perspective of society as a whole, these financial transfers have not been considered in this evaluation as they generate no additional value to the economy as a whole. For example, the 5 pence charge has reduced demand for SUCBs, which in turn has delivered cost savings for retailers which now purchase fewer SUCBs. However, this reduced cost for retailers will be 'cancelled out' by reduced revenues for suppliers.

6.11 Although from a societal perspective these affects net out, this overlooks potentially important trends within the sector. There is the potential for distributional issues between firms, for example some companies are affected more than others (e.g. manufacturers of plastic bags relative to manufacturers of re-useable bags), and where affected businesses are located. That said, the evidence from the surveys suggests that such effects are limited. Further, there may be some impact on employment by bag manufacturers: however, in economic appraisal from a societal perspective, this is balanced by this resource becoming available to undertake productive activity in a different sector of the economy, as money saved through reduced bag purchases will be spent elsewhere.

7 Findings – Impacts on Welsh Government and Local Government

Economic Evaluation

Administrative burden of the Welsh Government

7.1 Implementation of the charge requires resource at the Welsh Government level. At the time of the evaluation, it was reported that there were two Full-Time Equivalent staff working on the policy at an estimated gross cost of £79,452 (2015 prices). Since, the activity of these staff was not directly related to the carrier bag charges or demand for bags, this figure has been considered as constant. Therefore although bag demand profiles change, for this evaluation it has been considered that policy administration costs at the Welsh Government level remained at a consistent level throughout the evaluation timeframe.

Administrative burden of local authorities

7.2 In addition to these relatively fixed costs, there have also been variable costs associated with enforcement of cases of non-compliance. Currently, the legislation provides a power for local authorities to enforce the carrier bag charge. It should be noted that this power is different to a duty; duties are accompanied by finance to enforce compliance, whereas powers are not. Local Authority Trading Standards departments are responsible for enforcing over 100 pieces of primary legislation, and many more Regulations and Orders. They respond to intelligence from other agencies, businesses or complaints from the public; therefore their activity directly relates to complaints made and intelligence received. Once non-compliance is identified, the trader will be provided with advice in order to achieve compliance. It is only when advice and information is ignored or repeated mistakes are made, that enforcement tools will be used.

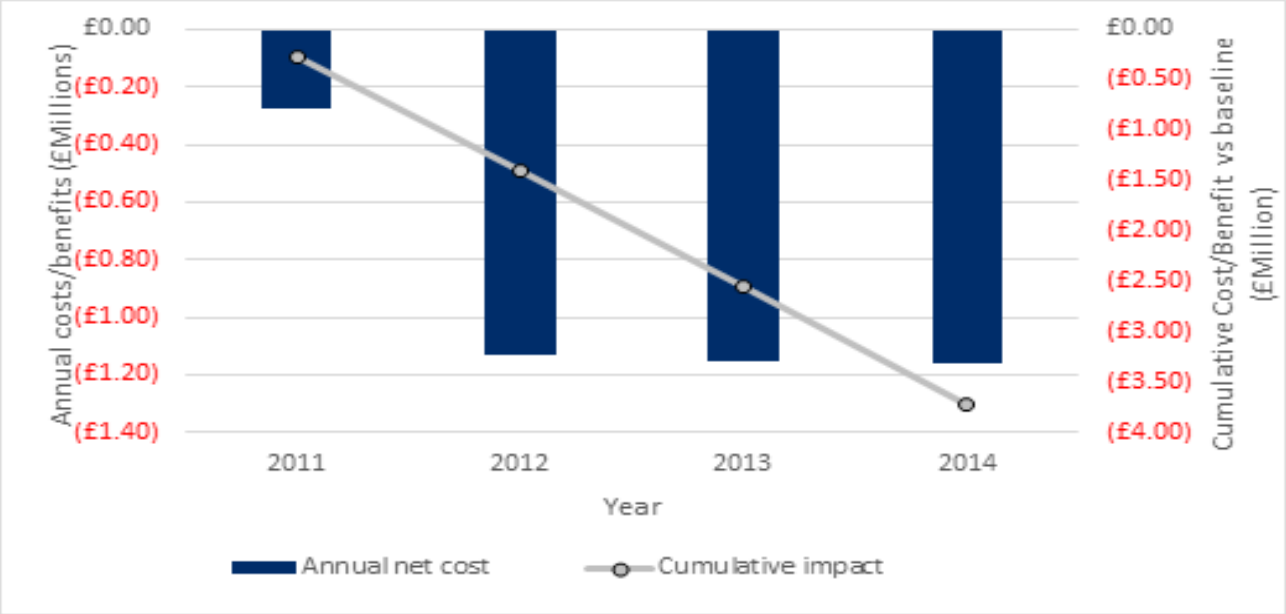
7.3 Since the introduction of the charge in October 2011 and, up to February 2013, 25 complaints have been received by Trading Standards from consumers across Wales. All were investigated and nine of these were deemed justified. Four complaints were received from businesses about other businesses; two were justified. In addition, 141 requests for advice were received from businesses regarding their obligations. Eleven requests for advice were received from consumers regarding the Regulations and 127 enforcement contacts have been made with businesses. This includes proactive inspections, test purchases and reactive visits as a result of complaints received or letters of advice issued.

7.4 These activities will have had an associated compliance cost. This was estimated as £1 million per annum in the Welsh Government SUCB 2010 charge impact assessment. From correspondence with the Welsh Government, we understand that the level of activity which actually occurred in the evaluation period has not been greater than that anticipated in the RIA. This is supported by the survey results undertaken which highlighted that it was rare for consumers not to be charged for SUCBs, and where this did occur consumers were unlikely to raise it

as an issue with Trading Standards. As a result, within this evaluation the initial estimate of £1 million per annum has been adjusted for inflation but otherwise maintained as constant within the evaluation timeframe. Figure 7.1 shows the annual costs and benefits resulting from administrative burden and enforcement costs.

7.5 This impact category was subject to sensitivity testing (with the results presented in Appendix 4) as it is considered highly likely that costs may have been much lower than originally estimated. This is because although issues have been raised, evidence gathered as part of the evaluation suggests that only limited legal and enforcement activity has been undertaken. The difference could have been as high as £3 million across the timeframe of evaluation. If this is the case then the net benefit and the cost benefit ratio of the policy will be higher as a result of lower costs associated with reduced investments of public funding, representing more efficient and effective policy implementation.

Figure 7.1: Annual costs and benefits resulting from administrative burden and enforcement costs



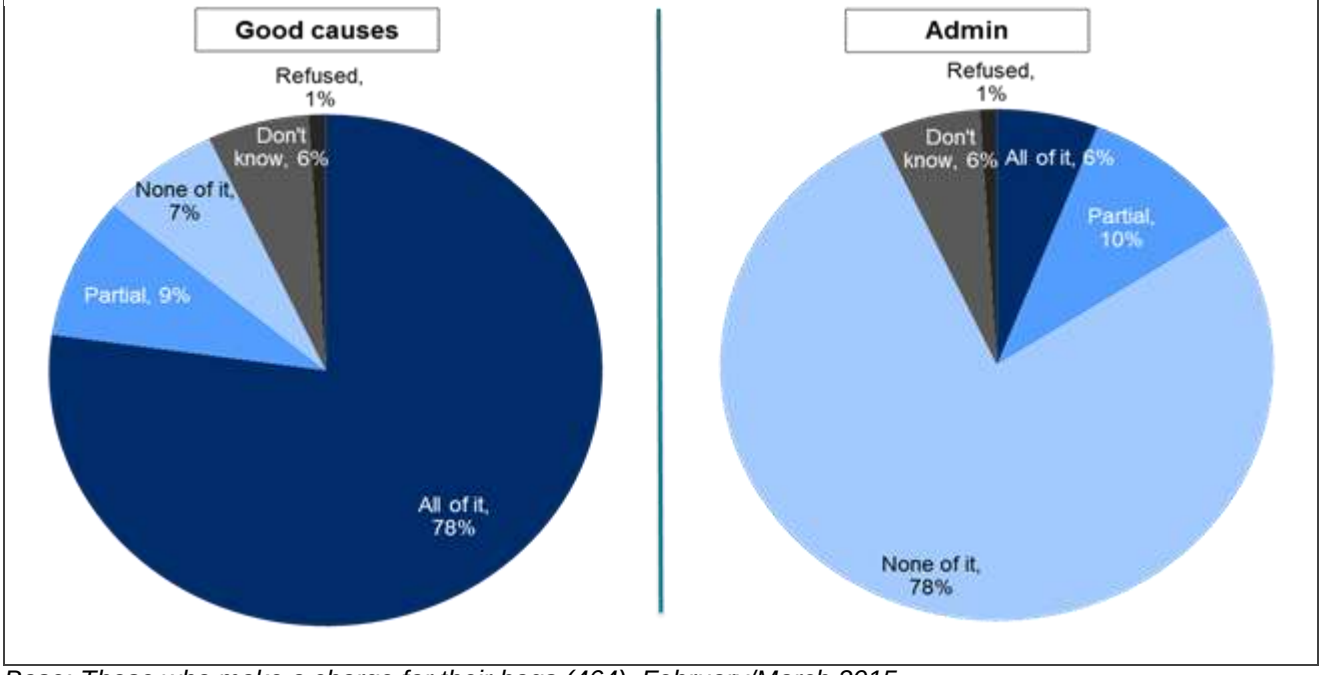
8 Findings – Impacts on Donations to Good Causes

8.1 Figure 8.1 shows that among retailers in Wales who charge for their bags, over three-quarters (78%) reported that they donated all net proceeds to good causes. A further 9% reported that they donated a proportion of the net proceeds to good causes, while 7% reported that they give none.

8.2 Focusing on retailers issuing SUCBs in Wales who reported that they take at least some of the net proceeds for administrative costs (71 of retailers surveyed), close to four in five (81%) cited spending part of the proceeds on the cost of purchasing bags whereas around one in 10 (9%) said they *'use the money to put back into the business/running of the business*'.

Figure 8.1: What proportion of the charge do retailers issuing SUCBs in Wales report is used for good causes and what proportion for administration?

Q10. Ignoring VAT and focusing just on the net proceeds from the charge, what proportion of the charge would you say the business sets aside for charitable donations and what proportion for general administration/business costs? A broad estimate is fine.



Base: Those who make a charge for their bags (464), February/March 2015

8.3 Just over half (54%) of retailers giving the net proceeds to a good cause reported that they donate to a single organisation. A proportion (19%) reported that they give to two good causes, while one in four (25%) said that they give to three or more. Looking at the type of good cause to which the proceeds were donated, two- thirds of retailers (67%) give to a health/disability cause followed by 'local community causes' (29%) and causes focused on young people (10%). Around one in 20 (6%) gave to environmental causes.

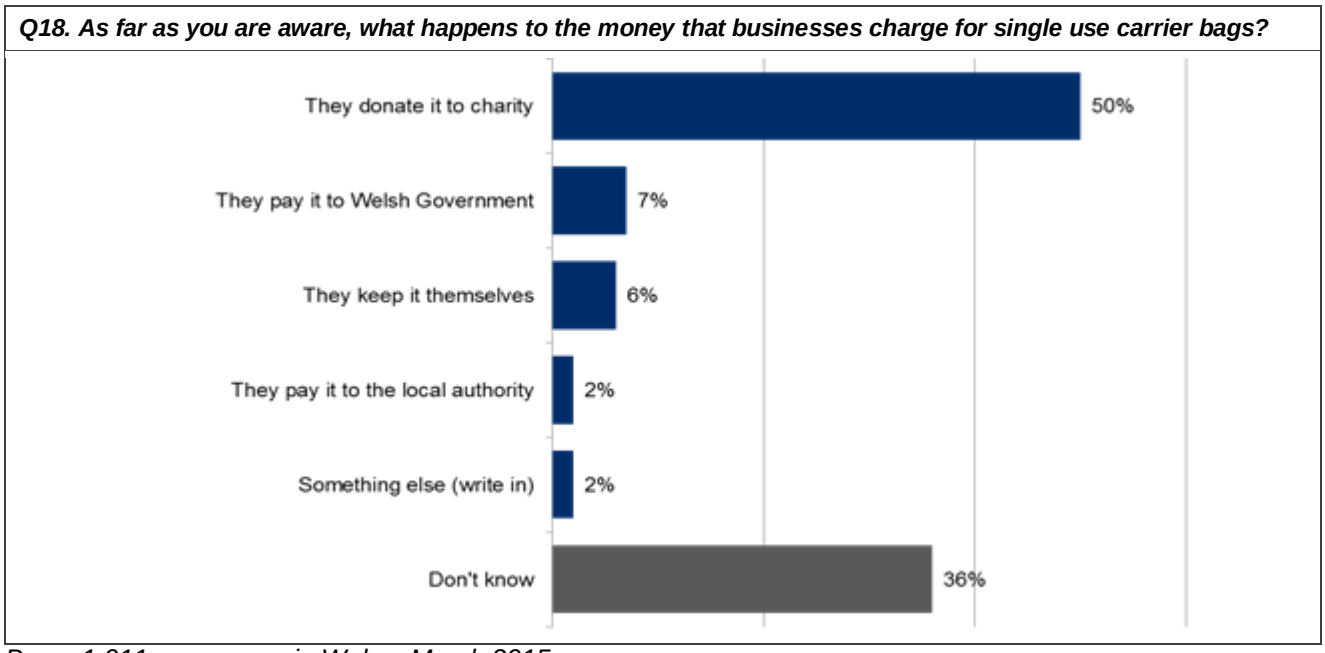
8.4 Feedback from the retailer focus group and additional discussions with retailers, highlighted a number of approaches for distributing the net proceeds of the charge. For example, one large retailer reported that they invite submissions from good causes and had supported in excess of 250 organisations since the introduction of the charge. In contrast, other large retailers reported that the net proceeds of the charge was distributed to a smaller number of good causes. One takeaway reported that it kept a number of charity boxes on its counter so that customers could choose which charity they wished to donate their 5 pence charge to; they found that this approach resulted in greater donations, as consumers tend to donate more than 5 pence.

8.5 Of retailers issuing SUCBs in Wales that donated net proceeds to good causes, 3% said that the donation was in place of other donations to good causes that they had been making previously. The retailer survey demonstrated that, in the majority of cases, the donation was either in addition to pre-existing donations (reported by 68% of retailers) or was the only donation they made (27%). There was some variation in the trend observed across the retail sector, with a higher proportion of food and drink retailers reporting that their donation was in addition to pre-existing donations (74%); while takeaways said that it was their only donation to good causes (36%).

8.6 While the findings of the retailer survey provide a positive picture of the charge's impact on donations to good causes, the consumer survey suggests that awareness of the charge's role could be higher. Figure 8.2 shows that at the time of the consumer survey, only half of consumers (50%) said that they thought the proceeds of the charge were donated to good causes. In contrast, 7% said they thought it was paid directly to the Welsh Government and 2% to local authorities, while 6% thought it was retained by retailers. Just over one in three consumers (36%) said that they did not know what happened to the proceeds from the charge.

8.7 Feedback from the retailer focus group suggested that attendees believed that all organisations should publicly report on the number of SUCBs issued, as the data was already recorded by businesses or could be obtained directly from suppliers. One suggestion was for a requirement to display information on the number of bags issued and what good causes had been supported within shops. However, the focus group commented that it would be crucial that any such reporting mechanism would be simple to use to avoid any additional administrative burden on retailers.

Figure 8.2: Awareness of what happens to the charge



Base: 1,011 consumers in Wales, March 2015

Economic Evaluation

Donations to Good Causes

8.8 Another impact category captured in the evaluation was the donations to good causes. This reflects the additional benefits accrued as a result of donations made to good causes via the 5 pence charging scheme's implementation. The first stage of this calculation was to multiply the charge rate (5 pence per bag) by the number of bag sales for single use bag types (paper and plastic SUCBs). This total potential donated to charity was then scaled based on data from the retailer survey regarding what proportion of the charge was actually donated to charity, less any value retained to cover costs of administration. An average donation rate of 87% was used as the key scaling factor in calculating the actual donations made. The results of this calculation are highlighted in Figure 8.3 below.

8.9 Figure 8.4 shows that significant donations to good causes have been made as a result of the implementation of the 5 pence charge across the sensitivity scenarios. The sensitivities also show the expected trend that if bag sales are at the higher end of what is expected, then donations to good causes will be highest.

Figure 8.3: Annual charitable donations

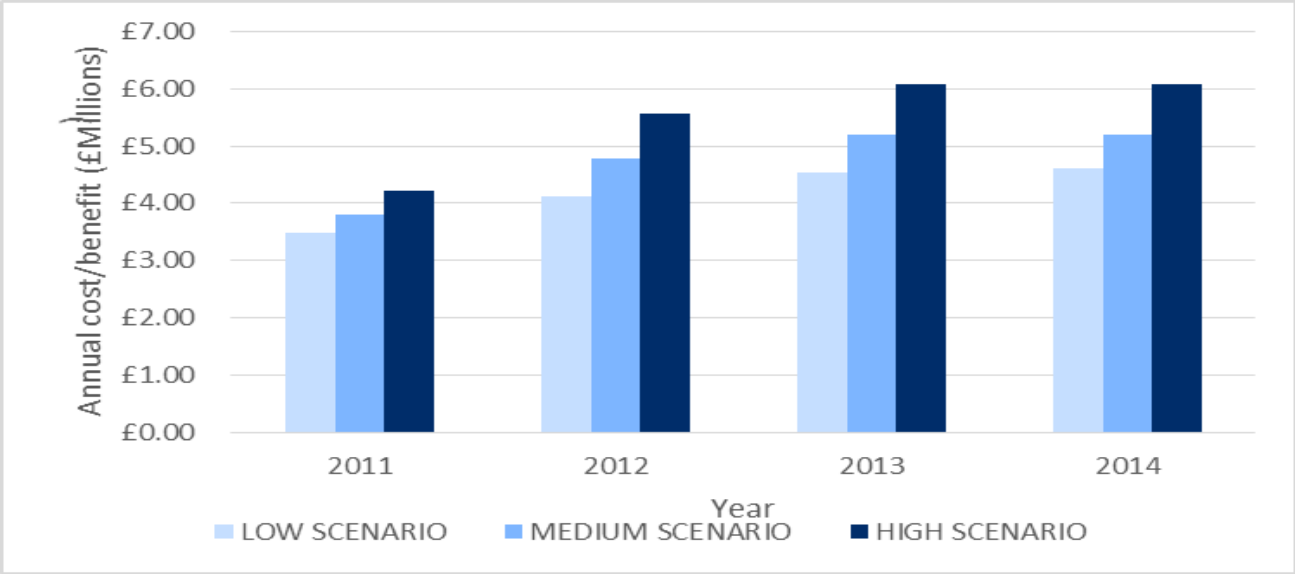
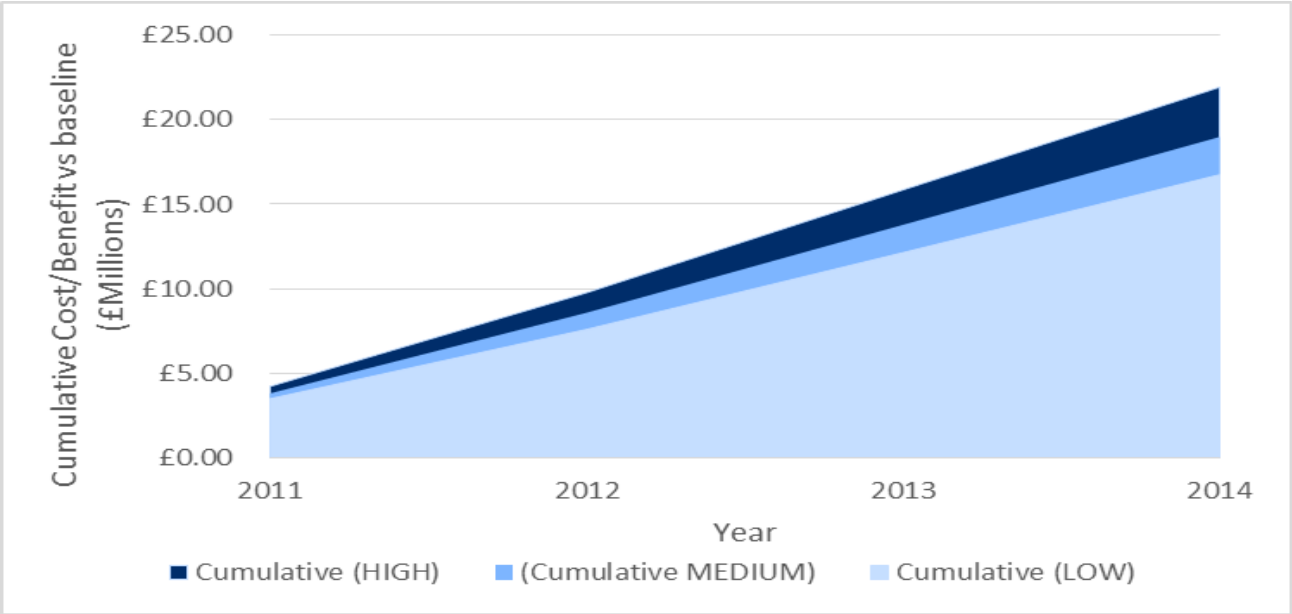


Figure 8.4: Cumulative donations to good causes versus the baseline as a result of policy implementation



Social benefit of donations to good causes

8.10 Charitable donations have two impacts for consideration in the economic evaluation: first the scale of the donations as assessed above, and second the social benefit that these donations deliver.

8.11 Given that the economic evaluation is being undertaken from the perspective of society as a whole, the first of these impacts is excluded from the evaluation given it is a transfer from one section of society to another: the benefit of the donation received by the charity is equally offset by the additional cost to the consumer (via

the retailer). The result is the financial donations themselves do not have a net impact for the Welsh economy. However, the actions and activities that are undertaken by the charities in receipt of the donations will deliver real benefits for society.

8.12 In order to understand this interplay between social benefit and funding transfers, research was undertaken to review literature which aims to quantify the wider social economic benefits of donations to good causes. Work undertaken by Oxford Economics (2012) estimated the social benefit of charitable donations to the voluntary sector to be between £2.60 and £2.90 per £1 donated/invested. This factor highlights the fact that for each £1 donated to the voluntary sector there will be wider economic benefits including job creation, environmental benefits and social benefits from improved education, health and reduced long- term social costs associated.

8.13 The lower bound of this estimate has been utilised in the model developed which represents a net impact of £1.60 of social benefit for each £1 donated. This net effect therefore includes the subsequent cost to the charity of spending the charitable donation received, combined with the benefit delivered. These results are presented in Figures 8.5 and 8.6.

Figure 8.5: Annual net social benefits resulting from donations to good causes

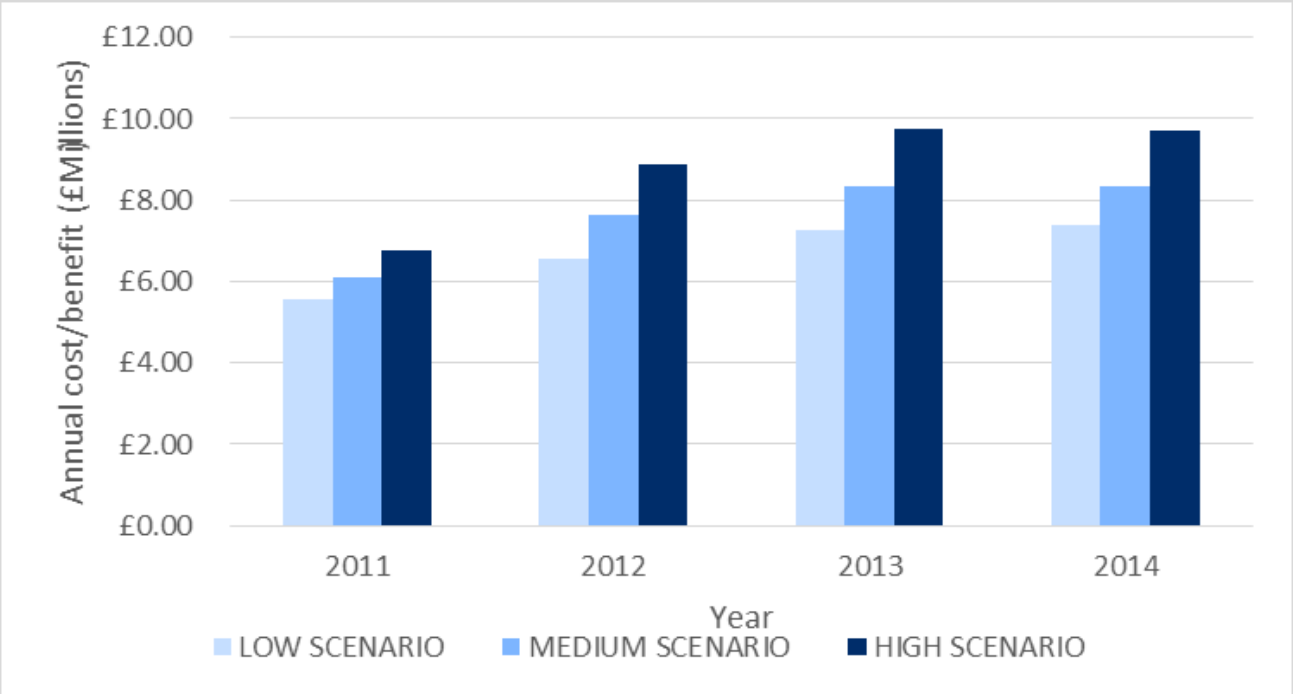
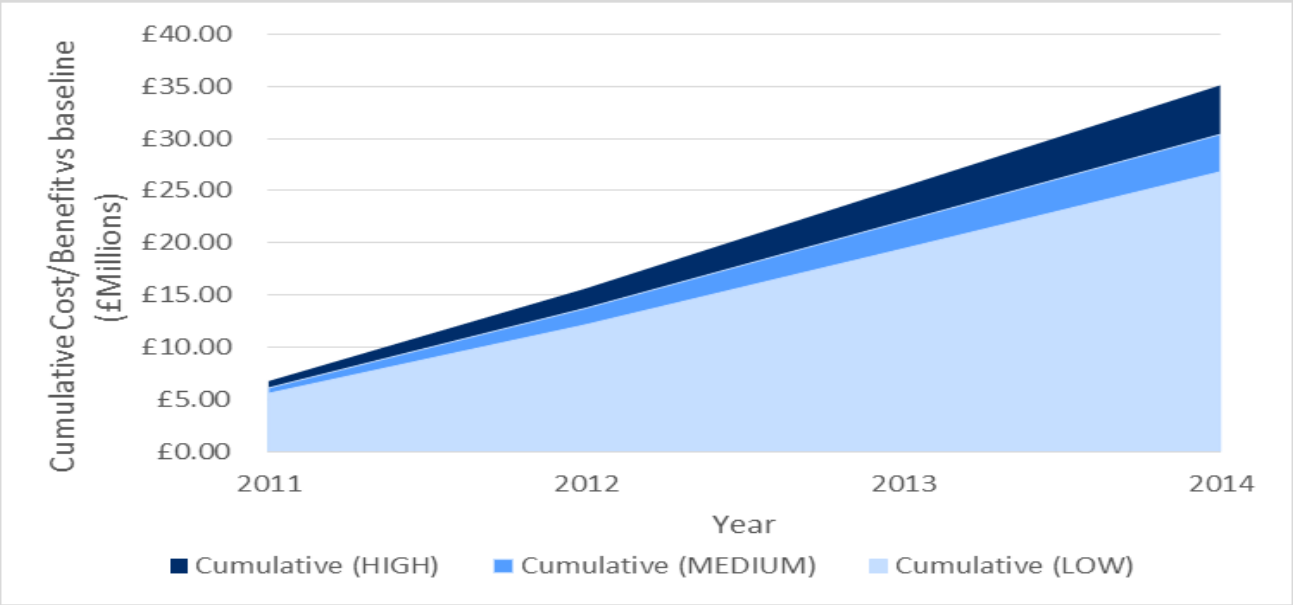


Figure 8.6: Cumulative net social benefits resulting for donations to good causes



9 Findings – Environmental Impacts

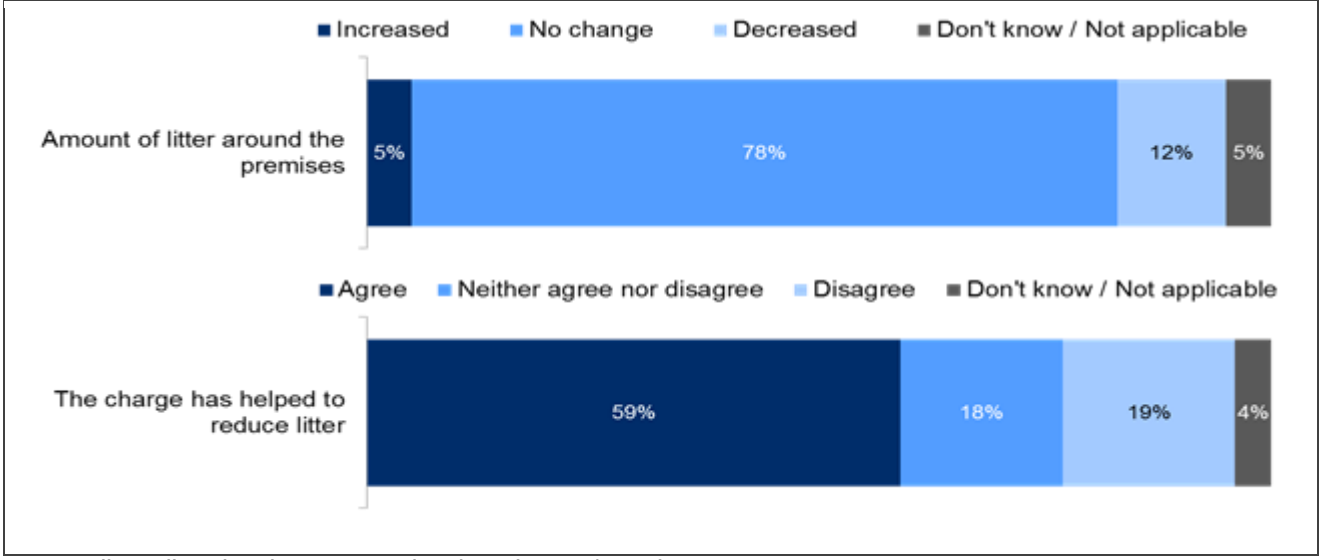
9.1 The findings of the retailer and consumer surveys provide mixed evidence on the impact of the charge on littering, with some responses suggesting the charge has had a neutral impact, whilst others indicated a positive impact.

9.2 As already noted in Section 5.8, almost four in five retailers (78%) reported that the charge has had no impact on the amount of litter around their premises (Figure 9.1). A small minority (5%) reported that littering had increased, whereas 12% reported that litter had decreased. However, when asked a broader question in an agree/disagree format, the neutral impact was less prominent, with over half (59%) of retailers agreeing with the statement *'the charge has helped to reduce litter'*.

Figure 9.1: Retailer perspective on the impact of the charge on litter

Q19.Thinking about the impact that the introduction of the bag charge in 2011 has had, would you say it caused an increase, decrease or has had no impact on …

Q21.To what extent do you agree or disagree with the following statements about the bag charge in Wales?

