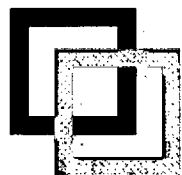


# Review of ACT Plastic Bag Ban

## Environment and Sustainable Development Directorate

September 2012



# Piazza Research

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# ACT Plastic Bag Ban Survey 2012

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# ACT Plastic Bag Survey 2012

## BACKGROUND AND METHODOLOGY

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The ACT Plastic Bag Ban was introduced on the 1<sup>st</sup> of November 2011. The ban is a high profile issue in the ACT and it is important to fully understand consumer attitudes and reactions to the ban. With the ban having been in place for ten months, the ACT Government's Environment and Sustainable Development Directorate (the Directorate) is conducting an interim review of the ban, exploring its impact on consumer shopping behaviour and the community's opinions regarding it.

Piazza Research is an independent ISO 20252 quality certified market and social research firm. It was selected to conduct a telephone survey of Canberra shoppers to support the review process.

### **Methodology**

A telephone survey was the selected methodology as it provided the most reliable option to sample a wide range of shoppers across Canberra.

#### ***Questionnaire design***

The interview questionnaire was designed based on input from Directorate management and in collaboration with Piazza Research consultants. The survey was designed to be succinct to minimise respondent burden and could be administered by phone in 3.5 to 4 minutes. Most questions were 'closed' (or tick-box) format with one question allowing for respondents to elaborate on their answer.

#### ***Data collection***

Piazza Research conducted the data collection from its data collection centre in Phillip ACT, between Thursday 06<sup>th</sup> of September and Wednesday 12<sup>th</sup> September 2012. Calls were made on weekday evenings as well as on a Saturday to capture a diverse demographic.

#### ***Sample Design***

A random sample of residents across the ACT was selected based on an electronic telephone directory available to the research industry. The primary grocery shopper of each household was interviewed.

A total of 604 responses were achieved. For the 95% confidence interval, results to this survey are calculated to be accurate to within +/- 4.1% (SE).

***Quality Assurance System*** – This project complies with ISO 20252 Market, Opinion and Social Research Standard.

# ACT Plastic Bag Survey 2012

## Data Processing and Analysis

Interviewers entered responses directly into a CATI database at the time of interviewing. Piazza Research used its own statistical software and 'Q' to analyse survey results. Software validation and post data-entry checks were conducted to ensure data integrity before analysis.

A descriptive analysis was performed to produce graphs, tables and frequency counts.

Results were also presented with a breakdown by age category of respondents.

**Treatment of open-ended question** – Open-ended (or free form) responses were analysed for content, then summarised. Consultants developed a coding frame for this question, sorting similar types of answers into descriptive categories. These groupings were then statistically analysed.

**Rounding error** – Percentage results have been rounded to the nearest whole per cent. Percentages in some graphs may total slightly more or less than 100%.

Please note: Breakdown results for age categories '25 and under' and '25 to 30' may be less reliable due to lower number of responses within these age groups. Age category '25 and under' has not been included in written commentary due to low reliability.

# ACT Plastic Bag Survey 2012

## SUMMARY OF MAIN FINDINGS

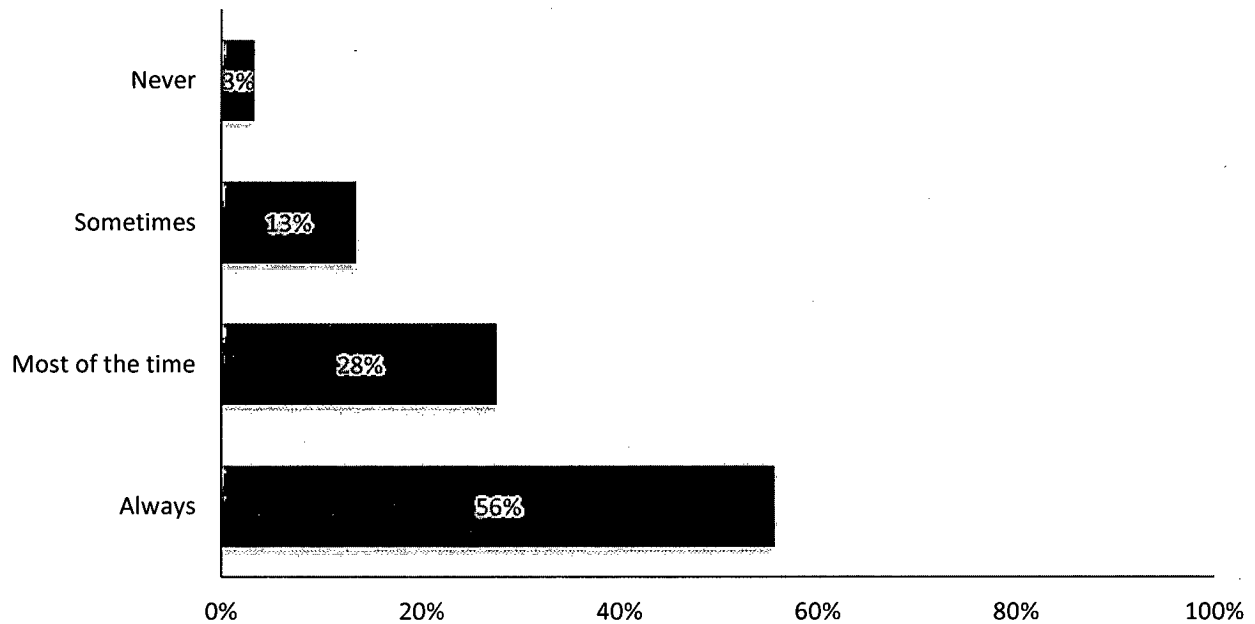
- Most primary shoppers (84%) reported taking reusable bags *always* or *most of the time*. Only 3% stated they *never* did. Respondents aged 51 or over were the most likely (58% to 67%) to *always* take re-usable bags. 25 to 30 year olds were more likely than others to report *never* taking reusable bags (11%).
- 85% of primary shoppers agreed that as a result of the ACT Plastic Bag Ban, they now take their own bags more frequently. This result was broadly consistent across different age categories (72% to 88% agree).
- Most shoppers (73%) disagreed that as a result of the Plastic Bag Ban they must now plan their shopping trips.
- Over half (56%) of primary shoppers disagreed that they were already using their own shopping bags before the bag ban. This result was consistent across most age categories except for the 25-30 year old group where 83% disagreed.
- A minority of shoppers (36%) reported that even with the bag ban, they mostly don't use reusable bags and they buy shopping bags as necessary. Age groups under 30 years were more likely than others to agree.
- The majority of primary shoppers (58%) supported the ACT Plastic Bag Ban, 33% did not and 9% were still unsure. While the majority of shoppers from every age group supported the ban, a trend was apparent showing the younger people were, the more likely to support the ban.
- The majority (69%) of primary shoppers did not want to see the bag ban widened to cover all plastic bags.
- Almost all ACT primary shoppers (94%) wanted all plastic bags to be made biodegradable. This result was consistent across all age groups.
- The idea of placing a national levy on plastic bags to use the money for litter reduction around the country was supported by the majority (54%), although a sizeable proportion (46%) did not support this. A breakdown by age showed the older people were, the less likely they were to support a national plastic ban levy; although the majority of all age groups (excepting 61-70 years) supported a levy.
- Two-thirds (66%) of shoppers would like the ban to be implemented nationally. People aged between 31 and 50 were more likely to support a national approach than other groups with between 73% and 75% of this age bracket showing support.
- 70% of ACT primary grocery shoppers did not want the ban to be overturned.

# ACT Plastic Bag Survey 2012

## Question 1. Are you the primary groceries shopper in your household?

NOTE: This question was not analysed as it was a filter question to target the correct population sample.

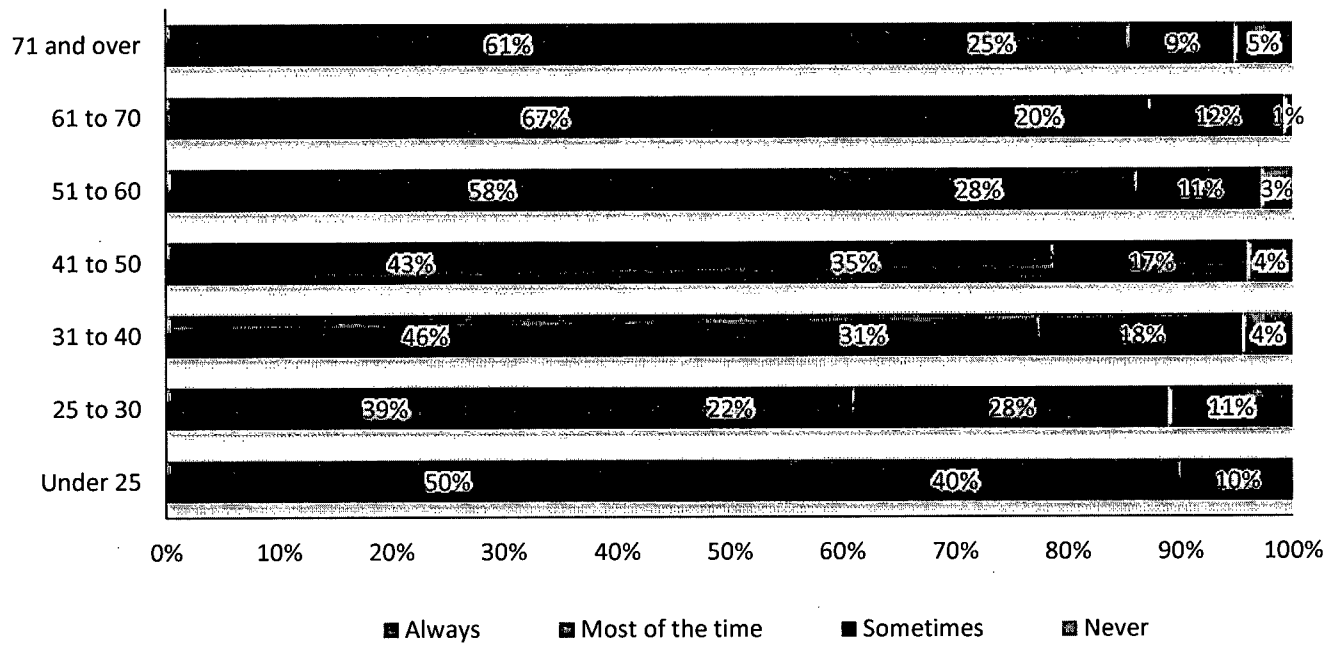
## Question 2. How often would you say you take reusable bags when you go shopping?



