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# Perception, Attitude, and Practice about Environment Conservation through Plastic Waste Management among Students in Ghazi University D.G. Khan

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## ABSTRACT

*The global issue of plastic pollution necessitated a comprehensive understanding of individual attitudes and behaviors toward plastic recycling and environmental conservation. Improper disposal of plastic waste significantly contributed to environmental pollution, as plastics took hundreds of years to decompose and some contained harmful chemicals that could leach into the environment, posing potential risks to human health. Proper management of plastic waste was essential to reduce exposure to these harmful substances and enhance public health and well-being. The present study, titled "Perception, Attitude, and Practice of Environment Conservation through Plastic Waste Management among Students in Dera Ghazi Khan," aimed to explore the intricate interplay between human behaviors and environmental sustainability. Specifically, it sought to: 1) explore the perception of students toward environmental conservation; 2) study the knowledge and attitudes among students regarding plastic waste management; 3) examine how students practiced plastic waste management; and 4) provide recommendations for proper plastic waste management and environmental conservation. A structured questionnaire was developed and targeted a sample size of 300 students from various departments of Ghazi University. In the first stage, 10 different departments were randomly selected from Ghazi University. In the second stage, 30 students were chosen from each department using*

*a convenient sampling technique. The study found that 55.7% of students strongly agreed that they supported businesses using plastic alternatives, and 44% strongly agreed that investing in advanced recycling systems is crucial for reducing plastic pollution. Awareness about plastic pollution was shown to significantly impact environmental conservation attitudes, with 37% strongly agreeing that it fosters a culture of responsibility. Additionally, 35.3% of respondents strongly supported providing incentives to reduce plastic use. Data analysis using SPSS revealed significant associations between attitudes toward reusable items and effective plastic waste management. Findings indicated that students who strongly agreed that increasing the use of reusable items can aid environmental conservation also believed that recycling plastic waste effectively reduces pollution. These findings provide valuable insights for future research and policy formulation in environmental conservation and plastic waste management.*

## Introduction

Throughout history, plastic has proven to be a very useful material. It is tragically estimated that tons of this plastic end up in our landfills every year. If the plastic does not break down completely, it takes up to a few years for it to decompose in landfills, but it never becomes easily biodegradable. Scientists are working on ways to use plastic waste as a source of energy, but it is possible that we may be able to convert it into something we can use to power our homes. There are now around 100 million tons of plastic on the planet, which is 20 times more than 50 years ago when there were only 5 million tons. Plastic waste is therefore being generated at an increasing rate. As waste plastic generation increases, solid waste is experiencing an increasing problem. Cities generate the most municipal and industrial waste following food waste and paper waste. As a result, local authorities responsible for solid waste management and sanitation are having to cope with an unprecedented increase in waste. The collection and disposal of plastic waste can be done in an environmentally friendly manner, and it is a resource that can be reused. Natural resources are being stressed by rapid industrialization and economic development, which have placed a great deal of pressure on most of the national and local governments. Plastic waste has already been recovered commercially in some developed countries. Developing countries like Pakistan face serious issues related to the environment and energy. There has been significant pollution in the country as a result of rapid population growth (2.61 percent on average annually) and GDP growth (5.5 percent on average annually). Environmental protection and sustainability were not addressed in the decision-making process of Pakistan. There is a total lack of adequate disposal methods for solid waste at present. Open dumping is used mainly to dispose of waste, causing significant environmental damage to flood plains and ponds (Masood, 2013).

It is uncommon for Pakistani citizens to be familiar with waste management patterns. Asia and Euro-Asia have much greater awareness than nations like the United States and Europe. Typical solid waste generation in Pakistani cities is 2 kg per person per day. Despite the fact that 140 tons of waste is generated every day in the Attock district, there is no appropriate waste disposal facility. Considering the rate at which waste is generated, a landfill capacity of 35 acres is necessary to dispose of huge amounts of trash. As a result of lack of proper waste management

procedures, the Tehsil Municipal Administration (TMA) has dumped waste inappropriately, posing a threat to the environment's sustainability (Ahmad et al., 2016).