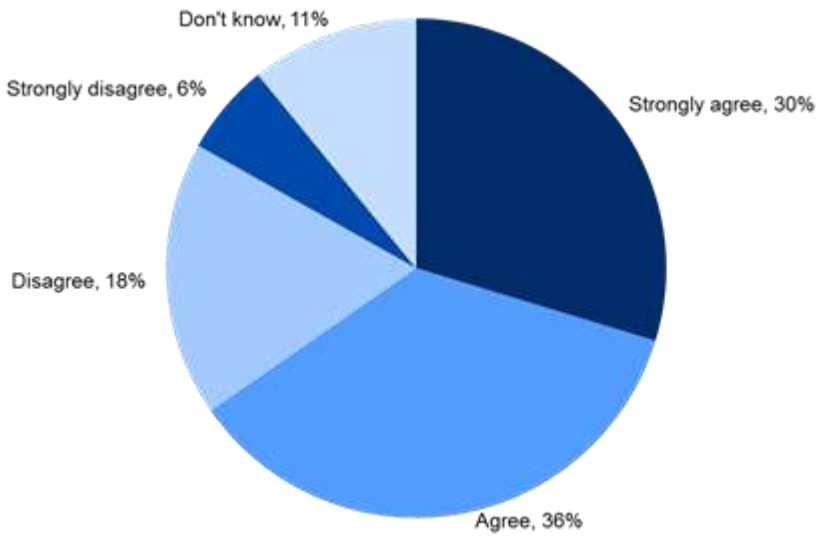


Base: All retailers issuing SUCBs (504), February/March 2015

9.3 Turning to consumers' views, two-thirds (66%) agreed with the statement '*the charge has helped to reduce littering in my local authority area'* (Figure 9.2). In contrast, almost one in four (24%) disagreed with the statement, while 11% said that they '*don't know*'.

Figure 9.2: Consumers' perception of the charge's impact on litter

Q14. To what extent would you say you agree or disagree with the following statements?
The charge has helped to reduce littering in my local authority area



Base: 1,011 consumers in Wales, March 2015

Economic Evaluation

Environmental burdens

9.4 The production, consumption and disposal of carrier bags has a range of associated negative environmental and social effects. These effects have a cost to society: for example, air pollution has a detrimental impact on human health, which in turn implies a remedial cost for health services. Before the implementation of the 5 pence charge, SUCBs were provided for free. As such, the price for SUCBs (or lack of price in this respect) did not reflect these environmental and social costs associated with the production, consumption and disposal of these products. The existence of these wider environmental costs (known to economists as 'negative externalities') which were not captured in the price, create an issue for society: as the price of SUCBs was below what it would have been if these effects were adequately reflected in the market price, the use of SUCBs is higher delivering a consequent larger negative environmental and social impact.

9.5 In the case of carrier bags (and specifically this evaluation), the associated environmental effects include:

GHG Emission of Greenhouse Gases (GHG) with Global Warming Potential

GHG emissions produced in the production of carrier bags has an inherent damage cost in relation to its contribution to long-term global warming impacts. Valued at £4 per tonne of carbon dioxide equivalent[34] (as a result of producers

[34] Department of Energy and Climate Change (2014) *Updated short-term traded carbon values used for UK public policy appraisa*l. [Online]. Available at:

being covered by carbon trading schemes) and scaled to a per bag basis, this provides a range for this impact of £0.0001 to £0.0238 depending on bag type.

Emission of pollutants to air with direct impacts on human health

Similar to GHG emissions, the production of carrier bags also results in emissions of harmful pollutants being released into the atmosphere. These gases (and SO_2 in particular) have a range of associated negative impacts, including to human health, crops and infrastructure in urban environments. Taking a unit damage cost for SO_2 of £1,633 per tonne[35] and scaled to per bag, provides an impact range of £0.0002 to £0.010 per bag depending on bag type.

Litter costs

Plastic bags are of specific concern for litter clean-up costs as their characteristics (lightweight, non-degradable) mean that they are easily dispersed and sometimes difficult to recover from the environment. This can have significant clean-up costs for local authorities or regional action groups, and therefore are included within the evaluation process.

Water pollution

Liquid effluents derived from bag manufacture will require treatment either at the manufacturing plant or off-site at a sewage treatment works prior to release to open waters. The costs of this treatment will be accounted for by manufacturers and hence internalised in the price of bags. As treatment facilities operate to legal limits on discharge, there should be little or no difference in the quality of water sent out after treatment, whether or not water sent to the treatment facility includes discharges from bag manufacturers. Overall, this evaluation has therefore considered that the costs of water pollution will be zero given that this will already be captured in the costs faced by manufacturers. This view of course assumes that bag manufacturers will all be subject to regulation, which may not be the case for bags manufactured outside of the EU. It also takes no account of water pollution arising from littered bags.

9.6 More detailed information on the methodologies utilised for valuation are available in Appendix 4.

9.7 For all of the above impact categories, a set of unit values was derived to capture the combined impact per bag type. These values were based on a combined valuation methodology which utilised LCA data to quantify the scale of the environmental impact and publicly available valuation factors per unit of pollutant. These impact factors were then scaled to produce a unit value per bag for

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360277/Updated_short-term_traded_carbon_values_used_for_UK_policy_appraisal__2014_.pdf

[35] Department for Environment, Food and Rural Affairs (2013). *Air quality: economic analysis*. [Online]. Available at: https://www.gov.uk/air-quality-economic-analysis

inclusion within the evaluation model. The resulting per bag values are presented in Table 9.1.

9.8 On a per bag basis, these carbon impacts and air pollution impacts are worse for more resource intensive production of bags for life. However, the re-usability of these bags and their ability to replace multiple numbers of their single use counterparts, means that the overall impact of shifting to bags for life is of significant benefit to the environment.

Table 9.1: Summary of Environmental unit costs applied in the model

Carrier bag type	CO_2 impact	Air Quality	Water Cost	Littering cost on land	Total per bag	Number of times bag used	Total per use
	£	£	£	£	£	N	£
SUCB	0.0001	0.0002	0.0000	0.012	0.0123	2.03	0.00607
Paper bag	0.0003	0.0009	0.0000	0.002	0.0032	2.60	0.00123
LDPE bag	0.0005	0.0008	0.0000	0.003	0.0043	2.43	0.00177
Non-woven PP bag	0.0013	0.0025	0.0000	0.001	0.0048	5.80	0.00083
Cotton Bag	0.0238	0.0999	0.0000	0.004	0.1247	125.70	0.00099

9.9 Figure 9.3 shows the annual costs resulting from the environmental impacts of carrier bag production between 2011 and 2014. Note that for 2011, the results have been adjusted as the charge was introduced in October 2011.

Figure 9.3: Annual costs resulting from environmental impacts of carrier bag production

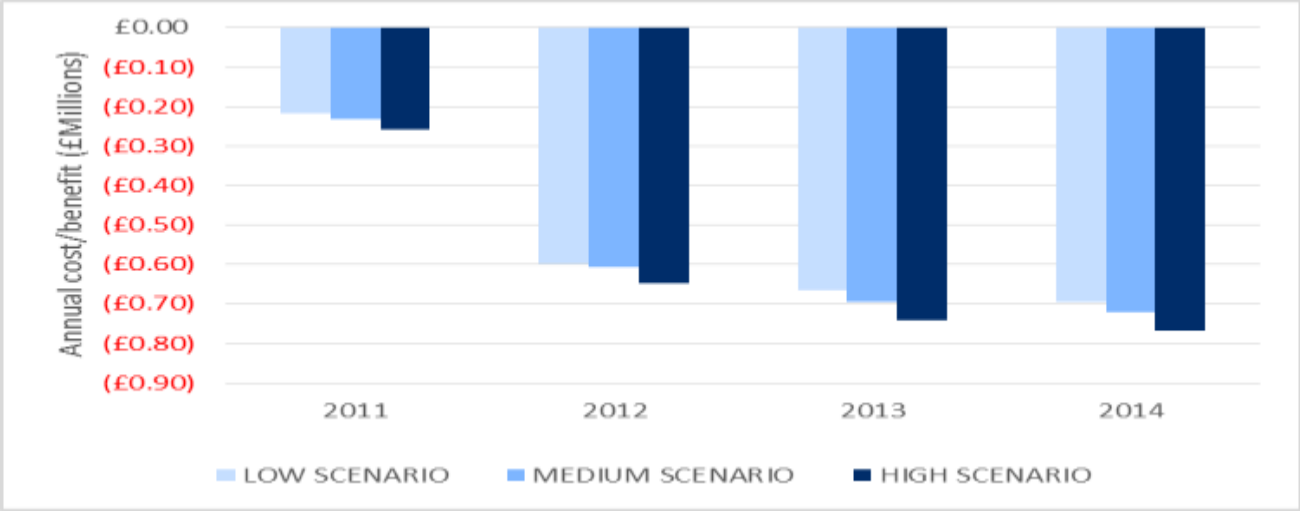
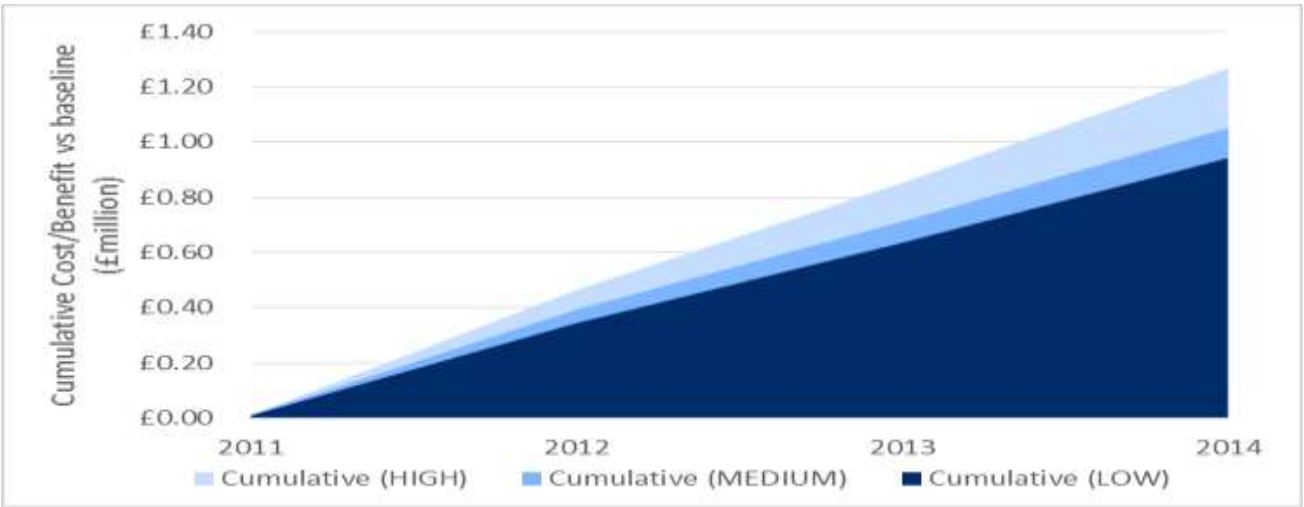


Figure 9.4: Cumulative environmental benefits versus the baseline as a result of policy implementation



9.10 Figure 9.4 shows that the estimated environmental benefit associated with the policy is a positive net impact of between £0.9 million and £1.3 million (circa £0.3 million annually). However, when compared with the RIA[36] they represent a relatively low estimate of the benefits of the charge. The RIA estimated potential benefits of between £4 and £6 million of annual benefits (£60–£90 million for the 15 year appraisal period).

[36] Welsh Government (2010) *Regulatory Impact Assessment on the proposals to introduce a single use carrier bags charge*. [Online]. Available at: http://gov.wales/topics/environmentcountryside/epq/waste_recycling/substance/carrierbags/regulatory-impact-assessment/?lang=en

9.11 The reason for this difference is partially driven by the alternative bag demand functions used (as drawn from new datasets), but also reflects calculations for this evaluation being undertaken with lower environmental damage costs per bag. When comparing the two studies it was understood that previous work undertaken utilised unit costs per bag which overestimated the potential environmental costs of bags. As such it is believed that the lower estimate presented in this evaluation (although still significant in scale), represents a more realistic estimate of the environmental costs of bag sales in Wales.

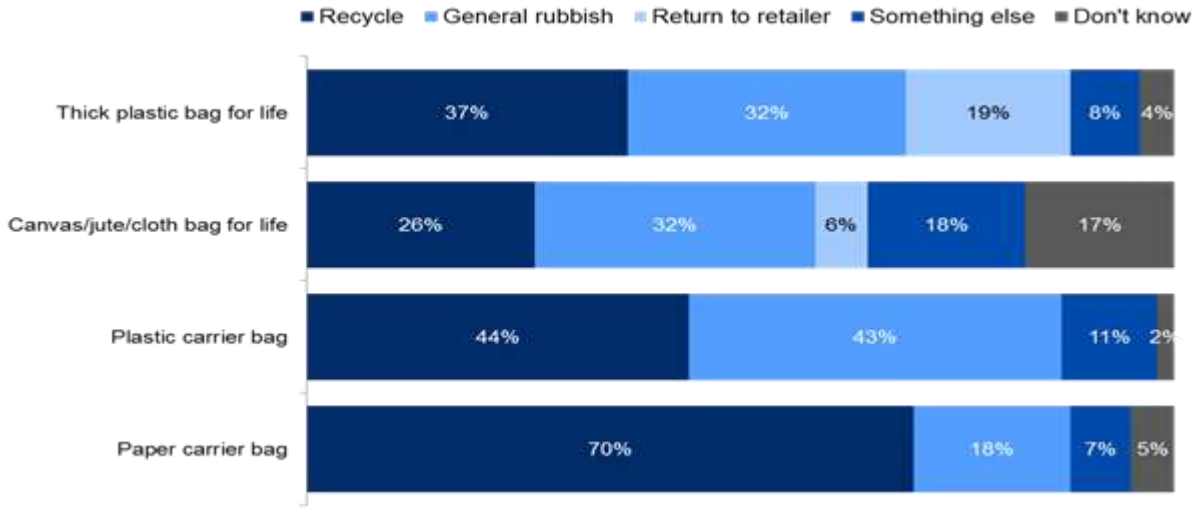
9.12 Although benefits are not as high as initially forecast, it is clear that the policy implementation has still performed its desired purpose in dis-incentivising SUCB use and significantly reducing the environmental impacts that they place on society.

9.13 However, it is likely that the figures presented underestimate the environmental benefits since for example, no data is available on the changing volume of SUCBs within litter and no 'willingness to pay studies exist to monetise the true value of a litter free environment. However, from the environmental factors that can be valued, it is clear that although the estimated environmental benefits listed above are to some extent eroded due to the larger resource embedded in bags for life, it is highly likely that the benefit of a cleaner, litter-free environment will be valued more highly by society. This is due to the proxy values (market equivalents) utilised in this study being less than the total social cost of litter and environmental degradation caused by plastic bags. This is a major reason as to why environmental economic evaluation is difficult to conduct fully, as many of the assets such as a "clean environment" are only valuable via the nearest market value and as such, are only estimates of the true societal costs – we can only value something that we have a value for.

Waste management costs

9.14 In order to estimate the cost of waste disposal and recycling, it was first required that the proportion of bags going to different waste streams (recycling, disposal, litter) be identified. Data was gathered during the consumer survey in which consumers where asked about the waste fate of their carrier bags, the result of which is illustrated in Figure 9.5.

Figure 9.5: Survey results identifying the proportional disposal routes by bag type



9.15 Once an understanding of the proportion of bags in each waste stream was prescribed as above, unit valuations per bag type were derived. For the purpose of this evaluation, WRAP gate fee reports[37] for materials recovery facilities (MRF) (recycling) and landfill (disposal) were utilised to identify a proxy value for which Local Authorities charge/rebate per tonne, and then scaled to a per bag level (see Table 9.2).

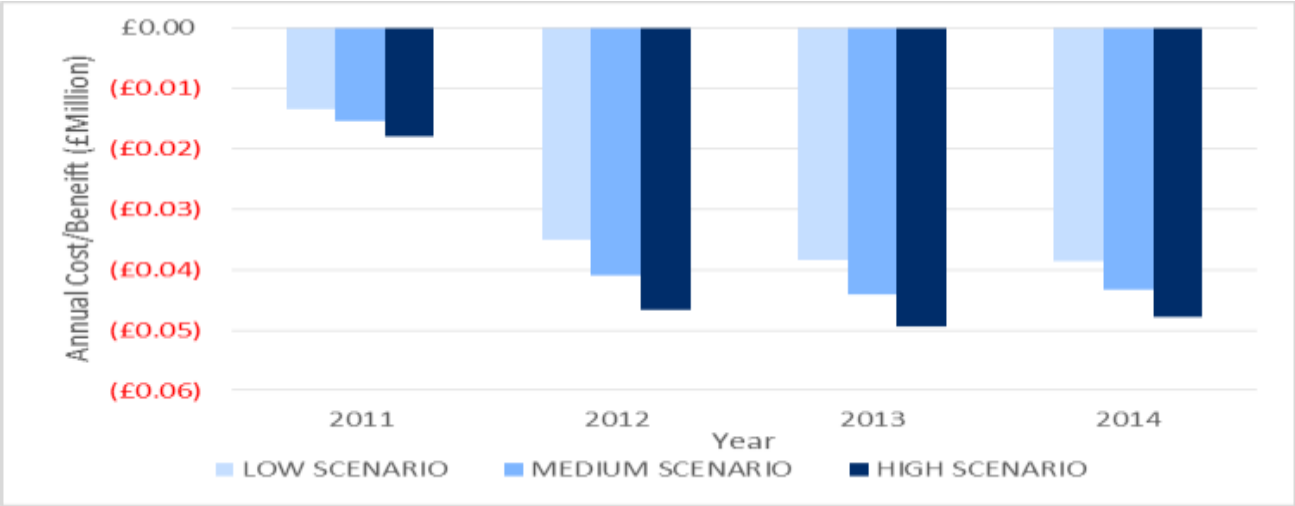
Table 9.2: Recycling and disposal costs per bag utilised in the evaluation model

Yearly calculated £/bag	2013/14 recycling	2014/14 disposal
	£	£
Plastic SUCB	£0.000073	£0.00017
Paper SUCB	£0.00050	£0.00116
Plastic bag for life	£0.00031	£0.00073
Cotton bag	£0.00165	£0.0038

9.16 Figure 9.6 shows the estimated annual costs associated with waste management arrangements for the quantity of bags used. For the purpose of this report, the recycling and disposal figures have been fixed at the 2013/14 UK values with the assumption that local authority contracts for disposal have been maintained across the timeframe of the evaluation.

[37] WRAP website. Available at: http://www.wrap.org.uk/content/wrap-annual-gate-fees-report

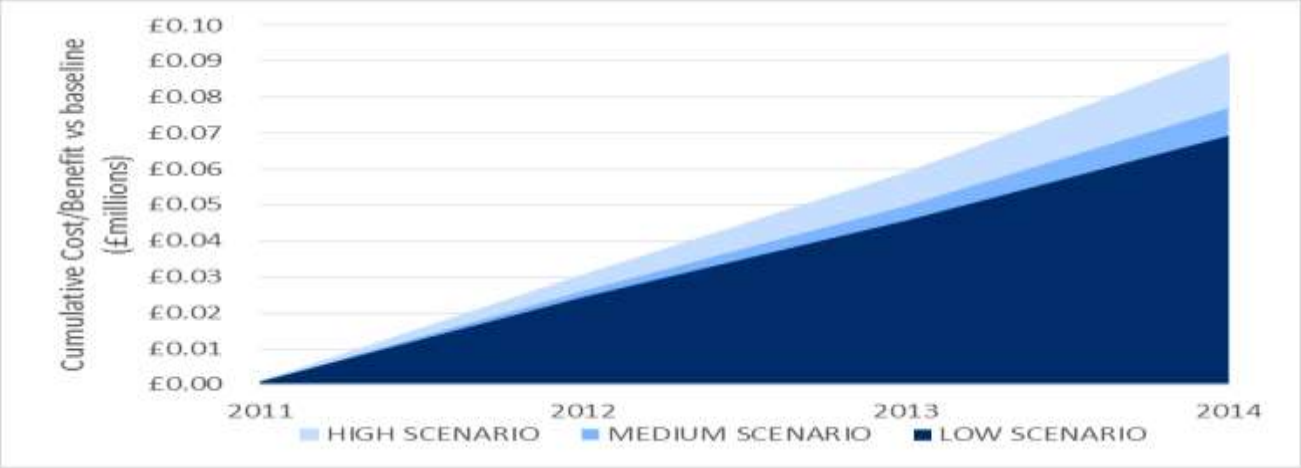
Figure 9.6: Annual costs resulting from waste management



Summary and comparison to original RIA

9.17 The results presented in Figure 9.7 estimate that the cumulative impact for the waste management sector could be a £0.1 million benefit in relation to costs of treatment and disposal of waste streams. This estimated benefit is driven by the significant reduction in SUCB sales and the reduced effort required to manage this waste stream via recycling and disposal routes, which outweighs any increase in demand for other, potentially more costly bag types. Although a relatively small factor of the overall evaluation outcome, this represents a real benefit for the sector and does not capture other associated unvalued impacts such as resource depletion and circularity in the economy. For example, the assessment is unable to evaluate the benefit of the reducing material consumption, which is the best waste management technique according to the waste hierarchy. This policy implementation has adhered to this principle in reducing bag sales and therefore overall benefits may be higher in that there are unvalued impacts associated with the reduction of extraction of abiotic resources.

Figure 9.7: Cumulative waste management benefits versus the baseline as a result of policy implementation



10 Findings – Summary of overall Impact

10.1 An overview of the total impacts of the 5 pence charging scheme is provided in Table 10.1 and Figure 10.1. The net benefit of the policy is estimated at being between £27.9 million and £32.3 million for the period 2011 to 2015 with the best estimate of benefits being £30.3 million. Further detail on the sensitivity around the medium estimate is presented in Appendix 4.

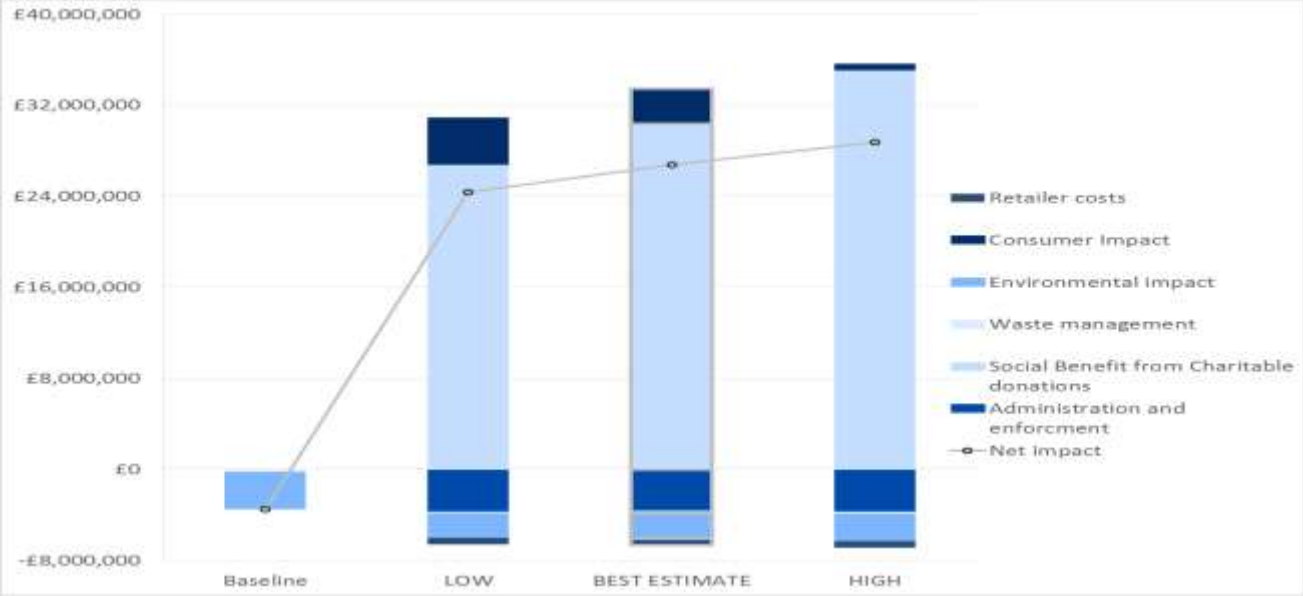
10.2 The impact of the social benefit from charitable donations provides the largest benefit associated with the policy. As such, any variation in either the proportion of charge donated or the ratio of donations to social benefit could significantly impact the results. This impact could be positive or negative depending on the direction of the change. In the most extreme case, if no social benefit is accrued beyond a direct transfer of £1 donated, then the benefits of the policy could be reduced by as much as £29 million–£32 million (i.e. no added value will be created by donations received and thus overall positive effects of the policy will be significantly reduced).

10.3 In relation to environmental impacts, the results show that the valuation of SO_X would have to be raised significantly for the shift in bag demand to have a net negative impact on the environment. Similarly if the proportion of carrier bags littered were reduced, then smaller clean-up costs associated with littering in the base case could mean that benefits of the charge in reducing these costs are lower. It is important to note that the environmental benefits of the charge may be underestimated as there is no evidence on which to assess the differential impact on watercourses (although this is not anticipated to have been a large contributing factor), air quality damage costs used are known to represent only a subset of the impacts of air pollution, and the proxy value of costs to clean up littered waste may not capture all social value placed on the reduced appearance of litter.

Table 10.1: Key outputs from evaluation

Option	Total impact over evaluation timeframe	Net Impact Compared with baseline	Difference to best estimate
	£m	£m	%
Baseline (best estimate)	-3.5	0.0	0.0%
Best estimate	26.8	30.3	0.0%
Low estimate	24.4	27.7	-8.7%
High estimate	28.8	32.7	8.0%

Figure 10.1: Total modelled costs and benefits for the timeframe of evaluation



10.4 Table 10.2 and Figure 10.2 present a summary of the key impacts of the SUCB policy. The key contributing factors in the accumulation of benefits for the Welsh economy include:

Social benefit of donations to good causes

Through the implementation of the 5 pence charge for SUCBs, additional donations to good causes have been raised equalling between £16.8 million and £21.9 million between October 2011 and January 2015. As a result of these donations to good causes, it is estimated that there could be social benefits of between £26.9 million and £35 million between October 2011 and January 2015

accrued through environmental, health and employment benefits within the Welsh economy.

Consumer benefit

This Study estimates that consumers also accumulated benefits through using re-usable bags rather than paying for SUCBs. These benefits are estimated at between £0.5 million and £4.1 million for the period October 2011 to January 2015

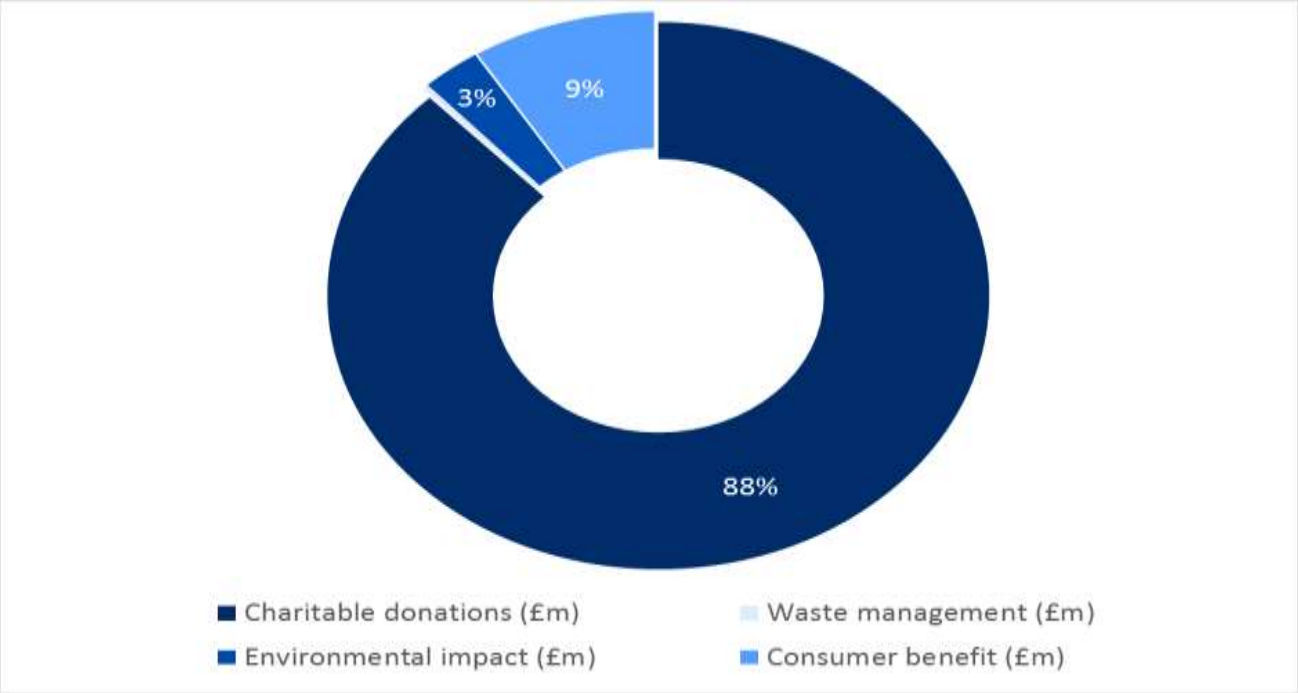
Environmental Benefits

Due to the significant shift in demand away from single use bag varieties to re-usable bag types (plastic or fabric), it is estimated that benefits of between £0.9 million and £1.3 million for the period October 2011– January 2015 have been achieved. These benefits have arisen from reduced externalities associated with the production and use of single use bags and their impact upon global warming, air pollution and litter clear up costs.

Table 10.2: Summary of key impact categories

Option	Low	Best Estimate	High
Total Net Impact	**£m**	**£m**	**£m**
Administration and enforcement	-3.7	3.7	-3.7
Social benefits of charitable donations	26.8	30.4	35.1
Waste management	0.1	0.1	0.1
Environmental impact	0.9	1.0	1.3
Consumer impact	4.1	3.1	0.5
Retailer costs	-0.6	-0.6	-0.6
Total Net Impact	27.7	30.3	32.7

Figure 10.2: Proportional attribution of economic benefits accrued under the best estimate scenario



10.5 As this analysis has been undertaken as an evaluation of the policy's implementation, not only was it key to understand the overall impact of the policy but also to some degree, how the implementation and resulting impacts related to what was anticipated in the policy appraisal in the development stage. To facilitate this comparison, each impact category (impacts on consumers' businesses, NGOs, Welsh Government and the environment) has been taken in comparison to the forecast benefits as anticipated within the RIA conducted in 2010.[38]

[38] Available from here: http://gov.wales/docs/desh/publications/100604carrier-bag-charge-regulatory-impact-assessment-en.pdf

11 Conclusions and recommendations

11.1 This review estimates the net benefit to Welsh society of the implementation of the SUCB charge to be between £27.9 million and £32.3 million over the period October 2011 to January 2015, with the best estimate of benefits being £30 million, which is an average of £8.8 million per annum

11.2 An attempt to compare the benefits estimated by this Study with those identified by the Regulatory Impact Assessment (RIA), demonstrates that some of the assumptions made for the RIA have not proven to be correct in practice. For example, the RIA assumed an average cost per bag for life of 16 pence, while this Study found that the average price paid by consumers was 28 pence per bag (calculated average of reported bag sales). The RIA looked at the potential impact of the regulation, and estimated that the SUCB charge would produce annual benefits of between £24 million and £38 million per annum while the net benefit as estimated by this Study was between £28 million and £32 million.

11.3 Further detail on the performance of the policy is presented below.

11.4 This review estimates a 57% reduction in use of all bags (SUCBs plus 'bags for life') and estimates that between October 2011 and January 2015 SUCB usage decreased by 70%, highlighting the success of the charge in reducing bag demand. Work undertaken by the Waste and Resources Action Programme (WRAP) for supermarkets in Wales showed that from the period 2010 to 2014, there was a 78% decline in SUCB purchases. The difference between the estimates derived from this Study and the WRAP surveys is likely to reflect the inclusion of non-supermarket retailers in this Study.

11.5 The WRAP data for supermarkets suggests that between the calendar years 2012 and 2014, there was an increase in SUCB use at 18% above that of the anticipated change in sales volume growth at 2%, indicating that consumers are purchasing more bags. This may impact on the benefits of the charge in the longer term.

