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Environmental Consciousness and People's Behavior: An Investigation of the Factors Influencing People's Willingness to Pay for Environmentally-Friendly Products in District Charsadda

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ABSTRACT

Eco-friendly products are useful to the environment and other living organisms. The world is becoming more receptive to adopting environmentally friendly products, including biodegradable plastic bags. This research aims to examine people's perception and willingness to pay for utilizing biodegradable plastic bags in Charsadda, Khyber Pakhtunkhwa, Pakistan. To achieve this objective, primary data were collected from 400 respondents through in-person interviews by using the contingent valuation survey method (CVM) in various markets and households within the study area. The data were obtained through an open-ended elicitation format. The study's findings suggest that demographic and socioeconomic factors, including age, income, employment status, education, and awareness, influence respondents' perceptions of paying higher prices for biodegradable plastic bags. Research findings also reveal that the respondents who are located in urban areas rather than in rural areas are more willing to pay a price premium if the product offered is biodegradable. Overall, the results suggest an 18 percent price premium for biodegradable plastic bags.

***Keywords**: Biodegradable plastic bags, willingness to pay, eco-friendly products, CVM, Pakistan*

INTRODUCTION

The environment and economy are linked in a complicated manner. The environment encourages economic activity by providing raw materials and energy, as well as amenities, life support systems, and garbage sinks. However, the ecological functions are not limitless. Natural systems have a limited ability to give resources and absorb waste, which is known as environmental carrying capacity. Unsustainable production techniques, changing consumption patterns, and rapid population growth have significantly

eroded this capacity, resulting in serious environmental imbalances. One of the most serious causes of this imbalance is the increased production and disorganization of solid waste, particularly plastic waste (Subhadarsini, 2015).

In recent decades, plastics have become prevalent in contemporary life due to their affordability, durability, and adaptability (Aamir et al., 2020). Despite its benefits, its widespread use has an impact on the environment. Plastic bags have a very short useful life, yet they remain in the environment for decades or centuries. When discarded, they accumulate in landfills, water streams, agricultural land, and marine habitats, posing a threat to wildlife, human health, and environmental quality (Kumar et al, 2013).

Plastic pollution today is a major environmental problem in the world. Plastic waste is produced in large amounts every year, the largest part of which is a single-consumer good (Geyer R et al. 2017). This has been the trend of the packaging industry, given the fact that the re-use of the container has been overtaken by the use of disposable ones, which has increased plastic consumption significantly (J. R. Jambeck et al. 2015). As urbanization and income level begin to rise, the volume of municipal solid waste also increases constantly, particularly in the middle and high-income states It is, however, an alarming situation that in most developing countries, the waste management system has been unable to keep up with such a high rate of growth, and consequently, the existing collection, disposal, and recycling systems are not as effective as they ought to be.

The issue of plastic waste is particularly troubling since the majority of traditional plastics are fossil-based and non-biodegradable. They are not naturally decomposed, and thus they build up in the environment. Plastic wastage has been reported in the water, rivers, land, and even air, which is indicative of the magnitude and continuity of the issue. Poor management of plastic bags results in blockage of drainage systems, pollution of groundwater, causes flooding, and damage to terrestrial and marine organisms.

As a result of the growing intensity of environmental awareness, there has been a trend towards green and sustainable alternatives worldwide. People who are concerned about the environment are better prepared to adopt products that will not pollute the environment to a large extent. The application of biodegradable plastic bags has been one of the alternatives that could be used in place of conventional plastic bags. The bags are made to break down under natural processes by use of sunlight, moisture, and microorganisms, and hence minimize the buildup over time in the environment (Gandhi Darshan, 2023). With the growing knowledge of climate change and environmental degradation, governments and companies are making biodegradable products as a component of larger sustainable solutions.

Although this trend is evolving globally, most developing countries, including Pakistan, are still creating little awareness and adopting environmentally friendly products. Lack of information, environmental awareness, income restriction, and weak enforcement of regulations are mentioned as factors that hinder the shift towards sustainable consumption (Wang and Nie, 2001). Free distribution of plastic bags continues to be popular in the markets and retail stores, which contributes to the dependency of consumers on single-use plastics, to encourages them to use biodegradable plastic bags.

Pakistan has serious problems with solid waste management because of the high population growth, urbanization, poor infrastructure, and insufficient levels of public awareness. The misuse of waste disposal is also prevalent, especially in open areas, parks, markets, and streets. The plastic waste not only harms the environment but also threatens the health of people because it contributes to the pollution of the air and water (Ferronato &Torretta, 2019).