Globally, both developing and developed countries face serious issues related to municipal solid waste management. A positive correlation has been found between waste generation rates and household expenditures in a variety of studies. In other words, if spending levels go up in the developing world, their waste generation rates will also rise. In order to make preemptive policy decisions, timely surveys and scientific studies are necessary in order to analyze waste generation patterns. Most cities in developed countries use Life Cycle Analysis (LCA) tools to assist them with waste management. A very limited number of studies have been conducted on the relatively smaller, yet rapidly expanding, cities of developing nations. In such smaller cities, most existing studies have concentrated on the characterization of waste. In such studies, solid waste management practices are usually not evaluated for their environmental impact. Small cities in developing countries therefore need decision support tools to make informed decisions. According to Getahun et al. (2012), studies on such cities focus on waste originating from households with varying income levels throughout the year. By taking this approach, a comprehensive picture of the ground situation can be compiled, and this can be used to make informed policy decisions (Ali et al., 2019).

As technological advancements accelerate, ecologically friendly products are fast emerging, but plastic waste presents a challenge to societies despite these innovations (Huysman et al., 2017). Because of its convenience, plastic consumption has increased with the changing lifestyles of consumers (Alam et al., 2018). There are many products in our everyday lives that are made from plastic. It consists of most commonly-used plastic items, such as plastic bags, plastic bottles, coffee cups and lids, straws, plastic cutlery, and food packaging (Johnston, 2017). It has taken 65 years to produce 8.3 billion metric tons of plastic. Globally, 297.5 million tons of plastic have been consumed by the end of 2015. It is predicted that by 2025, 12 billion tonnes of plastic will be dumped in landfills and pollute the environment. A number of toxic chemicals have been noted in plastics, including polychlorinated biphenyls (PCBs), nonylphenols (NP), organic pesticides, including dichlorodiphenyltrichloroethane (DDT), polycyclic aromatic hydrocarbons (PAHs), polybrominated diphenyl ethers (PBDEs), and bisphenol A (BPA), which cannot be disposed of in the soil by simple disposal. Although plastics contain toxic and hazardous chemicals, careless handling can result in their release into the atmosphere (Khan et al., 2019; Ma et al., 2022)

There is no doubt that climate change will have an adverse effect on Pakistan. Climate change has had a devastating impact on developing nations in the past two decades due to poor preparation. Further, most sustainability-oriented products, processes, and measures continue to originate in developed countries, despite countries like the United States of America (USA) and China producing more than 30% of all waste worldwide. Nevertheless, some of these efforts are aligned with the 17 Sustainable Development Goals (SDGs) mandated by the United Nations (UN). For a group of 17 Sustainable Development Goals, 193 UN members committed to actualizing Agenda 2030 in 2015. There has been a gradual realization of the preservation of the natural environment, as indicated by the concept of the triple bottom line (TBL), which entails three dimensions to achieve sustainable development: people, planet, and profit. Because of less developed countries' low levels of sustainability practices, more emphasis needs to be placed on recycling and waste mitigation. Transboundary waste movement leads to negative externalities, which hinder the achievement of Agenda 2030 as a result of the absence of such measures (Nawaz et al., 2021).

As a result of plastic waste accumulating in the environment, plastic pollution occurs. In Greek, plastic means 'a material that can be molded into various forms and shapes'. A plastic can be categorized as either primary, such as cigarette butts and bottle caps, or secondary, which is created by degrading a primary plastic. Microplastics are small particles that can be classified based on their size. The use of plastic has spread to every aspect of our lives. It is easy to handle and mold plastic into a variety of shapes and sizes, which has made it an important material. Plastic will have a wide range of characteristics, ranging from very soft to very hard, but will retain a high volume-to-weight ratio. Material made from polymers has a unique combination of strength and lightness. These qualities, combined with long durability, have led some iron-based materials to be replaced. A cheap, artificially attractive appearance can be achieved by adding colors to plastics. Construction materials, as well as composite materials, have been made with plastics. In addition to extensive literature on plastics, there is extensive research on their uses and benefits. A study suggests that synthetic polymers should be regarded as hazardous waste because they are globally dispersed throughout all oceans because of their buoyant and durable properties, and since they absorb toxicants while traveling through the environment. Ocean gyres contain debris fragmented by photo degradation and other weathering processes. There is a great deal of research on the impact of plastic pollution on marine life, including cetaceans, seabirds, and marine reptiles. As persistent organic pollutants adhere to plastic and are absorbed into tissues and organs through ingestion, they have a detrimental impact on marine mega fauna and lower trophic levels of organisms. As floating plastics persist, they further exacerbate these impacts, which include resin pellets, large derelict nets, docks, boats, and microbial communities that move to non-native regions via their drifting nets, docks, and boats, providing further reasons to monitor (and take steps to mitigate) plastic pollution distribution and abundance globally (Mukheed, 2021).