Base= 604

# ACT Plastic Bag Survey 2012

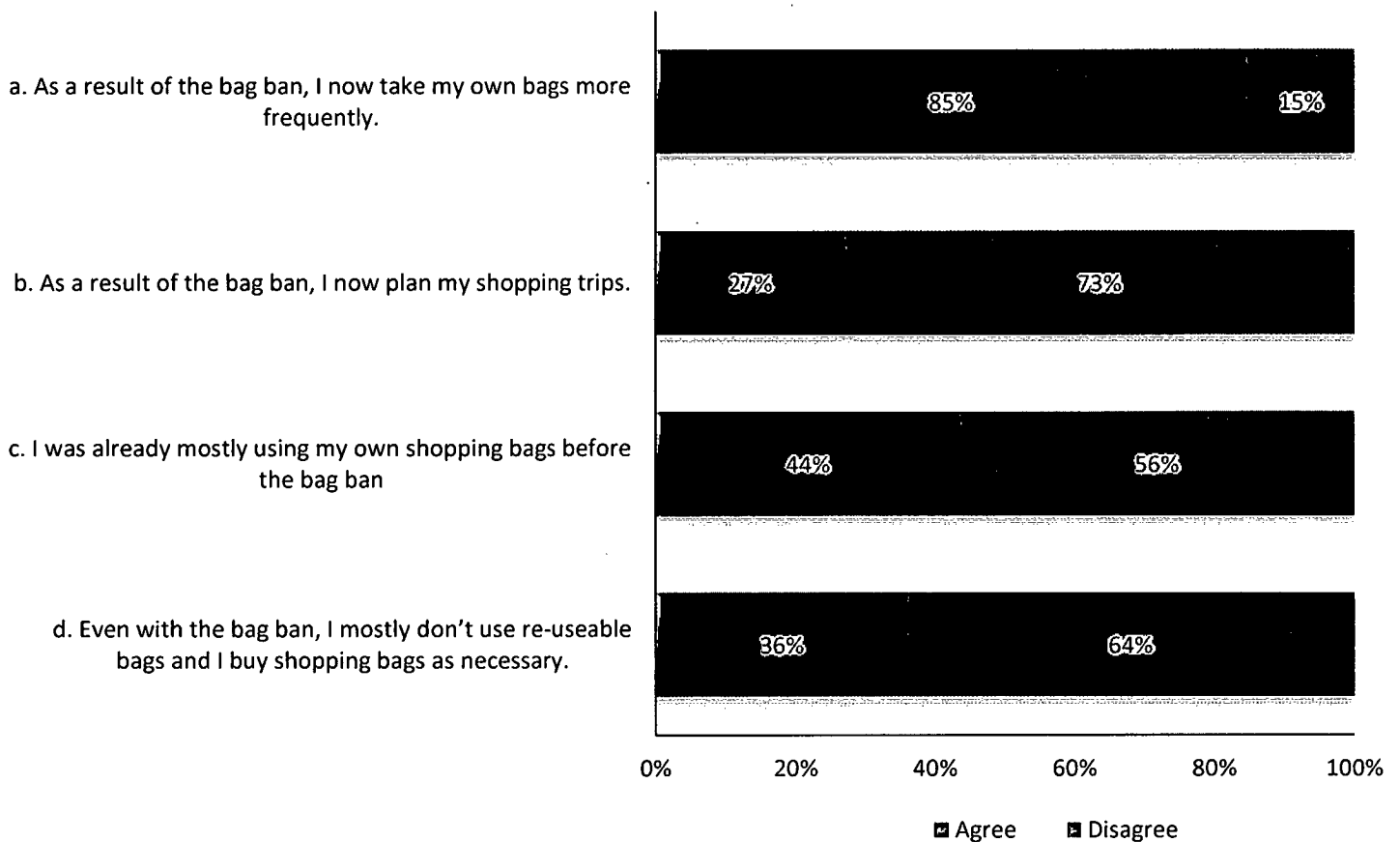
Question 2 by age categories.



Base MIN= 10  
Base MAX= 145

# ACT Plastic Bag Survey 2012

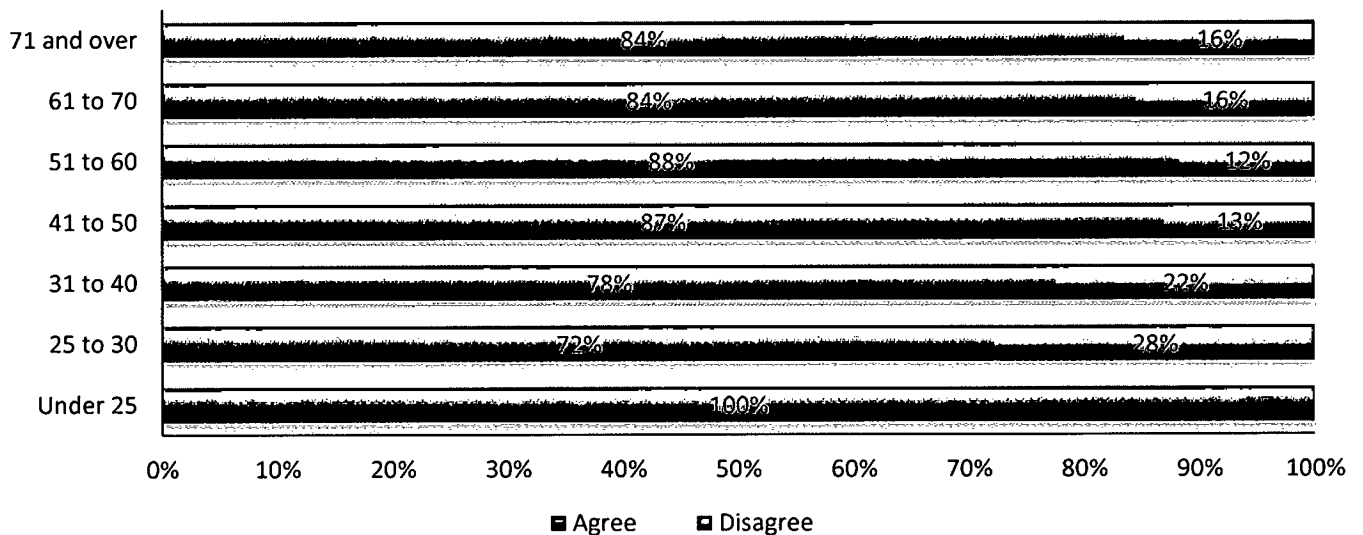
Question 3. Can you please tell me whether you agree or disagree with the following statements about the way the Plastic Bag Ban has influenced the way you shop?



Base MIN= 603  
Base MAX=604

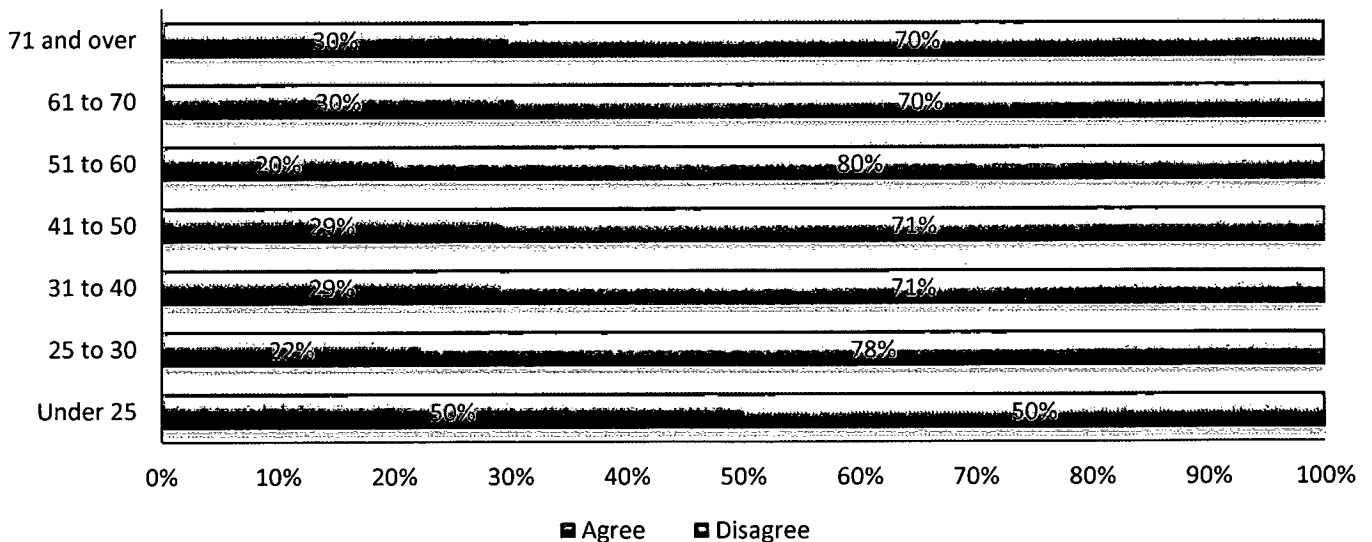
# ACT Plastic Bag Survey 2012

Question 3a by age categories. As a result of the bag ban, I now take my own bags more frequently.