11.6 The results from this study also highlight that re-use of plastic SUCBs is common in Wales with only 9% of consumers who use/receive them saying they are never re-used. On average, consumers are reporting re-using plastic SUCBs 3.6 times and paper SUCBs 1.3 times. By comparison, re-use of bags for life is far more common, with the average number of re-uses being 25.5 and 43.6 times for thick plastic bags for life and canvas, jute or cloth bags for life respectively. Comparing these results to the Environment Agency's LCA on carrier bags suggests that thick plastic bags for life are re-used over double the amount of times required to offset the global warming potential (11 times). There is no direct comparator for canvas, jute or cloth bags within the Environment Agency's study, only cotton bags were included. Cotton bags need to be used 131 times in order to offset the

global warming potential. However, it should be noted that within the consumer survey the largest category that consumers could report was 50+, with a figure of 50 used for this response to calculate averages. Hence, further studies may identify higher levels of re-use for canvas, jute or cloth bags than identified in this study.

The views of Retailers

11.7 Among retailers surveyed that charge for their bags, around one-fifth of these reported that the SUCB charge had had a positive impact on their business (22%) compared with 65% who reported a neutral impact and 13% a negative impact. Overall, 74% of those retailers who charged for their bags agreed with the statement: '*we are happy to see the charge continue as it is*', a further 14% agreed that '*we are happy for the charge to continue, but we would like to see some changes*', and 9% agreed that '*we would like to see the charge removed*'.

11.8 Retailers reported a number of benefits associated with the charge, including cost savings on the purchase of bags (23%), environmental benefits (16%), generation of money for charity (13%), reduced waste (11%) and less litter (5%). In terms of disadvantages, the most common issue highlighted related to customer unhappiness/complaints (27%), with few other disadvantages identified.

11.9 Retailers provided estimates of the time required to administer the charge. Over half of those retailers who issued SUCBs (58%) reported that they had spent zero days administering the charge over the previous year, and a further 27% reported spending one day or less, whilst 5% reported they spent more than one day, and 11% were not able to report on how much time had been spent administering the charge.

11.10 This review estimated that the total administrative cost of the SUCB charge to retailers in Wales to be less than £180k per year. This is significantly lower than the £900k per annum anticipated by the RIA, but as previously stated that appraisal was based on different assumptions.

The views of Consumers

11.11 The majority of the consumers surveyed for this Review were supportive of the charge. Consumers were asked whether they supported or opposed the charge: the level of support (respondents reporting that they strongly supported or tended to support the charge) increased from the 61% reported by Exodus[39] prior to the introduction of the charge, to a finding of 74% for this Study. Consumer support for the charge is also suggested by the self-reported actions of consumers, with 42% reporting that they took fewer SUCBs from shops than before the charge was introduced and 35% indicating that they had stopped taking SUCBs altogether.

[39] *Consumer behavioural study on the use and re-use of carrier bags 2012*, prepared by Exodus Research on behalf of Zero Waste Scotland and the Welsh Government (2012).

11.12 The Study found that SUCB use varied by the type of shopping, with 78% of consumers reporting having used a SUCB for their most recent takeaway purchase (65% plastic and 13% paper), compared with 36% for their most recent non-food shop, 29% for a 'top up' food shop and 17% during their regular supermarket food shop.

11.13 This does highlight that there is potential to further engage with consumers particularly in relation to non-food shops and takeaways. The reasons for these differences also need to be better understood. It may be a result of a difference in planned and unplanned shopping, or in relation to the number of bags used. For example, consumers may find it more acceptable to pay 5p for one bag when purchasing a takeaway or clothes shopping, compared with needing to purchase several bags when food shopping.

11.14 Consumers were asked if they had been given a carrier bag in Wales without being charged for it. A third of respondents reported that they had not been charged, and the types of shop in which this had occurred were a corner shop, local greengrocer, butcher, fishmonger, clothing/shoe shop and takeaway. This highlights potential shop types to target with an engagement campaign as well as potential areas to target for enforcement.

11.15 This review has estimated that consumers have accumulated benefits of between £0.5 million and £4.1 million between October 2011 and January 2015 through the improved utility of re-usable bag types over their single use counterparts. That is the value a consumer places on using re-usable bags over SUCBs, e.g. strength, attractiveness etc.

The Views of Suppliers of SUCBs

11.16 Respondents to the survey of retailers were asked to name their SUCB supplier(s). Five of the top 10 reported suppliers of SUCBs were contacted for detailed qualitative feedback on the impact of the charge. These suppliers ranged from manufacturers to distributors and wholesalers based in Wales.

11.17 The suppliers reported that they had experienced a negative impact on their business, with reports of a decline in overall sales, and a need to diversify their business.

Good causes

11.18 At the point of writing, there is no statutory duty on retailers to donate the money raised by SUCB sales to good causes, this aspect forms part of the voluntary agreement developed by Welsh Government that retailers can sign up to.

11.19 Overall, 78% of those retailers who charged for their bags reported that they donated all of the net proceeds to good causes, a further 9% reported that they gave a proportion and 6% said they didn't know how much was donated. The remainder (7%) reported that they did not make any donations, whilst 1% refused to answer the question.

11.20 Over half of retailers reported donating the net proceeds to a single organisation, 19% gave to two good causes, whilst 25% donated to three or more. In terms of the type of good causes supported, two-thirds of retailers donated to a health/disability cause, followed by local community causes (29%) and young people (10%), with only 6% donating to environmental causes. This donation was in the majority of cases in addition to pre-existing donations (68%) or the only donation made (27%). Only 3% reported that the donation of net proceeds was in place of other donations made previously. This suggests low levels of displacement associated with the charge.

11.21 The survey also highlighted that the awareness of the voluntary agreement and its requirement to donate the net proceeds to good causes could be higher, as only half of consumers agreed that the proceeds of the charge went to good causes, and 36% stating that they 'didn't know' what happened to the proceeds from the charge.

11.22 Through the implementation of the 5p charge for SUCBs, additional donations to good causes have been estimated as between £16.8 million and £21.9 million for the period October 2011 to January 2015. As a result of these donations to good causes it is estimated that there could be social benefits of between £26.9 million and £35 million between October 2011 and January 2015 accrued through environmental, health and employment benefits within the Welsh economy.

Environmental impact

11.23 This review used both consumer and retailer surveys to assess the impact of the charge on littering. Overall, 78% of those retailers who issued SUCBs reported no change to the amount of litter 'around their premises', but when asked whether they agreed with the following statement, 59% of retailers agreed that 'the charge has helped to reduce litter'. The disparity between these two findings may reflect the difference in the wording of the two questions with the former explicitly limited to their own premises and the latter potentially interpreted to relate to a wider area. Overall, 66% of consumers agreed with the statement 'the charge has helped to reduce littering in my local authority area'.

11.24 Further research on the impact of the charge on littering is required, and it is suggested that this research is focussed on collation of SUCB data within litter surveys conducted by local authorities, ensuring that the approach to sampling is appropriate for SUCBs.

11.25 Due to the significant shift in demand away from SUCBs to re-usable bag types (plastic or fabric), it is estimated that benefits of between £0.9 million and £1.3 million have been achieved (circa £0.3 million annually). These benefits have arisen from reduced externalities (i.e. associated negative environmental and social effects) associated with the production and use of SUCBs and their impact upon global warming, air pollution and litter clear up costs.

11.26 The RIA estimated potential benefits of between £4 million and £6 million of annual benefits (£60–£90 million for the 15 year appraisal period). The reason for this difference is associated with the bag demand data used in this study, but also reflects calculations for this evaluation being undertaken with lower environmental damage costs per bag. As such it is believed that the lower estimate presented in this evaluation (although still significant in scale) represents a more realistic estimate of the environmental costs of bag sales in Wales.

Recommendations

11.27 The authors of this Review have identified issues that could be targeted by Welsh Government to further improve understanding of the impacts of the existing charge and ensure its continued effectiveness:

- encourage consumers to take re-usable bags along when doing non-food shopping and collecting takeaways;
- encourage consumers to report instances of where they have not been charged;
- promote awareness of the charge among staff working in the types of shops where consumers reported they had not been charged, i.e. corner shops, local greengrocers, butchers, fishmongers, clothing/shoe shops and takeaways and target enforcement in those shop types.

11.28 The Welsh Government could consider further research in relation to the environmental impact of the charge on littering, as well as the impact on suppliers of SUCBs in Wales - both of which have been identified by this review to have limited available data. There is potential for more information on littering to be collated through the collation of additional data recorded via the Keep Wales Tidy Local Environmental Audit and Management System (LEAMS).

11.29 It is recommended that the Welsh Government should continue to monitor levels of bag usage, because the WRAP supermarket bag usage data gives a provisional indication that SUCB use may have begun increasing again in Wales. If further research conclusively demonstrates that SUCB use is increasing, the Welsh Government may wish to consider increasing the charge.

11.30 Results from this Study highlighted that increasing the charge would result in consumers purchasing less SUCBs. It is recommended that Welsh Government monitor the impact of Northern Ireland's policy of extending the 5 pence charge to all bags with a retail value of less than 20 pence including bags for life to assess its impact on bag use.

Appendices

Appendix 1 – Literature Review

1 Methodology

Literature Review

1.1 The review identified relevant sources of evidence ranging from peer-reviewed literature to policy documents and reports (so-called 'grey literature') through (1) searches of bibliographic databases (Web of Knowledge, Scopus, and Google Scholar); 2) general web searches (Google); and (3) a call for evidence posted on relevant email lists (Sustainable Development Research Network, Environmental Psychology Jiscmail, International Association of People-Environment Studies).

1.2 The principles of a systematic literature review were used to identify relevant peer-reviewed articles on the impacts of carrier bag charging schemes, the consumption of SUCBs and associated behaviours. The Web of Knowledge, Scopus, and Google Scholar databases were searched for publications published between 1994 (when the first plastic bag tax was introduced in Denmark) and 2014, using the search terms 'carrier bag' and/or 'plastic bag' in combination with 'levy', 'tax', or 'charge' (and variants thereof). In order to identify non-peer reviewed publications, including policy documents and reports, general web searches were conducted with the same combinations of search terms. This process led to identification of over 120 sources, all of which were examined in greater detail to identify whether they contained evidence suitable for inclusion in the literature review.

1.3 Publications were included in the review if they reported original empirical data, detailed original analysis and/or provided a commentary on pre-existing empirical data on the impacts of carrier bag charging schemes and other policy initiatives to reduce the consumption of SUCBs. This includes field experiments and other non-policy interventions that have tested methods to reduce the consumption of SUCBs and associated behaviours in natural settings (e.g., supermarkets). Lab-based experiments and other studies in non-natural settings were excluded from the review. The studies and reports were critically appraised in terms of their relevance, quality and coverage to ensure that the evidence was of sufficiently high quality for meaningful assessment of evidence gaps. In addition, data were included from retailers' publications, trade bodies and other sources, which indicated the number of bags sold and the wider impacts of bag reduction initiatives.

1.4 Studies and research projects that have been undertaken as part of the Welsh SUCB charge, including, but not limited to, AEA Technology plc's single use bag study, Cardiff University's evaluation of the Welsh SUCB charge, Zero Waste Scotland's behaviour study on the use and re-use of

carrier bags, and BIO-IS's 'Reducing plastic bag use in the UK and Ireland' (Lyons, 2013), were included in the literature review.

1.5 In addition, discussions were held with the Welsh Local Government Association and Keep Wales Tidy to discuss the data they hold related to the SUCB charge, and capture any other feedback on the charge.

1.6 The results of the literature review are presented in Section 2. Implications are drawn both for policy (e.g., how effective charging has been in different contexts) and also for research (e.g., how best to conduct further evaluations and improve the evidence base).

Monitoring Data Review

1.7 The monitoring data review was undertaken to ensure that the literature review was fit for purpose. A staged approach was used. Foremost, the project economists identified the impact categories which were to be considered during evaluation. These were split into 'final impacts' and 'contributing impacts'.

1.8 The data, which would be required to feed into the impact calculations, were outlined. For example, total enforcement costs could be calculated as an addition of marketing, legal, administrative and other costs. An outline of the final and contributing impacts and their associated estimation approach is provided in Table 1.

1.9 The results of the literature review were then compared with the data inputs listed. It was flagged where data were available (and the associated section was noted). Where data were either not available or inapplicable through being related to another country or timeframe, a strategy to collect relevant information was outlined.

1.10 Where information required further collection, the costs and benefits of doing so were considered.

1.11 The results of the monitoring data review is provided in Section 3.

Table 1: Final and Contributing Impacts

Final Impacts	Contributing impacts	Expected effect of SUCB policy on final impact (negative/ positive impact or negative or positive)	Impact estimation	Qualitative (Ql), Quantitative (Qn) or monetised (£)
Enforcement costs	Administrative, marketing, legal and other costs	Enforcement costs increase	Administrative + marketing + legal + other costs	£
Retailer profits	Small basket effects	Business profits decrease	% revenue reduced x total revenue (before SUCB charge)	£
	Shoplifting	Business profits decrease	% revenue reduced x total revenue (before SUCB charge)	£
	Administrative burden	Business profits decrease	Change in administrative costs	£
	Carrier bag production reduction	Business profits increase	Cost savings = (Change in number of carrier bags sold) x price per bag	£
Manufacturer profits	Carrier bag production reduction	Business profits decrease	Profit change = (Change in number of carrier bags sold) x profit per bag produced	£
Social and Environmental Investment	Charitable donation	Investment increases	Charitable contribution = (carrier bags sold after SUCB charge x charitable contribution per bag) + (other charitable contributions after SUCB charge - other charitable contributions before SUCB charge)	£
	Community network building	Investment increases	Building networks between businesses and communities who provide a greater level of gift in kind	Ql
Waste Management	SUCBs recycled	Number of SUCBs managed decreases	Cost savings = % of SUCBs recycled x (Change in carrier bags sold) x (recycling cost per bag - recyclate revenue per bag)	£
	SUCBs to landfill	Number of SUCBs managed decreases	Cost savings = % of SUCBs to landfill x (Change in carrier bags sold) x weight per bag (tonnes) x landfill cost per tonne	£
	Litter	Litter decreases	Change in perception of carrier bags in trees/hedges/rivers	Ql

Final Impacts	Contributing impacts	Expected effect of SUCB policy on final impact (negative/ positive impact or negative or positive)	Impact estimation	Qualitative (Ql), Quantitative (Qn) or monetised (£)
	SUCB reuse	Reuse increases	% of SUCBs reused	Qn
Increase in other bag use	Substitution effect from SUCB to heavy duty bags	Heavy duty bag use changes	Change in demand for heavy duty bags	Qn
	Bin liner use	Bin liner use changes	Change in demand for bin liners	Ql/Qn
Carbon emitted	Carrier bag production reduction and bag design	Carbon emitted in manufacture decreases	Carbon savings = CO2 per bag x Change in carrier bags sold x shadow price of carbon	£
Environmental sustainability multiplier effect	Environmental behaviour change	Environmental behaviour improves	Change in behaviour relating to other natural resource use (not SUCB)	Ql
Human health	Food poisoning	Risk of food poisoning increases	Admissions due to E. Coli, salmonella and campylobacter bacteria related to bag reuse	Ql/Qn

2 Findings

2.1 In this literature review we collated the available national and international evidence on the impacts of SUCB charging schemes. This includes impacts on consumers, businesses and government, as well as wider environmental and health impacts.

2.2 The literature review covers both primary and secondary impacts of carrier bag charging schemes on consumers. The primary impacts include public attitudes to carrier bag charging schemes, the short-term and long-term effectiveness of carrier bag charging schemes, and the impacts of carrier bag charging schemes on different consumer groups. The secondary impacts include behavioural adaptations, substitution effects, behavioural spillover, and other unintended consequences, such as shoplifting. The consumer section of the literature review also presents evidence on the relative effectiveness of alternative policy instruments to reduce the consumption of SUCBs, i.e., bans and voluntary measures.

2.3 The business section of the review considers the impacts of carrier bag charging schemes on retailer profits, bag manufacturing, and small basket shops, as well as the use and distribution of the proceeds.

2.4 The government section of the review focuses specifically on the cost of administering and enforcing carrier bag charging schemes.

2.5 The environmental impacts section reviews Life Cycle Assessments (LCAs) to determine the impacts of carrier bag charging schemes on bag manufacturing, bag disposal through regulated waste systems, and improper disposal (e.g., via littering).

2.6 The health impacts section specifically focuses on the potential for re-use of SUCBs and bags-for-life to pick up microbial contamination.

Primary impacts of carrier bag charging schemes on consumers

Public attitudes to carrier bag charging schemes

2.7 Carrier bag charging schemes are generally popular among the public where they are introduced. For example, despite Irish consumers being somewhat reluctant to support the 'plastax' charge prior to its introduction (Drury Research, 2000), Convery et al. (2007) reported that they became more positive after the policy was implemented. A national survey on environmental attitudes and actions showed that, one year after the Irish plastax was introduced, 91% of the Irish population were in favour of the plastic bag tax and only 6% against (Drury Research, 2003).

2.8 A survey among Sainsbury's and M&S customers in Plymouth, UK (n=100), using a convenience sampling strategy, found that 78% would support all shops charging for bags and that 60% would bring their own bags if this happened (Kwong 2014). When asked how the money from such a charge should be spent, shoppers at M&S (who voluntarily charge for SUCBs) tended to favour environmental charities (62% vs. 20% of Sainsbury's customers), while shoppers at Sainsbury's (78% vs. 34% of M&S customers) preferred prices of goods to be reduced (ibid).

2.9 A Manchester study (n=100) conducted in a single supermarket, similarly using a convenience sampling strategy, found that 55% of shoppers supported a plastic bag charge, with similar levels (59%) stating they were aware of the environmental impacts of plastic bags (Musa et al., 2013).

2.10 A survey conducted in the State of Johor in Malaysia (n=262) found high consumer awareness (94%) of the charge (which is implemented one day per week in major retailers) and its environmental benefits (66%) with support for a plastic bag ban in supermarkets but not elsewhere, such as markets (Zen et al., 2013). No methodological information was provided about how the data were collected.

2.11 Research conducted in Hong Kong (n=3,022) found that consumers were similarly very positive about the recently-introduced 50-cent (£0.04[1]) bag

[1] Throughout this report, local currencies are converted into GBP using September 2014 exchange rates.

levy and most supported its immediate roll-out to most retail businesses (Friends of the Earth [HK], 2010).

2.12 Support for the Chinese plastic bag charge (which is set by individual retailers at an average of CNY0.33 or just over £0.03) was also found to be high at 80%, according to a poll conducted after its introduction (O'Loughlin, 2010). Similarly, He (2012) reported that the mean supportive attitude dropped from 4.46 (SD=0.3) on a 5-point scale to 4.07 (SD=1.07) four months after the plastic bag regulation was implemented (n=1,039 before; n= 2,035 after). These findings are in clear contrast to Convery et al (2007) and Poortinga et al. (2013). The disparity in findings may be due to cultural or income differences and/or in pre-charge communications. He (2012) attributes the drop in public support to the greater inconvenience caused by charging (implying expectations may have been somewhat unrealistic).

2.13 Sharp et al (2010) found no significant changes in support for a ban on plastic bags in a longitudinal sample of 252 respondents that were interviewed before and after a ban came in to force in the state of South Australia.

2.14 In a quasi-experimental study with nationally representative samples of n=500, Poortinga et al. (2013) found that support for the Welsh carrier bag charge was already high in 2011 before it was introduced (59%). Support for the Welsh carrier bag charge increased to 70% in 2012 after it was introduced. The study also found that the Welsh public perceive a carrier bag charge as "a good way of reducing waste" and think it "helps to reduce litter", with agreement increasing from 77% and 70% respectively before to 79% and 76% after the introduction of the carrier bag charge in Wales.

2.15 Other research (Zero Waste Scotland and Welsh Government, 2013) with samples weighted to Census data (n=984 in Wales and n=1014 in Scotland) found that more Welsh than Scottish consumers strongly agree that "Charging 5p for each single-use carrier bag is" (or "would be", in the case of Scotland) "a good way of reducing waste" (34% vs. 24%) and "helping to reduce littering" (32% vs. 22%), and benefited charity (30% vs. 23%).

2.16 Retailer perceptions were assessed through a survey of independent retailers across three rural town and village shopping locations in SE Wales about customer reactions to the charge (93 out of 125 retailers responded, representing a response rate of 74%). The survey found that around 40% of retailers believed the public approved, while 32% (particularly takeaways, hardware shops, and clothing retailers) thought they disapproved (Jones, 2012). This is consistent with research showing that consumers want and expect to receive a SUCB from high street, especially expensive, stores because it signals prestige, is seen as part of the shopping experience,

offers proof of purchase when leaving the store, and makes returning items in original packaging easier (WRAP, 2005; Jones, 2012).

2.17 Furthermore, the public is particularly supportive of the money raised being given to charity, as indicated in Irish (AEA Technology, 2009; McDonnell et al., 2008) as well as Welsh research (Frater, 2011a; Nash et al., 2012). However, awareness of the use of funding is not universal: almost one year after its introduction, only 64% of respondents to a random household sample in SE Wales (n=153, representing a 51% response rate) selected "charities or good causes" from a list of potential beneficiaries of the charge; while 16% selected "Welsh Government", 8% "The shopkeeper", 10.5% "Don't know" and 1.9% "Other" (Jones, 2012). It is not clear from this, or other, research whether the public is aware that the proceeds are passed on to charities or good causes on a voluntary basis, albeit expected by WG. Nevertheless, the perception that retailers do not benefit directly from the charge appears to help the acceptance of the Welsh carrier bag charge (e.g., Nash et al., 2012). Killian (2005) attributed the relative success of the Irish levy to an effective use of the Revenue Services, both in terms of aiding traders implementing the charge and collecting the revenues for environmental projects.

2.18 Other research highlights the importance of communicating the specifics of a ban or charge to ensure public support and compliance (Cascadia, 2011; IEEP, 2014). Information provision is also an important component of habit formation for bag re-use, as forgetting to bring one's own bags is one of the most common reasons given for not using reusable bags (Laakso, 2013; Musa et al., 2013; cf. Yeow et al., 2013). For example, Zero Waste Scotland and Welsh Government (2012) found that consumers who took a new SUCB at the till most often did so because they 'did not have their own bags to hand' (43% in Scotland and 58% in Wales).

2.19 Yeow et al's (2013) analysis of UK attitudes to 'bags-for-life' shows they are used primarily for environmental reasons, with personal utility (e.g., bags being stronger and bigger), economic reasons (e.g., to save money on SUCBs), social reasons (e.g., other people are using them) or other reasons (e.g., free bag-for-life promotions) being less common (cf. Hawkins, 2001). The study involved several data sources, including an online questionnaire (n=316) posted on discussion fora and distributed via email to professional networks (i.e., convenience and snowball sampling). When survey respondents were asked how they would persuade others to adopt them, environmental arguments were also the most popular, followed by personal utility and social reasons.

2.20 The practical and economic utility of bags-for-life is further indicated by research using a more representative public sample (n=2,000). Zero Waste Scotland and Welsh Government (2012) found that around half of Welsh

and Scottish consumers preferred fabric bags-for-life if they had to buy one, with the most popular reasons being they are stronger than SUCBs (49%). The most common unprompted reason for using a bag-for-life, given by 47% of Welsh respondents, was to save money. In Scotland, more mentioned environmental or practical reasons for using bags-for-life. This perhaps suggests that the charge could – at least while in place – crowd out (intrinsic) environmental motives in favour of (extrinsic) economic ones, which is a well-known phenomenon in economic psychology (see Frey & Jegen, 2001; cf. WRAP, 2005). However, a notable three in ten respondents in both countries would choose to pay for a SUCB if required to buy one either because the charge is too small to worry them (54%) or because they could re-use the bag as a bin liner (20%). Many also felt SUCBs continue to be a convenient option (45% Wales, 60% Scotland), particularly for smaller shops, and when own bags have been forgotten (36% Wales, 37% Scotland). While it is expected that some people will prefer to pay the charge and that re-use as a bin liner is preferable to no reuse, these findings raise the question of whether the charge is set at a socially-optimal level (i.e., if 16% in Wales consider the charge too small to worry about). Further evidence relating to appropriate levels for bag charges is discussed later.

Single use carrier bag use: short-term effects

2.21 The available evidence on the effectiveness of carrier bag charging schemes suggests that a reduction in the consumption of SUCBs of 50 to 95% can be achieved in the short term, depending on the size of the charge, its design, and the quality of the communication accompanying the introduction (Convery et al., 2007; Hasson et al., 2007; Dikgang & Visser, 2012a,b; He, 2010; 2012; AEA Technology, 2009).

2.22 The Irish 'plastax' levy appears to be one of the more successful schemes to date. Plastic bag consumption fell from an estimated 328 bags per capita per year to about 21 after its introduction (Convery et al., 2007; Lyons, 2013; Doyle & Hagan, 2013; Clarke, 2014), a reduction of about 94%. However, plastic bag use started to increase again, up to 33 bags per capita in 2007, and the levy was therefore raised in 2007 (see below). The Irish levy does not differentiate between different types of plastic, and therefore includes biodegradable bags. Significant reductions in bag use of up to 95% have also been evidenced for UK retailers who have voluntarily introduced a charge for bags (AEA Technology, 2009).

2.23 The plastic bag charge that was introduced in China in 2008 appeared to be somewhat less effective than the Irish charge. Evaluations of the scheme (using ad-hoc observations, small-scale surveys, and secondary sources) have found that consumer awareness about the charge was low and that many retailers failed to apply the charge (O'Loughlin, 2010;

Qunfang, 2011). Data compiled by a Chinese retail association from sales volume, market share, and other factors (reported by O'Loughlin, 2010) indicate, however, that where shops had implemented the charge, a reduction in bag use was observed; with plastic bag use within supermarkets across the country being 66% lower 12 months after the charges had been introduced. This was confirmed by He (2010; 2012) who surveyed shoppers in the open markets and supermarkets in two Chinese cities before and after policy implementation (total n=3,074). He found that, overall, Chinese consumers reduced their overall plastic bag consumption by 49% per cent, and the average number of new bags used per trip decreased by 64%, from 3.0 to 1.1. Notable differences were found in plastic bag use between supermarkets and the open market. Before the policy was introduced, people surveyed in the open market consumed three more bags per week than those surveyed in supermarkets. The difference increased to 5.3 bags per week after the introduction of the charge, despite a reduction in bag consumption in both areas. He (2012) suggests this may be due to better pre-packaging of goods in supermarkets (necessitating fewer bags) and the more competitive nature of the open market to provide plastic bags for free.

2.24 Knowler (2008, cited in Dikgang et al., 2012a) reported that the South African charge introduced in May 2003 led to a 90% decrease in the consumption of plastic bags, while Hasson et al (2007) reported a decrease between 60-90%. However, the consumption of plastic bags rose again after the price was reduced from 0.46 to 0.17 Rand in August 2003 (£0.03 to £0.01). The effect of the price change was not uniform across retailers: while the overall decrease was still in the order of 50-80% for most retailers, one retailer targeting lower-income consumers saw an increase in plastic bag sales after the charge was reduced, even compared to the baseline period in which bags were given out for free (Hasson et al., 2007). Dikgang et al. (2012a) estimated the overall reduction in plastic bag consumption to be 44%, with a high-income retailer and low-income retailer experiencing 57% and 50% reductions respectively. This makes the South African levy one of the least successful schemes, in particular in the long-term. This relative lack of success may be in part be due to an absence of a pre-emptive campaign to raise consumer awareness about the charge and a sharp drop in price only three months after the charge was introduced (Dikgang et al., 2012b).

2.25 Killian (2005) conducted a detailed comparison of the Irish and South African charges, from which she concluded that the relative success of the Irish levy could be attributed to an effective use by the Irish Revenue Services, both in terms of practical support and legitimacy (see above). Various authors identify economic interest of and pressures from plastic-bag manufacturers, and an absence of effective awareness campaigns, as

factors that have contributed to the sub-optimal implementation of the South African charge (e.g., Killian, 2005; Dikgang et al., 2012a,b)

2.26 The plastic bag legislation introduced in Botswana in 2007 is unique in the sense that it does not stipulate the amount that retailers have to charge for plastic bags (Dikgang & Visser, 2012). On average, retailers charged around 0.18 Botswana Pulas (£0.01). Data from retailer sales show that plastic bag consumption dropped 24% in the weeks following the introduction of the charge, and fell overall by 50% within 18 months (Dikgang & Visser, 2012). The decline after 18 months was steepest for high-income retailers (64%) followed by low-income (58%) and upper middle-income (56%) retailers, with lower middle-income retailer only seeing an overall decrease of 26%.This disparity can in part be explained by the higher (72%) price increase over the 18 month period charged by high-income and low-income (44%) retailers, compared to the average (33%) increase (ibid).

2.27 The Botswanan charge appeared far more effective than the previously reported South African charge, despite the charge being significantly lower. Dikgang and Visser (2012; Dikgang et al 2012a) suggest this is at least in part because the price of a Botswanan plastic bag increased by 33% in the first 18 months after the charge was introduced, whereas the South African charge fell on average by 46% within three months (see also below). Clearly, other factors may also account for these different experiences with carrier bag charging, including cultural and income differences between the two countries.

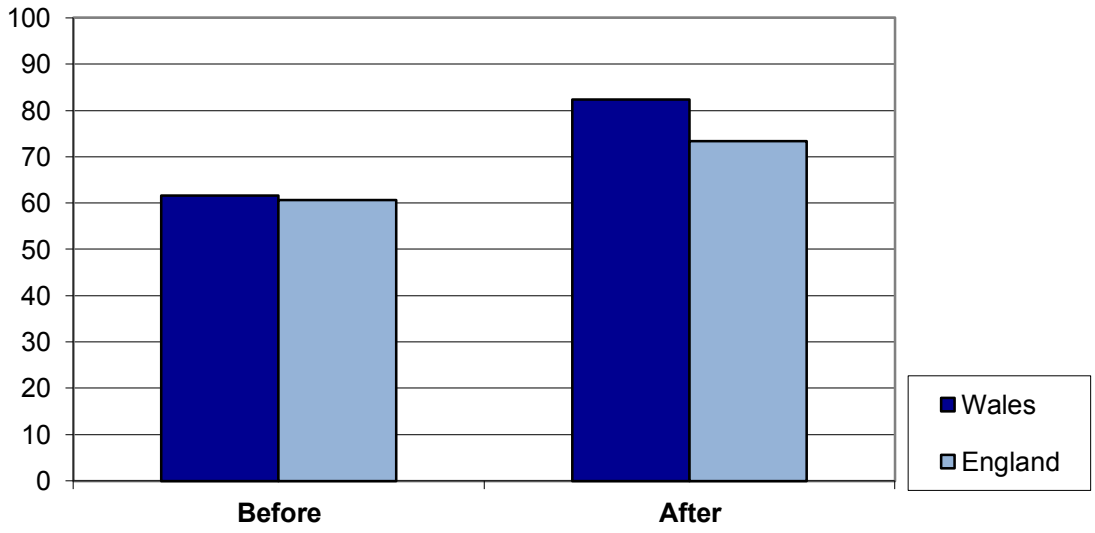
2.28 In a cross-sectional study, with a sample recruited from an online research agency panel (n=8,000), comparing waste-prevention behaviours of consumers in three Japanese mega-cities, Kurisu and Bortoleto (2011) found significantly higher rates of self-reported ‘own bag use’ (81%) in Aichi compared to the other two mega-cities, most likely as a result of widespread charging in that area. Bringing your own bag was far less common in Tokyo (57%) and Osaka (50%) where charging was not fully implemented yet. Wards in Tokyo where plastic bags were no longer distributed for free saw a similar level of own bag use as in Aichi (81%).