It is complicated to deal with plastic, just as it is complicated to deal with climate change. There are cheaper, more durable, and more accessible plastics available in the country. With a tough economy, a blanket ban may lead to job losses or a reduction in foot traffic. Most single-use plastics are not biodegradable, but they do find their way into open landfills, garbage sinks, or municipal sewers, slowing down the sewage disposal process. As a result of system exploration conducted by the solution mapper in Lahore and ethnographic research conducted by the solution mapper in Islamabad, the problem is magnified, since waste is being picked up from communal bins and disposed of in urban fringes without segregation, material recovery, or recycling, and by not making communities take responsibility for their waste. Public and private partners are required to help waste management companies address this complex problem. Plastics make up 9 percent of Pakistan's solid waste. It is estimated that 30 million tons are produced each year. It is estimated that 55 billion plastic bags are manufactured here each year. In most cases, these non-biodegradable, single-use bags are dumped into open garbage dumps, landfills or municipal sewers, choking the system and increasing utility costs. Due to their inability to segregate, recycle, or recover material from waste, and the fact that they do not require communities to act responsibly, current urban waste management practices are partners in this crisis. Waste is only picked up from communal bins and disposed of in urban fringes without segregation, recycling, or material recovery. In addition to being thicker and not flying with air pressure, the shopping bags of 30 microns can also be reused. Despite these sanctions, authorities in Pakistan are yet to enforce them, as bags without D2W are openly used everywhere, including Karachi (Mukheed, 2021).

**Big cites waste management**

The Pakistani economy is experiencing rapid urbanization (Ali et al., 2019b). According to them, although Pakistan's population is growing at just 1.6%, its urbanization rate is 3.0%. Cities are

becoming increasingly urbanized, but their infrastructure is not keeping up. Pakistan's urban solid waste management challenge is among the most pressing issues today. As a result of household, market, and industrial activities, as well as health care and park maintenance, urban waste can come from many different sources. Almost all of Pakistan's collected urban waste is discarded in open dumping grounds without pre-treatment or environmental protection. Ali et al. (2019) report that solid waste is disposed of in open landfills throughout the country due to the lack of sanitary landfills for municipal waste. Public health and environmental pollution have been caused by this situation (Hafeez et al., 2016; Khan et al., 2018). Urban solid waste in Pakistan has a considerable environmental impact, so it needs to be remedied urgently. Our study will use the benchmark indicators and carbon footprint techniques to assess a secondary city in Pakistan. It is difficult to establish policy based on existing studies because they lack sufficient depth. Among other things, (Mahar et al., 2007) present waste generation statistics for several Pakistani cities, but do not discuss treatment technologies or waste emissions, nor do they provide recommendations for improving waste management. This study's framework aims to be a blueprint for future studies across secondary cities across the country and region (Ali et al., 2019).

**Mismanagement of Municipal Corporation**

The environment will be greatly affected if appropriate measures are not taken to recycle waste now. The insufficient management of waste has led to an insufficient number of landfills. It is possible that the consequences of neglecting this issue will be too great to overcome if we continue to ignore it. Ineffective collaboration with the general public and other related agencies has contributed to the Municipal Corporation's poor performance, which has been attributed to their lack of collaboration. The collection of solid waste accounts for more than half of the operating budget allocated to local governments. Citizens should be made aware of all the flaws in TMA management by the local government. In addition to eliminating duplicated efforts, by maximizing your resources, the TMA can also save you a significant amount of money on the TMA budget. A lack of participation among individuals and skilled laborers, mismanagement and underutilization of resources, unorganized waste collection practices, and other inadequacies in the legal and management systems have a negative effect on the country as a result. Unless these waste management issues are addressed in a timely manner, Pakistan will face even greater challenges in the future (Ahmad et al., 2016).