Base MIN=10  
Base MAX=145

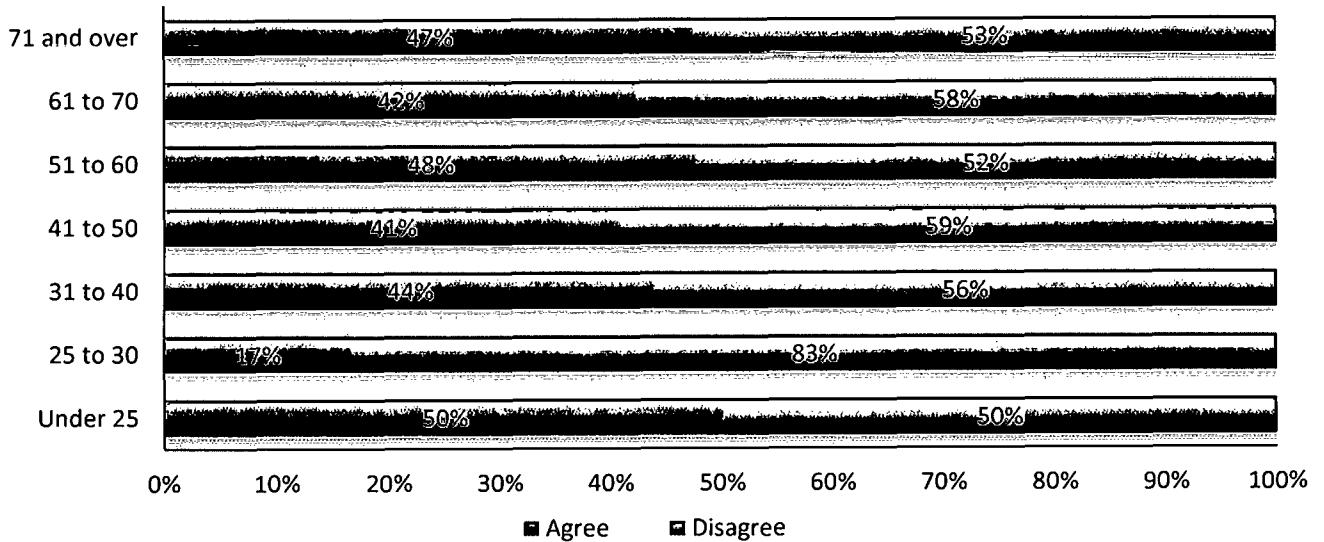
Question 3b by age categories. As a result of the bag ban, I now plan my shopping trips.



Base MIN= 10  
Base MAX= 145

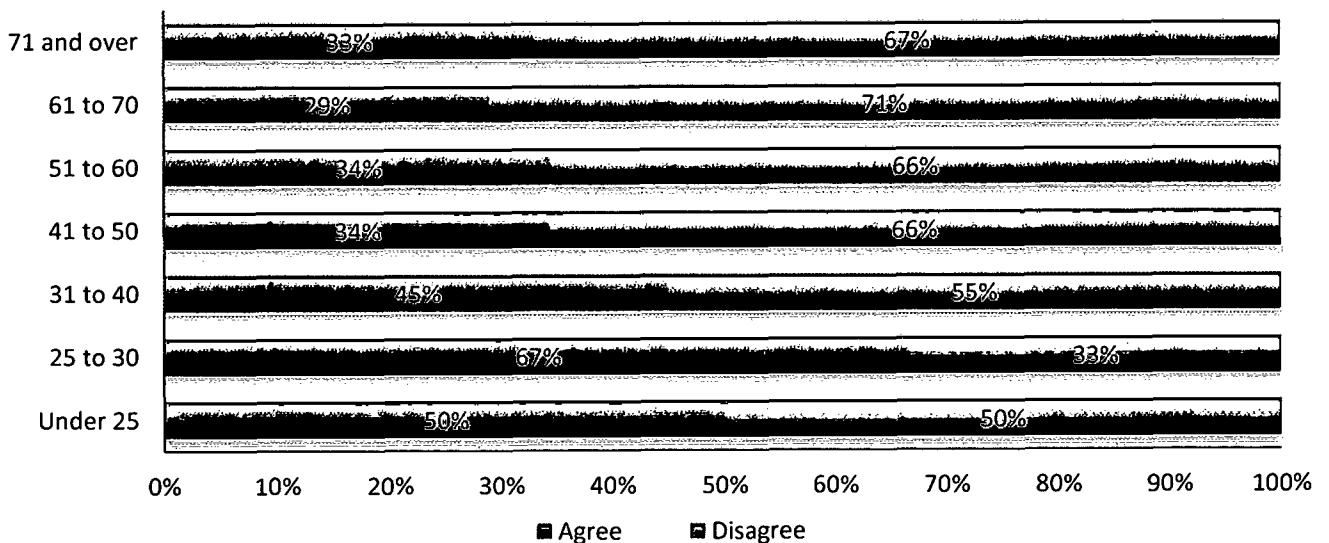
# ACT Plastic Bag Survey 2012

Question 3c by age categories. I was already mostly using my own shopping bags before the bag ban.



Base MIN= 10  
Base MAX= 145

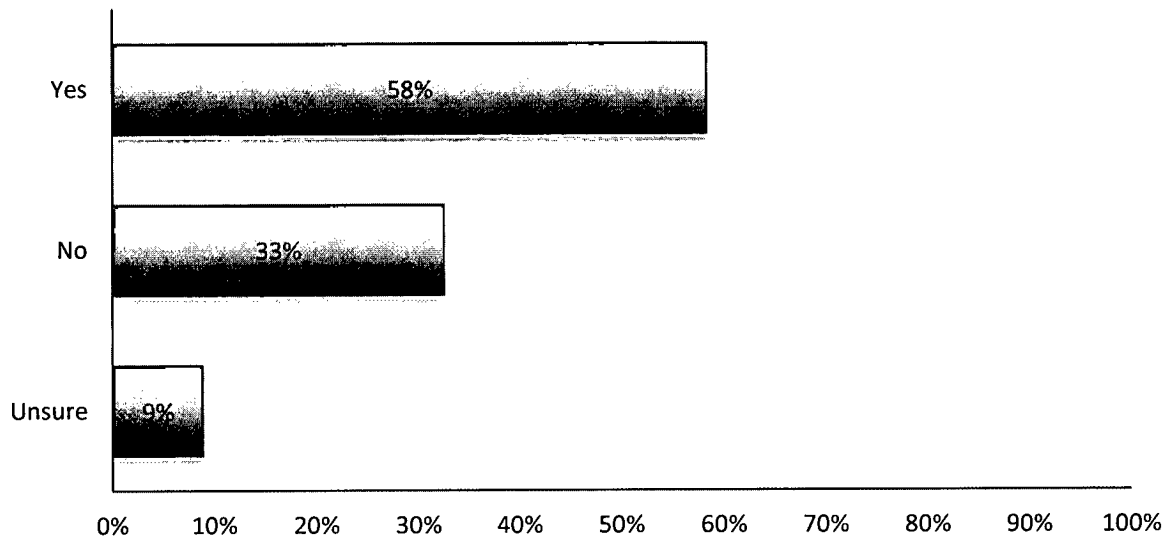
Question 3d by age categories. Even with the bag ban, I mostly don't use re-useable bags and I buy shopping bags as necessary.



