

# Title: An Empirical study to assess awareness level and perception level and perception of college students towards ban of plastics

Dr. Vanitha Esaimani

Asst. Professor  
KES Shroff College of Arts and Commerce

## ABSTRACT

Plastics are inexpensive, lightweight and durable materials, which can readily be moulded into a variety of products that find use in a wide range of applications. As a consequence, the production of plastics has increased markedly over the last 60 years. However, current levels of their usage and disposal generate several environmental problems. Recycling is one of the most important actions currently available to reduce these impacts and represents one of the most dynamic areas in the plastics industry today. This research aims at understanding the awareness level among young college going students about the ill-effects of use of plastics and their perception towards the new legislation prohibiting the usage of plastic bags. A survey was developed and administered to 614 youth. The research background in conjunction with the data collected indicated these findings firstly certain changes have been noted in the behaviour of college students after the ban on plastic, secondly students are aware of the effects of use of plastic bags on the environment and finally college students believe that the ban on plastic will have positive results.

*Keywords: Ban, Youth, Environmental problems, Plastic*

**1. Introduction:** Plastics are inexpensive, lightweight and durable materials, which can readily be moulded into a variety of products that find use in a wide range of applications. As a consequence, the production of plastics has increased markedly over the last 60 years. However, current levels of their usage and disposal generate several environmental problems. This research aims at understanding the awareness level among young college going students about the ill-effects of use of plastics and their perception towards the new legislation prohibiting the usage of plastic bags. A survey was developed and administered to 614 youth. The research background in conjunction with the data collected indicated these findings firstly certain changes have been noted in the behaviour of college students after the ban on plastic, secondly students are aware of the effects of use of plastic bags on the environment and finally college students believe that the ban on plastic will have positive results. China's plastic bag pollution has harmed the environment. Since June 2008, China has enforced a plastic-bag ban (PBB), but its impact is fading. This study discusses plastic bag use and effects in China. By visiting markets and conducting public-opinion polls in Hangzhou, Zhejiang province, the root reasons and current solutions are examined. Numerous experimental strategies cut plastic bag consumption quickly. (Yitian 2014). Ocean plastic pollution is a major human issue. Several land- and water-based pollutants cause marine plastic contamination. Plastic trash in the oceans can cause ingestion, entanglement, hunger, suffocation, and death of organisms. Plastic production has grown worldwide. Both developing and developed nations pollute. (Andrady 1977). Plastic and paper bag shoppers nowadays have many opinions. Paper and plastic bag supporters have their reasons. Today's popular topic is which is better for the environment, however some individuals avoid the debate by using reusable bags. (Muthu Subramania 2009). Plastic bag production energy costs, lifespan, landfill content, and incapacity to biodegrade are symbolic and practical proof of a "throwaway" consumer culture that hinders sustainable consumption and growth (Ritch 2009). Biodegradable plastics address plastic waste issues. Biodegradable bioplastics are polymers that microbes mineralize into carbon dioxide, methane, water, inorganic chemicals, or biomass. Hence, they may be an eco-friendly alternative to petrochemical plastics. (Adele 2020). Betel nut, chocolate, chip, handbag, cold drink bottle, and other plastic wrappers are environmental and economic issues. They waste energy and other natural resources. Plastic is used in manufacturing, building, and delivery services because of its low weight, cheap, and strength. Banning plastics will waste natural resources like paper and wood. It is formed of many chemical elements and is considered a very pestilent material that does not disintegrate in the environment. (S.S. Verma 2008)

Unrestrained use of plastic on daily basis is creating environmental hazard. Plastic hampers with hygiene harshly and also poses serious harm since most of it is not bio-degradable. Consumers today are aware of brands and companies that manufacture products that are environment-friendly. The plastic industry has been one of the largest industries in India. Plastic bags are favoured for regular use as they are handy, light weight and cost-effective. However, efforts to ban plastic were not effective in changing consumer behaviour. A combination of policies has been created to raise awareness amongst the consumers. However, the heavy price and destruction to environment that disposal of waste plastic articles cause cannot be overlooked as it exerts a huge burden on the society (Gupta 2014). It's a known fact that plastics take anywhere between 15 to 1000 years to biodegrade (Sutton 2014). They pose a great hazard to the well-being of human life and environment (Halden 2010). Apart from causing problems like blocking drainage systems, waste plastic bags become a haven for mosquitoes as rain water accumulated gets in them where they breed and multiply. However, a worrying observation that has emerged from studies on consumer preference is that most people have no concern towards environmental aspects (Hopewell 2009). Further, lack of will in enforcing laws against use of plastic by the legislation has also diluted the effect of ban on plastic (Gupta 2014). It is a contributory factor intensifying unrestricted use of

plastic bags by sellers, hawkers, retail stores as well as large shopping malls. The study also included evaluating the level of awareness about dangers that use of plastic poses to health among the people and their views on ban on plastic bags by the legislation.

**2. Significance of the Study:** The mid-17th century saw the emergence of plastic. The term has its origin in the French word *plastique*, Latin *plasticus* or Greek *plastikos*. The context marking this study also recognises the present concern and need for the ban of plastic bags. The world is witness to unprecedented use of plastic bags, which has raised serious environmental degenerations hazards, which is aggravated by unsuitable disposal of plastic bags. There is a dire need for the world to become environmentally conscious, and it is something that should be incorporated in the fabric of public awareness and education about the consequences of using plastic at such a level. It will be highly beneficial if use and disposal of plastic and plastic bags is equated with social progress. It may be appreciated as a thoughtful interdisciplinary approach, which empowers youngsters to resolve the concern through an understanding of actual systemic sources, barriers and answers

### 3. Scope of the Study

The study has the potential to be rewarding if it equips the government to introduce initiatives to ban use of plastic and make the manufacturers and sellers of plastics appreciate the present situation and views of youngsters better. These findings can push the sellers refurbish their marketing strategies and provide better alternatives to plastic. Overall, people would become aware of the harmful consequences of use of plastic and be ready to adopt better solutions. It should motivate people to give up use of plastic for the betterment of their well-being and environment.

### 4. Review of Literature

**Rumana Hossain, Riya Shanker (2019)** observation in her paper, there is an alarming increase in generation of plastic waste in big cities, which needs to be addressed immediately. The study pronounces very clearly that the policy on plastic ban was essentially ineffectual, which is evident in the survey conducted on different markets. Since the plastic ban policy failed to achieve its objective, a need to develop more incentive-compatible policies for users and sellers is felt. The researcher is of the opinion that every individual needs to take initiative to act responsibly and minimise use of plastic for our well-being.

**Haoran He (2011)** reveals that in order to minimise plastic bags waste in China, the government made it compulsory for all retailers to levy charges on plastic bags from June 2008. This policy implementation was regarded as a natural trial, and individual level data before and after the implementation was collected to evaluate the effectiveness of the regulation. It was observed that the use of new plastic bags had been reduced by 49%. It was also observed that consumers' views about the regulation and socio-economic characteristics of some of them had an impact on reducing use of plastic carry bags. However, the regulation effects differ largely among consumer groups and among regions and shopping occasions.

**Diana Starovoytova (2016)** conducted a study which is a part of a larger-research on finding prospective environment-friendly alternatives to polyethylene shopping bags.