2.29 The 50 cents (£0.04) levy introduced in Hong Kong in July 2009 was assessed by Friends of the Earth (HK) (2010) using a three-stage survey (one month before, one month after, and six months after its introduction) with over 3,000 consumers. They found that the SUCB consumption dropped from 78% pre-charge to 54% one month post-charge, and 15% six months later. Furthermore, 77% of the sample claimed to ‘always’ bring their own bags six-months post-charge, compared to 53% pre-charge, indicating a change in bag reuse habits.

2.30 The reduction in single-use carrier bags in Wales was at the higher end of the spectrum. Data published by the Waste & Resources Action Programme (WRAP) shows that supermarket customers in Wales used 80% fewer single-use bags in 2012 relative to 2010, the year before the charge was introduced. Single-use carrier bag use by supermarket customers in England increased by 4% over the same time period. The Welsh Government reported a 70-96% reduction in the consumption of SUCBs in food retail, using figures compiled by the British Retail Organisation. However, consumer behaviour appears to differ by retailer type and sector with bag reuse in supermarkets higher than in other shops (e.g., 64% versus 43% post-charge claiming to 'always' take their own bags in the Poortinga et al., 2013 survey).

2.31 Poortinga et al (2013) also evaluated the effectiveness, as well as further attitudinal and behavioural impacts, of the Welsh SUCB charge. The study used quota samples of 500 to represent the populations of Wales and England, with the English sample serving as comparator. Respondents were interviewed just before and six months after the introduction of the carrier bag charge in Wales. The study found a statistically significant difference between the countries. While an increase in own bag use 'at last visit' to the supermarket was identified in both samples, the increase was significantly greater in the Welsh sample (rising from 61% to 82%; Figure 1). This measure assessing the most recent supermarket visit may be more amenable to memory, and therefore less open to social desirability bias, than measures asking about typical behaviour. However, typical behaviour may be more useful as an indicator of habit (e.g., Verplanken & Wood, 2006). Indeed, the study also showed that habits were changed as a result of the charge: before the introduction of the carrier bag charge, 42% of the Welsh sample reported 'always' taking their own bag to the supermarket; after the introduction a significantly higher proportion (64%) reported this; similarly, before the introduction of the carrier bag charge only 27% 'always' took their own bag to 'other shops', while more than two-fifths (43%) reported doing so after the introduction of the carrier bag charge.

Figure 1: Percentage bringing their own bag to the supermarket 'at their last visit' in Wales and England before and after the introduction of the carrier bag charge



Source: Poortinga et al., 2013

2.32 A third study of the Welsh carrier bag charge (Zero Waste Scotland and Welsh Government, 2012), which included Scotland as a comparator, demonstrated the efficacy of the charge. The study used behavioural observations as well as self-reported behaviours. Observations show that one year after the Welsh charge was introduced less than one-fifth (18%) of containers used by Welsh consumers were SUCBs, compared to 70% by Scottish consumers. The study also observed that bags-for-life were used by more than 6 out of 10 consumers in Wales, but only 2 out of 10 in Scotland. Re-used SUCBs accounted for 8% of containers used in Wales and 2% in Scotland. The study highlights the limitations of using self-report data as compared to behavioural observations: households appear to systematically over-state bag re-use and under-state SUCB consumption (see

2.33

2.34 Table **2**). Note that these differences may in part be due to methodological differences, as well as to social desirability affecting self-reports (as noted in previous research; e.g., Corral-Verdugo, 1997). While the survey asked about the 'last time' respondents visited a shop, observations were made of a different sample of shoppers on a particular date – however, disparity

here would not account for the systematic differences observed. The report authors, however, note that the differences between self-reported and observed behaviour may be compounded by respondents taking bags-for-life but forgetting to use them in-store, rather than entirely a social desirability effect. Consistent with others' findings (Jones, 2012; Poortinga et al., 2003), the study showed that bag reuse was higher at food chains (such as Tesco, Sainsbury's, Morrisons, ASDA, Co-op Food, Waitrose M&S Food, Spar) than at non-food chains (e.g. clothing retail) and independent shops (e.g. local butchers).

Table 2: Proportion of consumers taking new SUCBs and reusing bags in different retail contexts and comparing different research methods

	Type of store[2]	Scotland		Wales	
		Reuse bag-for-life (%)	New SUCB (%)	Reuse bag-for-life (%)	New SUCB (%)
Stated behaviour	Food chain	65.2	24.8	79.4	9.6
	Non-food chain	24.8	56.3	54.7	27.9
	Independent	33.3	27.3	53.3	12.9
Observed behaviour	Food chain	27.7	66.3	51.2	15.8
	Non-food chain	0.7	65.9	17.6	25.9
	Independent	2.9	60.4	32.7	24.3

Source: Zero Waste Scotland and Welsh Government, 2012

Single use carrier bag use: long-term effects

2.35 Little is known about the long-term effectiveness of plastic bag charging schemes. Two countries where the long-term effects have been studied extensively are Ireland and South Africa. The two countries constitute very different case studies. In Ireland, the charge lost value due to inflation; while in South Africa the charge was reduced in absolute terms three months after its introduction.

2.36 As mentioned above, while the 'plastax' in Ireland decreased plastic bag consumption from 328 to 21 bags per capita per year initially, this increased to 33 bags per capita in 2007 before the levy was increased. After the levy was increased, plastic bag consumption fell to 26 bags per capita per year in 2007 (Pre-Waste, 2011), 18 bags per capita in 2010 and 14 bags per capita in 2012 (Clarke, 2014). The Irish evidence suggests that a plastic bag charge may need to be increased after a number of years in order to

[2] Examples of 'food chains' in the study were: Tesco, Sainsbury's, Morrisons, ASDA, Co-op Food, Waitrose M&S Food, Spar. Examples of 'non-food chains' were: New Look, Next, Boots, B&Q, WHSmith, Argos, M&S, Sports Direct, Superdrug. Examples of 'independents' were: local butcher, newsagent, baker, market stalls, clothing and gift shops.

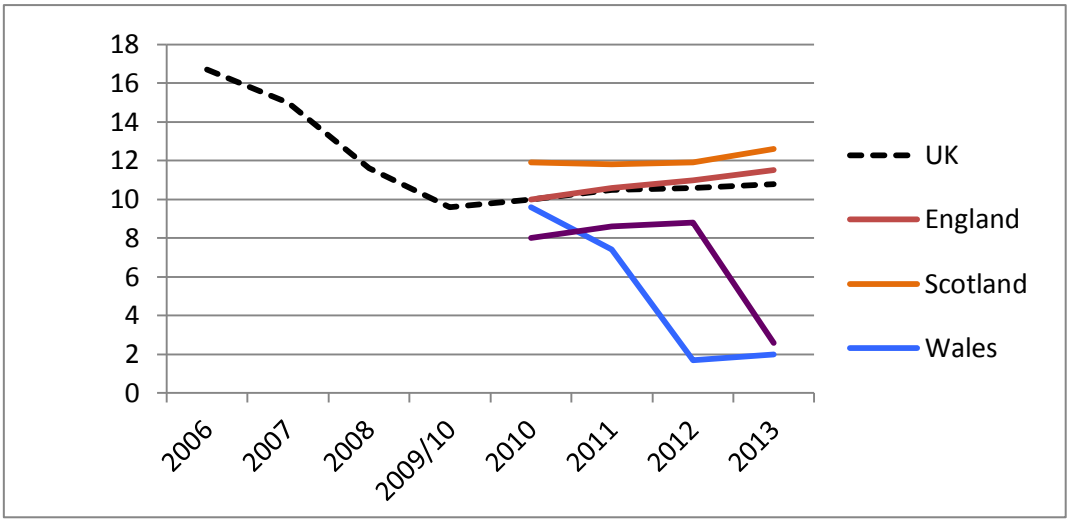
retain its effectiveness. However, low levels of bag use have been sustained for several years since the 2007 increase (with no further increases to the charge). This may suggest that the initial levy was not set at a socially optimal level to create sustained behaviour change. Other factors, such as associated communications campaigns, may also have contributed to the success of the increased Irish charge.

2.37 In South Africa, plastic bag use increased around two years after the introduction of the plastic bag levy. However, in South Africa the price of the plastic bag levy fell substantially three months after its introduction, which could partly account for the observed increase in bag use (Dikgang et al., 2012). Indeed, this is supported by the disparity in consumer behaviour observed between retailer type: low-income retailers barely reduced the price of SUCBs and saw very little rebound in bag consumption to 2008; while middle- and high- income retailers dropped bag prices more significantly and saw equivalent (albeit gradual over 1-2 years) increases in SUCB consumption (ibid). On the other hand, Jones (2012) suggests the short-term efficacy of the South African charge was likely to be in part due to the initial shock-value of the charge to which consumers subsequently habituated. However, even accounting for rebound, bag consumption across retailers in 2008 (between 8 and 13 per 1000 Rand of shopping) still did not reach baseline (around 40 bags per 1000 Rand in 2002). Similar rebound effects have been observed in Hong Kong, where plastic bag disposal reduced by 36% between 2005 and 2009 (the charge was introduced in 2009). However, it started to increase again in 2010 (Chan, 2011, cited in Kwong, 2014). The scarcity of long-term data from other charges, however, make it difficult to delineate the effects of habituation and price changes, indicating this is a priority for future work.

2.38 Elsewhere, rebound effects from bag charges have so far not been observed. Charges introduced in certain shops in Portugal in 2007 resulted in reductions of 64% by 2009. However, no measurements were taken in between. It is therefore not known if the reduction was greater shortly after the charges were brought in. In the UK, retailers Marks & Spencer (2014) report that their £0.05 charge (donated to environmental causes) for food bags introduced in 2007 led to a drop of 75% in plastic bag use by 2012, which has been maintained to 2014. According to Schembri (2006), the Maltese eco-tax scheme, which included a tax on non-degradable plastic bags and a communications campaign to highlight negative impacts of plastic and positive impacts of the tax, led to a complete shift from ‘normal’ to ‘degradable’ plastic bags after 18 months. However, this change appears to have been driven by retailers changing bag supplies, rather than a change in consumer behaviour.

2.39 In Wales, latest figures from supermarkets suggest a slight increase in the number of SUCBs sold from 1.7 to 2.0 per capita per month between 2012 and 2013. However, this still represents a significant decrease from the baseline figure (pre-charge) of 9.6 per capita per month in 2010, and is smaller than the increases in bag use observed in England and Scotland (where charges had not yet been introduced) over the last 12 months (WRAP, 2014; see Figure 2). Note that this data is based on monthly sales figures provided by seven leading UK supermarkets (e.g., Tesco, Sainsbury's). It should be noted that data quality is not known and that data were not available for other supermarkets. Furthermore, as noted earlier, bag reuse in supermarkets is likely to be higher than for any other type of retailer.

Figure 2: Single-use carrier bag sales in supermarkets per capita per month in the UK[3]



Source: WRAP

Impacts on different consumer groups

2.40 One argument against carrier bag charges is that they could be considered a regressive economic policy. That is, they impose a greater burden on lower-income groups than higher-income groups (Baker, 2011; Jones, 2012). However, as proponents have argued, the charge can easily be avoided by reusing bags – indeed, this is the behaviour change intended by the charge. It seems the Irish levy did not have strong implications for income distribution (IEEP, 2014) and a consumer survey after its introduction did not indicate different views about their charge (including

[3] Participating supermarkets were Asda, Co-operative Group, Marks & Spencer, Morrison's, Sainsbury's, Tesco and Waitrose.

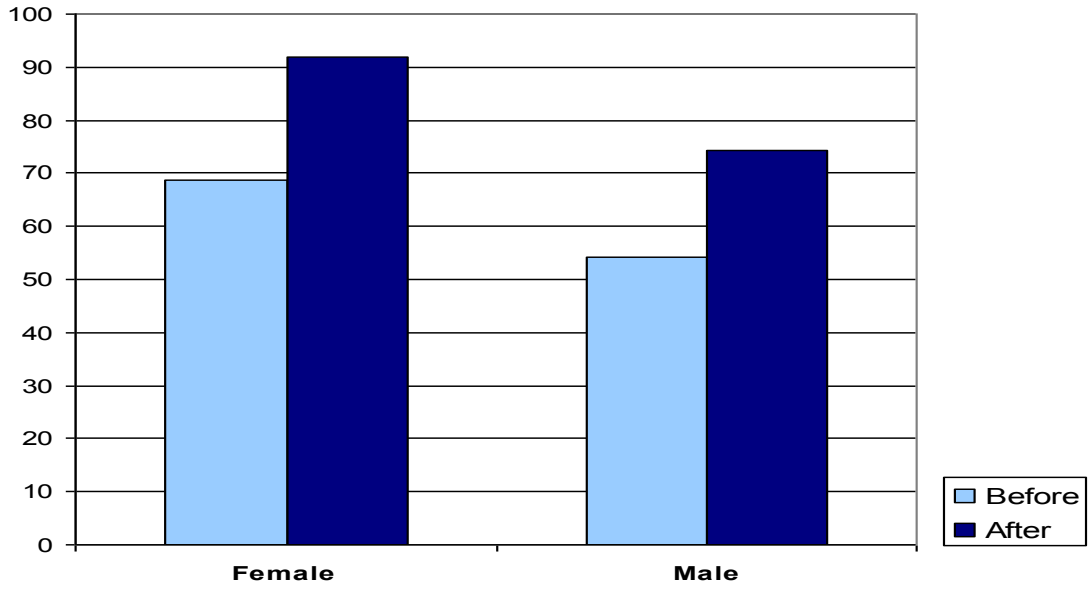
financial burden) amongst different socio-economic groups (Convery & McDonnell, 2003).

2.41 Based on a contingent valuation study with Utah (US) consumers (based on a combination of random and convenience samples; n=275), Dunn (2014) concludes that older, female and lower-to-middle-income individuals, as well as larger-sized households, are more likely to switch to reusable bags when faced with a tax on plastic bags.

2.42 Other studies show similar age, as well as gender, effects to those of Dunn (2014) (e.g., Zero Waste Scotland and Welsh Government, 2012; WRAP, 2005). For example, Poortinga et al. (2012) found that older consumers, as well as women, were more likely to bring their own bags to the supermarket both before and after the introduction of the Welsh charge (see Figures 3 and 4).

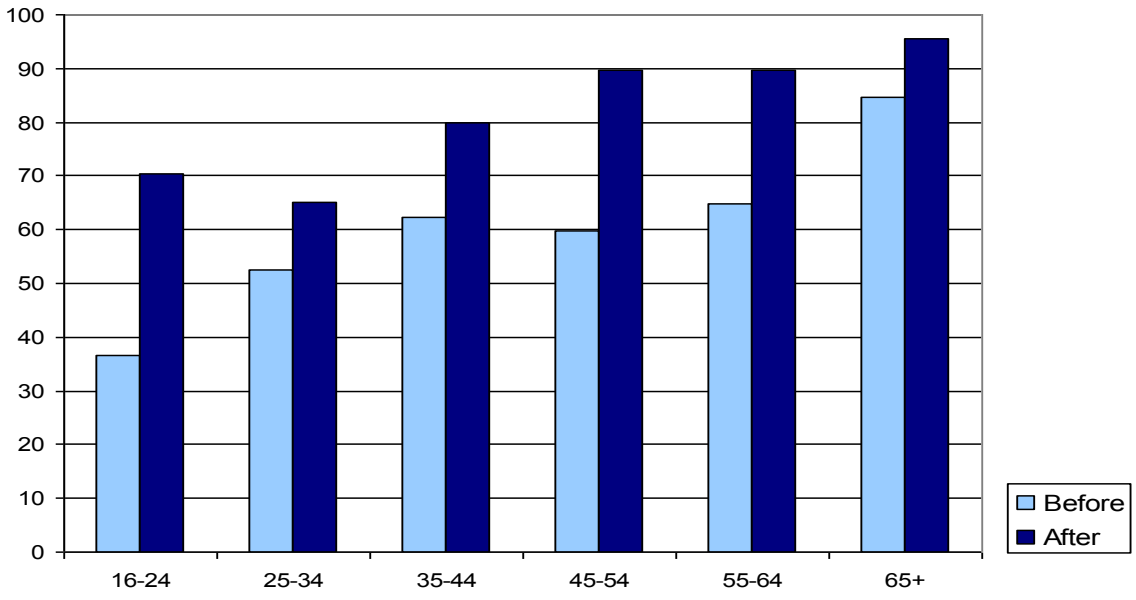
2.43 In addition, the Poortinga et al (2012) study found that gender, age and income were associated with 'always' taking one's own bag/s to the supermarket and to other shops. Men were 37% less likely to always take their own bag/s to the supermarket and 32% in the case of other shops; younger participants (aged between 16 and 24 years) were 51% less likely to take their own bags to the supermarket and 70% less likely to take them to other shops, whilst older participants (in particular those aged 65 years and over), were more 3.5 times likely to take their own bag/s to the supermarket and 3.6 times in the case of other shops. Those on higher incomes (over £20k) were 53-62% less likely to take their own bags to other shops than those on the lowest (up to £10k) incomes, although there was no difference in attitudinal support for the charge by income group.

Figure 3: Own bag use among men and women before and after the introduction of the SUCB



Source: Poortinga et al., 2012

Figure 4: Own bag use by age group before and after the introduction of the SUCB in Wales



Source: Poortinga et al., 2012

2.44 Other research highlights that, alongside socio-demographic factors, attitudinal variables are strong predictors of consumer behaviour (Jayaraman et al., 2011). For example, Lam and Chen (2006) surveyed 150 hypermarket shoppers before and after shopping two years after SUCB charging was introduced in Taiwan. The findings showed that both intentions to bring their own bags and actual bag reuse were predicted primarily by self-efficacy of bringing bags, as well as positive attitudes, environmental concern, and personal norms[4]. In addition, actual SUCB consumption was predicted by income as well as situational factors (e.g., buying more than planned). This highlights the value of including psychological and contextual variables alongside demographic information to fully understand SUCB consumption.

Secondary impacts of carrier bag charging schemes on consumers

Behavioural adaptations

2.45 Besides bag re-use, two behavioural adaptations that have been observed where charging has been introduced (e.g., Zen et al., 2013) are bag abstention (i.e., not using a bag at all) and bag optimisation (i.e., filling bags until they are almost full), In an observational study that compared shoppers in Portuguese supermarkets that charge €0.02 (just under £0.02) versus those that do not charge for bags, Luís and Spínola (2010) found that more customers re-used bags (37% vs. 0%), avoided using bags altogether (12% vs. 5%), and filled their bags completely (52% vs. 17%) in shops charging for bags. In Wales, observations of bag abstention following the introduction of the charge indicate that 40% of shoppers (compared to 27% in Scotland) took at least some items loose from food chains, such as Tesco and M&S Food (with 19% vs.14% doing so in non-food chains, and 29% vs. 11% doing so in independent stores; Zero Waste Scotland and Welsh Government, 2012). Here, self-reports of taking items loose were lower as compared to the behavioural observations, although the observations include shoppers using containers as well as taking some, often bulky, loose items (e.g., multi-pack toilet rolls or nappies).

Behavioural spillover

2.46 Behavioural 'spillover' is the idea that undertaking one (pro-environmental) behaviour can lead to adopting other, associated behaviours (Thøgersen, 1999; Austin et al., 2011). It is notable that one of the arguments for

[4] Lam and Chen (2006) used composite psychological measures of attitude towards the behaviour (e.g., 'It is worthwhile to bring my own bag(s) to shopping'), environmental concern (e.g., 'I worry that plastic trash will damage the health of our next generation'), personal norm (e.g., 'I feel obliged to comply with the government's plastic bag restriction'), self-efficacy (e.g., It is easy for me to bring a bag to shopping') and response efficacy (e.g., 'If I have a habit of not requesting plastic bags, I can help Taiwan to reduce its plastic trash').

introducing the Welsh charge was that it would change Welsh social attitudes to resource use away from a 'throwaway society' to a more sustainable one, supporting several waste and environmental objectives and changing a host of behaviours (not only bag use per se; AEA Technology, 2009). Poortinga et al. (2013) examined whether the consumption of re-usable bags could act as such a 'catalyst' for further waste-conscious changes. Drawing on the spillover literature, they hypothesised this process would be mediated by a change in identity, such that environmental concern and/or waste-consciousness would become more central to people's sense of self. Such a heightened sense of green or waste-conscious identity may, given appropriate opportunities, lead on to other pro-environmental actions. They found higher levels of a waste-conscious/environmental identity[5], after when compared with before the carrier bag charge was introduced in Wales, which they suggest could lead to other waste-conscious decisions in the longer term. This observed change in identity is consistent with previous qualitative research which shows that using 'environmentally-friendly' bags signals and reinforces one's self-identity since it is a visible, public display of pro-environmental commitment (Cherrier, 2006).

2.47 However, despite this change in identity, Poortinga et al. (2013) did not find evidence of behavioural spillover to other types of waste or environmental actions among the Welsh public within the timeframe of their study (September 2011 – May 2012). This is consistent with Frater's (2011a) research that suggested shoppers did not make any connection between the charge and broader consumption behaviours. No other research has made appropriate pre- and post- charge measurements of other waste or environmental behaviours in Wales or anywhere else, so no conclusions can be drawn about spillover arising from environmental charges, including SUCB charges. This would thus appear to be a significant gap in the literature that future consumer behaviour studies could address.

Substitution effects

2.48 Sherrington et al. (2012) use supermarket carrier bag sales data collected by WRAP (2012) for the UK Voluntary Agreement on Carrier Bags to estimate the size of substitute effects of reduced SUCB consumption. Substitution effects are considered in terms of (a) using other types of container than SUCBs for 'primary uses' (i.e., carrying shopping) and (b) using alternatives to SUCBs for 'secondary uses' (e.g., lining bins). They suggest that for every 1000 SUCBs avoided in the supermarkets that provide data to WRAP, 29 LDPE (low density polyethylene) 'bags-for-life' are used, and 4 other re-usable bags, such as bags made from cotton.

[5] Measured with four statements, e.g., 'I think of myself as a waste conscious person'; 'I think of myself as someone who is very concerned about environmental issues'.

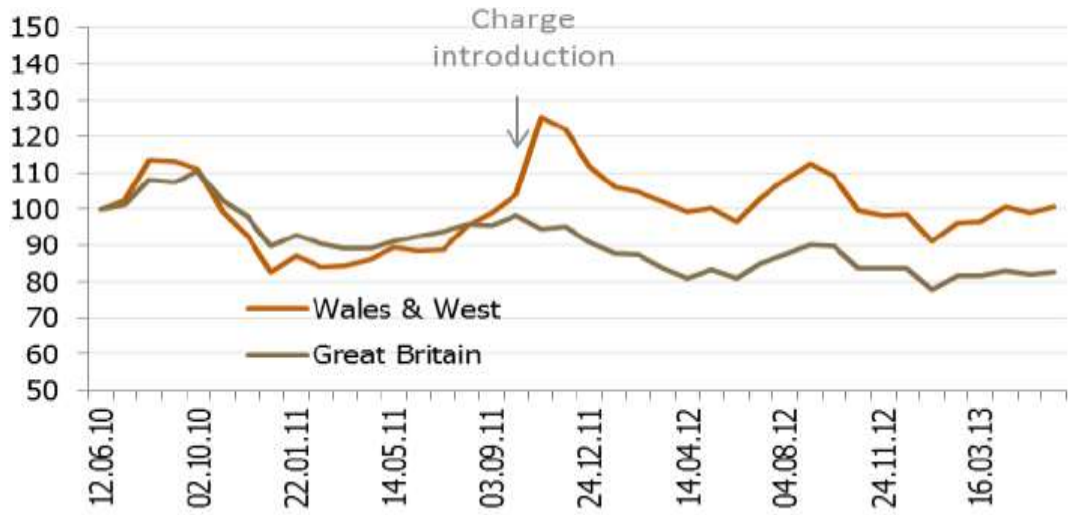
However, the report does not make clear how many times it is assumed these more durable alternatives would be used. Similarly, they used 2005 WRAP data to estimate that per 1000 SUCB reduction, 40% more bin liners will be used. This estimate was based on self-reported re-use of SUCBs, with 76% of consumers reporting re-using all or most SUCBs, of which 53% reported re-use as a bin liner (WRAP, 2005). However, this could not be confirmed by a more recent study by WRAP (2013a). The latter study found as little as a 4% increase in bin liner sales as compared to the reduction in SUCBs, and a 130% increase in bag-for-life sales (discussed further below). Similarly, an evaluation of the Hong Kong bag levy found only a 2% increase in bin liner sales following its introduction (Friends of the Earth [HK], 2010).

2.49 Other research shows that bin liners are the most common re-use of carrier bags (Musa et al., 2013; Zen et al., 2013; Zero Waste Scotland and Welsh Government, 2012). Poortinga et al. (2012), however, found only a small reduction in the self-reported use of carrier bags as bin liners between September 2011 and May 2012; those claiming to 'always' re-use carrier bags for 'other purposes (e.g., as a bin liner)' dropped from 57% to 51% following the introduction of the charge. This drop in secondary use (e.g., as bin-liners) is consistent with the reported increase in SUCBs for primary (i.e., shopping) purposes (discussed earlier). Other research found that the number of Welsh householders using carrier bags as bin liners decreased after the introduction of the carrier bag charge, whilst those using purpose-made bin liners increased (Zero Waste Scotland and Welsh Government, 2012). Similar findings were observed in China after the introduction of bag charging, resulting in authorities formulating standards for bin liners, including biodegradable liners (O'Loughlin, 2010). Since the price of bin liners varies considerably, this substitution may or may not be economically rational; it is unclear, however, from this analysis whether consumers undertake any sort of economic calculation of the cost of buying bin-liners versus new SUCBs.

2.50 Using electronic point-of-sale data from across the retail sector, WRAP (2013a) found that the introduction of the Welsh SUCB charge was associated with an increase in bin-bag sales. Bin-bag sales were found to be persistently higher in Wales & West than in Great Britain as a whole after the introduction of the charge (Figure 4). This suggests that people in Wales were using some of the SUCBs as bin liners before the charge was introduced, and that the charge was responsible for the increased sales. However, the increases in bin liner sales were small in comparison to the overall reduction in SUCBs. As noted, WRAP estimated that the increase in bin liner sales was only 4% of the reduction in SUCBs by weight or number. While this sales data points to small secondary substitution effects from SUCBs in respect of bin-bags, more detailed (e.g., qualitative) consumer

behaviour data would help elucidate how these substitution effects have occurred and what other factors (e.g., bin-bag abstention) may also be occurring.

Figure 4. Indexed sale of pedal-bin liners in Wales & West and Great Britain



Source: WRAP, 2013a[6]

2.51 The WRAP study using retailer point-of-sale data also found that there was a substantial increase in the use of 'bags-for-life' at the time of the introduction of the charge in the order of +130% (WRAP, 2013a). In terms of material, this equated to 28% of the overall reduction in SUCBs. The report therefore concludes that the positive effects of the Welsh SUCB charge outweigh the magnitude of unintended consequences in terms of increased bin-bag and 'bags-for-life' sales. This would appear to undermine claims that charging for carrier bags has an overall negative impact on the environment due to an increase in vehicles delivering heavier bags (PAFA, 2014).

2.52 A plastic bag charge may also have also unintended environmental impacts if bags-for-life are not being re-used and replaced as intended (AEA Technology, 2009). While an overwhelming majority of shoppers re-use 'bags-for-life' at least once (e.g., Clarke, 2014), there is some evidence that a significant proportion of heavy-duty plastic bags ultimately end up in landfill. Zero Waste Scotland and Welsh Government (2013) found that most households (93% in Wales, 86% in Scotland) own one or more bags–for-life, and use them at least ten times (70% Wales, 68% Scotland). However, of those that had disposed of a bag-for-life within the last year

[6] 100 = four weeks to 12th June, 2010

(32% Wales, 23% Scotland), 30% of Welsh and 40% of Scottish respondents said that they did this using the general waste stream rather than recycling them. Furthermore, and consistent with previous research (WRAP, 2005), almost no-one (0.3%) returned to the retailer to request a replacement bag-for-life once it had worn out. Overall, these results suggest that more could be done to improve recycling and replacement rates of 'bags-for-life'. In respect of replacement, this might include requiring retailers to advertise that they replace 'bags-for-life' for free in order to raise awareness of this option. This should be facilitated by the fact that consumers are more likely to use a branded 'bag-for-life' that they have purchased from the store they tend to shop in (Zero Waste Scotland and Welsh Government, 2013).

2.53 Another unintended consequence of carrier bag reuse relates to consumer health. This is discussed in detail later under 'Health Impacts'.

Shoplifting

2.54 Prior to introducing the Welsh charge, concerns were raised that shoplifting would be made easier when large numbers of people carry their own bags (AEA, Technology, 2009). However, while a small increase in shoplifting was reported following the Irish charge, this was small compared to retailers' savings associated with purchasing fewer bags and related storage costs (ibid). Based on a survey among retailers in Ireland, Convery and McDonnell (2003) concluded that shoplifting rose initially in some stores (e.g., supermarkets) but returned to pre-levy levels within a year of its introduction. However, this research was based on retailer perception (elicited through interviews with seven leading retailers from diverse sectors, whose market share represents around 50% of Irish retail sales) rather than shoplifting statistics from financial or electronic data. Other research using Radio Frequency Identification Tags (RFIDs) showed no link between shoplifting and customers carrying their own bags (Pate et al., 2011 cited in Jones, 2012); although RFIDs are more commonly used in some retail sectors (e.g., clothing, technology) than in others (e.g. supermarkets). One small-scale survey in rural SE Wales found that only 3% of retailers reported an increase in shoplifting (Jones, 2012). Overall, UK retailers have recorded a decline in shoplifting in the 12 months up to February 2014 (ACS, 2014).

The effectiveness of different policy instruments to reduce carrier bag use

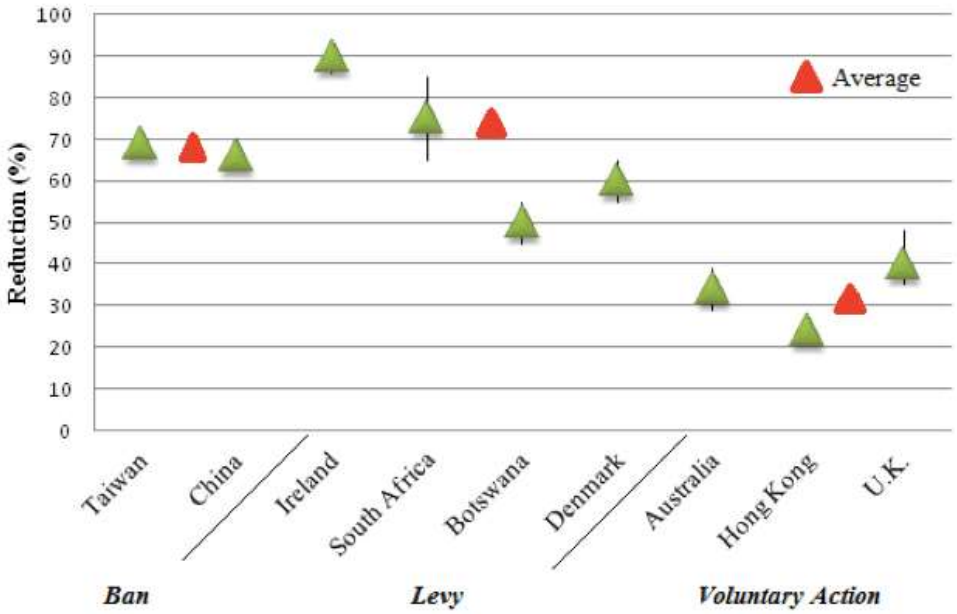
SUCB bans, levies and voluntary measures

2.55 Limited research has been conducted on the relative effectiveness of different policy instruments, including SUCB bans, pricing instruments (i.e., a levy, charge or tax), and voluntary (non-regulatory) retailer measures, to

reduce the consumption of SUCBs. Coercive policies (i.e., bans) have mainly been used in countries, such as India and Bangladesh, where plastic bag use is associated with public health and environmental risks (e.g., flooding). In contrast, European countries have tended to favour pricing instruments and voluntary measures (Ritch et al., 2009). Comparisons of the economic, social and environmental impacts of bans, pricing instruments and voluntary retailer measures to reduce the consumption of SUCBs highlight the various strengths and weaknesses of the different approaches, but tend to favour pricing instruments in terms of offering a balance of environmental benefits, consumer choice/equity, and business/administrative costs (Miller, 2012; City of Fort Collins, 2012; Nolan-ITU, 2002; Sugii, 2008; GHK, 2007; Tough, 2007; DoENI, 2012; cf. Nilsen, 2010).