Base MIN= 10  
Base MAX= 145

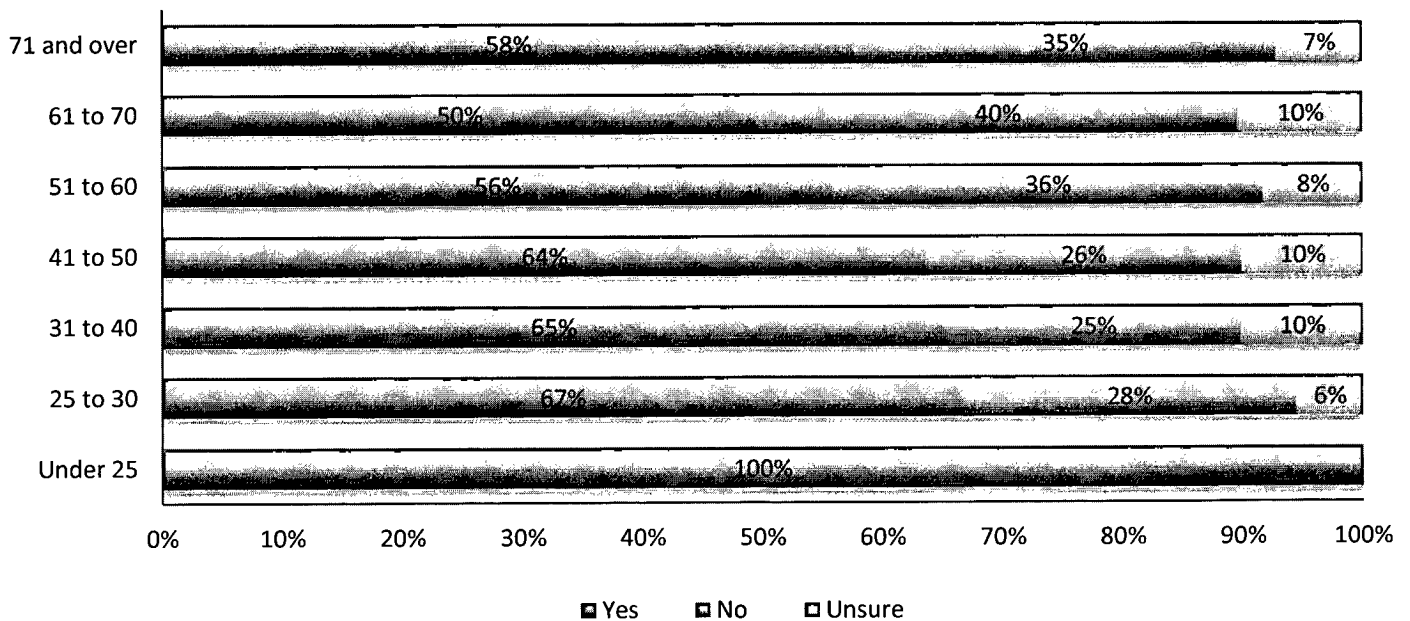
# ACT Plastic Bag Survey 2012

## Question 4. Do you support the ACT Plastic Bag Ban?



Base= 604

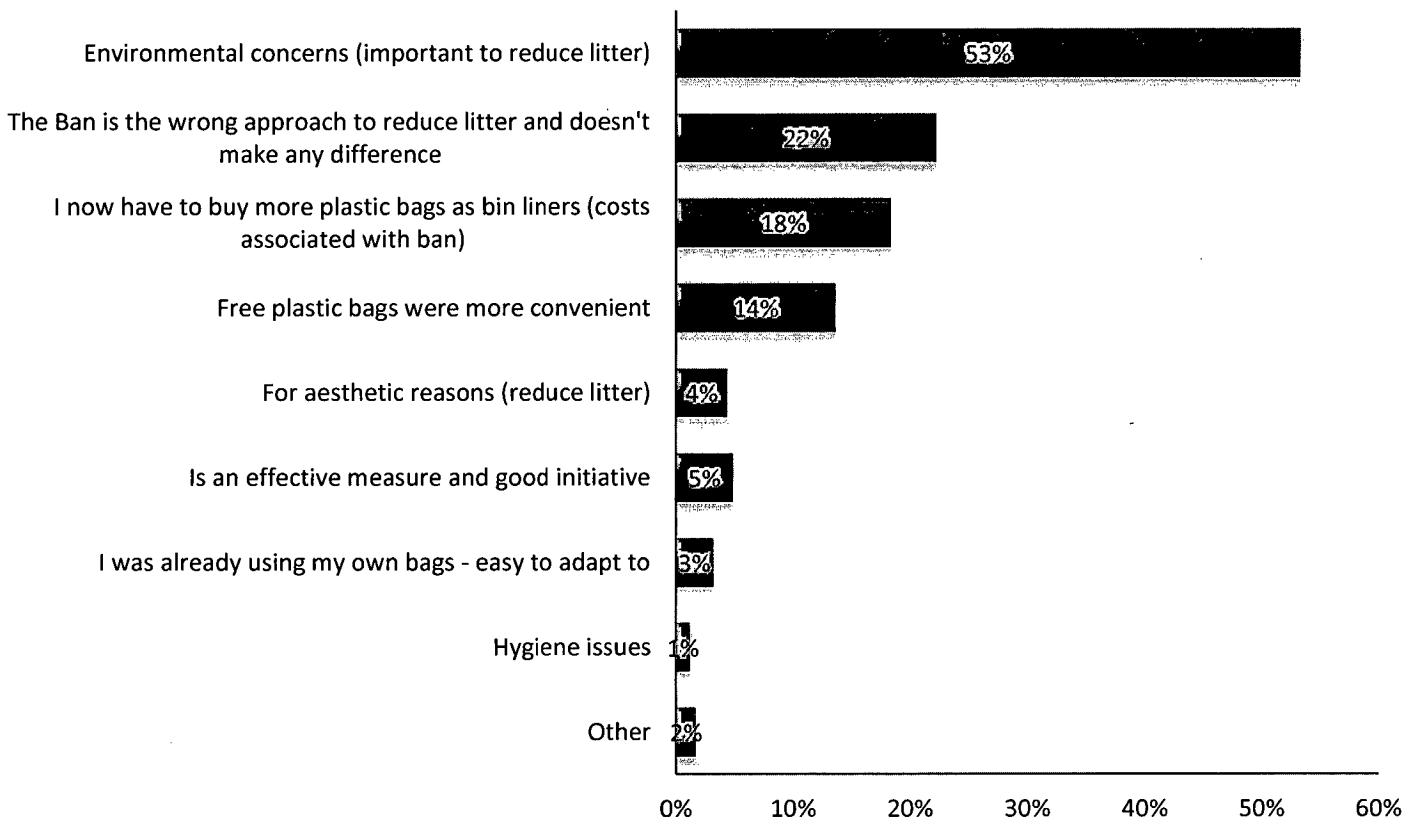
## Question 4 by age categories



Base MIN= 10  
Base MAX= 145

# ACT Plastic Bag Survey 2012

## Question 4a. What is the main reason for your answer?

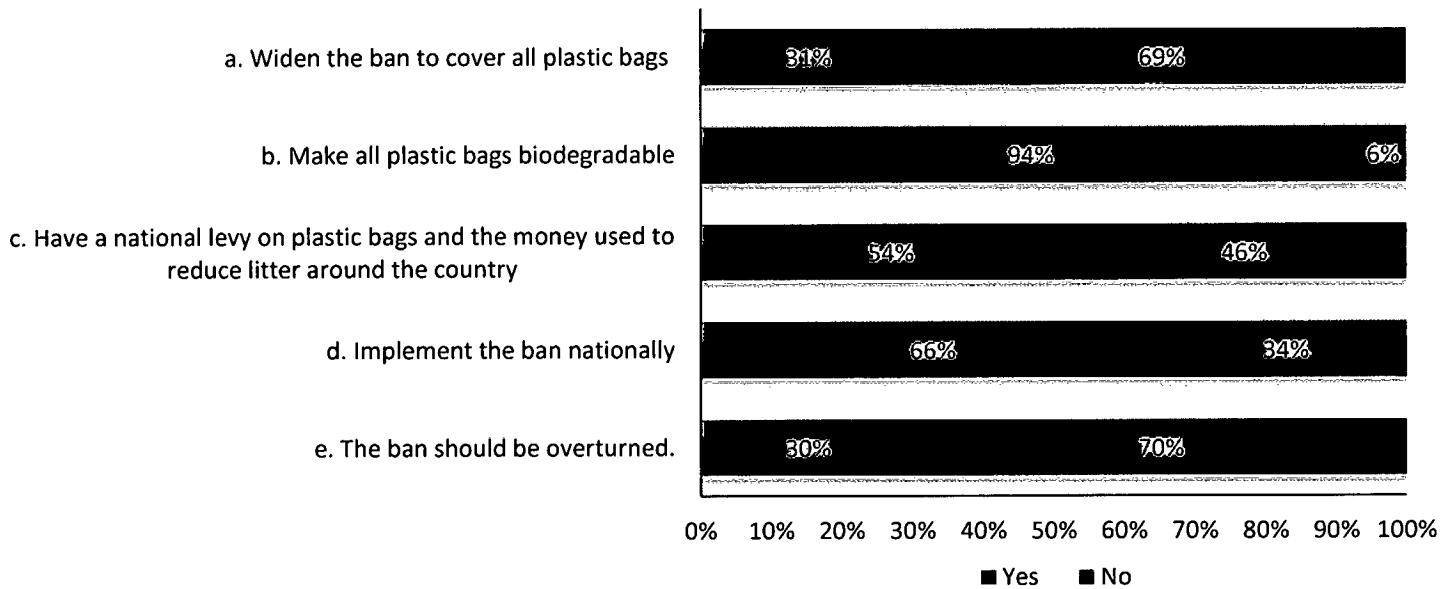


Base= 594

*NOTE: Percentages in this graph may add to greater than 100% as respondents were able to provide more than one answer.*

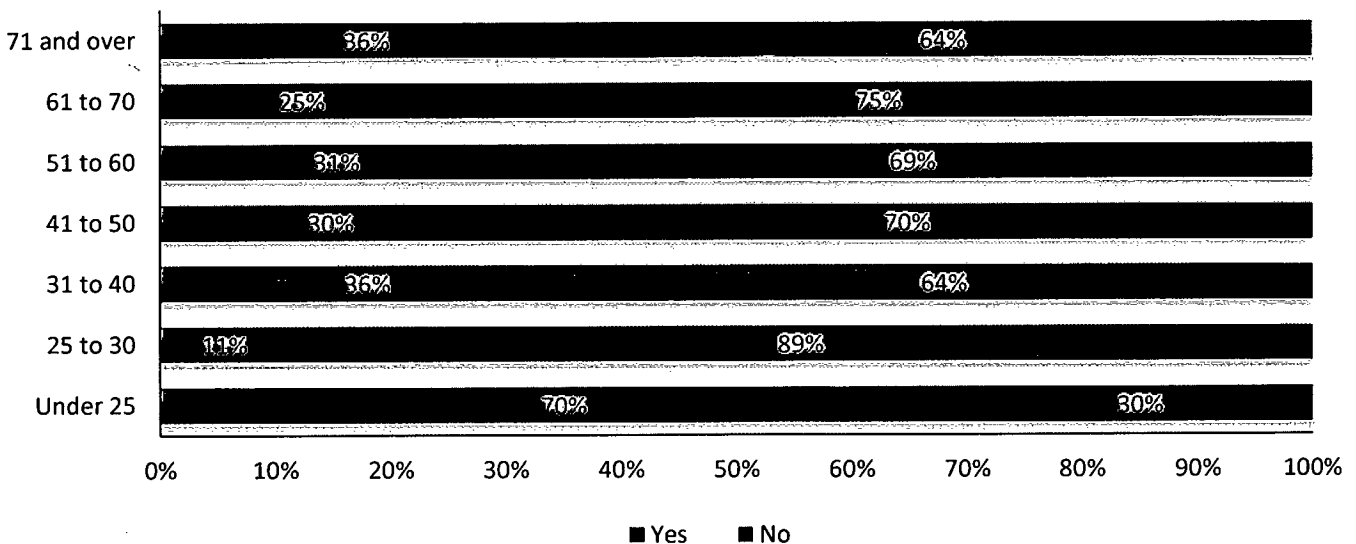
# ACT Plastic Bag Survey 2012

Question 5. Would you want to see any of the following changes to the current Plastic Bag Ban?