**Life style of urban areas**

As Pakistan's population has grown, so have lifestyles, which tend to be more prevalent in urban areas where waste management is more severe. It is therefore necessary for the public to change their consumption patterns in the interest of the nation, as proposed by Wang et al. (2022). The 15-44 age group, which represents over half of the country's population, can be catalysts for change and have a significant positive impact on the environment if they adopt more developed countries' practices and adjust their attitudes. The authors concluded that education and businesses have an even greater impact on societal norms, lifestyle patterns, and consumption habits as they have a global presence. This, in turn, affects environmental issues, especially sustainability and recycling (Ahmad et al., 2016)

**Awareness in Young Generation**

The PAT's waste management system still needs to be improved even though it has reached an excellent level. Young generations can be involved in the improvement process, so as to nurture

environmentally conscious citizens who understand the importance of making a positive contribution to environmental sustainability. Moreover, young people spend most of their time at school, contributing substantially to general waste generation. Keeping waste management systems effective, efficient, economical, transparent, technical and economically feasible, as well as adhering to the principles of prevention, accountability, cooperation, and transparency, can lead to improvements. It is important to follow the principles of effectiveness, efficiency, economy, transparency, technical and economic feasibility, and the "polluter pays" principle (Zuberi & Ali, 2015).

**Environmental Pollution**

All living beings are at risk of environmental pollution, both from a theoretical and practical standpoint. According to research, policymakers emphasize households' accountability for the environment's sustainability. A sensitive topic such as environmental pollution and climate change is encompassed by the concept of sustainability. In order to conserve the climate, we need to reduce the use of fossil fuels and adopt alternatives, reduce energy usage (, consume green food, recycle, and make sustainable consumption. It is not common for individuals to adopt such behavior. As a result, the purpose of this study is to identify the factors affecting consumer sustainable recycling behaviors toward plastic waste (Hameed et al., 2022; Iram et al., 2024; Asghar et al., 2024)

**Students and Universities Role**

The current study examines the factors that determine individuals' recycling behaviors in Pakistan through 230 students selected from the COMSATS Institute of IT (CIIT). Several prominent theories in the field are incorporated into the study, including the Theory of Reasoned Action and the Theory of Planned Behavior (TPB). The consumption patterns of Pakistan's youth directly affect the sustainability of the environment, as they represent Pakistan's future consumers. During the study, participants were administered a detailed questionnaire to assess their knowledge of recycling issues. Based on their responses, we assessed their understandings and attitudes regarding recycling. One of the main objectives of the study is to determine how one's awareness and any previous information he or she may have about environmental issues impacts recycling behavior. As well as understanding recycling behaviors, it examines how social values, demeanor, and perceptions affect recycling (Ahmad et al., 2016).

Among the GUIs are awareness programs that educate students about sustainable developments to reduce the negative effects of unsustainable consumption while raising students' moral obligations to sustain. By using technology, students contribute to reducing adverse environmental impacts and shaping pro environmental behavior. Furthermore, the University offers opportunities to foster sustainable learning on its campus. According to researchers, three points need to be remembered by students: first, renewable resources play a key role in promoting sustainability; second, sustainable development is connected to social development; third, society should be benefited by a share of income. In addition to lectures, research, and sustainable development workshops, other researchers concluded that student behavior might be affected by campus activities. University students should also be engaged in sustainability-related activities and advantaged of sustainable initiatives. Universities play a crucial role in developing sustainable activities and instilling a sense of environmental responsibility in students, according to researchers. It is possible for higher education institutions to achieve social and environmental goals through the implementation of green initiatives. A pilot project with awareness campaigns could be utilized by universities in

order to highlight environmental issues contributing to the goal of green campus development (Wang et al., 2022).

**Plastic Waste Disposal Issues**

Since Pakistan's environmental vulnerability is increasing, waste management (WM) issues have gained major attention. Waste production in Pakistan increases by 3.67% to 7.42% annually, according to numerous surveys. Also, Pakistan fails to handle plastics properly, ranking highest in South Asia. There are 30 million tons of solid waste in Pakistan each year, and plastic waste contributes about 0.2 million tons. There are 9% of those wastes that are plastic. Around 55 billion plastic bags are produced every year, which end up in water streams and landfills, complicating sewage management. Plastic bags have been banned in some countries, such as Bangladesh, France, and Rwanda. Furthermore, the Pakistani Environment Protection Agency (EPA) has issued a Statutory Regulatory Order to ban plastic bags within Islamabad and other cities. There are no provisions in the federal constitution or provincial constitution addressing the broader consequences of single-use plastics or the management of plastic waste. Generally, Pakistani municipalities provide community bins for collection after they have been filled, which are emptied by the municipality. Throughout a community, households are provided with convenient places to dispose of waste. After fulling these containers, waste pickup vehicles should empty them. It is unfortunately common for waste to overflow and land to be dumped on illegal sites near these bins and near their overflows. Moreover, households are forced to resort to inappropriate dumping on unauthorized sites due to the lack of bins, increasing their time, effort, and costs of waste disposal. On unlicensed land, in canals, streams, and along roadsides, illegal dumping pollutes canals and groundwater. A blockage of sewage also invites mosquitoes to breed, which carry diseases such as malaria and dengue (Akmal & Jamil, 2021a)

According to this study, minor administrative reforms will require minimal planning. As well as reducing GHG emissions, the study will generate revenue so the government can ease its financial burden. The role of developed nations is crucial in mitigating global climate change. Providing technical expertise and green waste treatment technology in low-income countries like Pakistan allows landfill methane reduction at high prices.