2.56 Furthermore, comparisons of the efficacy of SUCB bans, pricing instruments, and voluntary measures that have been rolled out by national governments show levies to be slightly more effective (73% reduction in plastic bags) than bans (68% reduction), and considerably more effective than voluntary retailer action (31% reduction) – although there is considerable variation within these categories due to various contextual factors relating to the implementation of the policy (Miller, 2012; see Figure 5; cf. GHK, 2007). For example, in Malaysia, where a charge is only applied one day per week, many shoppers simply buy less on charging days than on non-charging days (Zen et al., 2013). Research also suggests that where environmental policies (including those to reduce the consumption of SUCBs) have been most successful, multiple tools were used (e.g., economic, communication, standards) to ensure stakeholder and consumer compliance (Pape et al., 2011; Hasson et al., 2007). While it may seem surprising that bans are not more effective than pricing instruments, those that have been implemented to date (e.g., in Taiwan and South Australia) have only been in force for a relatively short period of time or included numerous exemptions and illegal selling (Miller, 2012). In South Australia, retailers could still offer paid-for alternatives, such as compostable plastic bags and ‘green’ bags designed for multiple use after a ban on plastic bags was introduced (Sharp et al., 2010).

Figure 5. Reduction in plastic bag consumption by policy type



Source: Miller, 2012

2.57 Research conducted by Sharp and colleagues (2010), based on 1,167 consumer interviews pre-ban and follow-up interviews with a sub-set (n=253) post-ban, found that self-reported own bag use rose sharply to 95% after a legislated retail ban on single use polyethylene bags in South Australia, as compared to 60% before the ban. However, a sizeable proportion of the shopping public (18%) still bought compostable SUCBs after the ban was in place. Overall, the impact of a ban on single-use plastic bags appears to be of a similar size to that of a plastic bag charge if retailers can still offer paid-for alternatives such as compostable SUCBs (Cascadia, 2011). Schemes where retailers could decide how much to charge (whether this is a voluntary or mandatory charge) have shown substantial reductions in plastic bag use as retailers typically charged high prices (Jones, 2012). Research conducted in China (cited in Jones, 2012) and elsewhere (e.g., South Africa, Ireland) also suggests the level of the charge influences its efficacy (as discussed further in next sub-section).

2.58 There is evidence that mandatory charging instruments are more effective in reducing the use of single-use carrier bags than voluntary measures. For example, research for Colorado's City of Fort Collins (2012) estimated that customer education alone would result in only 5% reduction in total carrier bag use, compared to around 50% with a fee charged for disposable bags and over 60% with a ban on disposable bags. Field experiments in which supermarket shoppers received 'prompts' or 'persuasive normative messages' or made 'pledges' similarly found only moderate reductions in carrier bag use (Ohtomo & Ohnuma, 2014; De Groot et al., 2013; Laakso,

2013). Broadly consistent with the very small predicted or observed changes in consumer behaviour in these studies, Malaysian research suggests consumer education had no effect on consumption of SUCBs (although levels of baseline awareness is not known; Jayaramen et al, 2011).

2.59 In 2007, 21 UK retailers agreed with Defra to cut the environmental impact of the carrier bags they give out by 25% between May 2006 and December 2008. In 2008, the British Retail Consortium (BRC) entered a voluntary agreement with the Scottish Government, Defra, the Welsh Assembly Government, and the Northern Ireland Department of the Environment to reduce the number of single-use carrier bags by 50% between 2006 and 2009. This higher target was narrowly missed with a 48% reduction measured for the UK (WRAP, 2009). Once the voluntary agreement ended in 2009, however, a small increase (from 7.2 billion in 2009 to 7.6 billion in 2010 and 8.0 billion in 2011; from a baseline of 12.2 billion in 2006) in SUCBs was observed in the UK (WRAP, 2013c).

2.60 The UK carrier bag voluntary agreement also provides indications of how supermarket behaviour can affect carrier bag use. Notably, supermarkets that saw the greatest increase in sales of 'bags-for-life' were the ones that removed SUCBs from direct view of customers (WRAP, 2009). While other supermarkets achieved some success by rewarding customers with 'card' points for reusing bags, these effects appeared smaller overall. The findings of this study should however be treated with caution, as they were based on a limited number of case studies and no consistent strategy was used across the different supermarkets to evaluate the impacts of the voluntary measures. Furthermore, no information is provided about how the reductions were calculated.

2.61 Although, bags-for-life usage remained static at around 5% between 2006 and 2012, the largest proportion of users seem to have adopted them around 2008 when the voluntary agreement between BRC, leading supermarkets and the UK governments to reduce single-use carrier bag was introduced (Yeow et al., 2013). Most of the shopping public (67%) also heard about them from supermarkets, pointing to the active role of large retailers in their promotion (e.g., provision of prompt magnets, voluntary charging for SUCBs, and offering green loyalty points; Yeow et al., 2013).

2.62 Ohtomo and Ohnuma (2014) used observations and questionnaires in Japanese supermarkets and found that a voice prompt by cashiers (i.e., asking shoppers if they wanted a plastic bag) reduced the number of shoppers accepting plastic bags to 73%, as compared to 78% in the baseline period when cashiers stayed silent; the intervention also produced an equivalent increase in the motivation to use fewer plastic bags. Laakso (2013) similarly found that customers considered a voice prompt was to be

the most significant in-store influence on their bag re-use behaviour. These findings are consistent with the Zero Waste Scotland/Welsh Government (2012) study of the Welsh and Scottish shoppers' bag use behaviour; their findings suggest the far higher usage rate of SUCBs in Scotland is at least in part to do with cashier behaviour (i.e., packing items into SUCBs without consulting the consumer). As noted earlier ('short-term effectiveness' section), this highlights the significance of SUCB charging for breaking habits (both on the consumer and retailer side) and the importance of changing defaults (Sunstein & Reisch, 2013).

2.63 De Groot et al. (2013) conducted a naturalistic experiment (n=200) in a UK supermarket to examine how normative messages could encourage shoppers to use fewer plastic bags. They found that shoppers used, on average, significantly fewer plastic bags per trip when an injunctive norm message ('Shoppers in this store believe that re-using shopping bags is a worthwhile way to help the environment. Please continue to re-use your bags'; 2.04 bags used) or a combined personal and injunctive norm message ('Shoppers in this store believe that re-using shopping bags is a worthwhile way to help the environment. We thank you for helping the environment by continuing to re-use your bags'; 1.86 bags) was shown than when only an environmental message was shown ('Caring for the environment. Reuse your bags'; 3.12 bags). Laakso (2013) tested a community-based social marketing (CBSM) approach to bag reuse, involving educating customers about reasons for re-use, encouraging them to make a written pledge, and giving normative messages and prompt stickers in a Washington supermarket (pre-n=164; post-n=144), and found an 11% reduction in SUCBs. Information campaigns have also been used elsewhere with indications of some impact on bag use habits; for example, the No Plastic Bag Day (NPBD), co-organised by environmental groups in Hong Kong and involving 39 participating retailers by November 2006, led to 51% of consumers claiming to be developing the habit of not using plastic bags or bringing their own bags when shopping on NPBD (GHK, 2007).

2.64 In a rare example of a SUCB experiment not set in a supermarket context, a pilot study conducted in the Netherlands non-food retail sector found that the visual removal of free small plastic bags in combination with pricing of larger 'heavy duty' bags at a minimum of €0.10 (£0.08) reduced the overall number of (free or paid-for) plastic bags issued per purchase (transaction) by 70-77% (Kennisinstituut Duurzaam Verpakken, 2014). This can be compared to a reduction of 48% in a shop that already charged for plastic bags in the baseline period. In this particular pilot, retailers were asked to provide information on the number of bags issues, their price, as well as the number of purchase transactions over a 3-month period in the Christmas shopping season. The whole of 2012 was used as the baseline period.

2.65 The Dutch pilot study also found that the proportion of transactions in which free plastic bags were issued dropped from 57-95% in the baseline period to 4-5% in the pilot period (Kennisinstituut Duurzaam Verpakken, 2014). The reduction was the smallest in the shop that already charged for plastic bags in the baseline period (from 64% to 31%). The proportion of transactions in which larger paid-for 'heavy duty' bags were issued increased from 0-2% to 3-25%. The increase was the smallest in the shop that already charged for plastic bags in the baseline period (from 2% to 3%). Overall, the increase in larger 'heavy-duty' plastic bags only partly offset the decrease free plastic bags. This suggests that the visual removal of plastic bags in combination with shops stopping actively offering them to customers can have the same effect as a carrier bag charging scheme.

2.66 In a field experiment conducted in the semi-organised retail section (i.e., 180 fruit and vegetable shops) in and around Delhi, Gupta and Somanathan (2011) and Gupta (2011) examine the effectiveness of several price and non-price instruments to reduce the use of plastic bags in India. The staged experiment consisted of three cumulative phases (i) provision of information to consumers, (ii) a cash-back scheme contingent on use of non-plastic bags and (iii) provision of substitutes for plastic bags. The information provision treatment included both negative information (showing the harmful effects of plastic bag use) and positive information (stressing the positive impacts of cutting down on plastic bags). The results indicate the cumulative introduction of these measures led to an increase in own bag use from 4.6% before to 17.8% after. The number of consumers who would only use plastic bags reduced from 80.8% to 57.1%. In general, positive information appeared more effective than negative information.

2.67 Dai (1998) reported on the voluntary 'Use Less Plastic Bags' campaign that was conducted among retailers and wet markets in Hong Kong in the 1990s. Participating retailers and market stall owners were encouraged to develop the promotion and reduction programmes themselves with the help of the campaign committee. Both campaigns achieved a 9-10% reduction in plastic bag use, with the number of consumers bringing their own bag increasing from 12.5% before to 31.5% a year after the campaign. Reduction measures adopted included staff education and training, displaying ('Use Less Plastic Bags') campaign posters in prominent locations, and providing alternative carriers, such as paper bags and paperboard drink carriers.

2.68 Overall, it appears that, while they are easy to implement, voluntary agreements are not optimal in terms of reducing SUCB consumption (Lyons, 2013). At the other end of the spectrum, the evidence suggests that a complete ban could be as effective as a charge, but would leave little flexibility to producers, retailers, and consumers. Carrier bag charging

schemes are found to be highly effective while, at the same time, being publicly acceptable.

Size of the charge

2.69 There is conflicting evidence about the level at which a tax or charge needs to be set to be effective. According to economists, a carrier bag tax or charge is a typical market-based instrument that provides a market signal for consumers to internalise the costs of environmental pollution it produces (Convery & McDonnell, 2003), with the marginal social cost of a plastic bag being estimated to be around $0.10 (£0.06; Akulian et al., 2006). However, carrier bag pricing instruments are not strictly 'Pigouvian'[7] in the sense that they aim to change consumer behaviour rather than cover the external costs of carrier bag use (Convery et al., 2007).

2.70 Willingness to pay (WTP) studies have been used to estimate the level at which charges need to be set to discourage consumers using SUCBs. A study conducted in 1999 (i.e., three years before the introduction of the Irish charge) with 1,003 Irish adults found that only 8% of Irish consumers found it worth paying more than €0.07 (£0.05) for a plastic bag (Drury Research, 2000; cited in Convery et al., 2007). The success of the Irish initiative may therefore be due to the initial charge being multiple times higher than the maximum willingness to pay for a plastic bag (ibid). On the other hand, Frater (2011a) found 38% of Welsh consumers were willing to pay more than 5 pence for a bag, compared to 29% willing to pay 5 pence, and 30% between 0 and 4 pence. A stated preference study conducted among shoppers before the introduction of the Chinese charge (He, 2010) found that the proportion of shoppers indicating that they would stop using plastic bags was 27%, 35% and 64% at 0.3 (£0.03), 0.5 (£0.05) and 1 (£0.10) yuan respectively. While the actual total bag consumption was different to the predicted total bag consumption under the 0.3 yuan case, they were essentially the same under the 0.5 yuan case, suggesting that consumers can predict their future bag use reasonably well (ibid). Dunn (2014) used data from an online survey of shoppers to determine the WTP for continued plastic bag use, as well as the willingness to accept (WTA) switching to reusable grocery bags. In line with the empirical findings of Homonoff (2013), he found that shoppers have a greater aversion to paying for plastic bags than an affinity for a subsidy on re-usable bags.

2.71 There is however no strong evidence that higher charges are more effective than lower charges. Experiences from other countries show that even a relatively small charge can produce a substantial reduction in plastic bag use (Hasson et al., 2007; Homonoff, 2012; WRAP, 2012). The Welsh

[7] The economist Pigou's (1960) seminal work on environmental taxation argued that marginal external costs should be identified in order to determine the optimal level of tax. A Pigouvian tax is then one where the marginal social cost determines the tax rate.

charge (£0.05) was significantly lower than the initial Irish charge (€0.15 = £0.12), but still achieved a substantial reduction in supermarket plastic bag use (WRAP, 2012). Similarly, the initial South African charge of 0.46 Rand (about £0.03) led to a 'dramatic' 80% reduction in SUCB sales, although that effect was diluted when the charge was lowered significantly a few months later (Hasson et al., 2007). In the UK, retailer WHSmith report that their £0.01 charge (donated to an environmental charity), accompanied by cashier prompts, was sufficient to produce a 53% drop in plastic bag use (BRC, 2011). While Homonoff (2013) also found that a small tax of 5 dollar cents (£0.03) imposed in the Washington Metropolitan area reduced the number of customers using a disposable bag from 8% to 45% (with the number of customers using a reusable bag increasing from 16% to 49%), a policy that offered customers a five-cent bonus for reusable bags had virtually no effect. The strength of Homonoff's (2013) study is that it made a before-and-after comparison in a number of counties with different charging policies (i.e., 'always charging'; only charging in the post-period; and never charging). Within the different counties there were a number grocery chains that offered a bonus program and a number that did not. The study was therefore able to compare the effects of different conditions. The results of this study are not in line with conventional economic theory, and suggest that a charge should not only be understood as an economic instrument, but also as a 'habit disruptor' that forces shoppers to make a conscious decision as to whether or not they want to use a plastic bag (Poortinga et al., 2013). There are, however, indications that price is important in maintaining the reduction in the long term, and that any drop in charges may lead to rebound in SUCB consumption, as discussed earlier ('Long-term effectiveness' section).

2.72 Understanding the relationship between the size of the charge and consumer demand is not only important for determining the initial charge but also for estimating the impacts of inflation (Sherrington et al., 2012). Price elasticity studies suggest that plastic bag demand is relatively price inelastic (Hasson et al., 2007), and that a small tax (under $0.05, i.e., £0.03) can have a significant impact on SUCB consumption (Dunn 2012). Economic analysis commissioned by the Irish Government (AP EnvEcon Limited, 2008) argued for the levy to increase over five years from €0.22 to up to €0.40 (£0.37 at that time) per bag, both to sustain a gap in price of single-use bags and bags-for-life and to account for the diminishing value of the levy in real terms due to inflation.

Impacts of carrier bag charging schemes on businesses

Retailer profits

2.74 Various measures, including phased implementation, exemptions, allowing for variable charging of reusable bags, and cooperatives for small businesses to buy reusable bags in bulk, have been shown to facilitate business compliance with single-use bag bans in the US (Cascadia, 2011; Pape et al., 2011). Other US analysis points to staff training costs associated with implementing a ban/charge, but also shows that most fee-based policies adopted in the US direct a proportion of the fee to the retailer to cover these costs (City of Fort Collins, 2012). Analysis of the Irish charge shows costs saved in bag purchasing by retailers offset administrative (and shop-lifting) costs (Convery et al., 2007), thus leading to retailer acceptance despite initial resistance (Jones, 2012; Pape et al., 2011). Other research suggests retailers are more resistant to supplier levies, which was expected to damage business and have no impact on consumer habits, than to consumer charging (GHK, 2007).

2.75 Analysis of the District of Columbia disposable plastic bag tax (Taylor, 2013) found that worker productivity (e.g., number of items scanned per 10-minutes) fell 5% during the first few weeks of the tax, but recovered to pre-tax levels within twelve months as workers adapted and learnt (including often by learning from co-workers).

2.76 Within Wales, research in Cardiff city centre and in rural SE Wales with retailers found business responses to the charge were largely neutral or positive (Frater, 2011b; Jones, 2012). For example, in rural SE Wales, 65% of retailers reported 'no effect' on their business. In terms of economic impact, most felt there was no impact, while 25% stating their costs had decreased; similarly, most (66%) felt there was no administrative impact. However, some sectors (e.g., takeaways, clothing) reported problems, such as customer annoyance (particularly near the English border), loss of advertising opportunities (i.e., branded bags), undermining the 'full service' experience of expensive clothing or jewellery stores, and concerns about injury when handing over hot food order (Jones, 2012); some initially also complained about lack of information from WG (Frater, 2011b). This is consistent with research from Japan that found supermarkets were more positive about bag charging that other retailers (Shukuya et al., 2011). As previously discussed, this highlights the need for further work to examine differences in perceptions and consumer behaviour across different retailer types.

2.77 Overall, however, it seems most retailers are positive about the charge in Wales and indeed the proposed charge in England, provided there are no exemptions for certain shop or bags (e.g., BRC, 2013; The Grocer, 2014).

For example, the Association of Convenience Stores (ACS, 2013) reports that 62% of British convenience store owners, rising to 82% of Welsh retailers, support a carrier bag levy. Industry bodies, while largely welcoming carrier bag charging, have also argued that carrier bag use is a marginal issue and that attention should be paid to broader issues around waste, resource efficiency, and the circular economy (BRC, 2014; CIWM, 2013).

Bag manufacturing, wholesale and distribution

2.78 The South African, Maltese, and Chinese policies have led to a loss of jobs related to single-use carrier bags (Fourie, 2004; O'Loughlin, 2010; Schembri, 2006). For example, several wholesalers and producers of ultra-thin plastic bags and containers closed down in China, including the largest plastic bag manufacturer (Suiping Huaqiang Plastic) with a loss of 20,000 jobs. However, with few, if any, manufacturers in the UK, such effects would be unlikely here. Indeed, in the UK, there is evidence that new start-ups have exploited the economic opportunities afforded by SUCB charging (e.g., Bag Re: Born). Further work could explore these economic implications further.

2.79 Lower demand for SUCBs will have implications on total financial and carbon costs of manufacture. The Akullian et al. (2006) study estimated that the monetised cost of a disposable plastic bag was 10.52¢ / bag (6.53p/ bag). This was made up of CO_2 emissions from production: 0.20¢ / bag (0.12p/ bag); litter: 5.20¢ / bag (3.23p/ bag); landfill: 2.92¢ / bag (1.81p/ bag); and improper recycling: 2.20¢ / bag (1.36/ bag).

Small-basket shops

2.80 There is largely only indirect evidence of the impact of carrier bag charging on small-basket shops (e.g., Zen et al., 2013). Zero Waste Scotland and Welsh Government (2012) do note that shoppers buying few items are more likely than those buying more (e.g., weekly supermarket shop) to use new SUCBs: 30% of Welsh shoppers deliberately do not use bags-for-life for 'small, ad hoc or unplanned' shops. Similarly, 35% say they do not use bags-for-life when non-food/clothes shopping (ibid; cf. Jones, 2012).

Distribution of proceeds

2.81 Bag charges where funds are donated to charities are more attractive than taxes to the public and are associated with lower administration costs for government than taxes (Scottish Government, 2013). In the first five years of the Irish levy (2002-2007), over €85m (£67m) had been raised (McDonnell et al., 2008). By 2012, this had risen to €196m (£154m) in revenue, although this was only one-tenth that expected due to the unexpected success of the charge (IEEP, 2014). Money raised covers administrative costs and supports an environmental fund. In the UK, the

voluntary £0.05 food bag charge implemented by Marks & Spencer in 2007 has raised over £4m for environmental charities (Marks & Spencer, 2013).

2.82 In a small-scale rural SE Wales survey of retailers, 83% claimed to direct proceeds from the charge towards charities (especially local ones), while 10% stated they went towards shop takings. It seems that national retailers have directed levy funds more towards environmental than other charities, although fully 17% did not confirm they sent bag sale proceeds to charity (Vincent Wildlife Trust, 2012, cited in Jones, 2012; cf. The Grocer, 2012).

Impacts of carrier bag charging schemes on government

2.83 Costs associated with landfilling (as well as environmental externalities) have been assessed in a number of studies (AP EnvEcon Limited, 2008; IEEP, 2014), as have the savings made from reduced landfill levies (and associated interest) following the introduction of charges (McDonnell et al., 2008).

2.84 Costs associated with implementing the Irish charge were modest: one-off costs for IT and advertising of around €1.5m (£1.2m) and 3% of revenues (IEEP, 2014).

2.85 Convery and McDonnell (2003) reported that the costs of implementing the plastax in Ireland were modest and were more than offset by the savings resulting from not having to provide plastic bags free of charge.

2.86 A discussion was held with the Policy Officer (Regulatory Services) at the WLGA, as well as a member of the Trading Standards team from Rhondda Cynon Taf County Borough Council (RCT) regarding the use of the civil sanctioning powers available to local authorities under the SUCB Regulations. In particular the discussion concentrated on how Councils were administering any non-compliance penalties or enforcement costs recovery. The following points were made by the WLGA:

2.87 Trading Standards Officers consider that the legislation is complex with regards to enforcement.

2.88 An intelligence led approach is used by Trading Standards, so that if few complaints or intelligence are received regarding the SUCB charge then it is unlikely that Trading Standards would seek out retailers that are not complying with the requirements of the SUCB charge;

2.89 The time for enforcement activity is lessened given the 30% austerity cuts in Wales in trading standards provision, which will inevitably reduce the effort on low risk activities such as the SUCB charge;

2.90 The approach used by Trading Standards is to use a proportionate, prioritised and transparent approach to enforcement. Hence, every opportunity will be given to retailers to respond to their advice to achieve compliance. It is only when advice and information is ignored or repeated

mistakes are made, that an escalated use of the enforcement tools available would be used.

2.91 Limited data can be made available from Trading Standards on enforcement activity related to the carrier bag charge, related to the number of complaints, requests for advice, and enforcement activities. However, these data cannot easily be assessed due to the nature of the data recording by Trading Standards Departments (WLGA, 2014).

2.92 Many of these points are also echoed in the views from a Trading Standards Officer from RCT. The enforcement mechanism introduced by the SUCB charge is considered bureaucratic and impractical, and the charge was introduced without providing any additional resource to Trading Standards to deal with the charge. Therefore, other enforcement functions will take priority, and in addition Trading Standards would not be able to check whether sales of carrier bags are being recorded, and how the proceeds are being spent (RCT, 2014).

Environmental impacts

2.93 Environmental impacts from bag use fall into the following categories:

- Impacts associated with bag manufacture
- Impacts associated with bag disposal through the regulated waste system
- Impacts associated with improper disposal (e.g., via littering)
- The impacts associated with the first two categories have been addressed through a series of LCA studies carried out in different countries.

2.94 A typical list of the impact categories considered in the LCAs is as follows:

- Consumption of non-renewable primary energy
- Consumption of water
- Climate change (emission of greenhouse gases)
- Acid rain (atmospheric acidification)
- Air quality (ground level ozone formation)
- Eutrophication of water bodies
- Solid waste production
- Risk of litter

2.95 The following conclusions were reached from these sources and from a screening assessment performed specifically for the Welsh work. A general concern arising from the review of bag LCAs was that the study had been commissioned by particular bag manufacturers, with some potential for bias.

2.96 Most LCAs that specifically compared paper and plastic bags (Franklin, Carrefour/AEAT, Boustead Consulting and Schwarzwalder et al) were consistent in showing that paper bags perform worse than plastic against most burden categories. On this basis, a proposal for a charge that left scope for an increase in paper bag use would appear to have potential for significant adverse consequences. Indeed, WRAP's response to the Scottish Environmental Levy Bill (WRAP 2004) stated a levy that substituted plastic bags with free paper bags would be a step in the wrong direction.

2.97 A review of additional LCA data, particularly from Ecoinvent and BUWAL250, suggested that the differences between paper and plastic may not be as large for some impact categories, notably global warming and fossil fuel use, as suggested by these comparative analyses. Significant variation in the environmental performance of paper manufacture was observed between different assessments, reflecting factors such as the availability of water and renewable sources of energy (water and wood/biomass). However, whilst there seems scope to question the extent of differences previously reported between the choice of paper or plastic, no firm rationale has been identified for preferring "average" paper manufacture to plastic. On this basis the concern was considered valid that there could be adverse environmental consequences of a charge that applied only to lightweight plastic bags and not to paper carrier bags. The Billerud study challenged this view, in concluding that paper bags have a lower impact on global warming (the only impact category assessed in the study) than plastic bags. However, Billerud considers only one (Swedish) manufacturer and makes some assumptions that are unfavourable to plastic bags.

2.98 Studies comparing single use bags with heavyweight bags available from supermarkets tend to show that the heavier bags outperform the lighter ones if used about four times more. Factoring bin liner usage into the analysis, as in the work done by AEA Technology for the Scottish Executive (AEA Technology, 2005), did not have a significant negative impact on the overall results. The extent to which lightweight plastic bags may continue to substitute for bin liners was questioned in the light of changing systems for municipal waste collection by local authorities across the UK, particularly in relation to the separate collection of food waste (also see Section 2 'Substitution Effects'). This may lead to increased use of cornstarch bags, but not bags made from HDPE and other non-bio plastics. The AEA Technology study also demonstrated that exempting some businesses (SMEs and charity shops) would have a small negative impact on the results, which was of course to be expected.

2.99 A further question concerns whether recycled or biodegradable bags offer advantage over HDPE single use carrier bags. It was concluded that they do not for the following reasons:

2.100 Lightweight bags of any material are equally as likely to cause problems through littering.

2.101 Degradable bags can take a substantial amount of time to degrade, in the order of months or years. They therefore have the potential to persist as litter in the environment. Rapid degradation is only ensured when they are sent to composting plants that operate at optimised conditions (i.e. environmental parameters such as temperature, moisture content and residence time), otherwise degradation may not occur.

2.102 Once degradable bags start to fragment they become more difficult to collect and fragments may be more easily ingested by animals.

2.103 The LCA by Boustead Consulting raised questions about the broader lifecycle impacts of biodegradable bags.

2.104 A mixture of non-degradable and degradable bags in the waste stream would be problematic for attempts to recycle bags, as degradable plastics can contaminate and results in non-degradable plastic not being suitable for use.

2.105 Recycling is lower in the waste hierarchy set out in the EU Waste Framework Directive than waste reduction.

2.106 This does not rule out the use of degradable bags in some applications, for example the use of corn starch bags to line bins in areas where food waste is collected separately for composting (indeed, these are provided by some local authorities in Wales for this purpose).

2.107 Overall, it was concluded that long-life bags outperform single use bags and that plastic outperforms paper. No comparison with other bags (e.g., those made from cotton or canvas) was been made as these had not been included in the LCAs reviewed.

2.108 A major contribution to the literature since the 2009 study was carried out for the Welsh Government was commissioned by the Environment Agency and published in 2011. This considered the following types of bag available on the market in 2006:

- a conventional, lightweight carrier made from high-density polyethylene (HDPE);
- a lightweight HDPE carrier with a prodegradant additive designed to break the down the plastic into smaller pieces;
- a biodegradable carrier made from a starch-polyester (biopolymer) blend;

- a paper carrier;
- a ‘bag-for-life’ made from low-density polyethylene (LDPE);
- a heavier more durable bag, often with stiffening inserts made from non woven polypropylene (PP); and
- a cotton bag.

2.109 The following impact categories were considered:

- Resource depletion
- Acidification
- Eutrophication
- Human toxicity
- Fresh water and marine aquatic ecotoxicity
- Terrestrial ecotoxicity
- Photochemical oxidation (ozone formation)

2.110 The main conclusions of the research were as follows:

2.111 The environmental impact of all types of carrier bag is dominated by resource use and production stages. Transport, secondary packaging and end-of-life management generally have a minimal influence on their performance.

2.112 Whatever type of bag is used, the key to reducing impacts is to reuse it as many times as possible and where reuse for shopping is not practicable, other reuse, e.g., to replace bin liners, is beneficial.

2.113 Starch-polyester blend bags have a higher global warming potential and abiotic depletion than conventional polymer bags, due both to the increased weight of material in a bag and higher material production impacts.

2.114 The paper, LDPE, non-woven PP and cotton bags should be reused at least 3, 4, 11 and 131 times respectively to ensure that they have lower global warming potential than conventional HDPE carrier bags that are not reused.

2.115 Recycling or composting generally produces only a small reduction in global warming potential and abiotic depletion.

2.116 The conclusions in the Environment Agency’s newer LCA work therefore support the conclusions reached in the original study for Welsh Government, that all types of bag should be considered. This is particularly interesting given the position proposed for England, where paper and biodegradable bags would be exempted from a charging scheme.

2.117 A Life Cycle Analysis (LCA) study, conducted by Imperial College London on behalf of the National Non-Food Crops Centre (NNFCC), compared the environmental impacts of four single use bags; a lightweight HDPE bag, a starch polyester biopolymer bag (under brand name Mater-bi), a PLA/Ecofoil biopolymer bag (Octopus) and an oxo-degradable HDPE bag (Murphy et al, as reported by Environment Agency, 2011). These relate to monetised damages as per the DECC's carbon values, as outlined in Table 4. The performance of each type of bag, accounting also for different waste management options (energy from waste (EfW) (i.e. incineration with energy recovery), landfill and recycling) is shown in Table 3, relative to the HDPE/EfW case. As is often the case in LCA work, results are mixed, with no option performing best against all parameters (highlighted by the HDPE/EfW option having the worst performance against global warming, but the best against acidification). Results in the original report are provided in terms of mass emission or material use, and can be used in part at least for appraisal of the environmental impacts of introducing the charge.

Table 3: Life Cycle Assessment (LCA) of different single use bag options, accounting for alternative waste management routes. All figures relative to the HDPE/EfW case

Bag type	End of life processing	Global warming (kg CO_2 eq)	Abiotic depletion (kg Sb eq)	Acidification (kg SO_2 eq)	Eutrophication (kg PO_4 eq)
HDPE	EfW	1.00	1.00	1.00	1.00
	Landfill	0.72	1.09	1.18	1.05
	Recycling	0.60	0.68	1.16	0.73
Oxo-degradable	EfW	0.82	0.27	1.03	0.41
	Landfill	0.57	0.35	1.18	0.45
Mater-bi	EfW	0.67	0.69	1.05	2.05
	Landfill	0.43	3.08	1.17	3.40
	Recycling	0.77	0.76	1.17	2.08
Octopus	EfW	0.73	0.92	1.86	4.03
	Landfill	0.43	1.00	2.03	5.84
	Recycling	0.86	1.02	2.02	4.05

Source: Murphy et al 2008 featured in Environment Agency, 2011[8]

[8] EfW = Energy from Waste

Table 4: DECC's updated short-term traded sector carbon values for policy appraisal in real 2013 terms, £/tCO2e

	Low	Central	High
2013	0.00	3.49	15.57
2014	0.00	3.59	16.73
2015	0.00	3.67	18.01
2016	0.00	3.79	19.39
2017	0.00	3.92	20.89
2018	0.00	4.22	22.49
2019	0.00	4.53	24.19
2020	0.00	4.87	25.98
2021	3.81	12.01	34.82
2022	7.62	19.14	43.65
2023	11.43	26.28	52.49
2024	15.25	33.41	61.33
2025	19.06	40.55	70.16
2026	22.87	47.69	79.00
2027	26.68	54.82	87.84
2028	30.49	61.96	96.67
2029	34.30	69.10	105.51
2030	38.12	76.23	114.35

2.118 The RIA carried out by the Welsh Government before introducing the SUCB charge quantified costs associated with the greenhouse gas burden of different types of bag. It said that the analysis performed in the RIA would be reviewed and adjusted as required to account for alternative data and assumptions on the number of bags used. Further contact with WRAP will be necessary to consider whether further data than the information so far published on line (WRAP, 2014a; 2014b) will be made available. Costs linked to GHG emissions will then be quantified using HM Treasury Green Book Supplementary Guidance (DECC, 2013).