Base MIN=593  
Base MAX= 601

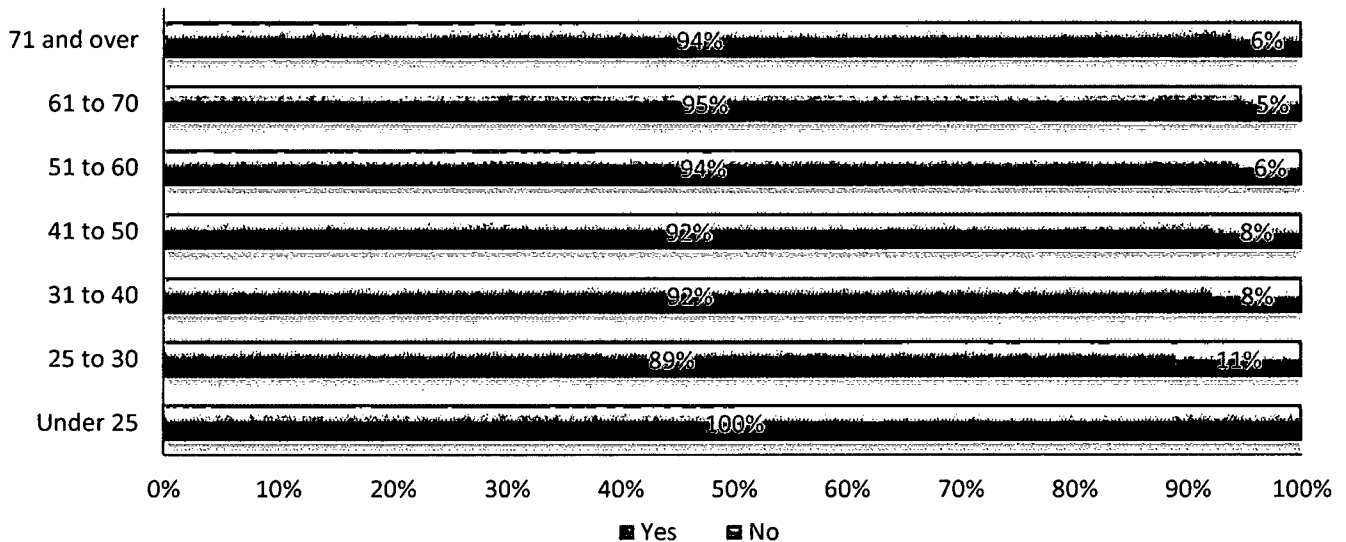
Question 5a by age categories. Widen the ban to cover all plastic bags.



Base MIN=10  
Base MAX= 144

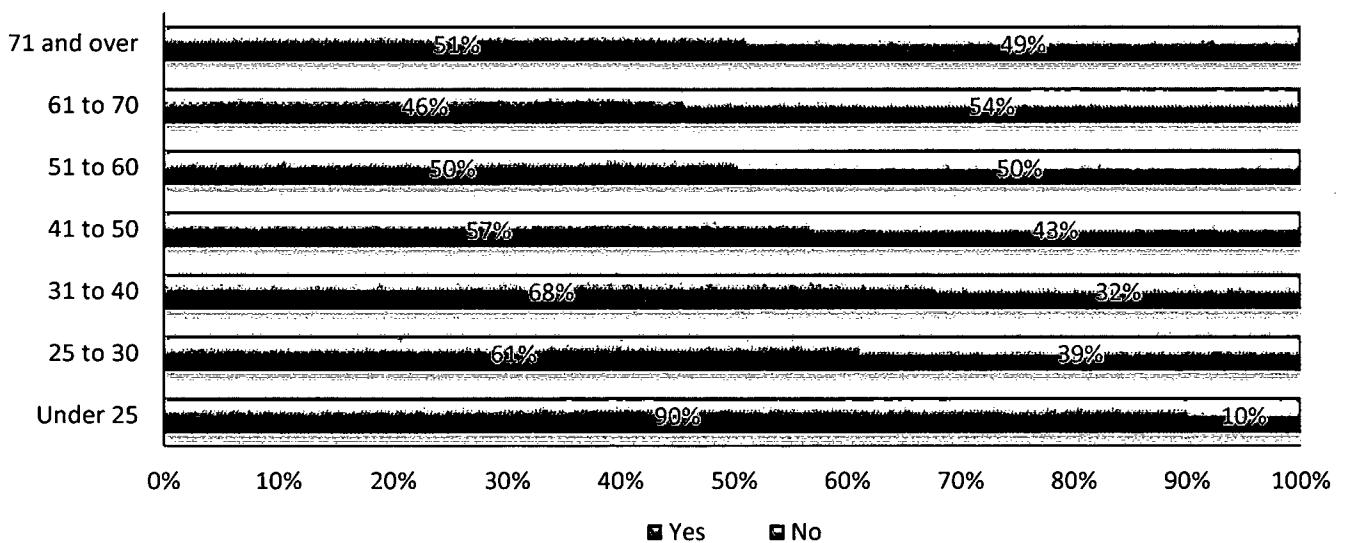
# ACT Plastic Bag Survey 2012

Question 5b by age categories. Make all plastic bags biodegradable.



Base MIN= 10  
Base MAX= 144

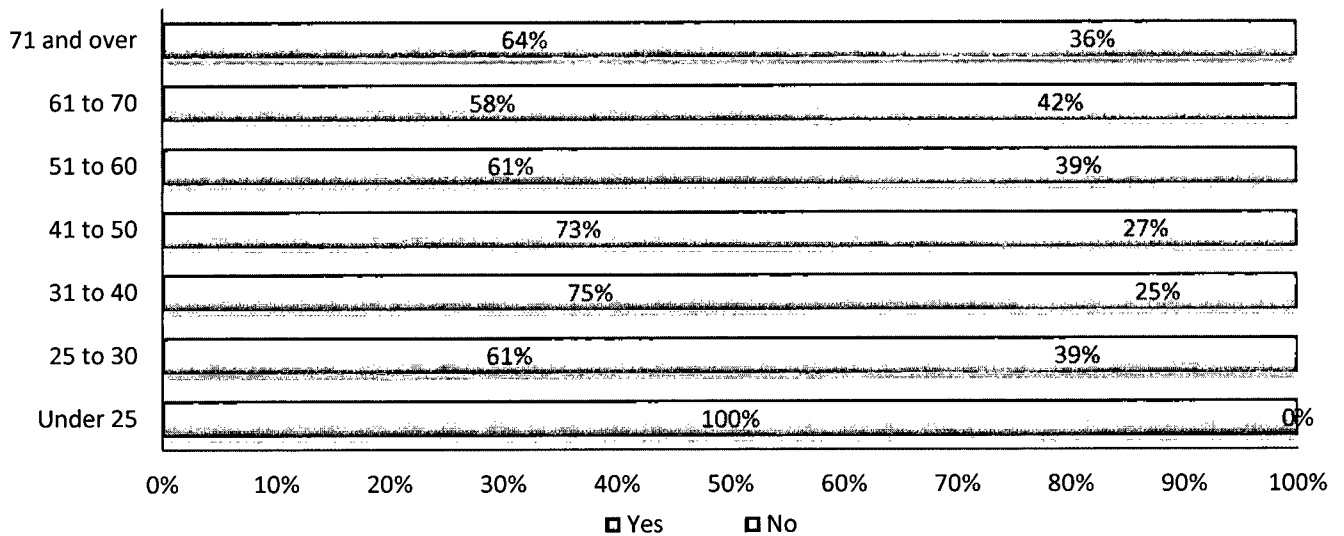
Question 5c by age categories. Have a national levy on plastic bags and the money used to reduce litter around the country.



Base MIN= 10  
Base MAX= 143

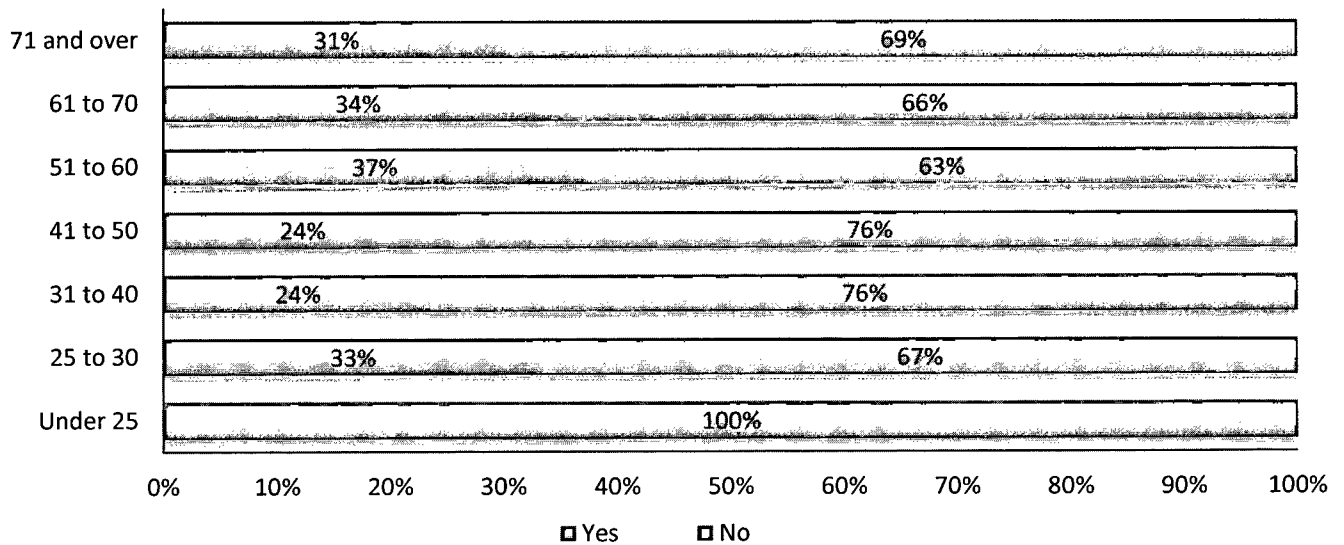
# ACT Plastic Bag Survey 2012

Question 5d by age categories. Implement the ban nationally.



Base MIN= 10  
Base MAX= 145

Question 5e by age categories. The ban should be overturned.