**Vaishnavi Chandrashekhar (2018)** refers to the stringent plastic ban that was introduced in Mumbai and Maharashtra in June 2018. Although attempts to ban plastic bags in Maharashtra were made previously which did not yield desired results, this time, support by a popular young local politician ensured that the ban was far more effective this time. The ban prohibited manufacture, sale and use of throwaway plastic articles and also included new regulations on retail packaging and Styrofoam. The penalty for manufacturing and selling of plastic items was very high and also entailed a jail term of up to three months. The first week of the ban witnessed a lot of chaos and confusion as more than 300 plastic bag manufacturers reportedly had to close their factories which rendered thousands of people unemployed. People tried to cope with the ban amidst uncertainties, with virtually all the sections of the society affected in some way or the other. However, in a week, due to requests and appeals from small traders, plastic manufacturers, milk suppliers, consumer giants and e-commerce companies, the government relaxed the rules slightly. It also exempted small traders from the ban and granted more time for bigger companies to provide effective solutions for packaging, introducing alternative resources and recycling schemes. At present, only plastic bags, takeout containers, plastic cutleries and Styrofoam remain forbidden as a part of the ban.

### 5. Objectives of the Study:

1. To understand the level of awareness among college students on use of plastic bags
2. To understand the views college students had before introduction of ban on plastic
3. To understand the change in behaviour of people after plastic ban
4. To know the impact of plastic ban on the environment
5. To comprehend college students' opinion about the new rule of ban of plastic in Mumbai (on account of the researcher being based in Mumbai)

### 6. Hypothesis:

#### Hypothesis 1

H0: College students are not aware of ban on plastic.

H1: College students are aware of ban on plastic.

**Hypothesis 2**

H20: College students do not have a substantial view / approach towards the use of plastic before the ban imposed by the government.

H21: College students do have a substantial view / approach towards the use of plastic before the ban imposed by the government.

**Hypothesis 3**

H30: There is no change in the behaviour of college students after the ban on plastics.

H31: There is some change in the behaviour of the college students after the ban on plastics.

**Hypothesis 4**

H40: Students are not aware of the impact of use of plastic bags on the environment.

H41: Students are aware of the impact of use of plastic bags on the environment.

**Hypothesis 5**

H50: College students are of the opinion that ban on plastic will not be an effective approach.

H51: College students are of the opinion that ban on plastic will be an effective approach.

**7. Statistical Analysis**

a. Cronbach's Alpha using ANOVAs Single Factor method

b. Pearson Correlation Coefficient

c. F Test

d. Student's T Test

e. Mann-Whitney Test

**Research Findings**

1. 225 males and 389 female respondents were surveyed for this research. The number of female respondents dominated that of the males for this research. From the survey the researcher found that 99% of youth are aware of the ban of plastics, and only 1% youth do not know it. Also it is seen that 54% of the youth made more use of plastic prior to the ban. More than half of the respondents, irrespective of gender, age group or educational qualification, responded in the affirmative when asked if they used plastic more before the ban. In the research the main reasons on account of which plastic is commonly used are that it is cheap, easily available and priced very low. 38% of the youth stated that the main reason for using plastic is that it is very cheap, 24% said they use plastics as it is easily available and 18% said its price is very low. It was seen in the research that 360 youth out of 614 used to carry their own cloth bags for shopping before the ban on plastic while 251 youth have said they never carried non-plastic bags for shopping. Research points out that the two main alternative materials used by respondents for shopping reusable cloth bags and paper bags; 71% respondents said they use reusable cloth bags for shopping and 14% use paper bags. Thus, overall, most respondents said that they make use of reusable cloth bags. Finally, it can be inferred that 96% of the respondents across categories like age, gender and education, are aware of the consequences of use of plastic on the environment.

This research also indicates that 48% of the youth specified that the chief reason for ban on plastic is that it is harmful to wild life and marine life, and the other reason, according to 29% respondents, is that it is not easy to recycle and so should not be used. The third reason, according to 13% respondents is that it is harmful to human health. It is also revealed that 97% expressed that they are very much in favour of the rule of government to ban plastic bags. Only 1% respondents are not in favour of the rule of ban of plastics. 86% of the youth favour continuing use of plastics and only 13% feel that its use should be discontinued. Majority of the respondents support the view that there is a need to increase awareness about avoiding use of plastic and increase awareness about using alternatives of plastic. Research also demonstrates that as responsible citizens, respondents are fully aware of the ban on plastics by the government; about 59% of the respondents have expressed that they strongly agree with this statement, and 28% of the respondents have indicated that they agree to it. Research also reveals respondents' view on whether plastic should be allowed for use or banned. The respondents are acutely conscious of the use of plastic bags in daily life, since about 30% of the respondents have indicated that they disagree with the statement whereas about 33% have indicated they 'strongly Disagree' with it.

The research deduces that after the ban on plastic, people have begun considering use of alternative materials; nearly 40% of the respondents who participated in the survey have indicated they agree with this statement while the same number of respondents have mentioned that they strongly agree with the statement. It was also illustrated that the use of plastic bags is damaging the environment and natural resources severely. About 23% of the respondents agree with this statement and up to 61% strongly agree. Respondents indicated that the decision of the government to ban use of plastic bags is set to be a positive step in preserving the environment and quality of life; about 25% of the respondents agree to this statement while up to 60% have indicated they strongly agree with this statement. They also specified the need for raising awareness about avoiding use of plastic. About 30% of the respondents said that they agree with the above statement while approximately half indicated that they strongly agree with the statement. Researchers also illustrated that an increase in the price of plastic materials is likely to limit the use of plastic. About 29% of the respondents agree with this statement whereas about 27% of the respondents indicated them 'Strongly Agree' to the statement.

TABLE NO 1

Statement Code	Statement	Strongly Agree (as % of Respondents)
S1	As a citizen, I am fully aware about the ban on plastics by the government.	59%
S2	Whether allowed or banned, I am always thinking about usage of plastic bags in day to day life.	4%
S3	After the ban, now I am thinking about using alternative materials instead of plastic bags.	40%
S4	The use of plastic bags is affecting our environment and natural resources in a significant manner.	61%
S5	In my opinion, the new rule by government to ban the use of plastic bags may be considered as good step in improving our lives.	60%
S6	There is a need to increase awareness about not using plastic in the community.	50%
S7	There is a need to increase awareness about using alternative materials to plastic in the community.	51%
S8	Increasing price of plastic materials may help in reduction of its usage.	27%

Summary of responses for various statements (for the response viz. strongly agree and in the descending order of the response) is as presented below.

#### Correlation between these Statements

The correlation matrix or the Pearson's Coefficients are as shown below.

TABLE NO 2  
Correlation Matrix

	S1	S2	S3	S4	S5	S6	S7	S8
S1	1.0000							
S2	-0.0041	1.0000						
S3	0.6322	0.0173	1.0000					
S4	0.6232	-0.0092	0.5736	1.0000				
S5	0.6981	-0.0582	0.6324	0.7059	1.0000			
S6	0.5365	0.0129	0.5250	0.5809	0.5942	1.0000		
S7	0.5220	0.0458	0.5498	0.5277	0.5755	0.5878	1.0000	
S8	0.3189	0.0496	0.3647	0.3711	0.4173	0.4208	0.3484	1.0000

Following pairs of the statements have showed good correlation (more than 0.60):

- S1 and S3 (0.6322)
- S1 and S4 (0.6232)
- S1 and S5 (0.6981)
- S3 and S5 (0.6324)
- S4 and S5 (0.7059)

This correlation is self explanatory.