Impacts of carrier bag charging schemes on litter and littering behaviour

2.119 There are good reasons to believe that a carrier bag charging scheme can reduce the amount of urban, rural and marine litter. The risk of littering plastic bags is substantially reduced where fewer of them are given out, even if plastic bags only account for a small proportion of litter (PAFA, 2014). However, analyses to determine the impacts of carrier bag schemes on litter are difficult to ascertain, as there often already is a stock of littered items in the environment (Sherrington et al., 2012). Furthermore, littering rates may differ per country, making it difficult to extrapolate findings from one country to another (Lyons, 2013).

2.120 While there is little systematic evidence regarding the impacts of a plastic bag charge on the prevalence of littering, Ireland's Litter Monitoring Body (2003, 2005) has shown that the proportion of plastic-bag litter fell from 5% prior to the introduction of the plastic bag levy to 0.32% in 2002, 0.25% in

2003 and 0.22% in 2004. At the same time, a series of litter surveys conducted by An Taisce (National Trust of Ireland) and Irish Business Against Litter (IBAL) found that the number of 'clear' areas (i.e., areas in which there is no evidence of plastic bag litter) increased by 21% between January 2002 and April 2003, while the number of areas without traces increased by 56% over the same period (Convery et al., 2007). This is also supported by Keep Wales Tidy based on feedback from Tidy Towns Officers across Wales, which stated that they have observed a significant reduction in the number of carrier bags littered since the introduction of the SUCB charge (Keep Wales Tidy, 2014).

2.121 The impacts of other carrier bag charging schemes on litter and littering behaviours have not been studied systematically. Keep Wales Tidy only observed a marginal decrease in littered carrier bags following the introduction of the Welsh SUCB charge, using their annual Local Environmental Audit and Management System (LEAMS) survey. They found that the number of local authority streets with carrier bag litter dropped from 1.1% the year before to 0.9% the year after the introduction of the charge. These street-data are likely to understate the extent of carrier bags litter. Carrier bags are easily dispersed due to their physical properties of being lightweight and 'aerodynamic', and are therefore easily blown away into trees and river banks (Keep Wales Tidy, 2013; Godman, 2013).

2.122 The impacts on marine litter may therefore be more pronounced. Indeed, plastic, including carrier bags, make up a great part of marine litter. This is an increasing problem around the world, with plastic bags accounting for approximately 9% of all litter found on the coastline (MCS, 2013). There are some indications that carrier bag charging schemes may help to reduce marine litter. Coastal survey data collected by Coastwatch (Coastwatch.org) showed a reduction in plastic bag litter from 10 to 5 plastic bags per 500 meters of beach in the year following the introduction of the Irish plastic bag levy. The mean number of plastic bags per 100 meters of surveyed beach is also consistently higher in the UK than in Ireland, which may reflect fewer plastic bags being given out in Ireland as compared to the UK (Doyle & O'Hagan, 2013).

2.123 The high number of plastic bags being found on UK beaches was confirmed by the Beachwatch surveys carried out by Marine Conservation Society (MCS): in the 2012 survey 4,092 plastic bags were found on 238 beaches around the UK, which equates to 45 bags for every kilometre of coastline surveyed (MCS, 2013). It is currently not know if the Welsh SUCB charge has led to less carrier bag litter on Welsh beaches. Here it also has to be noted that it may be difficult to attribute changes to any particular policy, such as the Irish and Welsh charges. Plastic bags do not necessarily wash up on beaches in country in which they were issued. Bags found on a

beach may have originated from abroad (Sherrington et al., 2012), although it could be assumed that the changes will be the greatest in the areas in which the reduction has taken place.

Health impacts

2.124 There have been press reports raising concerns over the potential for bag re-use to increase rates of infection from E.coli, Campylobacter, Salmonella and other organisms[9]. The same is unlikely to apply to an SUCB provided that it is only used once and manufactured, transported and stored under clean conditions. These reports mainly reference analysis by Klick and Wright (2012) who assessed data for San Francisco County, the first major US jurisdiction to enact a ban on plastic grocery bags. The ban, implemented in 2007 for larger stores, banned single use non-compostable bags and required a charge to be levied for the supply of other bags. From their analysis, Klick and Wright concluded that: "there is evidence that reusable grocery bags … contain potentially harmful bacteria. We examine emergency room (ER) admissions related to these bacteria in the wake of the San Francisco ban. We find that ER visits spiked when the ban went into effect. Relative to other counties, ER admissions increase by at least one fourth, and deaths exhibit a similar increase"[10].

2.125

2.126 Figure 5 shows data for data for 2.5 years before and after the ban was introduced to San Francisco (each period = 1 quarter). Results show a discontinuity at the time that the ban was introduced with results averaging 40 admissions per quarter before the ban and increasing to around 60 per quarter 2.5 years after it was introduced.

2.127 Figure 6 shows the trend in neighbouring counties where the ban was not in place over the same period, indicating no increase in emergency room visits. We note that the lack of variability after the introduction of the ban looks strange. Klick and Wright report similar findings for Campylobacter and Salmonella, but not Toxoplasmosis. Turning to mortality, the authors report an additional 5 deaths per year amongst the residents of San Francisco County after the introduction of the ban.

[9] See, for example, http://www.dailymail.co.uk/health/article-2478235/How-bag-life-POISON-Expert-warns-reusable-carriers-contaminated-E-coli.html.

[10] The quoted text is from a version of the Klick and Wright report dated November 2012. In an earlier version, dated August 2012, conclusions are stronger: *the San Francisco bag ban led to a 50-100% increase in deaths and emergency room visits due to foodborne illness (e.g., E-coli) associated with reusable bags.* Preference is here given to the later version.

Figure 5: Emergency room visits for E.coli infection in San Francisco before and after the ban

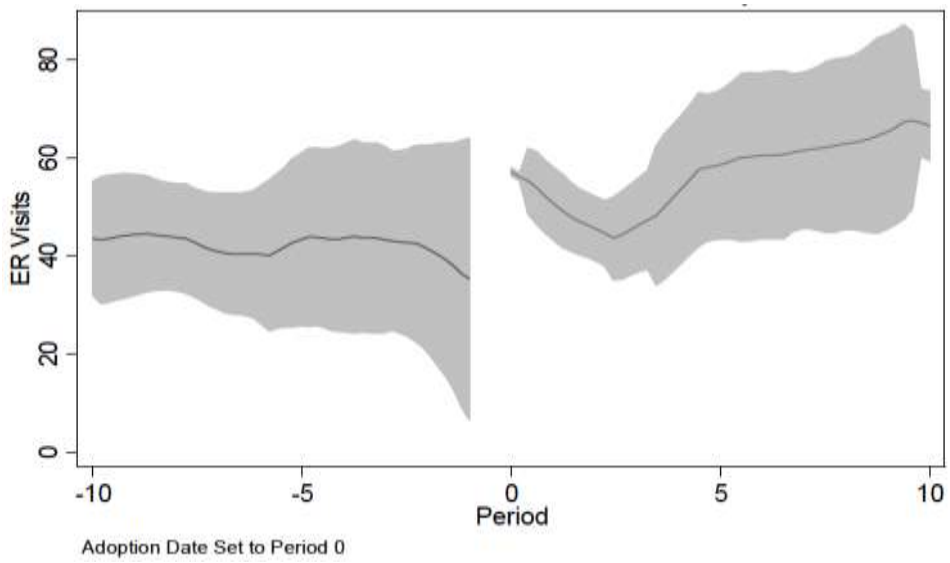
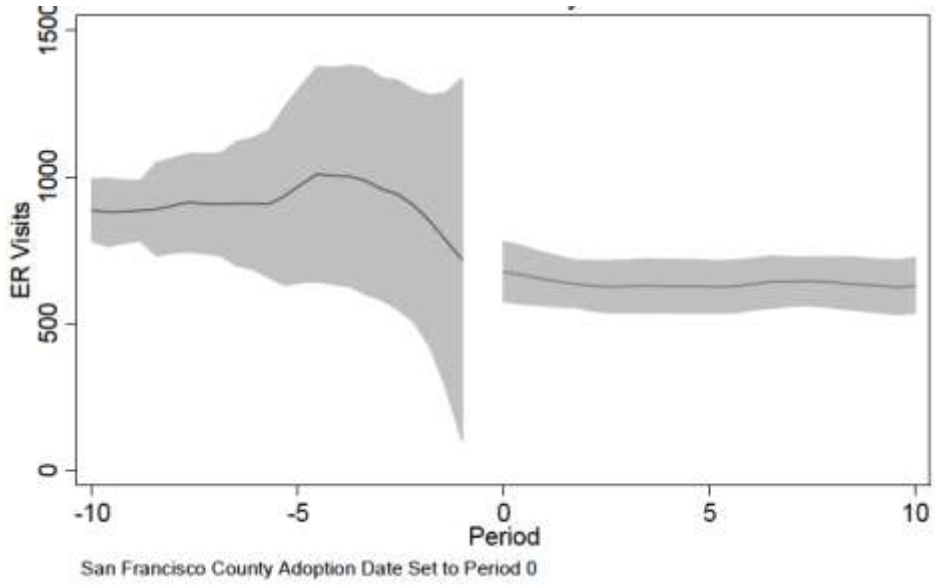


Figure 6: Emergency room visits for E.coli infection in counties neighbouring San Francisco before and after the ban



2.128 It must be recognised that the Klick and Wright report simply shows an association between infection and the introduction of the ban in San Francisco. It is possible that the associations observed arise simply through chance, a common issue in epidemiological research, where association is not taken as proof of causality. There are, indeed, numerous examples of bogus association cited in the literature, for example, a strong association between a fall in the European birth rate and declining populations of storks. Much has been written on this subject including the development of

the Bradford Hill criteria / Hill's criteria for causation, published in 1965 (Hill, 1965) that provide a strategy for evaluating evidence of association. A search on Pub Med using the terms [plastic, bag, coli, campylobacter, salmonella, shopping] in various combinations identified no studies in the peer reviewed literature. This in itself is not a reason for disregarding the Klick and Wright analysis, as it is quite possible that no-one else has investigated the problem. Recognising that their findings suggest a significant effect on public health, we now consider whether there are alternative explanations for the observed association, whether a possible link in San Francisco may not apply in Wales, and what available data on infection rates from the UK might indicate on this matter.

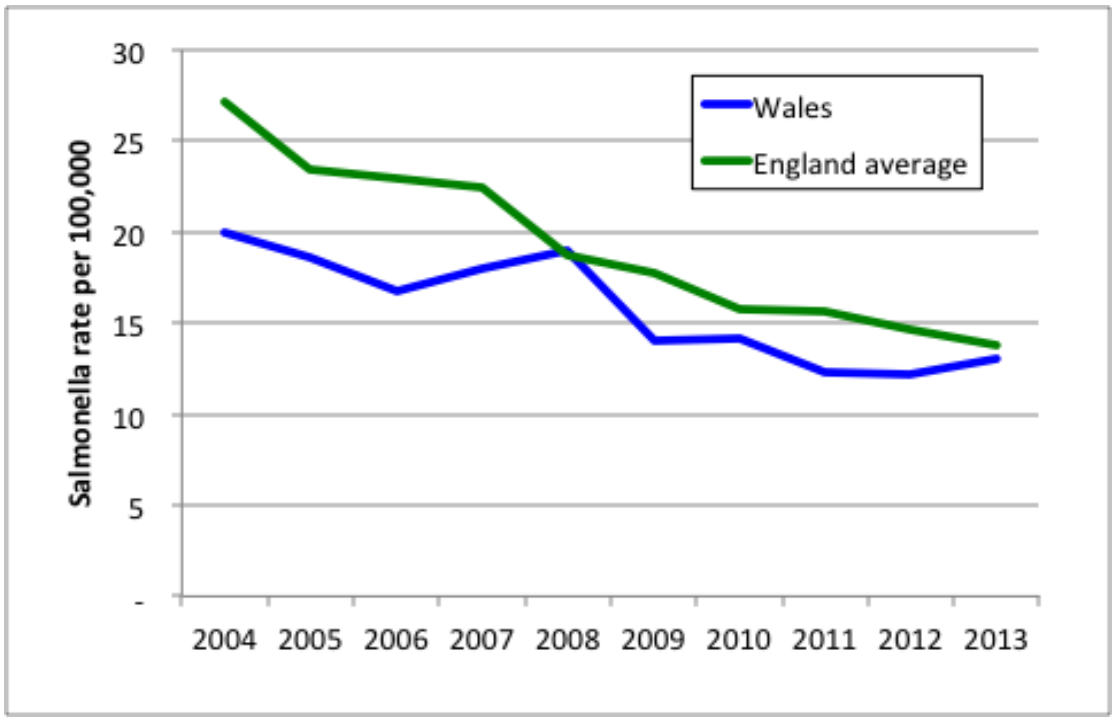
2.129 The Klick and Wright paper does not consider alternative explanations for their association. It also does not assess whether other changes occurred at the same time as the bag ban. These could include, for example, a change in the regulatory regime for restaurants (e.g. reduced inspections of food establishments following budget cuts), to a change in the sourcing of food. Further to this, the paper does not consider how individuals were infected, whether from the purchase of raw food or from eating in restaurants.

2.130 There are a number of reasons why results in Wales may be different. The San Francisco ban is specifically on plastic bags, but this does not rule out other single use bags, for example made of paper. It is, however, difficult to see how the use of Kraft paper bags (commonly used in the USA) would promote the spread of infection if used only once. Weather conditions relative to temperature and humidity may be a factor, as may differences in shopping behaviour, restaurant cuisine and the inspection regime for food suppliers. There may be differences in the sale of root vegetables in relation to the amount of earth left on at point of sale. In any event, the increase in risk associated with bag re-use by Klick and Wright seems very large.

2.131 The question then arises of how incidence rates for infection with Salmonella, E. coli and Campylobacter have changed in Wales after the introduction of the charge. Available data from the public health authorities are not supportive of the trend observed in San Francisco (**Error! Reference source not found.** for Salmonella, **Error! Reference source not found.** for Campylobacter based on information from Public Health England, 2014). The Public Health England data for Salmonella showed a large difference between rates for Wales and England. However, recalculation of incidence rate per 100,000 population based on total incidence reported by Public Health England together with population data for the regions, showed broadly comparable rates between England and Wales (**Error! Reference source not found.**). The English data are useful

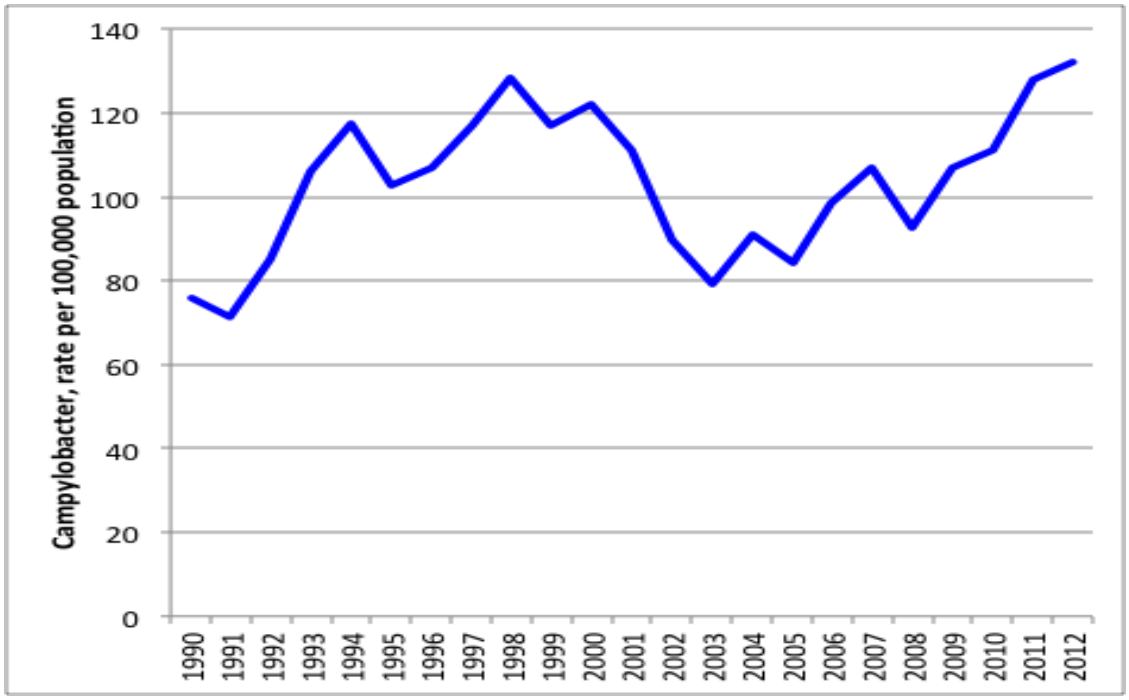
as an indication of trends in the absence of the SUCB charge. Results for Salmonella show a long-term decline in both England and Wales. Rates increase in 2013 for Wales, but only slightly. Comparing the lines for England and for Wales for the final years shown, when the bag charge applied in Wales shows the two lines coming together. There is a slight increase in the rate for Wales, but it is slight and certainly within the variability observed between years.

Figure 7: Trends in Salmonella incidence rates in Wales and England over time



Source: Rates taken directly from Public Health England, 2014

Figure 8: Trends in Campylobacter incidence rates in Wales over time,



Source: Rates taken directly from Public Health England, 2014

2.132 Clearly the most relevant data in Figure 8 concern the final years, with the introduction of the SUCB charge. A longer time series is useful, however, to enable assessment of typical fluctuations in data. Results for Campylobacter show more variability than for Salmonella, with an increase of about 50% since 2003. Rates in England also increase by a broadly similar rate over this period (Public Health England, 2012: differences in presentation between Public Health Wales and Public Health England prevent the two datasets being plotted on the same figure for the present). The increased rate in Wales continues into the period after the bag charge was introduced, but the rate of increase is no greater than for the years immediately before.

2.133 Overall, the data currently available suggest that the conclusion of Klick and Wright from San Francisco, that reusing bags leads to a major increase in severe illness from exposure to food-borne pathogens, does not apply to Wales. However, this issue needs to be kept under review in the coming years. It is interesting that there is no mention of this risk on the website of the Environment Department of the City and County of San Francisco.

3.1 In this literature review international evidence was collated on the effectiveness of carrier bag charging schemes to reduce the consumption of SUCBs, considering their impacts on consumers, businesses and government. Although various factors (e.g., income, culture, nature of policy) make comparisons across countries difficult, there are nevertheless various lessons that can be drawn for decision-making about the Welsh SUCB charge.

3.2 The literature search has shown that a range of approaches have been used to minimise SUCB usage, and the evidence shows that carrier bag charges are generally popular amongst the general public, with popularity tending to increase once they are implemented and their benefits (e.g., reduced litter) are observed. The popularity of charging schemes is also associated with the proceeds being donated to charity rather than kept by retailers or government, highlighting the importance of communicating these schemes' details and benefits.

3.3 The available evidence on the effectiveness of carrier bag charging schemes suggests that a reduction of 50 to 95% can be achieved in the short term, depending on the size of the charge, details of the design, and the quality of the communication accompanying the introduction. The Irish 'plastax' levy appears to be one of the most successful schemes to date, initially producing a 94% reduction in plastic bag use but started to increase slightly again later. Less is known about the long-term effectiveness of plastic bag charging, although there is some evidence from Ireland and South Africa. In both cases, and after initial dramatic declines, small rises in SUCB use were observed, which have been attributed to the diminishing value of a charge in real terms as a result of inflation and an absolute reduction in the charge, respectively. The evidence suggests that a plastic bag charge should not be reduced, and may even need to be increased after a number of years in order to retain its effectiveness. The latest Welsh figures (from supermarkets) indicate that the initial decline of over 70% in SUCBs has been sustained, albeit with a small increase in 2013.

3.4 In terms of behavioural adaptations, bag re-use, abstention from using bags and bag optimisation have been observed in a number of studies. So far, there is no concrete evidence of positive spillover from bag charges to other waste or pro-environmental behaviours, although charging interventions and policies have not typically been designed to produce such spillover effects or to encourage consumers to make any connection between the charge and broader consumption behaviours.

3.5 In terms of substitution effects from SUCB charging, evidence suggests there has been only a small increase in bin liner sales as compared to the overall reduction in SUCB use, while there have been large increase in

bag-for-life sales. While most shoppers re-use bags-for-life several times, there is evidence that more heavy-duty plastic bags end up to landfill as a result of a SUCB charge.

3.6 The impacts of carrier bag charging schemes on litter are difficult to ascertain with little systematic evidence. Evidence from the Irish levy suggests reductions from 5% to 0.22% in urban litter after several years, while Welsh data to date indicate much smaller reductions. Reductions in marine litter are likely to be more pronounced, as plastic bags are easily blown into waterways and washed out to sea. Indeed, evidence from coastal surveys shows that fewer plastic bags have washed up on shores following the introduction of the Irish levy. In respect of the impacts of carrier bag charging schemes on shoplifting, evidence suggests little or no increase. Where small increases in (perceived) shoplifting were observed (e.g., in Ireland), this was temporary and greatly outweighed by retailers' savings associated with purchasing fewer bags and related storage costs.

3.7 Limited research has been conducted on the relative effectiveness of different policy instruments to reduce the consumption of SUCBs. Comparisons of the economic, social and environmental impacts of coercive (bans), market-based (charges), or voluntary (non-regulatory) measures to reduce plastic bags highlight the various strengths and weaknesses of each approach, but tend to favour charging schemes in terms of offering a balance of environmental benefits, consumer choice/equity, and business/administrative costs. Furthermore, comparisons of the efficacy of these three types of measure where they have been rolled out by national governments shows charges to be slightly more effective (73% reduction in plastic bags) than bans (68% reduction), and considerably more effective than voluntary measures (31% reduction) – although there is considerable variation within each of these categories due to various contextual factors relating to implementation, acceptance, and so on. However, even simple, low-cost interventions, such as removing plastic bags from sight or cashiers asking shoppers if they want a bag, rather than staying silent, can produce some modest reductions in SUCBs.

3.8 There is conflicting evidence about the level at which a tax or charge needs to be set to be effective. It is not necessarily the case that higher charges are more effective than lower charges. Rather, a charge could also be understood as a 'habit disruptor' that forces shoppers to make a conscious decision as to whether they want to use a plastic bag or not. Currently very little known about the influence of retailer behaviour on the effectiveness of carrier bag charging schemes. It is possible that the ease at which plastic bags can be obtained (e.g., at self-service check outs) may have a substantial impact on the number of SUCBs given out.

3.9 There is only limited evidence of differential impacts of bag charging on different consumer groups. Pre-existing differences in bag re-use appear to endure once a charge is implemented: women and older age groups are most likely to take their own bags shopping. There is also some evidence that higher income groups and those with less positive attitudes towards bag reuse appear to be less likely to reuse bags.

3.10 Broadly speaking, retailers have expressed positive opinions about bag charging, particularly once initial fears (e.g., about shoplifting) are not realised and benefits (reduced costs, etc.) are experienced. Indeed, the responses from the British Retail Consortium and Association of Convenience Stores to the Environment Audit Committee expressed disappointment that their members were to be exempted from charging under the proposed scheme for England. However, there seem to be differences between retailer categories, with some (e.g., takeaways, clothing stores) experiencing more difficulties. Negative impacts on bag manufacturing, with associated job losses, have also been recorded; although this is unlikely to affect Wales where bags are typically imported. Charity donations raised by charging are significant, although a small proportion of retailers may be keeping funds raised. However, the approaches used vary, for example in Northern Ireland, the money raised is paid into a central fund, compared to the Welsh approach of retailers being responsible for the dissemination of the money raised.

3.11 The initial work for the Welsh Government prior to the introduction of the charge identified environmental benefits from applying the charge to all types of bag. This conclusion is supported by the more recent LCA work carried out for the Environment Agency, even if it has not been followed in the English proposals for a bag charging scheme.

3.12 There has been no noticeable increase in Wales in illnesses associated with food hygiene (e.g., Salmonella, Campylobacter), despite research from the USA that found a link between illness and a non-compostable carrier bag ban.

3.13 Overall, changes in bag sales clearly show that carrier bag policies can have a positive impact on bag usage. However, further assessment is needed on the wider impacts of such policies, including littering, impacts on consumer behaviour (e.g., substitution, spillover), and economic impacts, to gain a more holistic view on the impacts of such policies. The quality of the evidence from much of the existing research on wider impacts is not high. Very few studies use nationally representative samples or control groups, and many rely on self-reported behaviours (which tend to under-estimate SUCB use, for example) rather than behavioural observations or other objective measures. Furthermore, more evidence exists about the impacts of bag charging in the food chain context than in the context of other retailer

types, despite indications that there are wide variations in retailer experiences and consumer practices with respect to bag charging across the retail sector.

Introduction

4.1 To evaluate the impact of the SUCB charge in Wales, a range of impacts will need to be considered in the following areas:

- SUCB manufacturers, wholesalers and distributors
- Retailers
- Public/ consumers
- National and local government
- Charitable donations, i.e. distribution of proceeds
- Waste management
- Other environmental impacts
- Health impacts

4.2 Impacts in each of these areas will be considered and data availability and robustness considered.

4.3 Those data sources discussed within the literature review as well as wider sources of data that could potentially be used within the policy evaluation stage of the project are discussed within this section of the report. The data available within the literature review was analysed to understand what additional primary research would be required to undertake the evaluation.

Data Availability

Manufacturers, distributors and wholesalers

4.4 No data have been identified on the impact of the SUCB charge on manufacturers, distributors and wholesalers in the UK. Sherrington et al (2012) reported that based on the engagement with industry stakeholders, between 90 and 98% of HDPE and PP bags were imported from the Far East, and that it was likely that most cotton bags are also produced in this way.

4.5 The impact on manufacturers has been identified elsewhere, with other countries reporting job losses as discussed in Section 2. These countries include South Africa, Malta and China (Fourie, 2004; O'Loughlin, 2010; Schembri, 2006).

4.6 This limited data suggests that the impact of the SUCB charge on the manufacturing of SUCBs in the UK is likely to be limited; however the impact on wholesalers and distributors of SUCBs in Wales may have a larger impact. Data collation should also consider those manufacturers, wholesalers and distributors producing bags-for-life. This is an aspect for which data will need to be collated for inclusion in the evaluation.

Retailers

4.7 The key contributory impacts to retailers are likely to include:

- Bag sales
- Administrative burden
- Shoplifting
- Small basket effects

4.8 WRAP publish data on an annual basis on the sales of single use carrier bags across the UK from seven of the UK's leading supermarkets, which provides a regional breakdown for Wales. This is a key data source for use in the evaluation of the SUCB charge. However, data from other sectors are limited. Companies with greater than 10 employees are required to record the number of SUCBs sold, and this provides scope that the data may be available if companies are contacted for this data.

4.9 Limited data have been found on the cost to retailers of administering the SUCB charge in Wales. As discussed in Section 2, a small survey in Cardiff and SE Wales suggested that 66% of those surveyed (n=93) did not consider that the SUCB charge was an administrative burden to their business. Data available from the US and Ireland suggest that the administrative costs are offset by the costs saved in bag purchasing (Cascadia, 2011; Pape et al., 2011; Convery et al., 2007).

4.10 Limited data are available on the impact of the SUCB charge on shoplifting. Overall, retailers in the UK have reported a decline in shoplifting (ACS, 2014). Data from retailers in Ireland suggest that shoplifting rose initially but returned to their pre-charge levels within a year of its introduction (data based on retailer perception rather than shoplifting statistics).

4.11 No data has been found on the impact of SUCB charges on small basket shops.

Public/ Consumers

4.12 A number of studies have been undertaken to assess public response to the SUCB charge in Wales and elsewhere, which were discussed in Section 2. However, data are limited on the public attitudes and behaviours to the charge in different sectors in Wales. It would be beneficial to gain an understanding public attitudes and behaviours to the charge in various sectors, circumstances (e.g. differences between adhoc and planned shopping trips), as well as the impact on other pro-environmental behaviours.

4.13 A key aspect to consider is the potential impact of claimed and actual behaviour on public response to the charge.

National and local government

4.14 No data are available on the impact of the SUCB charge on the administration at both national and local government level. Discussions held with Trading Standards representatives from WLGA and RCT (see Section 2) suggest that obtaining data on their effort in relation to the SUCB charge would be difficult due to the manner in which their data are collated and recorded. Therefore, any data would be limited to qualitative feedback discussed in this report, or potentially from wider engagement with local authorities in Wales. However, it is anticipated that data may be available from Welsh Government related to its policy activities.

Charitable donations

4.15 As the net proceeds of the charge are distributed directly by the retailer, data on the donations made as a result of the charge are limited. However, a desktop study of large retailers has enabled some data to be collated from a range of sectors, including supermarkets, department stores, and clothes stores. However, this data set is limited.

Waste management and other environmental impacts

4.16 A number of LCA studies have been conducted on the relative impacts of a range of bag types as discussed in Section 2, and these data are available for use within the next stage of this project to evaluate the impact of the SUCB policy in Wales.

4.17 It is not possible to identify from audited data sets (WasteDataFlow and Natural Resources Wales quarterly returns submissions) the management of different bag types as they do not have a unique European Waste Catalogue code, and thus they will be mixed with other plastic types. For example, plastic carrier bags would be mixed in with other plastic films.

4.18 A range of published data sources are available to enable the costs associated with waste management costs to be identified. These includes the annual WRAP Gate Fees Reports[11], as well as the income associated with the sale of a range of a number of material types to reprocessors from a number of websites including:

- www.letsrecycle.com
- www.mrw.co.uk

4.19 There is not a robust data set relating to litter. However there is a limited data set available from Keep Wales Tidy regarding the prevalence of carrier bags in litter. Keep Wales Tidy has provided a breakdown of the LEAMS survey results related to carrier bags present in litter samples from each of the local authorities in Wales (discussed further in Section 2). These data do provide a number of carrier bags found within the sample areas in each local authority. However, further discussion is needed with Keep Wales

[11] Available from: www.wrap.org.uk

Tidy to discuss these data, in terms of the definitions used for carrier bags, i.e. do the data relate to plastic carrier bags only. There are also some additional data available on marine/ coastal litter which were also discussed in Section 2, including that from the Marine Conservation Society and Coastwatch (MCS, 2013).

Health impacts

4.20 As discussed in Section 2, there have been press reports raising concerns over the potential for bag re-use to increase rates of infection from E.coli, Campylobacter, Salmonella and other organisms. The same is unlikely to apply to an SUCB provided that it is only used once and manufactured, transported and stored under clean conditions. However, the data to support this are limited, as the reports mainly cite analysis by Klick and Wright (2012). A high level analysis was conducted on data from Public Health England which suggested that the trends observed in San Francisco do not apply to Wales. However, this is an area which should be kept under review as more research and data become available.