District Charsadda is particularly experiencing the problem of plastic bag disposal. The mismanagement of waste and irresponsible littering has led to environmental degradation and blockage in drainage

systems, posing the dangers of floods and health problems (Khattak et al, 2019). In order to address this issue, the policy must be intervened in, and it is also important to understand the people's behavior. Specifically, it is necessary to learn how people perceive biodegradable plastic bags, what the level of their knowledge about the environmental benefits of those bags is, and whether they are willing to pay a higher price to purchase such environmentally friendly products.

To formulate effective, environmentally friendly policies and market-based solutions, people's WTP for such eco-friendly products needs to be understood. WTP indicates the intentions of the people for products towards the quality of the environment and the products that are sustainable. By examining people's WTP to biodegradable plastic bags, policymakers and businesses will be able to implement certain policies that will promote sustainable consumption and reduce plastic pollution.

As a result, the purpose of this research study is to look into people's perception, awareness, and willingness to pay for environmentally friendly products, with a particular emphasis on biodegradable plastic bags.

REVIEW OF LITERATURE

Environmental degradation, climate change, and littering have emerged as significant factors affecting sustainable economic growth globally. The amount of empirical research on people's perception, awareness, and willingness to pay for environmental protection and eco-friendly product purchases in developed and developing countries is growing.

Several studies emphasize the importance of health and environmental awareness in the development of WTP. On the basis of the data of the China Household Finance Survey and the ordered probit model, Chen et al. (2024) discovered that well-health individuals showed much more willingness to pay in preserving the environment, especially younger and childless respondents. The authors have underlined the role of awareness of the environment and health in enhancing pro-environmental behavior. On the same note, according to a study conducted by Philip (2024), Nigerian customers were ready to have premium products that were environmentally friendly primarily because of health and quality issues, which reveals the importance of enhancing information access and product availability to encourage sustainable consumption.

There is extensive research on consumer attitudes and behavioral intention towards environmentally friendly products. Ashwini and Aithal (2023) found environmental perceived advantages, social pressure, product quality, environmental awareness, and readiness to pay extra as the major predictors of adopting an eco-friendly bag. Hoang and Le (2023) documented that in Vietnam, attitudes to environmentally friendly bags, personal image, and concern about the future generation were strong predictors of purchase intentions, whereas environmental knowledge alone did not predict purchase intentions. The same conclusion was made by Sari (2023), who proved that green brand attributes and green advertising can have indirect impacts on purchasing choices via green awareness.

The willingness-to-pay literature also widely uses contingent valuation techniques to determine the level of support that the population has for environmental improvements. Chatterjee (2023) demonstrated that the mean WTP of the population in the industrial areas in West Bengal was high, which means that the society supports the use of cleaner production technologies. Geng et al. (2023) established that Chinese customers were ready to spend extra monthly revenues on different green lifestyle elements, and the attitudes and moral norms appeared to be the most powerful predictors. Nam et al. (2021) demonstrated that consumers were also ready to pay high premiums on eco-certified agricultural products, which demonstrates the significance of trust and awareness in certification systems.

Policy interventions and plastic waste management are still at the center of environmental economics studies. As shown by Mentis et al. (2022), environmental levies and awareness campaigns led to the successful reduction of plastic bag use in Greece. Dikgang et al. (2022) discovered that the money charged on plastic bags in South Africa was too little to reduce its use and there was a need to implement proper pricing strategies. Song et al. (2022) found that income and education positively contributed to WTP to decrease the use of plastic bags in Vietnam, and a lack of awareness decreased attendance.

The developing countries have provided evidence of institutional and awareness-based limitations. Rafique et al. (2022) discovered that even with the lack of environmental consciousness, urban residents in Pakistan were ready to spend money on pollution control. Huda et al. (2021) also found that there was a significant correlation between income and WTP on waste management services, whereas education and occupation were irrelevant. Alam et al. (2020) demonstrated that the willingness to pay for solid waste management was less than the ability of households to pay in Karachi, which explains the necessity to stimulate policies with incentives.

In general, the literature supports the idea that the desire to spend money on eco-friendly products and waste management solutions depends on environmental awareness, health concerns, income, education, attitudes, and moral norms. Nonetheless, local-level empirical research in Pakistan, specifically on biodegradable plastic bags, is limited. This research gap supports the necessity of carrying out localized research to evaluate the perception, awareness, and willingness to pay on the biodegradable plastic packages in District Charsadda.

RESEARCH METHODS

Contingent Valuation Method

The Contingent Valuation Method (CVM) is an economic technique of valuation based on a survey to estimate willingness to pay (WTP) or willingness to accept (WTA) that are not readily available in the market, including environmental quality, biodiversity, and public goods. It is based on hypothetical situations to generate monetary values of goods not traded in standard markets and, therefore, is applicable broadly in environmental economics, public policy analysis, and health economics.

CVM has been widely used to assess environmental protection, improvements to infrastructure, and health-related benefits. As an illustration, surveys can inquire about whether the respondents are willing to pay the projects of reducing pollution or restoring the environment. To get credible valuation estimates, it is important to have a clear and elaborate statement of the resource and the mode of payment (Loomis et al., 2000).