#### Hypotheses Testing

Summary of Hypothesis Testing is as follows:

TABLE NO 3

Sr. No.	Hypothesis Code	Hypothesis Type	Hypothesis Description	Inference
1	H11	Alternative Hypothesis	College students are aware about ban on plastics.	Accepted
2	H21	Alternative Hypothesis	College students do have a considerable view / approach towards the use of plastics before the ban by government.	Accepted
3	H31	Alternative Hypothesis	There is some change in the behavior of the college students after the ban of plastics.	Accepted
4	H41	Alternative Hypothesis	Students are aware of the impact of use of plastic bags on the environment.	Accepted
5	H51	Alternative Hypothesis	College students are of the opinion that ban of plastics will be an effective approach.	Accepted

For testing hypothesis we have used combination of statistical tests (such as F test, T test and Mann-Whitney test) and Correlation analysis.

The details about the hypothesis testing are presented herewith.

### Hypothesis 1 Testing

Null Hypothesis:

H10: College students are not aware about ban on plastics.

Alternative Hypothesis:

H11: College students are aware about ban on plastics.

For testing this, we have considered responses for the following two datasets:

Gender (Q2) and Awareness (Q5) and

Gender (Q2) and Q. 15 S1

Statistical tests applied and their results are given subsequently.

Gender (Q2) and Awareness (Q5)

Data obtained for (Q2) and (Q5)

**TABLE NO 4**

Description / Statistics	Q2	Q5
n (Count)	614	614
Mean (Average)	1.63	1.01
Median	2.00	1.00
Standard Deviation (Variance)	0.48	0.08
Standard Error	0.02	0.00

**TABLE NO 5**

F-Test – Variance	
Condition is True Accept alternative hypothesis	Q2 variance > Q5 variance
p-value:	0.000%
Reject equality of variances - Use Heteroscedastic T-Test	
T-Student Test (Homoscedastic)	
Condition is True Accept alternative hypothesis	Q2 average > Q5 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True Accept alternative hypothesis	Q2 average > Q5 average
p-value:	0.000%
Reject equality of means	
Mann-Whitney Test	
Condition is True Accept alternative hypothesis	Q2 median > Q5 median
p-value:	0.027%
Reject equality of medians	

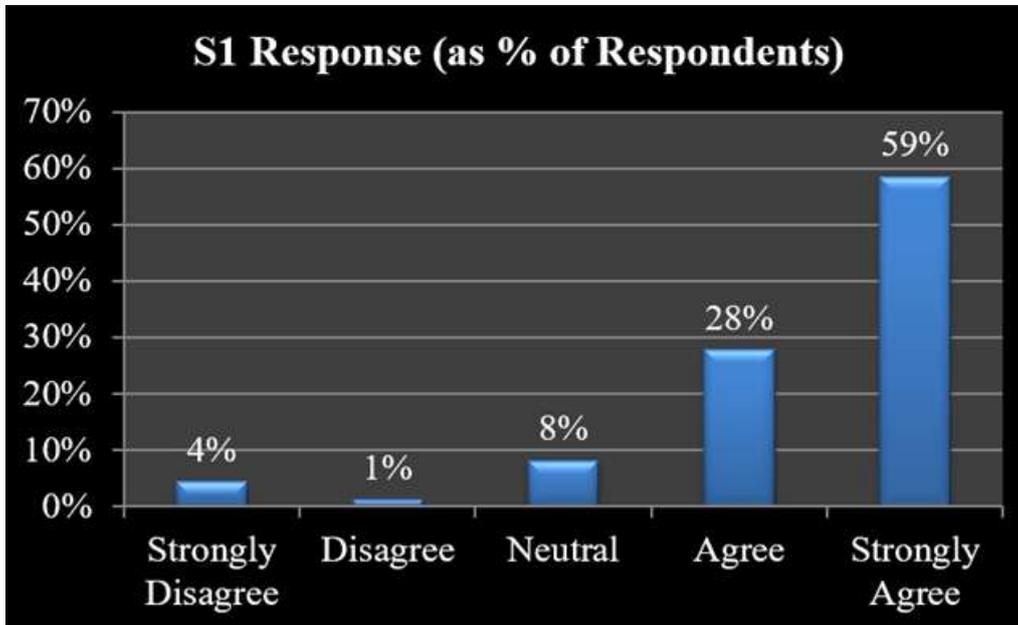
Inference: The alternative hypothesis H11 stands accepted.

Gender (Q2) and Q15 S1

Data obtained for (Q2) and (Q15 S1)

Responses for the individual statements are presented subsequently.

S1				
As a citizen, I am fully aware about the ban on plastics by the government.				
N = 591				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4%	1%	8%	28%	59%



**Chart. No. 1 As citizens, respondent’s awareness about ban**

About 28% of the respondents participated in the survey have indicated their opinion as ‘Agree’ to this statement, whereas about 59% of the respondents have indicated the opinion ‘Strongly Agree’ to this statement.

**TABLE NO 6**

Description / Statistics	Q2	Q15 S1
n (Count)	614	614
Mean (Average)	1.63	4.19
Median	2.00	5.00
Standard Deviation (Variance)	0.48	1.28
Standard Error	0.02	0.05

**TABLE NO 7**

F-Test – Variance	
Condition is True Accept alternative hypothesis	Q2 variance < Q15 S1 variance
p-value:	0.000%
Reject equality of variances - Use Heteroscedastic T-Test	
T-Student Test (Homoscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S1 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S1 average

p-value:	0.000%	
Reject equality of means		
Mann-Whitney Test		
Condition is True		
Accept alternative hypothesis	Q2 median < Q15 S1 median	
p-value:	0.031%	
Reject equality of medians		

Inference: The alternative hypothesis H11 stands accepted.  
 Hence the alternative hypothesis is accepted, which is stated as below:  
 H11: College students are aware about ban on plastics.  
 Other criteria  
 Correlation Matrix for Q2, Q5 and Q15 S1 is as shown below;

**TABLE NO 8**

	Q2	Q5	Q15 S1
Q2	1.0000		
Q5	0.0196	1.0000	
Q15 S1	-0.0006	-0.1543	1.0000

The correlation matrix shows that there is no correlation between them and hence all these parameters are independent in nature.  
 Hence the alternative hypothesis is accepted, which is stated as below:  
 H11: College students are aware about ban on plastics.

**Hypothesis 2 Testing**

Null Hypothesis

H20: College students do not have a considerable view / approach towards the use of plastics before the ban by government.

Alternative Hypothesis

H21: College students do have a considerable view / approach towards the use of plastics before the ban by government.

For testing this, we have considered responses for the following two datasets:

Gender (Q2) and is your usage of plastic was more before the ban by the government? (Q6) and

Gender (Q2) and Q. 15 S2

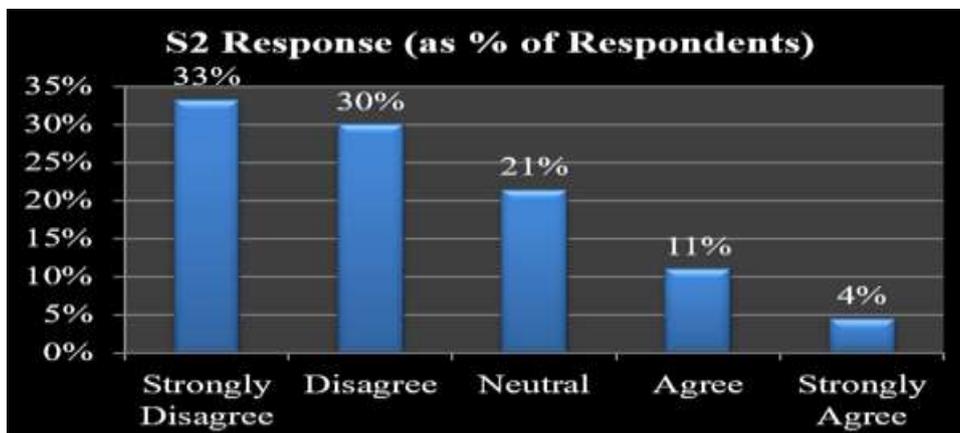
Statistical tests applied and their results are given subsequently.