4.21 Table 5 summarises data availability for the policy evaluation stage of the project.

Table 5: Data Review Matrix

Input data required	Data in existing literature review	Are data available for Wales	Year for which data are available
Impacts to manufacturing industry			
Revenue (after SUCB charge)	No	-	-
Revenue (before SUCB charge)	No	-	-
Response to loss of Welsh market for manufacturing SUCBs	No	-	-
Impacts on retailers			
Cost per bag purchased (excl VAT), before and after charge introduced	Yes	No	Prices available online
Carrier bags sold after SUCB charge	Partial – supermarkets only	Yes	Data available from 2010
Carrier bags sold before SUCB charge	Partial – supermarkets only	Yes	Data available from 2010.
% retailer revenue reduced as a result of "small basket effects" whereby SUCB charge puts off "small basket" customers from shopping.	No	-	-
Other impacts to retailers arising from the need to buy and store fewer bags.	No	-	-
% revenue reduced by shoplifting	Limited data	Limited	2012
Change in demand for heavy duty plastic bags (quantitative)	Limited data	Yes	2012
Change in demand for bin liners (quantitative)	Limited data	Yes	2012

Input data required	Data in existing literature review	Is data available for Wales	Year for which data is available
Charitable donations			
Charitable contribution per bag sold	Limited data	For some retailers in Wales	2013/14
Change in other charitable contributions after SUCB charge	Limited data	For some retailers in Wales	2013/14
Type of charity to which donations were made	Limited data	For some retailers in Wales	2013/14
Costs to national and local government			
Administrative costs for implementation/ enforcement for WG	No	-	-
Administrative costs for implementation/ enforcement for local government	No	-	-
Waste stream impacts			
Weight per bag	Yes, quantitative	-	Various sources
% of SUCBs reused	Limited data	Yes	2012
% of SUCBs recycled	Limited data	Yes	2012
% of SUCBs to landfill	Limited data	Yes	2012
Quantity of additional bags bought by the public to replace carrier bags previously used for holding sports kits, sandwiches, various wastes, etc.	Limited data	Yes	2012
Costs for waste management			
Recycling cost per bag - recyclate revenue per bag	Yes	No – UK wide	Current prices available
Landfill cost per tonne	Landfill tax rates, currently £80/tonne for bag waste	Yes	2014/15
Cost for clearing up bag litter	No		
Environmental and health impacts			
CO_2 per bag	Yes	N/A	Various
Shadow price of carbon	Yes	N/A	2013
Change in behaviour relating to other natural resource use (not SUCB) (qualitative)	Limited data	Yes	2012
Littering of carrier bags	Limited data	Yes	2013/14
Health impacts			
Admissions due to E. Coli, salmonella and campylobacter bacteria related to bag reuse (qualitative)	Yes, quantitative	Yes	2013

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Appendix 2 – Retailer Survey Questionnaire

Single use carrier bags: retailer survey

INTERVIEWER: YOU MAY CONDUCT THE INTERVIEW WITH THE OWNER, MANAGING DIRECTOR (MD), PROPRIETOR, CEO, OR OTHER DIRECTOR. CHECK RESPONDENT IS MOST APPROPRIATE PERSON TO SPEAK TO AT THE ORGANISATRION REGARDING CARRIER BAG USE. IF NOT COLLECT APPROPRIATE CONTACT DETAILS / ARRANGE APPOINTMENT.

Yes □ CONTINUE
No □ ARRANGE APPOINTMENT IF POSSIBLE AND CLOSE

Eligibility and quota questions

QR1	**Can you tell me how many full time equivalent employees the business has in Wales, including yourself?** SINGLE CODE. DO NOT READ OUT PROMPT IF NECESSARY: **An estimate is fine.** PROMPT II IF NECESSARY: **it would be fine to tell us how many employees the business has in total in Wales – including both full time and part time staff, and including yourself.**			
	One, just myself	1		
	2-4	2		
	5	3		
	6-9	4		
	10-24	5		
	25-49	6		
	50-99	7		
	100–149	8		
	150-199	9		
	200-250	10		
	251+	11		
	Don’t know	12		

QR2	**Does the business ever provide single-use carrier bags (plastic or paper) to your customers in Wales?** IF REQUIRED: **By single-use carrier bag, I mean any bag used to carry goods which are sold, regardless of what they are made from - plastic, paper, degradable plastics or natural starch, regardless of whether or not they have handles and which are subject to the single use carrier bags charge in Wales. A single use carrier bag is any bag which, although it may be used more than once, is not specifically designed for multiple re-use and is not replaced for free by the retailer when worn out** SINGLE CODE		
	Yes	1	CONTINUE
	No	2	CLOSE & THANK

Bags: type, quantity and charge

Q1	**Which of the following types of bags do you offer to your customers in Wales?** READ OUT. MULTI-CODE		
	Single use – plastic	1	
	Single use – paper	2	
	Single use – biodegradable/starch	3	
	Re-usable thick plastic 'bag for life' that is replaced for free of charge by the retailer and normally retails between 5 – 10 pence	4	
	Re-useable bag (made from fabric such as canvas, woven synthetic fibres, or a thick plastic) that is more durable than disposable plastic bags, allowing multiple use	5	
	Another kind of bag (write in then type of bag – Multi-code ok)	6	

FOR EACH TYPE OF BAG THEY PROVIDE

Q2	**Can you tell me how much you charge for a [ADD BAG TYPE] in Wales?**		
	Enter amount in pence	1	IF ENTERED AMOUNT GREATER THAN 50 PENCE, SOFT CHECK **You've said [add amount], can I just check this is correct?**
	Don't know	2	
	Refused	3	

FOR EACH TYPE OF BAG THEY PROVIDE (APART FROM CODE 6 AT Q1)

Q3	**Across all of its stores/outlets in Wales, about how many [ADD BAG TYPE] would you say the business provides to customers in an average week?** INTERVIEWER NOTE: IF RESPONDENT KNOWS THE EXACT NUMBER, WRITE IN ; IF EXACT FIGURE NOT KNOWN, PROMPT: **An estimate of the broad number would be fine.** READ OUT BANDS IF NECESSARY. SINGLE CODE		
	EXACT NUMBER - WRITE IN	1	
	ESTIMATE	CODE BELOW	
	Fewer than 10	2	
	10-24	3	
	25-49	4	
	50-74	5	
	75-99	6	
	100-249	7	
	250-499	8	
	500-749	9	
	750-999	10	
	1000-1499	11	
	1500-1999	12	
	2000+	13	
	Don't know	14	

FOR EACH TYPE OF BAG THEY PROVIDE (APART FROM CODE 6 AT Q1)

Q4	**How has the amount of [ADD BAG TYPE] that your business provides to customers in Wales changed since the introduction of the charge in 2011? Would you say it has…?** READ OUT. SINGLE CODE		
	Increased a lot	1	
	Increased a little	2	
	Stayed the same	3	
	Decreased a little	4	
	Decreased a lot	5	
	Only started offering it after the charge came in	6	
	Don't know	7	

ASK IF CODES 1-2 AT Q4 (I.E. THE AMOUNT OF BAGS HAS INCREASED SINCE CHARGE)

Q5a	**Would you be able to provide an estimate of how much of an increase you have seen in the number of these bags that you have provided to customers (since the charge was introduced)?** SINGLE CODE. READ OUT ANSWER RANGES IF NECESSARY

	1-20%	1	
	21-40%	2	
	41-60%	3	
	61-80%	4	
	81-100%	5	
	More than 100% (i.e. more than doubled)	6	
	Don't know	7	

ASK IF CODES 4-5 AT Q4 (I.E. THE AMOUNT OF BAGS HAS DECREASED SINCE CHARGE)

Q5b	**Would you be able to provide an estimate of how much of a decrease you have seen in the number of these bags that you have provided to customers (since the charge was introduced)?** SINGLE CODE. READ OUT ANSWER RANGES IF NECESSARY		
	1-20%	1	
	21-40%	2	
	41-60%	3	
	61-80%	4	
	81-100%	5	
	Don't know	6	

FOR EACH TYPE OF BAG THEY PROVIDE (APART FROM CODE 6 AT Q1)

Q6	**About how much would you say the business spends on [ADD TYPE OF BAG] to supply to customers in Wales, per month? An estimate is fine**		
	Write in £	1	
	Don't know	2	
	Refused	3	

ASK ALL

Q7	**As part of the research we are also looking to interview some of the main bag manufacturers and suppliers, to find out their views of the charge. Can I just ask which supplier or suppliers the business gets its bags from, just so we can be sure that we're covering all the suppliers that are operating in Wales?** WRITE IN. MULTICODE OK.		
	Open-ended, write in	1	
		2	
		3	
	Don't know	4	
	Refused	5	

Donations

Q10	**Ignoring VAT and focusing just on the net proceeds from the charge, what proportion of the charge would you say the business sets aside for charitable donations and what proportion for general administration/business costs? A broad estimate is fine.** READ OUT. MULTI-CODE			
		(a) Charity	(b) Admin	
	0% (i.e. none of it)	1	1	
	100% (i.e. all of it)	2	2	
	Write in exact estimate if between 1-99%	3	3	
	Don't know	4	4	
	Refused	5	5	

ASK IF >0% AT Q10B

Q11	**You said the business uses some of the net proceeds to cover general administration and business costs. What sorts of admin/business costs would this include?** DO NOT READ OUT, MULTICODE OK		
	Cost of bags	1	
	Reporting	2	
	Staff training	3	
	Communicating the charge to customers	4	
	Other (write in)	5	
	Don't know	6	
	Refused	7	

ASK IF >0% AT Q10A

Q12	**Thinking about the proceeds that you donate to charity, how many different organisations does the business make charitable donations to?** DO NOT READ OUT, MULTICODE OK		
	1	1	
	2	2	
	3	3	
	4	4	
	5+	5	
	Don't know	6	

ASK IF >0% AT Q10A

Q13	**Which of the following best describes the charity or charities that your business donates to (using proceeds raised through the bag charge)?** READ OUT. MULTICODE OK

	Environmental	1	
	Local Community Groups	2	
	Homelessness	3	
	Health and disability	4	
	Opportunities for young people	5	
	Own in-house foundation/charity	6	
	Other (write in)	7	
	Don't know	8	

ASK IF >0% AT Q10A

Q14	**What would you say were the main reasons why the business chose to donate to this charity/these charities?** DO NOT READ OUT. MULTI-CODE OK		
	Pre-existing relationship/given to them before	1	
	Was approached by a charity	2	
	Heard of the charity through networks/peers	3	
	Talked to employees/chose charity with employees	4	
	Talked to customers/chose charity with customers	5	
	Did a general search to find a good cause you believe in	6	
	Other (write in)	7	
	Don't know	8	

ASK IF >0% AT Q10A

Q15	**Would you say that the charitable donation that the business makes as part of the bag charge is…?** READ OUT. SINGLE CODE		
	…in addition to your existing donations to good causes	1	
	…in place of other donations to good causes that you have made in the past	2	
	…the only donation that you make to good causes	3	
	Don't know	4	

Attitudes to the charge and its impacts

We would now like to ask you some questions on the impact of the charge from the business' perspective, for example any disadvantages and disadvantages associated with the scheme.

ASK ALL

Q16	**First of all, and taking everything into account, which of the following would you say best describes the impact on the business of charging for all single use carrier bags?** READ OUT. SINGLE CODE		
	It has had a positive impact on the business	1	
	It has had a negative impact on the business	2	
	It has had a neutral impact – neither positive nor negative	3	
	Don't know	4	

Q17	**In what ways, if any, would you say the charge has benefited the business?** DO NOT READ OUT. MULTI-CODE. PROBE: **Anything else?**		
	Saves us money on bag purchases	1	
	Less waste	2	
	More convenient/less hassle	3	
	Money for charity	4	
	Less litter	5	
	Increase revenue/makes us money	6	
	Good for the environment	7	
	Good for the business's environmental policies / commitments	8	
	Other (write in)	9	
	None	10	
	Don't know	11	

Q18	**In what ways, if any, would you say the charge has been a disadvantage to your business?** DO NOT READ OUT. MULTICODE. PROBE: **Anything else?**		
	Customers unhappy/complain	1	
	Lost sales/customers	2	
	Inconvenient/more hassle	3	
	More shoplifting	4	
	More litter	5	
	Customers refuse to pay/aggressive	6	
	Embarrassing/uncomfortable to ask customer	7	
	Other (write in)	8	
	None	9	
	Don't know	10	

Q19	**We would like to focus specifically on some particular issues, now, such as shop lifting, littering and customer satisfaction.** **Thinking about the impact that the introduction of the bag charge in 2011 has had, would you say it caused an increase, decrease or has had no impact on ….** READ OUT. ROTATE ORDER OF ISSUES. SINGLE CODE FOR EACH							
		Increased a lot	Increased a bit	No change	Decreased a bit	Decreased a lot	DK	NA
A	**Shoplifting**	1	2	3	4	5	6	-
B	**Customer satisfaction with the business**	1	2	3	4	5	6	-
C	**Costs to the business of supplying bags**	1	2	3	4	5	6	-
D	**Amount of litter around the premises**	1	2	3	4	5	6	7
E	**Any costs that the business has to pay to clean up litter around the premises - if this does not apply to your business, say 'Not Applicable'**	1	2	3	4	5	6	7

ASK FOR ANY ISSUES THAT CODES 1-2 AT Q19 (I.E. INCREASED)

Q20a	**For those issues where you've identified an increase as a result of the bag charge, would you be able to provide an estimate of how much it has increased?** SINGLE CODE FOR EACH. READ OUT SCALE IF NECESSARY INTERVIEWER INSTRUCTION – CODE 'OTHER SPECIFY' FOR ANY SUBJECTIVE RESPONSES THAT DO NOT FIT A NUMERICAL RESPONSE (E.G. "We never had any shoplifting before and now we do").								
		1-20%	21-40%	41-60%	61-80%	81-100%	More than 100% (i.e. more than doubled)	Other specify	Not possibly to specify / DK
A	**Shoplifting**	1	2	3	4	5	6	7	8
B	**Customer satisfaction**	1	2	3	4	5	6	7	8
C	**Costs of supplying bags**	1	2	3	4	5	6	7	8
D	**Amount of litter**	1	2	3	4	5	6	7	8
E	**Costs to clean up litter**	1	2	3	4	5	6	7	8

ASK FOR ANY ISSUES THAT CODES 4-5 AT Q19 (I.E. DECREASED)

Q20b	**For those issues where you've identified a decrease as a result of the bag charge, would you be able to provide an estimate of how much it has decreased?** SINGLE CODE FOR EACH. READ OUT SCALE IF NECESSARY INTERVIEWER INSTRUCTION – CODE 'OTHER SPECIFY' FOR ANY SUBJECTIVE RESPONSES THAT DO NOT FIT A NUMERICAL RESPONSE (E.G. "customers don't seem as happy as before").							
		1-20%	21-40%	41-60%	61-80%	81-100%	Other specify	Not possibly to specify / DK
A	**Shoplifting**	1	2	3	4	5	6	7
B	**Customer satisfaction**	1	2	3	4	5	6	7

C	**Costs of supplying bags**	1	2	3	4	5	6	7
D	**Amount of litter**	1	2	3	4	5	6	7
E	**Costs to clean up litter**	1	2	3	4	5	6	7

Q21	**To what extent do you agree or disagree with the following statements about the bag charge in Wales?** SINGLE CODE FOR EACH						
		Strongly agree	Tend to agree	Tend to disagree	Strongly disagree	Do not have a view on this issue	Don't know
A	**The rules of the charge have been communicated clearly to retailers**	1	2	3	4	5	6
B	**We are very clear about our responsibilities under the scheme**	1	2	3	4	5	6
C	**The charge has helped to reduce litter**	1	2	3	4	5	6
D	**Many of our customers are now used to bringing their own bags**	1	2	3	4	5	6
E	**The charge has been enforced appropriately**	1	2	3	4	5	6

Administration

We are interested to know how much administration time is associated with implementing the charge for your business - for example, the amount of time it takes to monitoring/report, arrange donations to charity, etc.

Q22	**Thinking about the past year, how many staff days – roughly speaking – would you say your business spent administering the charge?** SINGLE CODE. DO NOT READ OUT		
	0 days	1	
	More than zero but less than 0.5 days	2	
	0.5 days	3	
	1 day	4	
	2-3 days	5	
	4-5 days	6	
	6-10 days	7	
	11-19 days	8	
	20+ days	9	
	Don't know	10	

The charge moving forward

Q23	**Thinking about the charge going forward, which of the following statements is closest to your view?** READ OUT. SINGLE CODE		
	We are happy to see the charge continue as it is	1	
	We are happy for the charge to continue, but we would like to see some changes	2	
	We think the charge should be removed	3	
	Something else (write in)	4	
	We don't have a view	5	

ASK IF CODE 2 AT Q23

Q24	**What changes would your business like to see?** DO NOT READ OUT. MULTICODE. PROMPT: **anything else?**		
	Reduce the charge	1	
	Increase the charge	2	
	Allow exemptions for certain types of companies	3	
	Only charge for certain types of bags (e.g. plastic)	4	
	More information/support for companies	5	
	More information for consumers	6	
	More enforcement (e.g. for companies that are ignoring the charge)	7	
	Other (write in)	8	
	Don't know	9	

Finally…

QR3	**How many stores do you have in Wales?** SINGLE CODE		
	1	1	
	2	2	
	3	3	
	4	4	
	5	5	
	6	6	
	7	7	
	8	8	
	9	9	
	10+	10	

QR4	**Could you please tell me the approximate turnover (or total sales revenue) of the business in your last financial year? Please answer in relation to the business in Wales only (if the business operates across multiple countries)?** SINGLE CODE. READ OUT CATEGORIES IF NECESSARY		
	Under £50k	1	
	£50k-£100k	2	
	£101k-£200k	3	
	£201k-£300k	4	
	£301k-£500k	5	
	£501k-£750k	6	
	£750k-£1 million	7	
	£1.1 million - £5 million	8	
	£5.1 million - £10 million	9	
	Over £10 million	10	
	Refused	11	
	Don't know	12	

QR5	**In which local authority area is your business based?** MULTICODE		
	Anglesey	1	
	Blaenau Gwent	2	
	Bridgend	3	
	Caerphilly	4	
	Cardiff	5	
	Carmarthen	6	
	Ceredigion	7	

	Conwy	8	
	Denbighshire	9	
	Flintshire	10	
	Gwynedd	11	
	Merthyr Tydfil	12	
	Monmouthshire	13	
	Neath and Port Talbot	14	
	Newport	15	
	Pembrokeshire	16	
	Powys	17	
	Rhondda Cynon Taff	18	
	Swansea	19	
	Torfaen	20	
	Vale of Glamorgan	21	
	Wrexham	22	
	Refused	23	
	Don’t know	24	

Appendix 3 – Consumer Survey Questionnaire

Single use carrier bags: consumer survey

Quota Questions

D1	**How old are you?** SINGLE CODE		
	16-24	1	
	25-34	2	
	35-44	3	
	45-54	4	
	55-64	5	
	65+	6	

D2	INTERVIEWER CODE MALE/FEMALE. ASK IF NECESSARY: **Are you…?** READ OUT. SINGLE CODE		
	Male	1	
	Female	2	

D3	**Which of the following best describes your work status?** READ OUT. SINGLE CODE		
	Employed full time	1	
	Employed part time	2	
	Self-employed (full or part-time)	3	
	Unemployed	4	
	Retired	5	
	Homemaker	6	
	Student	7	
	Other	8	

D4 – local authority (for region quota) – from sample (also derived from postcode for analysis)

Q1	**In the last month, how many times have you personally done each of the following shopping activities?** READ OUT AND CODE NUMBER (		
A	A large food shop in-store at a supermarket	[__]	GO TO SUPERMARKET LOOP
B	A large food shop online	[__]	GO TO ONLINE SHOP LOOP
C	A smaller ‘top-up’ shop in-store for food items	[__]	GO TO TOP UP SHOP LOOP
D	Bought non-food items on the high-street	[__]	GO TO NON-FOOD

E	Bought non-food items at a retail park/out of town shopping centre	[__]	LOOP
F	Collected food from a take-away / restaurant	[__]	GO TO TAKEAWAY LOOP

[SCRIPTER: 'Can't remember' for each as button]

IF THEY SAY ZERO FOR EACH OF A-F THEN CLOSE

SUPERMARKET LOOP

ASK IF Q1A >0

Q2a	**Thinking about the last time you went to the supermarket to do a large food shop, what type of bags did you bring the shopping home in?** DO NOT READ OUT. MULTICODE PROBE TO DISTINGUISH BETWEEN SINGLE USE CARRIER PLASTIC BAGS (e.g. **is that a single use plastic carrier bag or a plastic bag for life?**) ALSO PROBE TO CLARIFY THE TYPE OF BAG FOR LIFE (i.e. **Is the bag for life plastic or made from another material, such as canvas, jute or cloth?**).		
	Plastic carrier bag(s)	1	
	Paper carrier bag(s)	2	
	Bag(s) for life – thick plastic	3	
	Bag(s) for life – canvas, jute, cloth, e.g. have fabric handles etc.	4	
	Cardboard/Plastic box(es)	5	
	Another kind of bag e.g. backpack, holdall etc.	6	
	Just left it loose / carried it without a bag	7	
	Something else (write in)	8	

Q2b & c TO BE ASKED FOR EACH OF BAG TYPES 1-6 MENTIONED AT Q2a

Q2b	**How many [BAG TYPE] did you use on the last occasion, roughly speaking?** IF UNSURE PLEASE ASK FOR AN ESTIMATE		
	Plastic carrier bag(s)	[__]	
	Paper carrier bag(s)	[__]	
	Bag(s) for life – thick plastic	[__]	
	Bag(s) for life – canvas, jute, cloth, e.g. have fabric handles etc.	[__]	
	Cardboard/Plastic box(es)	[__]	
	Another kind of bag e.g. backpack, holdall etc.	[__]	

[SCRIPTER: 'Can't remember' for each as button]

PART 'c' ONLY ASKED FOR EACH OF BAG TYPES 1-**4** MENTIONED AT Q2a

Q2c	**And did you bring those bags with you, buy them at the supermarket or was it a mixture of the two?** DO NOT READ OUT AND CODE AS APPROPRIATE (CLARIFY IF NECESSARY)				
		i) Plastic carriers	ii) Paper carriers	iii) BFL - thick	iv) BFL – perm.
	Brought them from home	1	1	1	1
	Bought them at the checkout	2	2	2	2
	Brought some from home but had to buy extra at the checkout	3	3	3	3

ASK THOSE NOT CODING 3-4 AT Q2A

Q2d	**Do you have any bags for life, either made from plastic, cotton or something else?** SINGLE CODE		
	Yes	1	
	No	2	

ASK THOSE CODING 1 AT Q2d

Q2e	**Thinking about when you go to the supermarket to do a large food shop, which of the following statements would you say best applies to your use of bags for life?** READ OUT. SINGLE CODE		
	I often forget to bring them	1	
	I sometimes forget to bring them	2	
	I only forget to bring them on a few occasions	3	
	I don't use bags for life for this type of shop	4	

TOP UP SHOP LOOP

ASK IF Q1C >0

Q3a	**Thinking about the last time you did a smaller 'top-up' shop for food items, what type of bags did you bring the shopping home in?** DO NOT READ OUT. MULTICODE PROBE TO DISTINGUISH BETWEEN SINGLE USE CARRIER PLASTIC BAGS (e.g. **is that a single use plastic carrier bag or a plastic bag for life?**) ALSO PROBE TO CLARIFY THE TYPE OF BAG FOR LIFE (i.e. **Is the bag for life plastic or made from another material, such as canvas, jute or cloth?**).		
	Plastic carrier bag(s)	1	
	Paper carrier bag(s)	2	
	Bag(s) for life – thick plastic	3	
	Bag(s) for life – canvas, jute, cloth, e.g. have fabric handles etc.	4	

	Cardboard/Plastic box(es)	5	
	Another bag e.g. backpack, holdall etc.	6	
	Just left it loose / carried it without a bag	7	
	Something else (write in)	8	

Q3b & c TO BE ASKED FOR EACH OF BAG TYPES 1-6 MENTIONED AT Q3a

Q3b	**How many [BAG TYPE] did you use on the last occasion, roughly speaking?** IF UNSURE PLEASE ASK FOR BEST ESTIMATE		
	Plastic carrier bag(s)	[__]	
	Paper carrier bag(s)	[__]	
	Bag(s) for life – thick plastic	[__]	
	Bag(s) for life – canvas, jute, cloth, e.g. have fabric handles etc.	[__]	
	Cardboard/Plastic box(es)	[__]	
	Another bag e.g. backpack, holdall etc.	[__]	

[SCRIPTER: 'Can't remember' for each as button]

PART 'c' ONLY ASKED FOR EACH OF BAG TYPES 1-**4** MENTIONED AT Q2a

Q3c	**Did you bring those bags with you or did you buy them at the shop?** DO NOT READ OUT AND CODE AS APPROPRIATE (CLARIFY IF NECESSARY)				
		i) Plastic carriers	ii) Paper carriers	iii) BFL - thick	iv) BFL – perm.
	Brought them from home	1	1	1	1
	Bought them at the checkout	2	2	2	2
	Brought some from home but had to buy extra at the checkout	3	3	3	3

ASK THOSE NOT CODING 3-4 AT Q3A, BUT NOT IF BEEN ASKED Q2D

Q3d	**Do you have any bags for life at home; either made from plastic, cotton or something else?** SINGLE CODE		
	Yes	1	
	No	2	

ASK: (THOSE CODING 1 AT Q3D) OR (ANYONE CODING 1 AT Q2D, BUT NOT 3-4 AT Q3A)

Q3e	**Thinking about when you do a smaller 'top-up' shop for food items, which of the following would you say best applies to your use of bags for life?** READ OUT. SINGLE CODE		
	I often forget to bring them	1	
	I sometimes forget to bring them	2	
	I only forget to bring them on a few occasions	3	
	I don't use bags for life for this type of shop	4	

NON-FOOD LOOP (HIGH STREET AND RETAIL PARK COMBINED)

ASK IF Q1D >0 AND/OR IF Q1E >0

Q4a	**Think about the last time you went shopping for things other than food, either on the high street or at an out of town shopping centre. Which of the following best describes how you brought your shopping home?** READ OUT. SINGLE CODE		
	Everything went in bags/boxes that I got from the shops	1	
	Everything went in bags/boxes that I had brought with me	2	
	A mixture of the two	3	
	I carried it without any bags/boxes	4	

ASK THOSE CODING 2-3 AT Q4a

Q4b	**Which types of bag had you brought with you?** DO NOT READ OUT. MULTICODE PROBE TO DISTINGUISH BETWEEN SINGLE USE CARRIER PLASTIC BAGS (e.g. **is that a single use plastic carrier bag or a plastic bag for life?**) ALSO PROBE TO CLARIFY THE TYPE OF BAG FOR LIFE (i.e. **Is the bag for life plastic or made from another material, such as canvas, jute or cloth?**).		
	Plastic carrier bag(s)	1	
	Paper carrier bag(s)	2	
	Bag(s) for life – thick plastic	3	
	Bag(s) for life – canvas, jute, cloth, e.g. have fabric handles etc.	4	
	Cardboard/Plastic box(es)	5	
	Another bag e.g. backpack, holdall etc.	6	
	Something else (write in)	7	

ASK THOSE CODING 1 AT Q4A, BUT NOT IF BEEN ASKED Q2D OR Q3D

Q4c	**Do you have any bags for life at home; either made from plastic, cotton or something else?** SINGLE CODE		
	Yes	1	
	No	2	

ASK: (THOSE CODING 1 AT Q4C) OR (CODING 1 AT Q2D OR Q3D AND 1 AT Q4A)

Q4d	**Thinking about when you go shopping for non-food items which of the following would you say best applies to your use of bags for life?** READ OUT. SINGLE		
	I often forget to bring them	1	
	I sometimes forget to bring them	2	
	I only forget to bring them on a few occasions	3	
	I don't use bags for life for this type of shop	4	

TAKEAWAY LOOP

ASK IF Q1F >0

Q5	**Thinking about the last time you collected food from a take-away / restaurant, what type of bags did you bring your order home in?** DO NOT READ OUT. MULTICODE PROBE TO DISTINGUISH BETWEEN SINGLE USE CARRIER PLASTIC BAGS (e.g. **is that a single use plastic carrier bag or a plastic bag for life?**) ALSO PROBE TO CLARIFY THE TYPE OF BAG FOR LIFE (i.e. **Is the bag for life plastic or made from another material, such as canvas, jute or cloth?**). PROBE TO CLARIFY IF PROVIDED BY THE TAKEAWY OR IF THEY BROUGH A BAG WITH THEM (i.e. **did the take-away provide the bag, or had you brought it with you?)**		
	Bag(s) provided by takeaway		
	Plastic carrier bag(s)	1	
	Paper carrier bag(s)	2	
	Something else (write in)	3	
	Bag(s) they had brought with them		
	Plastic carrier bag(s)	4	
	Paper carrier bag(s)	5	
	Bag(s) for life – thick plastic	6	
	Bag(s) for life – canvas, jute, cloth, e.g. have fabric handles etc.	7	
	Cardboard/Plastic box(es)	8	
	Another bag e.g. backpack, holdall etc.	9	
	Just left it loose / carried it without a bag	10	
	Something else (write in)	11	

ONLINE GROCERY LOOP

ASK IF Q1B >0

Q6a	**Thinking about the last time that you had your food shop delivered to your home, was the food delivered with or without carrier bags?** SINGLE CODE		
	With carrier bags	1	
	Without carrier bags	2	
	Can't remember/not sure	3	

Q6b	**And were you given the option, when placing your order online, to have the food delivered with or without carrier bags?** SINGLE CODE		
	Yes	1	
	No	2	
	Can't remember/not sure	3	

BAGS FOR LIFE SECTION

I would now like to ask you a few questions about bags for life. They are often made from fabric such as canvas, woven synthetic fibres, or they can be a thick plastic bag that is more durable than disposable plastic bags and which is usually replaced free of charge by the seller when worn out, allowing for multiple use.

Q7	**How many times do you typically re-use the following types of bag for life before they are disposed of? If you never use one of these types of bag for life, you can just tell me that you never use them.** DO NOT READ OUT RESPONSE CATEGORIES. SINGLE CODE FOR EACH. USE 'OTHER SPECIFY' FOR QUALITATIVE RESPONSES, E.G. OFTEN FORGET TO USE THEM / LEAVE IN A DRAWER/CUPBOARD/CAR; OR I'VE NEVER HAD ONE WEAR OUT YET										
		0	1	2-5 times	6-10 times	11-20 times	20-49 times	50+ times	Other (specify)	DK	Never use
A	**Thick plastic 'bag for life' (that normally cost between 5 – 10 pence)**	1	2	3	4	5	6	7	8	9	10
B	**Canvas, jute or cloth bags for life**	1	2	3	4	5	6	7	8	9	10

DON'T ASK A / B IF THEY CODE 9-10 AT Q7A/B

Q8	**When a [BAG TYPE] wears out or gets old, what do you do with it?** READ OUT TYPES OF BAG BUT NOT ANSWER OPTIONS – CODE ACCORDINGLY, CLARIFY IF NECESSARY				
		Throw it away / bin	Recycle it	Return to the retailer/ swap for a new one	Something else (write in)
A	**Thick plastic bags for life**	1	2	3	4
B	**Canvas, jute or cloth bags for life**	1	2	3	4

SUCB SECTION

I would now like to ask you a few questions about single use carrier bags. These are bags provided at the till of stores and shops which are made wholly or mainly of paper or plastic film and are not specifically manufactured for multiple use.