**Aims and Objectives**

The objective of this research is to:

- To explore the perception of students towards environmental conservation.
- To study the knowledge and attitude among students regarding plastic waste management.
- To examine how students practice of plastic waste management
- To suggest some recommendations for proper plastic waste management and environment conservation.

**Research Questions**

The study will address the following research questions:

1. What is the perception of students in Dera Ghazi Khan towards environmental conservation?

2. To what extent do students in Dera Ghazi Khan display a positive attitude towards plastic waste management?
3. How do students in Dera Ghazi Khan currently practice plastic waste management in their daily lives?
4. What recommendations can be suggested for proper plastic waste management and environmental conservation?

## Literature Review

Masood (2013) concluded that despite the fact that Pakistan has a large number of cities, none of them have a proper solid waste management system that handles waste from the moment it is collected to when it is disposed of properly. There are many ways to recycle waste around the world, including converting it into electricity. According to recent statistics, 41% and 32% of waste are recycled in Europe and the United States (US), respectively. A US 6.3 billion dollar investment has been made by China to be able to recycle 30% of its waste by 2030. Utilizing innovative technologies can solve problems associated with solid waste. Various waste-to-energy (WTE) schemes currently exist to recover and use energy efficiently. When energy recovery and natural resources are considered, economic opportunities, environmental reduction, and job creation can be achieved. Approximately 53-69% of trash generated in Pakistan is collected, with the rest accumulating in streets or at collection points. A variety of organic wastes are generated, including food, garden waste, street sweeps, textiles, wood, and paper. Organic waste, along with the soil that covers the landfill, is the most common source of landfill gas. There is without a doubt a connection between treating and disposing of solid waste. Wastes are treated to recover useful substances or energy, reduce volume, or stabilize wastes for disposal in landfills. It is a unique method of burying solid waste, such as paper, glass, and metal, in order to protect the surrounding area from contamination. The amount of gas produced by one ton of waste can range from 150 to 200 m3. When organic waste decomposes, it emits methane, carbon dioxide, nitrogen, and hydrogen sulphide (Landfill gas). The most viable technologies for the treatment of solid waste in Pakistan are landfill gas production and utilization and mass burn incineration. Due to their sufficient capacity, these two facilities can treat the current generated waste at lower costs. Furthermore, these technologies are capable of expanding their capacities as needed if more waste is generated in the future. In contrast, treating one ton of waste per day decreases the cost per ton. Pakistan generates a lot of solid waste. This is an excellent way to deal with it.

Zuberi and Ali (2015) supported that All over the world, landfills are a major factor contributing to global warming. Despite landfilling being one of the most common waste management systems in the world despite its high greenhouse gas emissions, landfilling should be prioritized last in the waste management hierarchy. Using the most up-to-date data available from the Pakistan Environmental Protection Agency, this study estimates methane emissions from landfills in Pakistan. Pakistan's landfills emit nearly 14.18 Gg of methane a year according to results. As part of a waste management scheme, methane can be converted into biogas from landfills in order to reduce greenhouse gas emissions by up to 88 percent. Analyzing potentially improved practices similarly yields the same percentage. Due to the continuously growing gap between the supply and demand of energy, Pakistan also faces a severe economic crisis. There has been an exponential increase in demand over the last few years, In spite of abundant renewable and alternative energy sources, supply has remained constant. Currently, electricity is short by up to 6000 megawatts. Pakistani landfills make almost no difference currently, contributing only 0.1% of the deficit. 83.17 MW of power can be generated in Pakistan if 75% of the waste is collected and 50% is

disposed of, contributing up to 1.4% to solving the current power shortage. The findings of this paper may also be useful for other developing countries.