Gender (Q2) and Is your usage of plastic was more before the ban by the government? (Q6)

Data obtained for (Q2) and (Q6)

**Table No. 17 Whether allowed or banned, usage of plastics in day to day life.**

S2 Whether allowed or banned, I am always thinking about usage of plastic bags in day to day life.				
N = 584				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
33%	30%	21%	11%	4%



**Chart. No. 2 Whether allowed or banned, usage of plastics in day to day life.**

About 30% of the respondents participated in the survey have indicated their opinion as 'Disagree' to this statement, whereas about 33% of the respondents have indicated the opinion 'Strongly Disagree' to this statement.

**TABLE NO 9**

Description / Statistics	Q2	Q6
n (Count)	614	614
Mean (Average)	1.63	1.46
Median	2.00	1.00
Standard Deviation (Variance)	0.48	0.50
Standard Error	0.02	0.02

**TABLE NO 10**

F-Test – Variance		
Condition is False Do not accept alternative hypothesis	Q2 variance > Q6 variance	
p-value:	20.047%	
Reject equality of variances - Use Heteroscedastic T-Test		
T-Student Test (Homoscedastic)		
Condition is True Accept alternative hypothesis	Q2 average > Q6 average	
p-value:	0.000%	
Reject equality of means		
T-Student Test (Heteroscedastic)		
Condition is True Accept alternative hypothesis	Q2 average > Q6 average	
p-value:	0.000%	
Reject equality of means		
Mann-Whitney Test		
Condition is True Accept alternative hypothesis	Q2 median > Q6 median	
p-value:	40.229%	
Reject equality of medians		

Inference: The alternative hypothesis H21 stands accepted.

Gender (Q2) and Q15 S2

Data obtained for (Q2) and (Q15 S2)

**TABLE NO 11**

Description / Statistics	Q2	Q15 S2
n (Count)	614	614
Mean (Average)	1.63	2.13
Median	2.00	2.00
Standard Deviation (Variance)	0.48	1.22
Standard Error	0.02	0.05

**TABLE NO 12**

F-Test – Variance	
Condition is True Accept alternative hypothesis	Q2 variance < Q15 S2 variance
p-value:	0.000%
Reject equality of variances - Use Heteroscedastic T-Test	

T-Student Test (Homoscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S2 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S2 average
p-value:	0.000%
Reject equality of means	
Mann-Whitney Test	
Condition is True Accept alternative hypothesis	Q2 median < Q15 S2 median
p-value:	21.665%
Cannot reject equality of medians	

Inference: The alternative hypothesis H21 stands accepted.

Hence the alternative hypothesis is accepted, which is stated as below:

H21: College students do have a considerable view / approach towards the use of plastics before the ban by government.

Other criteria

Correlation Matrix for Q2, Q6 and Q15 S2 is as shown below;

**TABLE NO 13**

	Q2	Q6	Q15 S2
Q2	1.0000		
Q6	0.0116	1.0000	
Q15 S2	-0.0574	-0.1001	1.0000

The correlation matrix shows that there is no correlation between them and hence all these parameters are independent in nature.

Hence the alternative hypothesis is accepted, which is stated as below:

H21: College students do have a considerable view / approach towards the use of plastics before the ban by government.

### Hypothesis 3 Testing

Null Hypothesis

H30: There is no change in the behavior of the college students after the ban of plastics.

Alternative Hypothesis

H31: There is some change in the behavior of the college students after the ban of plastics.

For testing this, we have considered responses for the following two datasets:

Gender (Q2) and Do you use to carry cloth bags from home for shopping before the ban on plastic? (Q8) and

Gender (Q2) and Q. 15 S3

**Table No. 18 Thought of using alternative materials**

S3 After the ban, now I am thinking about using alternative materials instead of plastic bags.				
N = 584				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4%	2%	14%	40%	40%

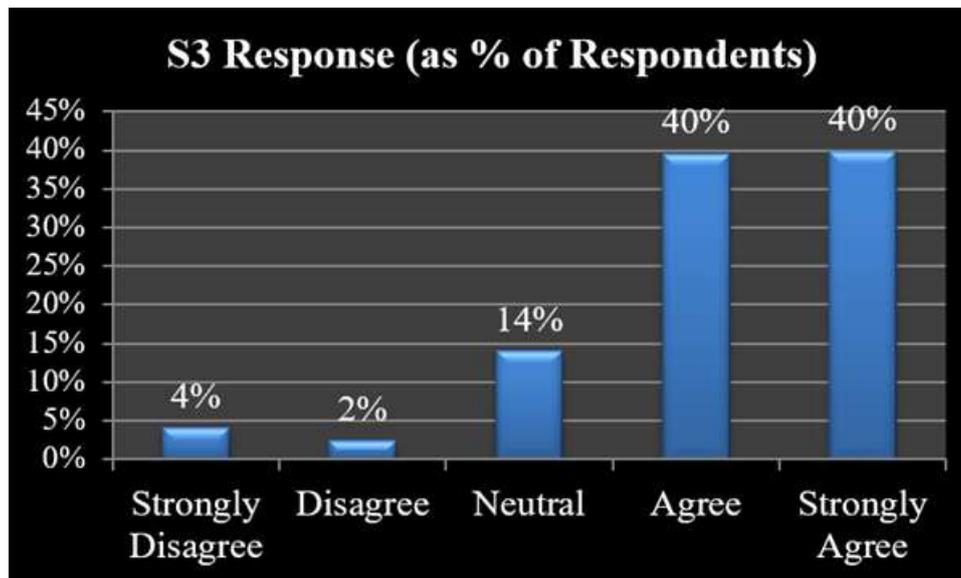


Chart. No. 3 Thought of using alternative materials

About 40% of the respondents participated in the survey have indicated their opinion as 'Agree' to this statement, whereas an equal number of the respondents (about 40%) have indicated the opinion 'Strongly Agree' to this statement.

Statistical tests applied and their results are given subsequently.

Gender (Q2) and Do you use to carry cloth bags from home for shopping before the ban on plastic? (Q8)

Data obtained for (Q2) and (Q8)

TABLE NO 13

Description / Statistics	Q2	Q8
n (Count)	614	614
Mean (Average)	1.63	1.40
Median	2.00	1.00
Standard Deviation (Variance)	0.48	0.50
Standard Error	0.02	0.02

TABLE NO 14

F-Test – Variance	
Condition is False	
Do not accept alternative hypothesis	Q2 variance > Q8 variance
p-value:	17.299%
Cannot reject equality of variances - Use Heteroscedastic T-Test	
T-Student Test (Homoscedastic)	
Condition is True	
Accept alternative hypothesis	Q2 average > Q8 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True	
Accept alternative hypothesis	Q2 average > Q8 average
p-value:	0.000%
Reject equality of means	
Mann-Whitney Test	
Condition is True	
Accept alternative hypothesis	Q2 median > Q8 median

p-value:	6.882%
Cannot reject equality of medians	

Inference: The alternative hypothesis H31 stands accepted.