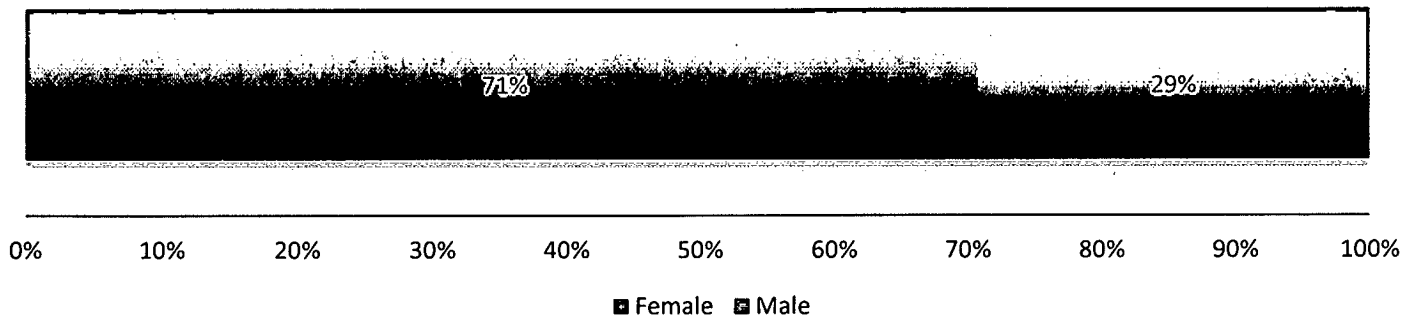


Base MIN= 10  
Base MAX= 145

# ACT Plastic Bag Survey 2012

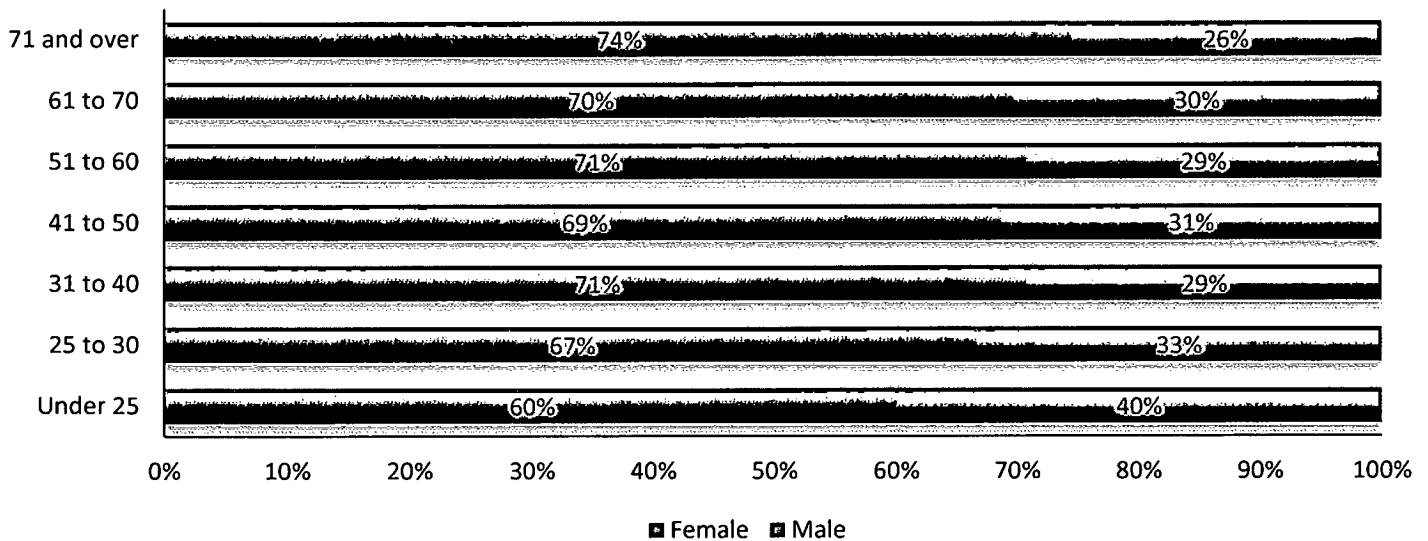
## DEMOGRAPHICS

Question 6. Customer gender profile.



Base= 591

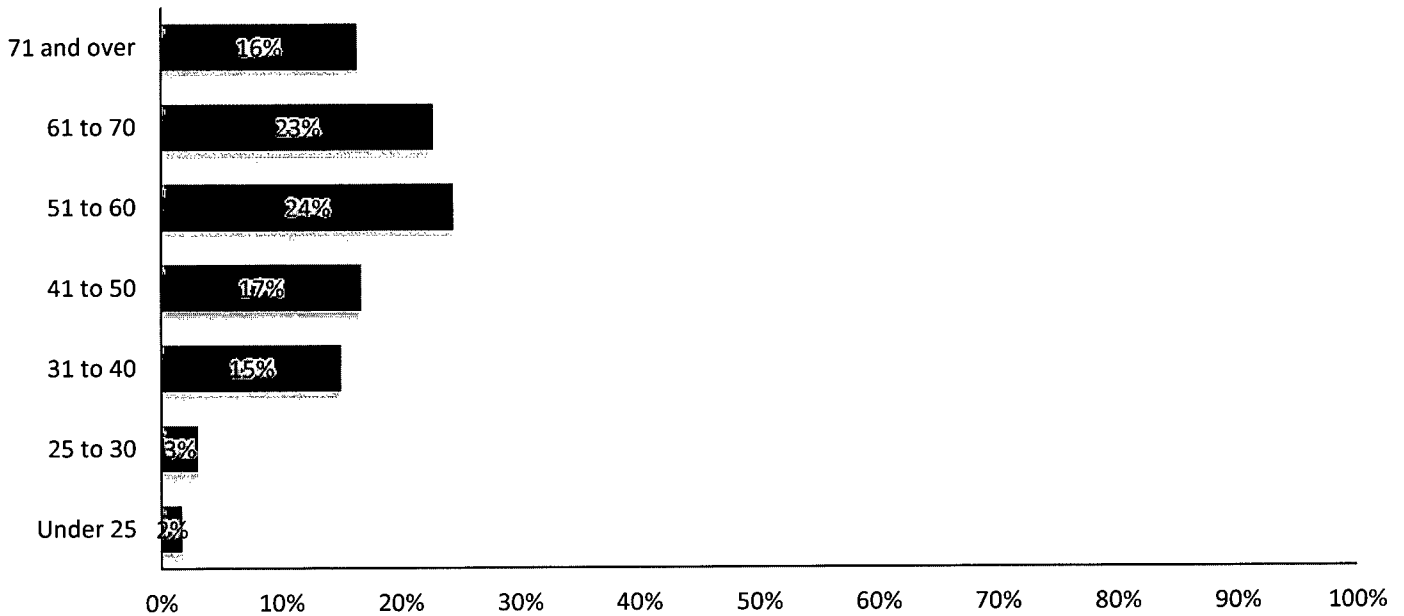
Question 6. Customer gender profile by age categories.



Base MIN= 10  
Base MAX= 140

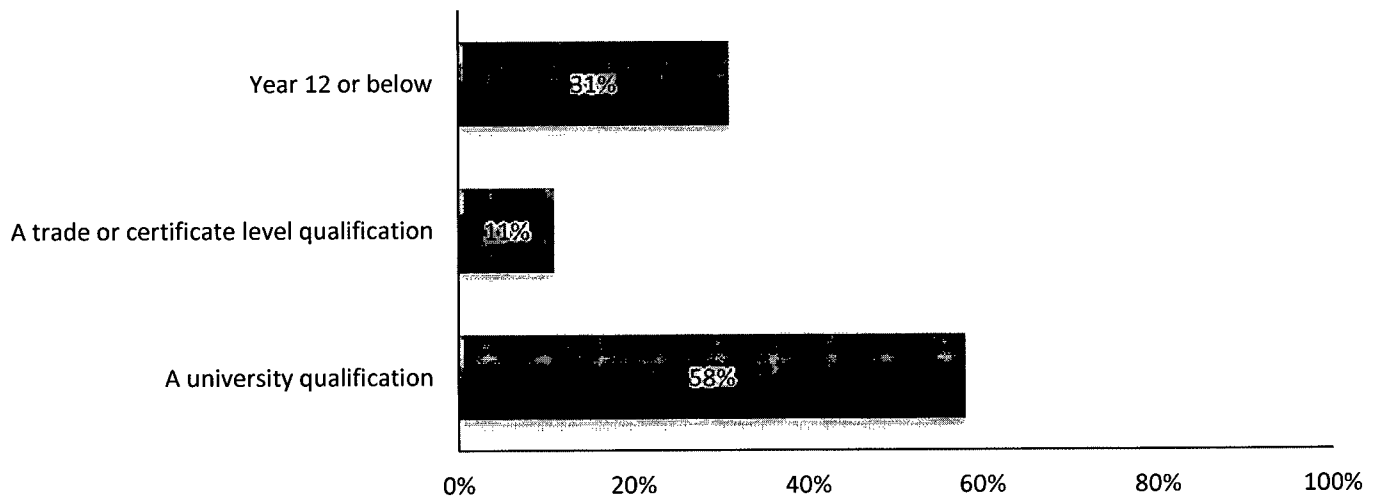
# ACT Plastic Bag Survey 2012

## Question 7. Customer age profile.



Base= 593

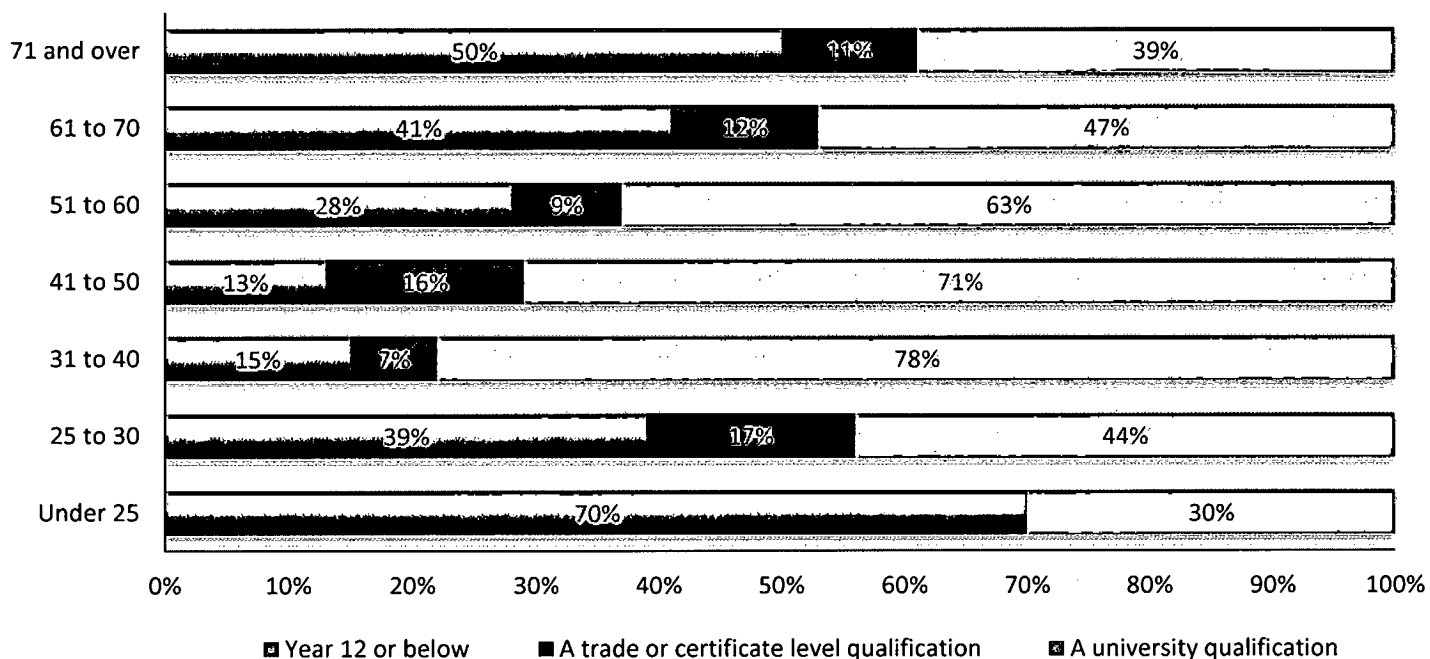
## Q8. Customer education profile.