Q9	**How many times do you typically re-use the following types of bags before they are disposed of? If you never use one of these types of bag, you can just tell me that you never use them.** DO NOT READ OUT RESPONSE CATEGORIES. SINGLE CODE FOR EACH. USE 'OTHER SPECIFY' FOR QUALITATIVE RESPONSES, E.G. OFTEN FORGET TO USE THEM / LEAVE IN A DRAWER/CUPBOARD/CAR									
		0	Once	2-3 times	4-5 times	6-10 times	11+ times	Other (specify)	DK	Never use
A	Paper carrier bags	1	2	3	4	5	6	7	8	9
B	Plastic carrier bags	1	2	3	4	5	6	7	8	9

DON'T ASK A and / or B IF THEY CODE 8-9 AT Q9A OR Q9B

Q10	**What do you do with [BAG TYPE] when you dispose of it?** READ OUT TYPES OF BAG BUT NOT ANSWER OPTIONS – CODE ACCORDINGLY, CLARIFY IF NECESSARY			
		Put it in the general rubbish bin	Recycle it	Something else (write in)
A	Paper carrier bags	1	2	3
B	Plastic carrier bags	1	2	3

ASK ALL

Q11	**Since 2011, shops in Wales have been required to charge 5p per bag to customers that want or need a single use carrier bag. Thinking about your main food shopping, how has the number of single use carrier bags that you take from the supermarket changed as a result? Do you…** READ OUT CODES 1 TO 6. SINGLE CODE		
	Take a lot more	1	
	Take a few more	2	
	Take about the same number	3	
	Take a few less	4	
	Take a lot less	5	
	Or have you stopped taking carrier bags altogether	6	
	Didn't use carrier bags before the charge [AS BUTTON]	7	

Q12a	**Since the charge for carrier bags was introduced, have you found yourself buying, or buying more, of any other types of bags?** SINGLE CODE		
	Yes	1	
	No	2	
	Don't know	3	

ASK IF CODE 1 AT Q12a

Q12b	**Which bags do you buy more of since the introduction of the carrier bag charge?** DO NOT READ OUT, MULTICODE OK		
	Bags for life – thick plastic	1	
	Bags for life – canvas, jute or cloth	2	
	Large bin liners (e.g. for kitchen bin)	3	
	Small bin liners (e.g. for bathroom / bedroom bins)	4	
	Bags for dog / animal mess	5	
	Other (write in)	6	

Q13a Q13b	**Thinking back to before the 5p charge was introduced, to what extent would you say that you supported or opposed it? Would you say that you…?** READ OUT. SINGLE CODE **Using the same scale, how do you feel about it now?** SINGLE CODE		
		A) Then	B) Now
	Strongly support(ed) it	1	1
	Tend(ed) to support it	2	2
	Tend(ed) to oppose it	3	3
	Strongly oppose(d) it	4	4
	I didn't/don't have a view either way	5	5

Q14	**To what extent would you say you agree or disagree with the following statements?** READ OUT – SINGLE CODE FOR EACH. RANDOMISE STATEMENTS					
		Strongly agree	Agree	Disagree	Strongly disagree	Don't know
A	**The charge for single use bags discourages me from using them**	1	2	3	4	5
B	**I feel guilty if I take new single use carrier bags at the till for my shopping purchases**	1	2	3	4	5
C	**I'm happy to pay 5p per bag if it means I don't have to carry bags for life with me when I'm shopping**	1	2	3	4	5
D	**The rules for when you can have a free bag are confusing**	1	2	3	4	5
E	**The charge has helped to reduce littering in my local authority area**	1	2	3	4	5

ASK THOSE CODING 1-5 at Q11. SPLIT SAMPLE INTO 2 LOTS, WITH EACH LOT SEEING A DIFFERENT MONETARY AMOUNT: A) 10p and B) 20p

Q15a	**We are interested in finding out what kind of impact it would have on the amount of single use carrier bags people would buy if the charge was increased.** **If the carrier bag charge was increased to __, would you be likely to buy more, fewer or about the same amount of bags when you do your <u>main food shop</u>?** SINGLE CODE		
	Buy a lot more	1	
	Buy a few more	2	
	Buy about the same number	3	
	Buy a few less	4	
	Buy a lot less	5	
	Stop buying carrier bags altogether	6	

ASK IF CODE 1-2 OR 4-5 AT Q15a

Q15b	**You said you would be likely to buy [MORE/FEWER] single use carrier bags. Could you estimate how many [MORE/FEWER] you would take per shop, roughly speaking? An estimate is fine.** DO NOT READ OUT. SINGLE CODE		
	Write in	[…]	
	Don't know	2	

ASK ALL

Q16	**Over the last year, do you remember visiting any shops in Wales where you were given a carrier bag but were not charged for it? This could be any type of shop, including supermarkets, high street shops, market or festival stalls, takeaways and food outlets.** SINGLE CODE (WITH PROBE TO CLARIFY SINGLE OR MULTIPLE TIMES)		
	Yes, multiple times	1	
	Yes, once	2	
	No, I've always been charged	3	
	Can't remember	4	

ASK THOSE CODING 1 OR 2 AT Q16

Q17a	**Was it any of the following types of shop(s), or another type?** READ OUT. MULTICODE		
	Supermarket	1	
	Corner shop, local greengrocer, fishmonger or butcher	2	
	Take away or food outlet	3	
	Clothing/shoes store	4	
	Electrical/Homeware/Furniture or DIY store	5	
	Market or festival stall	6	
	Another type of store (write in)	7	
	Can't remember [single code]	8	

ASK THOSE CODING 1 OR 2 AT Q16

Q17b	**Did you contact anyone to report this or not?** SINGLE CODE		
	Yes	1	
	No	2	

ASK THOSE CODING 1 AT Q17b

Q17c	**Who did you report it to?** DO NOT READ OUT. MULTICODE. PROBE IF THEY SAY 'COUNCIL' **Was that to a specific department of the council, or generally?**		
	Local council (general)	1	
	Trading standards department at local council	2	

	Other department at the council (write in)	3	
	Welsh Government	4	
	The retailer itself	5	
	Local councillor/MP	6	
	Local paper	7	
	Police	8	
	Other (write in)	9	

ASK THOSE CODING 2-4 AT Q16

Q17d	**As far as you know, who is in charge of enforcing the bag charge?** DO NOT READ OUT. SINGLE CODE. PROBE IF THEY SAY 'COUNCIL' **Is there a specific department of the council responsible for this, or do you mean the council in generally?**		
	Local council (general)	1	
	Trading standards department at local council	2	
	Other department at the council (write in)	3	
	Welsh Government	4	
	The retailer itself	5	
	Police	6	
	Other (write in)	7	
	No-one – there is no enforcement	8	
	Don't know / not sure	9	

ASK ALL

Q18	**As far as you are aware, what happens to the money that businesses charge for single use carrier bags?** DO NOT READ OUT. MULTICODE OK		
	They donate it to charity	1	
	They pay it to the local authority	2	
	They pay it to Welsh Government	3	
	They keep it themselves	4	
	Something else (write in)	5	
	Don't know	6	

And finally I'd just like to ask you a few more questions to make sure that we speak to a range of people. Once again I would like to reassure you that all of your responses are confidential and anonymous.

ASK ALL

D5	**Which of these best describes your living situation?** READ OUT. SINGLE CODE		
	Own the home outright	1	
	Own the home on a mortgage	2	
	Rent - from a private landlord	3	
	Rent - from the council or a Housing Association	4	
	Live with parents	5	
	University accommodation	6	
	Other	7	

D6	**What is your post code?**		
	Collect and then use to determine WIMD and urban / rural from index	1	
	Refused	2	

Appendix 4 – Economic evaluation – assumptions and uncertainty analysis

1 Model structure and details

1.1 To evaluate the economic costs and benefits of the 5p charge, a bespoke model was developed as part of this study. The model is set up to quantify the economic impacts of four policy scenarios of changes in carrier bag usage in Wales in relation to a 'no-intervention' baseline. The starting point for the model is the estimation of changes in demand for different types of bag under different levels of charge. The types of bags included in the model are: standard single use carrier bags made of thin plastic, paper carrier bags, two grades of bag for life and cotton bags for life.

1.2 Economic impacts are considered in the following categories, each of which is then discussed in further detail:

- Administrative and enforcement costs
- Costs to business
- Charitable donations
- Waste management
- Environmental impacts
- Consumer impacts

Number of bags of different types in circulation

1.3 Data are taken from the surveys of bag numbers in circulation. There are three dimensions to uncertainty in this parameter and how it changes over time:

- The total number of bags in circulation;
- The relative numbers of bags of different types in circulation; and
- The number of times that bags of each type are re-used.

1.4 Based on the results of the surveys comparison to data collected from other sources (e.g. WRAP), it is considered that associated uncertainties regarding the number of bags issued each year are likely to be low.

1.5 The surveys found that there was little increase in sales of bags for non-shopping purposes in response to the 5p charge, such as for use as bin liners. It is therefore assumed that any displacement which occurs generates negligible environmental and other impacts and has been omitted from the analysis.

Administrative and enforcement costs

1.6 This element is calculated as the sum of the administrative costs and legal or enforcement costs associated with implementation.

1.7 The source of information used for both costs is the 2010 Welsh SUCB charge RIA document. This suggests that enforcement costs are more significant. It is assumed that the administrative costs are known to a reasonable level of accuracy, based on employment of 2 Full Time Equivalent staff at Welsh Government. Enforcement or legal costs were estimated at £1 million per year in the initial RIA, though to date it is understood that there has been no formal legal action brought. There were, however, some costs of administration and enforcement in relation to 152 requests for advice and 127 enforcement contacts reported during the first 18 months after the charge was introduced. Accepting the figure of £1 million per year for associated costs implies a cost per case for the 279 requests for information and enforcement contacts combined of £5,430, a figure that is clearly too high as each case will not require something in excess of 1 person-month of effort. Assuming each case takes one day to deal with (accepting that some will involve a trivial amount of work, and others more, with repeat visits) implies a total cost (assuming 225 working days per year and costs per worker similar to those in Welsh Government) of £49,250 per year. This lower figure is used as part of this sensitivity analysis.

Costs to business

1.8 Costs to business arise at a series of levels through the supply chain:

1.9 Changes in revenue and costs for manufacturers: Those dealing exclusively with SUCBs and paper carrier bags would see a loss of trade (but also a reduction in manufacturing cost), whilst those dealing exclusively in bags for life made of plastic or cotton would see trade increase (with increasing revenue and production costs).

1.10 Changes in revenue and costs for wholesalers: These are likely to be less sensitive than the cashflow of manufacturers as wholesalers will naturally stock a wider range of products which will help to mitigate larger swings in revenue and costs.

1.11 Changes in revenue and costs for retailers: Some of these will be positive as a typical retailer will need to purchase and store a smaller stock of bags. There will be some additional administrative costs associated with record keeping and donations to charities.

1.12 Many of the changes in cashflow experienced by manufacturers, wholesalers and retailers will be offset by an opposite effect for a different economic operator in the supply chain. For example, a cost saving for

retailers will be cancelled out by a reduction in revenues for manufacturers and wholesalers. These private benefits within the supply chain act as transfer payments redistributing money between economic operators without generating additional value to the economy. Given the economic evaluation considers the net impact of the policy from the perspective of society as a whole, these transfers net out and hence are not considered as an additional impact in the analysis.

1.13 That said there may be impacts which are overlooked by this society-wide perspective. There may be some impact on employment by bag manufacturers, but this will be offset through job opportunities elsewhere, as money saved through reduced bag purchases will be spent elsewhere. There are some distributional issues, for example whether some companies are affected more than others and where affected businesses are located, but the evidence from the surveys suggests that such effects are limited.

1.14 Added administrative costs to business represent a real and additional cost of the policy. The costs estimated in this evaluation are based on information from the surveys, with most retailers considering that the total time spent on administration of the charge is less than one day per year.

Donations to good causes

1.15 Donations to good causes are calculated as the sum of bag sales under the implementation scenarios categorised as SUCBs, multiplied by the 5p charge and 87% which is considered to be the proportion of charge actually donated to good causes. Donations from sale of other bags are assumed to be zero. Although the donations to good causes themselves will represent a direct transfer of funds from consumers to good causes, the additional action and activities undertaken by good causes funded by these donations will deliver additional social benefits which are important to capture within this evaluation.

1.16 The figure of 87% has been drawn from the retailer survey data with all three sectors responding on average that 87% of the charge was donated to good causes. Variation around this data point are considered low as the consensus from the retailers survey suggests the proportion of donations that are actually donated to good causes in the UK is relatively consistent. If any variation were to occur it is believed (based on retailer survey data) that the proportion of charge donated would be higher rather than lower resulting in an increase in the level of donation to good causes.

Waste management

1.17 The costs of waste management are calculated as the sum of:

- Recycling and waste management costs for each type of bag.

1.18 These are calculated as:

- Number of bags of each type multiplied by the proportion going to recycling or waste disposal through landfill or incineration, multiplied by the cost per bag for each waste management route

1.19 The consumer survey provides the percentage going to recycling or waste management. The amount going to litter is calculated as the residual quantity and is estimated to be high at 13%. The figure may be high as a result of rounding in the estimates of the amount sent for recycling and disposal. A more appropriate figure may be around 0.5%, calculated as the residual number of bags from a Eunomia report to the European Commission1, which estimates that 99.5% of SUCBs in the UK end up go to landfill or incineration.

1.20 The figures going for recycling also appear questionable. Consumers may put plastic bags in recycling, but the bags may not be recycled as most recycling facilities do not accept plastic film. As noted, the Eunomia report to the European Commission estimates that 99.5% of bags are landfilled or incinerated in the UK, leaving very little for recycling or littering.

1.21 The estimates of cost per bag are based on the median estimates from the WRAP Gate fees report. For recycling this is quantified as the weight of a bag divided by the MRF figures per tonne for recycling. For waste management the weight of a bag is divided by the non-hazardous landfill charge. This could generate misleading results for recycling given that the cost range for recycling ranges through zero, and the cost per tonne will be highly variable across different materials sent for recycling. However it is assumed that SUCBs will be part of a mixed recycling stream (i.e. collected mixed with other recyclable materials) so this value for mixed waste arriving at the MRF is considered a reasonable proxy value. The WRAP figures exclude landfill tax and haulage.

Environmental impact

1.22 Environmental impact is calculated as the sum of:

- CO2 impact + air pollution + water pollution + litter collection costs

1.23 These effects are mainly associated with the manufacture of bags. Water pollution impacts are set to zero, as manufacturing facilities within the EU will be linked to water services and associated liquid effluents will be processed, for example at sewage treatment works, to prevailing standards prior to release to the environment. Any added pollutant load from any source could increase the effort needed to clean the water, but should not lead to differences in the quality of water in the receiving body when released.

[1] http://ec.europa.eu/environment/waste/packaging/pdf/study_options.pdf

1.24 Air pollution impacts are expressed in terms of SO2 emissions, and valued using data on damage cost per tonne emission from Defra. Alternative estimates of damage cost per tonne emission are available from the European Environment Agency2: these values would generate higher cost estimates per bag because they account for impacts over a greater area (Europe, rather than just the UK) and include a wider range of effects. The Defra damage costs follow the recommendations of the Committee on the Medical Effects of Air Pollutants (COMEAP)3, which is more conservative than the sources used by EEA. Using the EEA data would increase pollutant damage costs from the £1,633 per tonne assumed by Defra to £12,448 per tonne.

1.25 GHG emission impacts are valued at a cost of £4/tonne of CO2 equivalent, the cost for traded emissions recommended by DECC's UK government appraisal guidance. This assumes that bag producers are covered by the EU ETS.

1.26 Potential health impacts associated with bag re-use through the transfer of micro-organisms are not quantified specifically. Available evidence on infection rates that has been considered in the course of this study has found no evidence for an increase in the level of infections associated with greater re-use of bags following the introduction of the charge.

1.27 The litter collection costs are problematic as they do not take specific account of the characteristics of plastic bags in litter, in particular their dispersive qualities through being light and easily captured by the wind or water. As a result (together with their bright colours) plastic bags are highly visible in the environment and are often found in places that other litter is not (e.g. in trees and bushes). Collection costs for 'litter' do not take this into account, leading to underestimation. Results will be driven by the number of bags that go to littering, and as noted above, when considering the costs of waste management, this quantity may be overestimated significantly. No account is taken of the environmental impacts of bag litter, for example through effects on marine organisms or visual blight.

Consumer impact

1.28 The costs and benefits to consumers are calculated using the same approach as in the RIA document provided at the time that the charge was introduced. Benefits to consumers are derived assuming that, in transferring consumption from SUCBs to reusable bags there are significant private gains that arise from the use of 1 bag for life in the place of 14 (calculated as the differential reuse between SUCB's and Bags for

[2] http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2014

[3] http://www.environmental-protection.org.uk/committees/air-quality/about-air-pollution/air-pollution-and-health/

life) SUCBs. This is drawn from the survey data which demonstrated that on average bags for life where re-used 14 times more than single use varieties. From this it is inferred that 1 bag for life replaces the need to buy/consume 14 SUCBs. As a result of this there is an incentive to transfer demand to reusable bag types result in a net financial gain of up to £0.43 (calculated as the difference between the cost of bags for life and 14 SUCBs at 5p) per additional reusable bag bought. Therefore as the baseline and sensitivity demand profiles widen there is anticipated to be an increase in consumer benefits from the greater use of reusable bags. Costs to consumers are calculated on the basis that consumers willingness to pay for SUCBs is exhibited through the number of consumers who choose to forego SUCBs in a shift to reusable bag types. Therefore the loss of utility resulting from the reduced convenience factor of SUCBs can be estimated as the lost utility (reduced SUCB consumption multiplied by charge 5p) divided by two to represent the lost consumer surplus (an estimate of the areas under the demand curve). This reflects therefore an estimate of the monetised convenience lost by consumers in having to remember and carry bags for life with them to all shopping activities.

1.29 Utility is a concept in economics which represents the inherent and often intangible value that consumers place on the products they consume. In this case for example, consumers use bags as they provide a convenient means of transporting products, which consumers place a value on. Further, the utility associated with bags will differ between bag type depending on the different characteristics of each bag, such as strength of the bag, comfort in use and attractiveness. Utility is separate to the price paid for a bag: in fact, the utility or value a consumer derives from using a bag, less the price, represents the net benefit that a consumer gains from using a bag. Where price becomes greater than the utility gained from using a bag, the consumer may no longer choose to use the bag type in question as the costs (i.e. the price) outweigh the perceived benefit.

1.30 The net effect of the policy is the sum of all the individual changes in utility for each consumer. In this case, a change in utility will only occur where a consumer switches bag type. Where a consumer continues to use a SUCB following the introduction of the charge, there is no change in utility as they continue to consume the bag (taking a simplifying assumption that consumers' preferences with respect to bags remain constant over time). Where consumers switch to re-useable bags, the consumer will lose the utility associated with the SUCB, but gain the utility associated with using the re-useable bag.

1.31 It should be recognised first and foremost that estimating the value or utility that consumers place on using a particular type of bag is difficult. As noted above, the value attached to a particular bag will be influenced by a range

of factors, including convenience and comfort. This value will vary by consumer (as different people value characteristics differently), and by the situation (e.g. amount of shopping, distance to travel, etc).

1.32 Monetary values for utility and preferences are estimated in economics through a range of methodologies. A common technique is using 'willingness-to-pay' surveys, where consumers are asked directly to place a monetary value on the benefits they derive from different types of bags. However, in the absence of such studies, this evaluation uses a technique known as 'revealed preference' (i.e. deriving a value from observed behaviour) to place a monetary value on the utility associated with different bags. This is a similar methodology to that used in the original RIA which aids comparison of results with this study.

1.33 The logic to derive utility values from revealed preference is as follows. We assume that consumers exhibit perfectly rational behaviour (i.e. they are fully aware of the price and utility they place on different bag types and use this information in their bag purchasing decisions). Thereby, after the charge is implemented, those consumers who choose to forego SUCBs and shift to using reusable bag types can be assumed to place a value on SUCBs equal to or less than the charge. This is because with the implementation of the charge, the net benefit these consumers derive from SUCBs turns negative, and instead they choose to consume re-useable bags. Likewise it is assumed that consumers place a value on re-useable bags equal to or greater than their price, otherwise they would not switch.

1.34 When a consumer switches between bag types, they will lose the utility associated with the SUCB, but will gain the value placed on the re-useable bag. The net effect for society will be the sum of these net effects for each individual consumer. This in part will reflect therefore an estimate of the monetised convenience lost by consumers in having to remember and carry bags for life with them to all shopping activities.

1.35 This proxy for the utility value of bags for consumers which was developed in line with that deployed in the original RIA should be considered as an estimate only of the consumer impacts for this relatively small change in charge rate. If increasing charge rates are to be considered then the uncertainty around using this proxy to estimate utility impacts increases4. In this case more robust analysis should be conducted to estimate the benefits to consumers, based on their willingness to pay for the convenience of SUCBs versus the use of a bag for life.

[4] Here we assume a value of 5p attached to SUCBs, but in fact the utility of an individual consumer could range between 0p to 5p. Where we consider a charge of 10p for example, this range could increase to between 0p and 10p, increasing the range of uncertainty.

Uncertainty analysis

1.36 Uncertainty analysis focusses on whether alternative assumptions, alternative data sources, or variability in data could influence the main conclusion reached in the analysis, that:

- The introduction of the SUCB charge in Wales has generated significant benefits to society.

1.37 Each parameter is considered, with recommendations given for treatment within the uncertainty analysis.

Table A5.1: Recommendations for uncertainty analysis

Cost element	Parameter	Position
Number of bags of each type		Assumed that uncertainty in the number of bags overall, and the number of bags of each type in circulation, is low because data is sourced from the consumer surveys, WRAP[5], etc. Uncertainty accounted for using the low-high ranges
Administrative and enforcement costs	Administrative costs	Uncertainty low as data are from Welsh Government directly.
	Enforcement costs	Investigate sensitivity with enforcement costs set to £49,250/year.
Costs to business	Costs to manufacturers	Assumed to cancel out against reduced costs to retailers
	Costs to wholesalers	Assumed to cancel out against reduced costs to retailers
	Costs to retailers	Assumed to cancel out against reduced revenues to manufacturers and wholesalers
Charitable donations		Alternative estimate of fraction of costs donated to charity based on information from retailers (95%), though effect on overall results will be small.
Waste management costs	% bags going to waste management, recycling and litter	Using data from the consumer surveys may introduce error, where bags are put by consumers in recycling, but bags are not recyclable. % of SUCBs estimated as going into litter is high (13%), possibly through rounding errors. For sensitivity analysis assume 99% are sent to landfill or incineration and 0.5% each to litter and recycling. This will demonstrate

[5] http://www.wrap.org.uk/content/carrier-bags-reducing-their-environmental-impact

Cost element	Parameter	Position
		sensitivity of final conclusions to these estimates
	Cost of waste management options per bag	The sensitivity analysis assuming only 0.5% of bags are recycled largely takes out concern over the recycling costs for SUCBs. However, it does not address uncertainty in the costs of cleaning up SUCBs as litter, particularly when they become removed from other litter and become hard to collect (e.g. when in trees or rivers).
Environmental costs	Climate costs	Analysis adopts UK government figure (DECC) of £4 per tonne for carbon.
	Air pollution costs	For sensitivity analysis adopt a figure of £12,448 per tonne SO_2.
	Water pollution costs	These costs are assumed to be zero, on the grounds that emissions to water from manufacturing should be subject to water treatment which will treat water to a common standard.
	Environmental costs associated with litter	These costs cannot currently be quantified. Should be noted as a bias to the analysis. Sensitivity for collection costs accounted for partially against sensitivity analysis that assumes a very high proportion of bags go to landfill or incineration.
Consumer impact		Sensitivity analysis accounting for costs of bags before the introduction of the charge being factored into shopping prices.

Sensitivity analysis conducted

1.38 In developing the evaluation model a number of key assumptions were made in relation to the input values utilised. Although the majority of these values were driven by the best available data sets and new data collated as part of survey conducted, it is still important to understand the sensitivity of the model outputs if some of these input variables were to change.

1.39 These sensitivity tests have been undertaken on the best estimate scenario in order to assess the overall impact that they could have on the overall net impact of the charging scheme.

1.40 As identified key areas where sensitivity analysis was to be conducted include:

- Enforcement costs
- Environmental costs (Utilising a higher cost of carbon)
- Consumer impacts (Using a higher average cost for bags for life)

Enforcement costs

1.41 The evaluation model assumes constant annual costs of enforcement at £1 million (adjusted for inflation). However feedback from the survey would suggest that consumers at least have found no cause for concern in being charged for carrier bags with no examples where respondents reported instances of no charge to local authorities. Therefore it is likely that enforcement costs could in fact have reduced significantly since this first estimate was made in 2010/2011.

1.42 Over the appraisal period (3.years) this cost is equal to £3.5 million in enforcement actions. As stated above it is highly unlikely that these costs have increased and therefore this level of costs is considered worst case scenario for local authorities and trading standards.

1.43 Two sensitivities have been run below, one where enforcement costs are considered to be zero throughout the appraisal period (yielding additional benefit of £3.5 million) and a second where enforcement costs are lower at £49,250 per annum.

1.44 As can be seen from the additional sensitivity reducing the enforcement costs assumed will only have the effect of increasing net benefit of the policy implemented. The lower estimates provided under sensitivity analysis provide additional benefits of between £3.3 and £3.5 million across the timeframe.

Table A5.2: Outputs from sensitivity for alternate (Lower) enforcement costs

Option	Net benefit of Best estimate (constant £1million)	Net benefit of Best estimate (Annual costs of £49,250)	Net benefit of Best estimate (No enforcement costs)
Net impact (£m)	£30.30	£33.60	£33.80
Administration and enforcement (£m)	-£3.70	-£0.40	-£0.30
Charitable donations (£m)	£30.40	£30.40	£30.40
Waste management (£m)	£0.10	£0.10	£0.10
Environmental impact (£m)	£1.00	£1.00	£1.00
Consumer benefit (£m)	£3.10	£3.10	£3.10
Retailer costs (£m)	-£0.60	-£0.60	-£0.60

Charitable donations

1.45 The evaluation model assumes that 87% of charges go to good causes. As stated feedback from retailers would suggest that the potential variation in quantity donated would be positive in that more than 87% was being donated. A 95% value has been tested below resulting in additional net benefit of £2.8 million.

Table A5.3: Outputs from sensitivity for higher donation rate at 95%

Option	Net benefit of Best estimate	Net benefit of Best estimate (Increase to 95% donations)
Net impact (£m)	£30.30	£33.10
Administration and enforcement (£m)	-£3.70	-£3.70
Charitable donations (£m)	£30.40	£33.20
Waste management (£m)	£0.10	£0.10
Environmental impact (£m)	£1.00	£1.00
Consumer benefit (£m)	£3.10	£3.10
Retailer costs (£m)	-£0.60	-£0.60

Waste management costs

1.46 The evaluation model assumes that 44% of SUCBs are recycled, whilst 43% are disposed of to landfill with the remainder disposed of as litter. Sensitivity analysis has been undertaken that assumes 99.5% are disposed of at landfill with 0.5% caught as litter. The net effect of this results in a shift in waste management costs which is negligible, but a larger shift in the environmental costs, where clean-up costs of litter are accounted for. Litter of SUCBs is considered the most costly element of their environmental burden. Reducing the benefits accrued over the baseline in eradicating this potential benefit, by assuming minimal littering means that the shift to otherwise more environmentally degrading bag types results in net environmental cost. This is based on the impact categories included within this model. The net effect overall is a reduction in net benefit of £1.4 million.

Table A5.4: Outputs from sensitivity for higher rate of SUCB landfill disposal

Option	Net benefit of Best estimate	Net benefit of Best estimate (99.5% Disposal)
Net impact (£m)	£30.30	£28.90
Administration and enforcement (£m)	-£3.70	-£3.70
Charitable donations (£m)	£30.40	£30.40
Waste management (£m)	£0.10	£0.20
Environmental impact (£m)	£1.00	-£0.40
Consumer benefit (£m)	£3.10	£3.10
Retailer costs (£m)	-£0.60	-£0.60

Environmental costs

1.47 Unit cost per tonne of SOx pollutant were set at £1,633 per tonne in the evaluation model. If this figure were escalated to the European damage cost estimate of SOx then it could be that the environmental costs are significantly higher than initial estimates suggest. Sensitivity tests were run using new input factors detailed in Table A5.5.

Table A5.5: Updated unit values for carrier bags with higher SOx value

	SOx (g/ reference flow)	Bags per RF[6]	SOx grams per bag	£ per tonne (CE)[7]	£ per bag
SUCB	11.4	82.14	0.14	£12,448	£0.0017
Paper bag	34.5	64.98	0.53	£12,448	£0.0066
Plastic bag for life	29.3	60.68	0.48	£12,448	£0.0060
36p bag for life	101.3	66.13	1.53	£12,448	£0.0191
Cotton bag	2787.7	45.59	61.15	£12,448	£0.7612

[6] Reference flow

[7] Central Estimate from EEA: http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2014

1.48 Using the updated higher value provides the new outputs for higher SOx below. These values would represent a reduction in net benefit by £2.7 million caused by a shift in environmental burdens resulting from the greater proportion of higher polluting bags being produced and in circulation.

Table A5.6: Outputs from sensitivity for higher SOx valuation

Option	Net benefit of Best estimate	Net benefit of Best estimate (Higher SOX valuation)
Net impact (£m)	£30.30	£27.60
Administration and enforcement (£m)	-£3.70	-£3.70
Charitable donations (£m)	£30.40	£30.40
Waste management (£m)	£0.10	£0.10
Environmental impact (£m)	£1.00	-£1.70
Consumer benefit (£m)	£3.10	£3.10
Retailer costs (£m)	-£0.60	-£0.60

Consumer impact

1.49 Although an alternate methodology has not been adopted for this report, the table below suggests the scale of net benefits if the consumer impact category were to be left out of the aggregation process. As a result of this, net benefits are reduced by £3.1 million for the timeframe. Additional analysis does provide evidence that suggests that based on bag demand profiles for 2014 consumers now could be paying in total £17 million for carrier bags per annum (with £6 million to charity) versus a no charge cost of approximately £4.5 million. A shift of £12.5 million. Therefore consumers would have to value the benefits of reusable bags at least £12.5 million in order for the net impact to be positive.

Table A5.7: Outputs from sensitivity for consumer impact

Option	Net benefit of Best estimate	Net benefit of Best estimate (No Consumer impacts)
Net impact (£m)	£30.30	£27.20
Administration and enforcement (£m)	-£3.70	-£3.70
Charitable donations (£m)	£30.40	£30.40
Waste management (£m)	£0.10	£0.10
Environmental impact (£m)	£1.00	£1.00
Consumer benefit (£m)	£3.10	£0.00
Retailer costs (£m)	-£0.60	-£0.60

Appendix 5 - Bag demand profile data tables

As noted in Chapter 4, to assess changes in bag demand between October 2011 and January 2015, retailers were asked the extent to which the number of bags issued had increased or decreased since the charge was introduced. Retailers were asked to estimate the magnitude of the change against a set of pre-coded ranges. The highest and lowest values for the ranges were used to develop scenarios of bag demand ranging from high to low plus a medium 'best estimate' figure. Scenarios reflecting high, medium, and low estimates of bag demand (based on modelling separate scenarios reflecting the upper and lower ranges for the variables used in the calculation), and the counterfactual (business as usual (BAU)) scenario are presented in Figure A5.1, below.

Table A5.1 Estimated Demand Profiles, Trends from 2011 and 2015 by Bag Type

	2011	2012	2013	2014	2015
SUCB's- Plastic					
Low	303,845	78,416	89,151	92,382	95,047
Central	323,824	84,126	95,540	98,975	101,809
High	374,461	97,158	110,363	114,337	117,615
BAU(counterfactual)	402,774	407,607	415,759	433,637	448,380
SUCB's- Paper					
Low	16,645	16,215	15,519	13,759	12,614
Central	26,693	25,807	24,300	20,796	18,388
High	34,368	32,985	30,633	25,578	21,737
BAU(counterfactual)	26,760	27,081	27,622	28,810	29,790
Bags for Life- High Density Plastic					
Low	21,944	30,067	34,535	36,008	37,223
Central	21,985	30,114	34,584	36,058	37,273
High	22,334	30,473	34,949	36,424	37,641
BAU(counterfactual)	13,827	13,993	14,273	14,886	15,392
Bags for Life- Canvas					
Low	2,234	3,060	3,514	3,663	3,787
Central	2,259	3,091	3,548	3,699	3,823
High	2,318	3,165	3,631	3,784	3,911
BAU(counterfactual)	1,434	1,452	1,481	1,544	1,597