Gender (Q2) and Q15 S3

Data obtained for (Q2) and (Q15 S3)

**TABLE NO 15**

Description / Statistics	Q2	Q15 S3
n (Count)	614	614
Mean (Average)	1.63	3.88
Median	2.00	4.00
Standard Deviation (Variance)	0.48	1.32
Standard Error	0.02	0.05

**TABLE NO 16**

F-Test – Variance	
Condition is True Accept alternative hypothesis	Q2 variance < Q15 S3 variance
p-value:	0.000%
Reject equality of variances - Use Heteroscedastic T-Test	
T-Student Test (Homoscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S3 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S3 average
p-value:	0.000%
Reject equality of means	
Mann-Whitney Test	
Condition is True Accept alternative hypothesis	Q2 median < Q15 S3 median
p-value:	0.027%
Cannot reject equality of medians	

Inference: The alternative hypothesis H31 stands accepted.

Hence the alternative hypothesis is accepted, which is stated as below:

H31: There is some change in the behavior of the college students after the ban of plastics.

Other criteria

Correlation Matrix for Q2, Q8 and Q15 S3 is as shown below;

**TABLE NO 17**

	Q2	Q8	Q15 S3
Q2	1.0000		
Q8	0.0667	1.0000	
Q15 S3	0.0307	0.0189	1.0000

The correlation matrix shows that there is no correlation between them and hence all these parameters are independent in nature.

Hence the alternative hypothesis is accepted, which is stated as below:

H31: There is some change in the behavior of the college students after the ban of plastics.

**Hypothesis 4 Testing**

Null Hypothesis

H40: Students are not aware of the impact of use of plastic bags on the environment.

Alternative Hypothesis

H41: Students are aware of the impact of use of plastic bags on the environment.

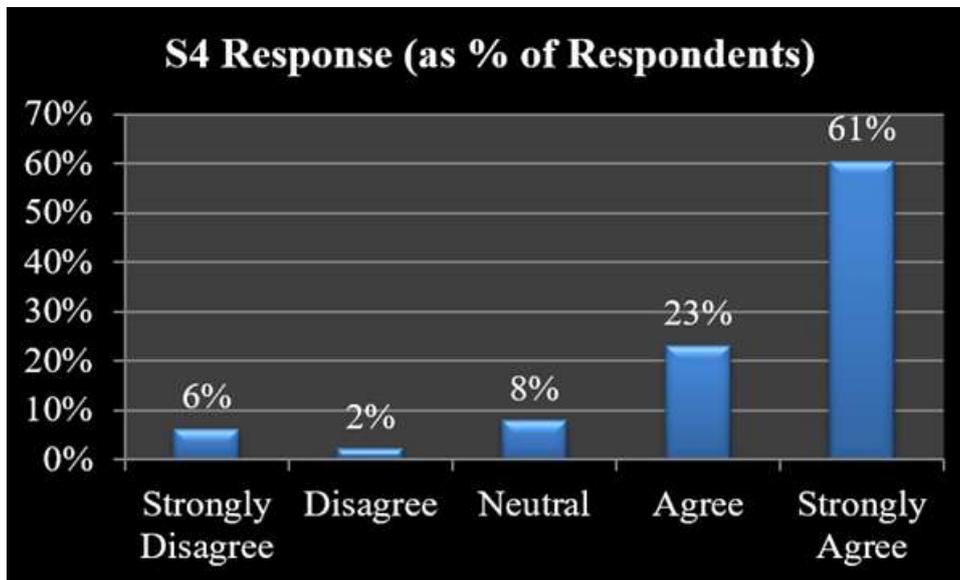
For testing this, we have considered responses for the following two datasets:

Gender (Q2) and Are you aware of the effects or consequences of usage of plastic on the environment? (Q10) and

Gender (Q2) and Q. 15 S4

**Table No. 18 Use of plastic bags is affecting environment and natural resources**

S4 The use of plastic bags is affecting our environment and natural resources in a significant manner.				
N = 580				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6%	2%	8%	23%	61%



**Chart. No. 4 Use of plastic bags is affecting environment and natural resources**

About 23% of the respondents participated in the survey have indicated their opinion as ‘Agree’ to this statement, whereas a large section of the respondents (about 61%) have indicated the opinion ‘Strongly Agree’ to this statement.

Statistical tests applied and their results are given subsequently.

Gender (Q2) and Are you aware of the effects or consequences of usage of plastic on the environment? (Q10)

Data obtained for (Q2) and (Q10)

**TABLE NO 19**

Description / Statistics	Q2	Q10
n (Count)	614	614
Mean (Average)	1.63	1.03
Median	2.00	1.00
Standard Deviation (Variance)	0.48	0.22
Standard Error	0.02	0.01

**TABLE NO 20**

F-Test – Variance	
Condition is True	
Accept alternative hypothesis	Q2 variance > Q10 variance
p-value:	0.000%
Reject equality of variances - Use Heteroscedastic T-Test	

T-Student Test (Homoscedastic)	
Condition is True Accept alternative hypothesis	Q2 average > Q10 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True Accept alternative hypothesis	Q2 average > Q10 average
p-value:	0.000%
Reject equality of means	
Mann-Whitney Test	
Condition is True Accept alternative hypothesis	Q2 median > Q10 median
p-value:	0.065%
Reject equality of medians	

Inference: The alternative hypothesis H41 stands accepted.

Gender (Q2) and Q15 S4

Data obtained for (Q2) and (Q15 S4)

**TABLE NO 21**

Description / Statistics	Q2	Q15 S4
n (Count)	614	614
Mean (Average)	1.63	4.06
Median	2.00	5.00
Standard Deviation (Variance)	0.48	1.46
Standard Error	0.02	0.06

**TABLE NO 22**

F-Test – Variance	
Condition is True Accept alternative hypothesis	Q2 variance < Q15 S4 variance
p-value:	0.000%
Reject equality of variances - Use Heteroscedastic T-Test	
T-Student Test (Homoscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S4 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S4 average
p-value:	0.000%
Reject equality of means	
Mann-Whitney Test	
Condition is True Accept alternative hypothesis	Q2 median < Q15 S4 median
p-value:	0.236%

Cannot reject equality of medians	
-----------------------------------	--

Inference: The alternative hypothesis H41 stands accepted.

Hence the alternative hypothesis is accepted, which is stated as below:

H41: Students are aware of the impact of use of plastic bags on the environment.

Other criteria

Correlation Matrix for Q2, Q10 and Q15 S4 is as shown below;

**TABLE NO 23**

	Q2	Q10	Q15 S4
Q2	1.0000		
Q10	0.0193	1.0000	
Q15 S4	0.0481	-0.0860	1.0000

The correlation matrix shows that there is no correlation between them and hence all these parameters are independent in nature.

Hence the alternative hypothesis is accepted, which is stated as below:

H41: Students are aware of the impact of use of plastic bags on the environment.

**Hypothesis 5 Testing**

Null Hypothesis

H50: College students are of the opinion that ban of plastics will not be an effective approach.

Alternative Hypothesis

H51: College students are of the opinion that ban of plastics will be an effective approach.