CVM was used in this study due to the lack of biodegradable plastic bags in the local market, and hence revealed preference method is not applicable

Survey Design

The research was carried out in District Charsadda, Khyber Pakhtunkhwa, Pakistan, to evaluate people's perception and their willingness to pay for biodegradable plastic bags. Primary data was collected through face-to-face interviews conducted in shopping markets and at their homes. This method of data collection ensured correct responses that helped the researcher to explain questions when needed.

A simple random sampling procedure was used to ensure that each individual had an equal chance of being selected. The survey included face-to-face interviews with 400 respondents. The sample consisted of respondents who frequently visited markets and shopping locations and actively utilized shopping bags, making them extremely relevant to the study objectives.

The linear regression model, together with both qualitative and quantitative methods was employed to examine the data. Descriptive statistics were employed to investigate respondents' socioeconomics and demographic characteristics. Data was analyzed using the binary regression method.

Econometric model

For data analysis, the Binary Logistic regression function was used as

$$Y = \ln\left[\frac{Pi}{1-Pi}\right] = \beta o + \beta 1 bid + \beta i Xi$$

Where:

X is a vector of socioeconomic factors such as age, gender, education, household size, and income. β = (i = 1, 2) are the estimated parameter**s.**

The Odds Ratio:$\frac{P}{1-P}$

The P represents the likelihood that the respondent will pay for biodegradable plastic bags in daily life.

RESULTS OF THE STUDY

Socioeconomic and Demographic Characteristics

Socioeconomic and demographic characteristics of the respondents are presented in Table 1. The respondents were mainly male, 97 percent were male, and only 3 percent were female. This was not contrary to our prior expectations since male household members are the primary decision makers while shopping. The age of the respondents is between 22 and 90 years, with a mean of 42 years. Respondents' formal education was 8 years, with higher education of 18 years of schooling. The mean income in the study area was Pakistani rupees 46780, with a mean value of PKR 23420 per month. Descriptive statistics showed that 54 percent of the respondents were employed in government and private organizations. Results also demonstrated that around 61 percent of the respondents were aware of the adverse impact of conventional plastic bags on the environment and human health.

Table 1: Socioeconomic and demographic characteristics of the respondents

Variable	Mean	Std. Deviation	Min	Max
Gender	.975	.1563205	0	1
Age	42.015	11.48672	25	90
Education	8.19	6.647132	0	18
Income	46780	23419.71	11000	150000
Employment	.54	.4990216	0	1
Awareness	.61	.4883608	0	1

Factors Influencing People's Willingness to Pay for Eco-Friendly Products

Estimated parameters and coefficients of the binary regression model are presented in Table 2. The estimated model shows that the R is approximately 0.57, indicating that the model can predict the WTP of the respondents correctly under the condition of the explanatory variable. According to our findings, variables such as income, education, awareness of the respondents, employment status, age, and locality

of the respondents have a statistically significant influence on people's willingness to pay a price premium for biodegradable plastic bags. In Table 3, the results of the diagnostic test indicate that multicollinearity and heteroscedasticity problems related to the combination of explanatory variables in our model did not exist.

Our findings indicate some useful information regarding the impact of socioeconomic and demographic factors on the willingness to pay for biodegradable plastic bags. The age of the respondents has a significant and positive impact on WTP. Findings reveal that as age increases, their WTP for biodegradable plastic bags increases. These results are in line with Soon et al (2014. They found a statistically significant relationship between age and WTP for eco-friendly cosmetics. Study suggests that with aging, respondents experience increases that directly develop their concern for environmentally friendly products and are willing to pay a price premium.

The other important variable that influences WTP in our research is the education level of the respondents. Our findings indicate that there is a positive correlation between education and people's WTP for such environmentally friendly products. More educated people are willing to pay for plastic bags that can easily decompose and have minimal adverse effects. The better educated people have a higher understanding of the effect of conventional plastic bags on human health and the natural environment. They perceive biodegradable plastic bags are beneficial for the ecosystem as well as human health. Income is another important factor that has a positive and statistically significant influence on people's WTP for such products, which supports the idea that higher-income respondents are more concerned about their health and willing to pay more to save their health. Our findings indicate a significant tendency to pay higher prices as people's income rises. These results justify the findings of Soon et al (2014, who conducted a study on WTP for eco-friendly cosmetics in Seoul and the Gyeonggi area.