Base= 588

# ACT Plastic Bag Survey 2012

Q8. Customer education profile by age categories.



Base MIN= 10  
Base MAX= 140

# ACT Plastic Bag Survey 2012

## Attachment 1: Questionnaire

1. Are you the **primary** groceries shopper in your household?

Yes 1  
 No 2  
**THANKS – (end survey)**

2. How often would you say that you take reusable bags when you go shopping? (Would you say...)

a. Never 1  
 b. Sometimes (or I often forget) 2  
 c. Most of the time 3  
 d. Always 4

3. Can you please tell me whether you agree or disagree with the following statements about the way the Plastic Bag Ban has influenced the way you shop:

	Agree	Disagree
a. As a result of the bag ban, I now take my own bags more frequently.	<input type="checkbox"/> 1	<input type="checkbox"/> 2
b. As a result of the bag ban, I now plan my shopping trips.	<input type="checkbox"/> 1	<input type="checkbox"/> 2
c. I was <b>already</b> mostly using my own shopping bags before the bag ban	<input type="checkbox"/> 1	<input type="checkbox"/> 2
d. Even with the bag ban, I <b>mostly</b> don't use re-useable bags and I buy shopping bags as necessary.	<input type="checkbox"/> 1	<input type="checkbox"/> 2

4. Do you support the ACT Plastic Bag Ban?

Yes 1  
 No 2  
 (Don't prompt) Unsure 2

4a ...Thank you. And what is the **main** reason for your answer? [Type as free text here – keep answer short]

5. Would you want to see any of the following changes to the current Plastic Bag Ban?

	Yes	No
a. Widen the ban to cover all plastic bags	<input type="checkbox"/> 1	<input type="checkbox"/> 2
b. Make all plastic bags biodegradable	<input type="checkbox"/> 1	<input type="checkbox"/> 2
c. Have a national levy on plastic bags and the money used to reduce litter around the country	<input type="checkbox"/> 1	<input type="checkbox"/> 2
d. Implement the ban nationally.	<input type="checkbox"/> 1	<input type="checkbox"/> 2
e. Or ... The ban should be overturned.	<input type="checkbox"/> 1	<input type="checkbox"/> 2

### Demographics

Thanks you for your answers, we're almost finished... Now we need to collect information about the types of people who have answered the survey.

6. Record gender (DON'T ASK)

Female 1  
 Male 2

7. How old are you?

8. Which is the highest level of education you have achieved?

a. Year 12 or below 1  
 b. A trade or certificate level qualification 2  
 c. A university qualification (Advanced diploma, Bachelor Degree, Grad. Diploma, Post Grad Degree) 3

Survey End.

# ACT Plastic Bag Survey 2012

This report was produced by Piazza Research Pty Ltd Ph (02)6282 4963  
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Project reference number: #ESDD270812



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Climate Change, Energy and Sustainability Policy,  
Environment and Sustainable Development  
Directorate, ACT Government

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## Review of impact on ACT litter of plastic bag ban

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September 2012

**- IMPORTANT NOTES-**

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Job title		Review Impact on ACT Litter of Plastic Bag Ban		Job number	
Document title		Review Impact on ACT Litter of Plastic Bag Ban		File reference	
Document ref					
Revision	Date	Filename	Review Impact on ACT Litter of Plastic Bag Ban		
1.0	28/9/12	Description	Draft report- Review Impact on ACT Litter of Plastic Bag Ban		
			Prepared by	Checked by	Approved by
		Name	M Rawson	C Colby	Mark Rawson
		Signature			
2.0	5/10/12	Filename	Review Impact on ACT Litter of Plastic Bag Ban		
			Final Report- Review Impact on ACT Litter of Plastic Bag Ban		
			Prepared by	Checked by	Approved by
		Name	M Rawson	C Colby	Mark Rawson
		Signature			
			Revised by	Checked by	Approved by
		Name			
		Signature			

# Executive Summary

## Background

The ACT Government introduced a ban on light weight single use plastic shopping bags in November 2011.

The purpose of this study is to assess the impact, if discernible at this early stage, of this ban on ACT litter from audit data reported in the annual Keep Australia Beautiful – National Litter Index.

This audit data includes 9 data points prior to the plastic bag ban with a single post-ban data point (May 2012 audit).

## Key Observations

The following key observations were made after undertaking analysis of the available data.

1. Table 1 below summarises the data extracted from the KAB National Litter Index report.

**Table 1: Summary of plastic bag litter occurrence data from audit events during 'Pre-ban' and 'Post-ban' periods**

Audit event	Plastic Bag litter occurrences (No./ audit)	
	Pre-Ban	Post-Ban
Nov-07	22	
May-08	36	
Nov-08	23	
May-09	15	
Nov-09	9	
May-10	29	
Nov-10	13	
May-11	27	
Nov-11	23	
May-12		11
No Data Points	9	1
Mean/Average	21.9	N/A
Standard Deviation	8.4	N/A

2. Table 1 indicated that the average (or mean) plastic bag litter occurrences prior to the ACT plastic bag ban (November 2011) was 21.9 (with a standard deviation of 8.4<sup>1</sup>) compared to the 11 plastic bag litter occurrences observed in May 2012.

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<sup>1</sup> Assuming normally distributed data

- Figure 1 below shows a graphical distribution of the pre-ban and post-ban data, as well as a linear regression of the pre-ban data.

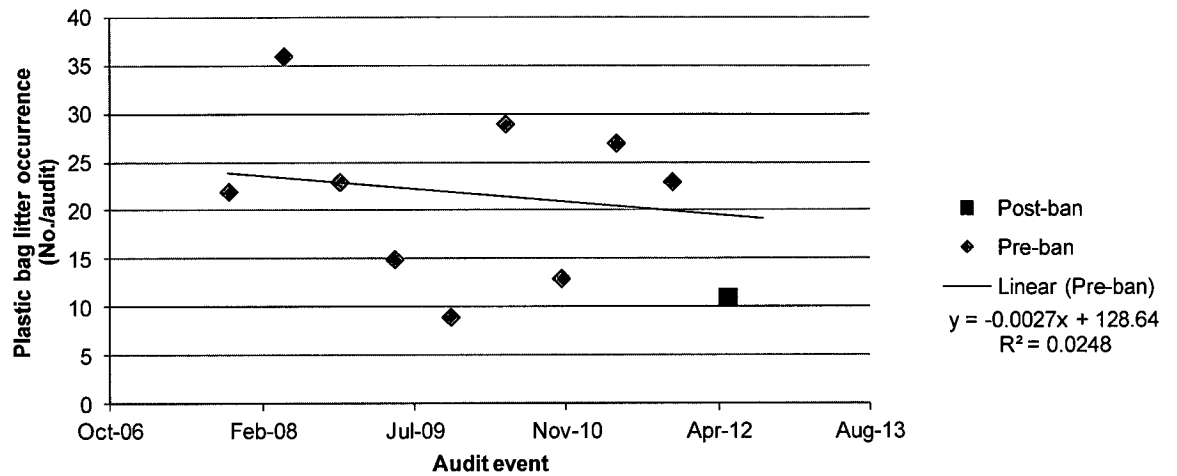


Figure 1: Plot of audit data, including linear (regression) trend line for 'pre-ban' data

- There is only one data point at 9 plastic bag occurrences from November 2009 that had a lower plastic bag occurrence than the 11 recorded in May 2012. The other 8 data points are above the May 2012 level.
- It is not possible from the single audit data point in May 2012 to statistically determine whether the plastic bag ban had an impact on the number of plastic bags in the litter stream.
- Future opportunity to confirm whether an impact has occurred from the plastic bag ban is explored in Section 3.2, including the number of additional audits that might be required to identify whether a reduction in plastic bag litter occurrences has been achieved.
  - For example, if the next two post ban audit results were 15 or less plastic bag litter occurrences (which would provide 3 sequential post ban results less than this value), it would be strongly indicative that a reduction in plastic bag litter had occurred due to introduction of the plastic bag ban.

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# 1 Introduction

Rawtec has been asked by the ACT Government Environment and Sustainable Development Directorate (ESDD), to assess composition-of-litter data for the ACT before and after the introduction of the plastic bag ban which came into effect on 1 November 2011 (*The Plastic Shopping Bags Ban Act 2010*). The objective of the assessment was to consider whether the data could be used to identify if the plastic bag ban had achieved any change, specifically a reduction, in plastic shopping bag litter.