For testing this, we have considered responses for the following three datasets:

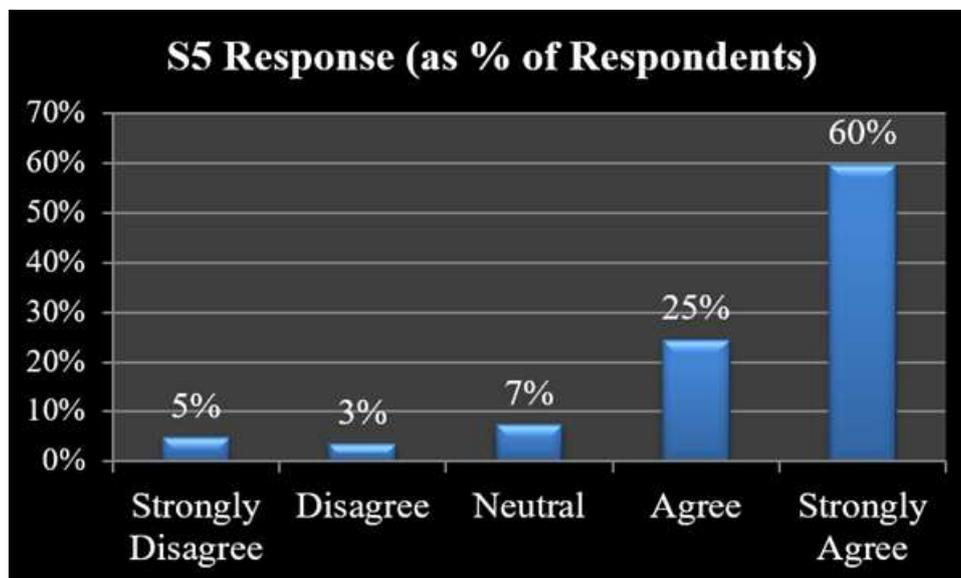
Gender (Q2) and Your opinion on the rule of government to ban plastic bags: (Q12)

Gender (Q2) and In your opinion, the use of plastic bags: (Q13) and

Gender (Q2) and Q. 15 S5

**Table No. 24 Opinion about ban as a good step**

S5 In my opinion, the new rule by government to ban the use of plastic bags may be considered as good step in improving our lives.				
N = 579				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5%	3%	7%	25%	60%



**Chart. No. 5 Opinion about ban as a good step**

About 25% of the respondents participated in the survey have indicated their opinion as 'Agree' to this statement, whereas a large section of the respondents (about 60%) have indicated the opinion 'Strongly Agree' to this statement.

Statistical tests applied and their results are given subsequently.

Gender (Q2) and Your opinion on the rule of government to ban plastic bags: (Q12)

Data obtained for (Q2) and (Q12)

**TABLE NO 25**

Description / Statistics	Q2	Q12
n (Count)	614	614
Mean (Average)	1.63	1.00
Median	2.00	1.00
Standard Deviation (Variance)	0.48	0.17
Standard Error	0.02	0.01

**TABLE NO 26**

F-Test – Variance		
Condition is True Accept alternative hypothesis	Q2 variance > Q12 variance	
p-value:	0.000%	
Reject equality of variances - Use Heteroscedastic T-Test		
T-Student Test (Homoscedastic)		
Condition is True Accept alternative hypothesis	Q2 average > Q12 average	
p-value:	0.000%	
Reject equality of means		
T-Student Test (Heteroscedastic)		
Condition is True Accept alternative hypothesis	Q2 average > Q12 average	
p-value:	0.000%	
Reject equality of means		
Mann-Whitney Test		
Condition is True Accept alternative hypothesis	Q2 median > Q12 median	
p-value:	0.065%	
Reject equality of medians		

Inference: The alternative hypothesis H51 stands accepted.

Gender (Q2) and In your opinion, the use of plastic bags: (Q13)

Data obtained for (Q2) and (Q13)

**TABLE NO 27**

Description / Statistics	Q2	Q13
n (Count)	614	614
Mean (Average)	1.63	1.46
Median	2.00	1.00
Standard Deviation (Variance)	0.48	0.50
Standard Error	0.02	0.02

**TABLE NO 28**

F-Test – Variance		
Condition is False Do not accept alternative hypothesis	Q2 variance > Q13 variance	
p-value:	20.047%	
Cannot reject equality of variances - Use Heteroscedastic T-Test		

T-Student Test (Homoscedastic)	
Condition is True Accept alternative hypothesis	Q2 average > Q13 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True Accept alternative hypothesis	Q2 average > Q13 average
p-value:	0.000%
Reject equality of means	
Mann-Whitney Test	
Condition is True Accept alternative hypothesis	Q2 median > Q13 median
p-value:	40.229%
Cannot reject equality of medians	

Inference: The alternative hypothesis H51 stands accepted.

Gender (Q2) and Q15 S5

Data obtained for (Q2) and (Q15 S5)

**TABLE NO 29**

Description / Statistics	Q2	Q15 S5
n (Count)	614	614
Mean (Average)	1.63	4.06
Median	2.00	5.00
Standard Deviation (Variance)	0.48	1.44
Standard Error	0.02	0.06

**TABLE NO 30**

F-Test – Variance	
Condition is True Accept alternative hypothesis	Q2 variance < Q15 S5 variance
p-value:	0.000%
Reject equality of variances - Use Heteroscedastic T-Test	
T-Student Test (Homoscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S5 average
p-value:	0.000%
Reject equality of means	
T-Student Test (Heteroscedastic)	
Condition is True Accept alternative hypothesis	Q2 average < Q15 S5 average
p-value:	0.000%
Reject equality of means	
Mann-Whitney Test	
Condition is True Accept alternative hypothesis	Q2 median < Q15 S5 median

p-value:	0.106%
Reject equality of medians	

Inference: The alternative hypothesis H51 stands accepted.

Hence the alternative hypothesis is accepted, which is stated as below:

H51: College students are of the opinion that ban of plastics will be an effective approach.

Other criteria

Correlation Matrix for Q2, Q12, Q13, and Q15 S5 is as shown below;

**TABLE NO 31**

	Q2	Q12	Q13	Q15 S5
Q2	1.0000			
Q12	0.0129	1.0000		
Q13	0.0116	-0.0091	1.0000	
Q15 S5	0.0780	-0.0615	-0.0362	1.0000

The correlation matrix shows that there is no correlation between them and hence all these parameters are independent in nature.

Hence the alternative hypothesis is accepted, which is stated as below:

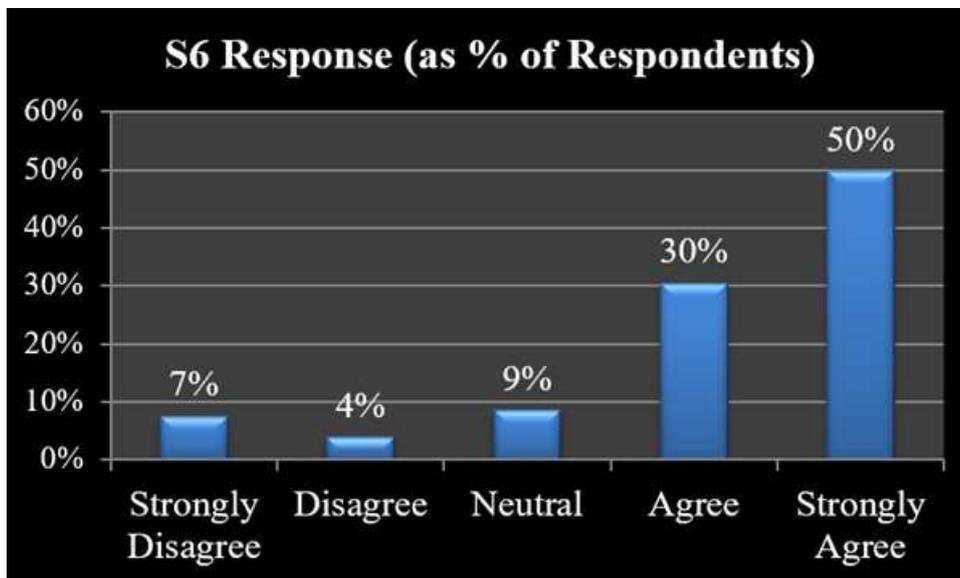
H51: College students are of the opinion that ban of plastics will be an effective approach.