We also included variable awareness of the respondents in our research study. On the one hand, there is a positive impact of the people who are aware of the fact that biodegradable plastic bags are useful for both the environment and other organisms are more likely to pay a higher premium for such products compared to those who are not concerned. Employment rank is also a critical factor that defines willingness to pay, since the employed people determine a higher WTP for eco-friendly products. This is because the economic strength enables people to weigh the long-term benefits of environmentally friendly products. Result of the study suggests that people who are employed in various government or private organizations have a higher level of awareness and more information regarding these useful products, and hence, they are willing to pay higher prices. Lastly, we found a statistically significant influence of the variable location of WTP. According to our findings, respondents who belong to urban locations are willing to pay higher premiums as compared to those who belong to rural areas. It can be interpreted that respondents who belong to urban locations are more aware of the positive effect of biodegradable plastic bags on human health and the environment. The awareness is likely to be due to education, as our result indicates that the average year of education is greater.

Table 2: Factors Influencing People's Willingness to Pay for Eco-Friendly Products

WTP	Coef	Std. Err	T-statistics	P- Value	95% conf	interval
Income	.0001814	.000168	10.83	0.000	.0001485	.0002144
Awareness	2.719103	.7148814	3.67	0.000	1.260539	4.177667
Employment	3.45816	.7518693	4.60	0.000	1.979959	4.936361
Education	.3673701	.0562167	6.53	0.000	.2568461	.4778942
Gender	-2.293405	2.305397	-0.99	0.320	-6.825894	2.239084
Age	.320087	.0342028	9.36	0.000	.2528432	.3873309
Urban	1.900264	.7518254	2.53	0.012	.4221493	3.378378
Constant	-8.787396	2.810337	-3.13	0.002	-14.31261	-3.262178

Marginal Willingness to Pay

Table 3 shows marginal willingness to pay for biodegradable plastic bags. The constant term (Cons) in the table has/had a margin of 18.33 with a standard error of 0.3562**,** showing a highly significant result (p = 0.000)**.** This advocates that, on average, when all independent variables are set to their mean values, the forecast willingness to pay score rests significantly from zero. The 95% confidence interval (17.63 – 19.03) settles the exactness of this estimate, certifying that the true effect falls within this range.

Table 3: Marginal Willingness to Pay

	Margin	**St. Err**	**T**	**P > |t|**	**95% conf**	**Interval**
MWP	18.33	.3562432	51.45	0.000	17.62961	19.03039

Post-estimation diagnostic test

The model was tested against multicollinearity by using variance inflation factors and Heteroskedasticity using the Breusch- Pagan test.

Variance Inflation Factors

Table 4 offers the Variance Inflation Factors (VIF) for the autonomous (independent) variables used in the regression investigation. The VIF test is an important analytical tool used to distinguish multicollinearity among explanatory variables in a regression model. Multicollinearity happens when independent variables are extremely interrelated with one another, which can change the reliability of the estimated coefficients and diminish the accuracy of the regression results.

Results of the test show that all variables have VIF values less than 2**,** with the highest VIF documented at 1.21 for both age in years and income**,** while the lowest is for gender (1.02)**.** Since a variance inflation factor below 10 is generally considered satisfactory, these values recommend that multicollinearity is not a significant problem in this model. The mean VIF is 1.11**,** highlighting the conclusion that the independent variables do not show challenging correlations with one another. This confirms that the expected coefficients for factors influencing willingness to pay for biodegradable plastic bags are consistent and free from the misrepresentation usually caused by multicollinearity.

Table 4: Variance Inflation Factors

Variables	**VIF**	**1 / VIF**
Age in Years	1.21	0.824262
Income	1.21	0.826039
Residence (Urban-rural)	1.11	0.902511
Employment	1.11	0.903768
Educations	1.10	0.911130
Awareness	1.03	0.969236
Gender	1.02	0.979619
Mean VIF	1.11	

CONCLUSION

Results of this research offer valuable insights about the determinants of people's WTP for biodegradable plastic bags in District Charsadda, Khyber Pakhtunkhwa, Pakistan. Findings of the study show that people's perception towards environmentally friendly alternatives is strongly influenced by determinants

such as socioeconomic, demographic, and awareness. There is a relatively greater propensity among urban respondents to pay more as compared to rural, because of the accessibility and awareness in determining sustainable purchasing behavior.

Furthermore, older people, especially those with higher financial stability, are more willing to pay higher prices for biodegradable plastic bags. This implies that economic security and life experience influence environmental responsibility, since economically stable individuals are more inclined to make sustainable decisions.

In general, the research highlights the importance of integrating multidimensional strategies to popularize the use of biodegradable plastic bags. The approaches that should be consider by policymakers and industry stockholders include environmental awareness campaigns, affordability, and the specific policy that will be applied to various group of people, depending on their income, education, and location, willingness to pay and the use of financial incentives, community based education programs and supporting environmental regulations can be greatly increased to draw a large number of individuals towards adoption of sustainable alternatives. By addressing these areas of concern, it will be easier to minimize plastic pollution, encourage sustainable consumption, and create a better and healthier environment.

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