The litter data provided by ESDD for analysis was sourced from publicly-available financial year annual reports by Keep Australia Beautiful (KAB). The plastic bag litter identified by these reports is light weight plastic bags, defined in these KAB reports as “Bags – supermarket type light weight carry bags”. This data has been collected from regular 6-monthly audits of designated sites in the ACT, including beaches, car parks, highways, industrial areas, recreational parks, residential, retail, and shopping centres. Each audit involved sampling from 76 sites with a total area of 115,955 m<sup>2</sup>. Data from these audits was available for November and May of each financial year from 2007/08 to 2011/12:

- May-12
- Nov-11
- May-11
- Nov-10
- May-10
- Nov-09
- May-09
- Nov-08
- May-08
- Nov-07

Within the 2011/12 financial year report, there were two data points following the introduction of the plastic bag ban on 1 November 2011 (November 2011 and May 2012). However, the November 2011 audit occurred at the same time the ban was introduced and is thus considered not to reflect post ban conditions as litter deposited prior to 1 November 2001 may be included in the audit figures. Consequently, there is a single data point, May 2012, which is expected to reflect a post-ban litter outcome.

It should be noted that we have not assessed the experimental design of the current audits.

## 2 Project scope

The agreed scope of this study, including relevant details of expected approach and methodology, is summarised below.

1. Obtain and analyse current year (Nov 2011 and May 2012) plastic bag litter results from the KAB annual litter index reports against up to 5 previous years of plastic bag litter results for the ACT.
2. Statistically analyse the results including standard deviation and certainty.
3. Prepare a draft high level report.
4. Discuss finding with client and receive feedback on draft report.
5. Finalise report.

# 3 Analysis

## 3.1 Review of data

Table 2 below summarises the plastic bag litter occurrence data from the:

- Pre-ban period: Audits from November 2007 to November 2011
- Post-ban period: Single audit in May 2012 (to date)

For the pre-ban period, there are nine data points. The values in this data set range from 9 up to 36 light weight plastic shopping bags observed during an audit event.

The light weight plastic shopping bag litter recorded in May 2012 was 11.

The variation in this pre-ban data appears to be normally distributed<sup>2</sup> with a sample mean and standard deviation of:

- Sample mean ( $\bar{X}$ ) = 21.9
- Sample standard deviation (s) = 8.4

Table 2: Summary of plastic bag litter occurrence data from audit events during 'Pre-ban' and 'Post-ban' periods

Audit event	Plastic Bag litter occurrences (No./ audit)	
	Pre-Ban	Post-Ban
Nov-07	22	
May-08	36	
Nov-08	23	
May-09	15	
Nov-09	9	
May-10	29	
Nov-10	13	
May-11	27	
Nov-11	23	
May-12		11
No Data Points	9	
Mean/Average	21.9	N/A
Standard Deviation	8.4	N/A

<sup>2</sup> Normality was checked graphically by normal probability plot and Anderson–Darling statistical test. Both test procedures strongly indicated that the data appeared to be normally distributed.

The 'pre-ban' audit data is also plotted in Figure 2. At face value, this plot might suggest there was already a trend towards reduction of plastic bag litter before introduction of the ban. However, linear regression of the 'pre-ban' data was not statistically significant<sup>3</sup>, so it is not possible to conclude that such a trend exists (i.e. it could just be coincidence due to natural variability in the data).

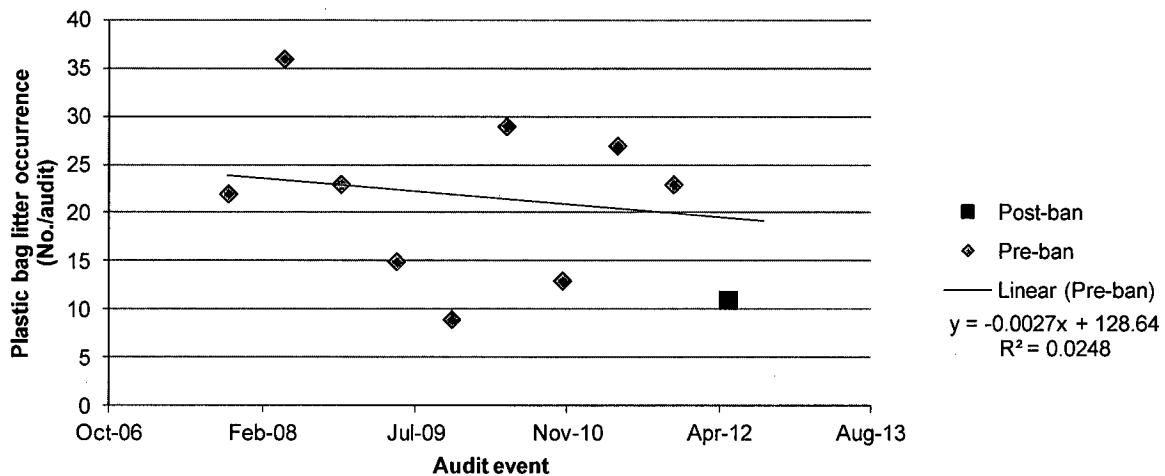


Figure 2: Plot of audit data, including linear (regression) trend line for 'pre-ban' data

### 3.2 Statistical analysis & observations

For the 'post-ban' data, there is currently only one data point: 11 plastic bag litter occurrences observed during the May 2012 audit (as shown in Table 2 and Figure 2). Unfortunately, a single data point will not allow evaluation of a sample mean and standard deviation; and thus, it is not feasible to determine from this data point whether the plastic bag ban has resulted in a reduction in plastic bag litter (e.g. statistically by Student's t-test<sup>4</sup>).

More 'post-ban' audits would be required for such assessment.

However, even if additional 'post-ban' audit data points are collected, it should be noted that the inherent variability of the 'pre-ban' data means that it could be challenging assess whether a statistically significant change will have taken place.

Figure 3 attempts to illustrate this potential problem. This figure shows the 'theoretical' variation in 'pre-ban' data (when plotted as a normal distribution). As can be observed, the variation in 'pre-ban' data would overlap the likely range of 'post-ban' values we might expect to see (e.g. say between 0 and 20 if the plastic bag ban is effective).

<sup>3</sup> Confirmed by analysis of variance on regression statistics (p-value for significance ≤ 5%)

<sup>4</sup> Note: There are other types of statistical analysis and testing approaches which could also be adopted; this is just one (and the simplest) example

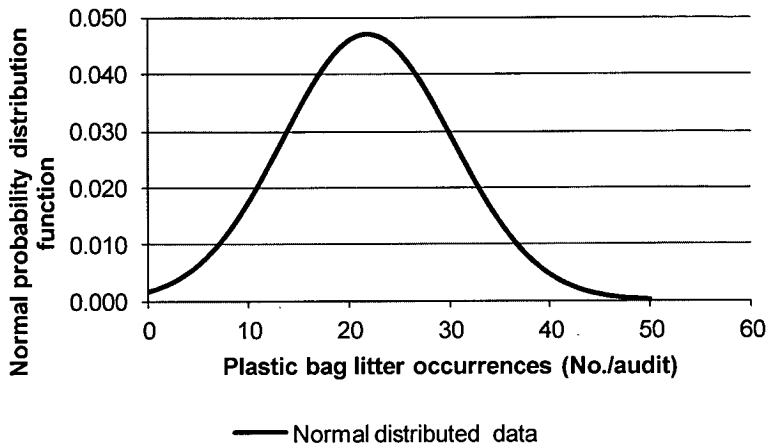


Figure 3: Plot of audit data, including linear (regression) trend line for 'pre-ban' data

This situation could therefore make it difficult to determine statistically whether there has been a change.

In view of this, the following provides high-level guidance on some possible approaches to identify the number of future audits necessary to determine the effect of the plastic bag ban on littering in the ACT.

One approach could be to conduct enough 'post-ban' audits so a statistically significant comparison can be undertaken. For example, Table 3 shows the change in probability-value (or p-value) with number of samples from statistical testing<sup>5</sup> when comparing 'pre-ban' sample data with a hypothetical 'post-ban' sample data set collected from additional audits. The analysis assumes the plastic bag ban has decreased both the sample mean and standard deviation of 'post-ban' audit data set by 30% (i.e.  $\bar{X} = 15.3$ ,  $s = 5.9$ ). A probability-value (or p-value) of 0.05 or 5% is usually deemed 'statistically' significant (i.e. indicative of a difference or change), and Table 3 suggests that at least 5 more audit samples would need to be collected to achieve this p-value, under the assumed change.

Table 3: No. of samples and p-value from statistic analysis<sup>5</sup> of 'post-ban' scenario where plastic bag ban achieves reduction of 30% in sample mean and standard deviation for 'post-ban' audit sample data (i.e.  $\bar{X} = 15.3$ ,  $s = 5.9$ )

No. samples	p-value
1	N/A
2	0.161
3	0.099
4	0.073
5	0.059
6	0.051
7	0.045

<sup>5</sup> Welch's t-test (where sample sizes and standard deviations are unequal)

An alternative (and perhaps more practical) approach might be to observe whether a sequence of 'post-ban' audit samples deliver a trend that indicate change has occurred following the plastic bag ban. For example, Table 4 estimates the probability<sup>6</sup> that additional 'post-ban' audits result in sequential (one-after-the-other) values less than a certain threshold value. For a threshold value of 21.9 (the 'pre-ban' mean value) in this table, 5 'post-ban' audit results less than this value could indicate that the plastic bag ban has reduced plastic bag litter. In this approach, a lower threshold value would need fewer sequential 'post-ban' audit results (below the threshold value) to indicate that change has occurred.

**Table 4: Probability of sequential occurrence of 'post-ban' audit values below a threshold value according to number of audits conducted**

Threshold value	Probability of sequential occurrence									
No. audits	1	2	3	4	5	6	7	8	9	10
25	0.64	0.41	0.26	0.17	0.11	0.07	0.04	0.03	0.02	0.01
21.9	0.50	0.25	0.13	0.06	0.03	0.02	0.01	0.00	0.00	0.00
15	0.22	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.12	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

We note that the *Plastic Shopping Bags Ban Act 2010* requires a review of the operation of the Act to occur after the end of its 2<sup>nd</sup> year of operation (Section 9). At this time there should be three data points available for the 'post-ban' period (May 2012, November 2012 and May 2013). The addition of this data may provide a statistically significant indication of the effectiveness of the ban in reducing plastic bag litter in the ACT.

<sup>6</sup> Based on t-distribution of 'pre-ban' sample data

## 4 Bibliography

Keep Australia Beautiful National Litter Index, McGregor Tan Research, Annual Results Tables, 2011/12, 2010/11, 2009/10, 2008/9, 2007/8