Overall, all the five alternate hypothesis have been proved since the P value is less than 0.5.

- College students have had a significant and clear approach towards use of plastics before the ban by the government.
- Certain changes have been noted in the behaviour of college students after the ban on plastic.
- Students are aware of the effects of use of plastic bags on the environment.
- College students believe that the ban on plastic will have positive results.

**Table No. 32 Need to increase awareness in community**

S6 There is a need to increase awareness about not using plastic in the community.				
N = 575				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7%	4%	9%	30%	50%

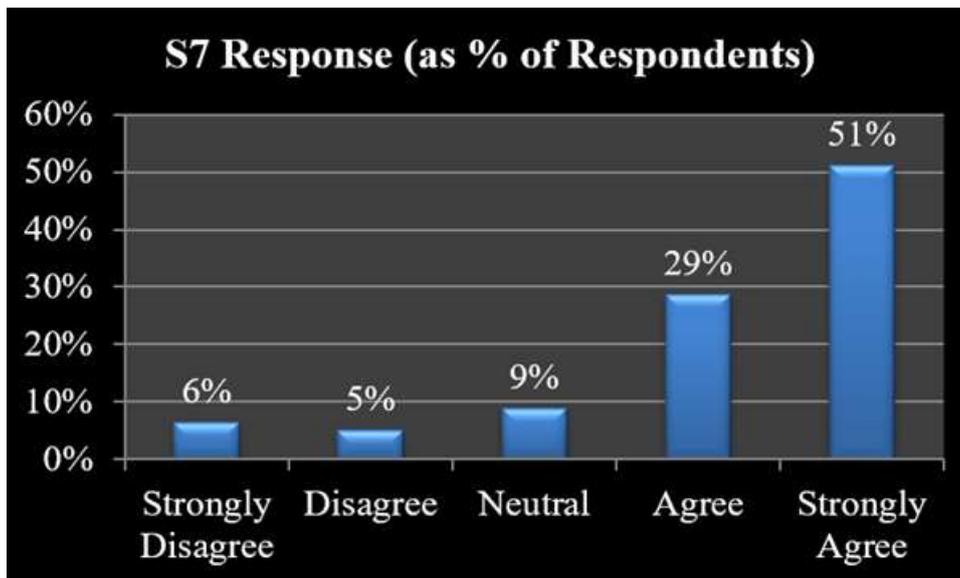


**Chart. No. 6 Need to increase awareness in community**

About 30% of the respondents participated in the survey have indicated their opinion as 'Agree' to this statement, whereas about half of the respondents (50%) have indicated the opinion 'Strongly Agree' to this statement.

**Table No. 33 Need to increase awareness about alternative materials in community**

S7 There is a need to increase awareness about using alternative materials to plastic in the community.				
N = 576				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6%	5%	9%	29%	51%

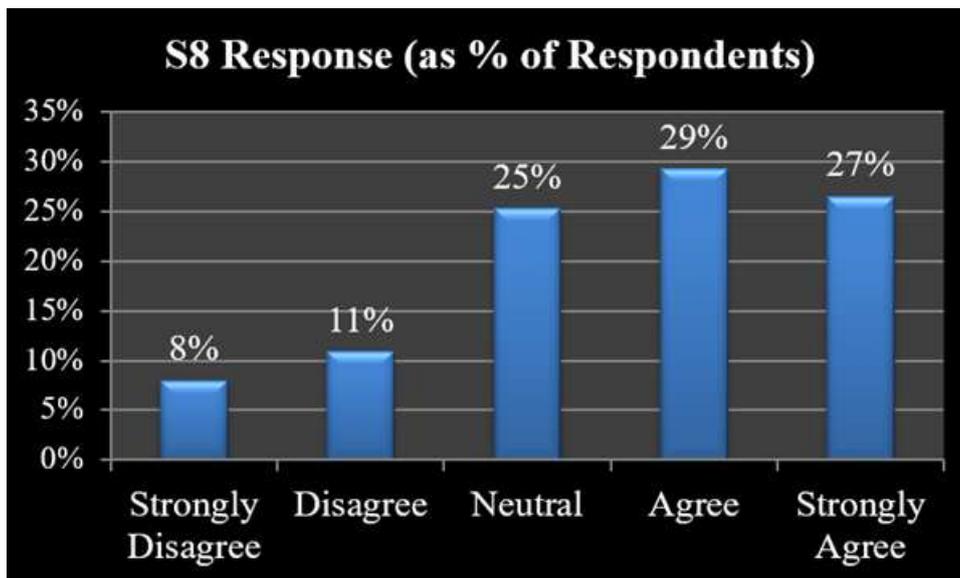


**Chart. No 7 Need to increase awareness about alternative materials in community**

About 29% of the respondents participated in the survey have indicated their opinion as ‘Agree’ to this statement, whereas about half of the respondents (51%) have indicated the opinion ‘Strongly Agree’ to this statement.

**Table No. 34 High price may help in less use**

S8				
Increasing price of plastic materials may help in reduction of its usage.				
N = 577				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8%	11%	25%	29%	27%



**Chart. No. 8 High price may help in less use**

About 29% of the respondents participated in the survey have indicated their opinion as ‘Agree’ to this statement, whereas about 27% of the respondents have indicated the opinion ‘Strongly Agree’ to this statement.

**8. Limitations:** The selection of the area or geographic location and the size of the sample acts as a limitation in the study vis-à-vis generalisation of the results of other regions. While the views of youths as influencing factors on the use of plastic bags were not in sync with studies undertaken in some other cities, the fact that the sheer diversity in characteristics of Indian markets makes it impractical to generalise the findings of the observations recorded in other parts of the country. The study engaged a probability (stratified random sampling and cluster sampling) method to select the respondents since obtaining sample frame of non-college going group was found to be difficult. This aspect indicates that it is important to exercise caution while generalising the results of this study for the entire population. Fieldworkers came across obstacles like rejection from respondents as some of the potential respondents were not willing to participate in the survey. A solution to this problem apparently lies in future research endeavours providing incentives to respondents for giving their time for participating in the survey.

**9. Conclusion:** Plastic waste is a cause of serious concern everywhere, all the more so in metropolitan cities like Mumbai. Since the problem of plastic use and waste was escalating unchecked, Maharashtra government introduced a complete ban on plastic bags on 23 March, 2018 across the markets. The ban met with satisfactory response in most parts of Maharashtra. As for the results of the research, it is evident that a majority of respondents across groups are acutely aware of the harmful effects of plastic on the environment. Many of the respondents expressed their support for ban on plastic bags apparently after participating in the survey. People in Mumbai desire a plastic-free city, which is why they carry their own bags made from alternative materials for shopping. Here, it's worth contemplating who is responsible for use of plastic carry bags in Mumbai- consumers or marketers. The research notes that some respondents are willing to pay extra for plastic bags at the time of shopping, while others prefer to carry their own bags. On account of this, sellers levy extra charges on plastic bags. When super markets and shopping malls in Mumbai started levying compulsory charges on plastic bags, many customers started carrying their own bags to avoid being charged extra. Presently, the population of Mumbai is estimated to be 22 million. Passing laws and taking fine from offenders to restrain the use and disposal of plastic bags is not the only solution. Therefore, the Government has begun collaborating with NGOs, educational institutes and youth to create awareness and encourage people to switch over to eco-friendly material like cloth bag, paper bag, etc. A clothing resale shop that went bagless has received excellent feedback from clients, and the business has not experienced a drop in either its profits or its customer base as a result of the change. When businesses decide to embrace environmentally conscious business practises, one of the most critical steps they can do is to educate their employees and consumers about the dangers of plastic pollution. Another crucial stage in obtaining customer support for plastic bag reduction efforts is informing customers of future bag ban or bag charge initiatives and allowing them time to adjust. This will allow them to better prepare for the change. Customers of colour, shoppers with disabilities, customers over the age of 65, and users of public transit may find this practise to be of particular significance. According to the findings of our study, there are reasons to be concerned about bagless efforts, which create the potential for dangers when customers carry things out of the store without a bag or a receipt as proof of purchase. Moving forward, digital strategies that prove purchase and encourage customers to bring their own bags from their homes or cars into stores are required. Additionally gradual implementation and eventual enforcement of plastic bag reduction policies or business initiatives by the government or private sector must occur.

**10. Future Research Directions:** Because of the negative effects that plastic has on the environment, governments and the general public are becoming increasingly wary of many consumer products made of plastic. As a direct response to the preferences of customers and the introduction of new regulations, a significant number of the world's largest firms have stated their intention to lessen the amount of single-use plastics included in their products. But, it might be difficult for the economy of the world to give up plastic, and businesses are always developing new ways to recycle it. Despite the widespread belief that plastic is bad for the environment, the global economy is having a hard time phasing out the production of new plastic goods. The elimination of plastics has not been directly beneficial to the bottom lines of many consumer product companies, in contrast to other environmentally responsible activities. Plastic has a number of benefits over other potential packaging materials, such as paper and glass, so S&P Global Ratings believes that it is highly unlikely that plastic packaging will be replaced in the near future for many of the uses to which it is currently put. It is more likely that there will be changes to the manufacture of plastic, including the possibility of an increase in the amount of recycled plastic over time. As a result of shifting consumer preferences and the introduction of new regulations, a large number of major corporations have made commitments to reduce the amount of single-use plastics that are contained within their products. These corporations include food giants from the United States such as Coca-Cola, Walmart, Starbucks, and McDonald's as well as major companies from Europe such as Danone, Nestlé, and Pernod Ricard. Many businesses are banking on the fact that consumers who are concerned of the environment would feel more at ease making purchases from them when their wares leave a smaller "impact" on the environment. Some businesses have the intention of switching to recyclable materials in the event that they are unable to completely eliminate plastics. Other businesses have already adopted new plastic policies, such as completely removing the use of plastic bags, while simultaneously making other adjustments to their products or supply chains.

#### **11. Theoretical and Managerial Implications:**

1. In the interest of reducing single-use and disposable plastics, legislation at the municipal level should be informed.
2. Provide a model for other companies to follow in adopting environmentally responsible methods of doing business.
3. Determine how consumers are reacting to efforts by the government and businesses to reduce the use of plastic bags.
4. Find out which, if any, of the possible reminder tactics are effective at getting consumers to bring their own bags.

#### **12. Recommendations**

The present study also furnishes measures that will improve keeping a check on use of plastic bags in Mumbai. Providing environmental education in a way that creates an indelible impact on the minds of the general public is bound to benefit extensively. A majority of respondents are in favour of discontinuing use of polythene bags and switching over to eco-friendly alternatives. Materials like cloth bags, paper bags, woven baskets and local material rank among the preferred choices in place of plastic. In addition, the government and other development organisations should endeavour to create awareness on polythene management. They should also arrange for effective garbage collection services to be made available to the public in the country, especially in urban areas. Eco-friendly substitutes for polythene can really diminish environmental pollution caused by polythene materials, for which the alternatives for it should be easily available and within everyone's means.

**13. References:**

1. Adele Folino 1 , Aimilia Karageorgiou 2 , Paolo S. Calabrò 1,\* and Dimitrios Komilis 2, Biodegradation of Wasted Bioplastics in Natural and Industrial Environments: A Review 27 July 2020 MDPI Sustainability
2. Andrady AL, Neal MA (July 2009). "Applications and societal benefits of plastics". *Philos. Trans.R. Soc. Lond. B Biol. Sci.* 364 (1526): 1977–84. doi:10.1098/rstb.2008.0304. PMC 2873019. PMID 19528050.
3. Diana Starovoytova Madara, Saul Sitato Namango, Charles Wetaka. "Consumer – Perception on Polyethylene- Shopping Bags". *Journal of Environment and Earth Science* ISSN 2224-3216 Vol 6, No.11, 2016.
4. Gupta K, Somanathan R. Consumer response to incentives to reduce plastic bag use: Evidence from a field experiment in urban India [Internet]. Delhi: Delhi School of Economics; 2011 Nov [cited on 2014 Jan 24]. Available from: [http://www.isid.ac.in/~pu/conference/dec\\_11\\_conf/Papers/KanupriyaGupta.pdf](http://www.isid.ac.in/~pu/conference/dec_11_conf/Papers/KanupriyaGupta.pdf)
5. Halden RU. Plastics and health risks. *Annual Review of Public Health.* 2010;31:179–94. [PubMed] [Google Scholar]
6. He Haoran, The effects of an environmental policy on consumers: lessons from the Chinese plastic bag regulation, Working Paper No. 453, 2010, University of Gothenburg, Sweden.
7. Hopewell J, Dvorak R, Kosior E. Plastics recycling: challenges and opportunities. *Philos Trans R Soc Lond B Biol Sci.* 2009;364:2115–26. [PMC free article] [PubMed] [Google Scholar]
8. Muthu, Subramania, 2009. "An exploratory comparative study on eco-impact". *Journal of Fiber Bioengineering and Informatic* 1.4.
9. Ritch, E., Brennan, C., & MacLeod, C. (2009). Plastic bag politics: Modifying consumer behaviour for sustainable development. *International Journal of Consumer Studies.* 33, 168-174. Retrieved September 14, 2010, from Business Source Premier database. doi: 10.1111/j.1470- 6431.2009.00749.
10. **Rumana Hossain\_Riya Shanker.** Plastic Waste Management in India: Challenges, Opportunities, and Roadmap for Circular Economy 14(8), 4425; <https://doi.org/10.3390/su14084425>
11. S.S. Verma. "Roads from Plastic Waste", *The Indian Concrete Journal*, p. 43-44. November 2008
12. Sutton J, Turner B. Plastic bags: Hazards and mitigation [Internet]. California: Social sciences department, California Polytechnic State University; 2012 May [cited on 2014 Jan 27]. Available from: <http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1082&context=socssp>.
13. Vaishnavi Chandrashekhar (2018) Times of INDIA In India's largest city, a ban on plastics faces big obstacles PG.155 Mumbai Reader
14. Yitian Shao\*, Haijing Cai, Gang Chen(2014) Rethinking plastic bag pollution problems in China *Environmental Science: An Indian Journal*, , 9(6), 2014 [215-222] ISSN : 0974 – 7451 Volume 9 Issue 6