Ahmad et al. (2016) stated that an analysis of recycling behaviors was conducted. Surveys were conducted with 230 university students. Using the Theory of Planned Behavior and Theory of Reasoned Action as guides, the study investigated. An evaluation of the collected data was conducted using Structure Equation Modelling. Generally, attitudes are shaped by the moral norms and general standards of a country's society, according to the study. A person's willingness to recycle is also greatly influenced by the extent to which he/she is aware of the environment and how much knowledge he/she has about it. It was also concluded that a person's past experience with recycling influenced the way he or she approaches recycling in the future (whether they will be willing or apprehensive to recycle). Time commitment had the greatest impact on whether individuals recycled, despite convenience and cost both playing a significant role. In these studies, the Theory of Planned is not only endorsed.

Ilyas et al. (2017) supposed that the industrialization and economic growth of developing countries such as Pakistan are causing an increase in plastic waste. Cities face challenges in planning solid waste management services because of limited resources and incomplete data. In addition to solid waste generation and characterization, environmental sustainability is greatly influenced by both of these parameters. A study is being conducted in Gujranwala, Pakistan, to document waste production and composition. A waste management system for the country's expanding cities can be developed based on the findings of this study, it is hoped. Waste generation rates for four residential areas with different income levels were calculated, with rural or low-income areas generating an average of 0.33 kilograms per capita per day (kg/c/d), while higher-income neighborhoods generated an average of 0.46 kg /c/d. There are 15 categories of waste, with kitchen waste making up 46 to 68 percent.

Ali et al. (2018) professed that throughout the world, waste management is a serious challenge in many resource-constrained countries, causing environmental problems, such as pollution, high soil occupation rates, and health problems as a result of poor hygienic conditions. Additionally, municipal budgets are heavily impacted by high waste management costs. An extensive study was conducted on the effects of different waste disposal scenarios on the environment in a large city of Pakistan. Environmental burdens associated with waste processing technologies are not considered in existing studies on waste management in Pakistan. By identifying environmental footprints based on donor or nature, we try to counteract this problem in this paper. In the analysis, three scenarios were considered: the current practice of open dumping (Scenario A); sanitary landfilling with composting and material recycling (Scenario B); and incineration with composting and recycling (Scenario C). They presented the results of our study as well as greenhouse gas emissions in kilograms of carbon dioxide equivalent per tonne of waste based on Emergy calculations. The worst option was scenario A because it produced high emissions and produced no useful output. According to Emergy indicators, scenario B indicates relatively lower stress on the environment than scenario C, even though both scenarios result in similar net emissions. Our recommendation is to engage public awareness campaigns to reduce waste and minimize resource consumption in the subject city. For the construction of waste disposal infrastructure, the civic society is also urged to contribute resources. It is imperative that the results and recommendations presented in this document be highlighted in a timely manner so that current practices do not pose a risk to the environment and public health.

Khan et al. (2018) announced that a key part of Pakistan's economy is Karachi, the most urbanized and industrialized city in the country. Despite this, the coastal city continuously suffers from pollution and lacks waste management systems. With over 20 million people living in the city, the city produces 14,000 tons of municipal waste every single day, yet the city has no adequate waste management system. In turn, this can threaten groundwater and marine life as well as emit greenhouse gases into the atmosphere. To highlight the current issues regarding municipal waste in Karachi, we are analyzing how fuel and putrescible waste can be used to produce energy. Using biodegradable organic waste, Karachi can generate 90 Gg of methane each year from anaerobic decomposition. The city can offset its GHG emissions by generating over 20 million dollars annually through recycling.

Butt et al. (2019) expressed that Changing climates and environments have forced individuals around the globe to mitigate and adapt to climate change. By analyzing students' behavioral intentions, this study evaluates their role in mitigating and adapting to climate change. In assessing university students' environmental knowledge, we incorporated the theory of planned behavior. A person's pro-environmental behavioral intentions are significantly shaped by their attitude, societal norms, and perception of behavioral control. The findings also revealed that education merely contributes to the building of attitudes toward a pro-environmental lifestyle. Education was found to have a less considerable effect on societal norms and a person's perception of their behavioral control.

Khan et al. (2019) uttered that as plastic consumption increases worldwide, litter is generated and the environment is endangered. By recycling plastic waste, we can reduce the danger it poses to the environment. In this paper, the author identifies the factors influencing the consumer's return/recycling intentions for plastic waste. It was also examined in detail how consumers recycle. Adaptations and extensions were made to the theory of planned behavior in order to determine the factors influencing recycling behavior. In this study, 243 households were surveyed via a survey questionnaire, and a purposive sampling technique was used to collect data. In order to test the hypotheses, the collected data were subjected to PLS-SEM. Several factors influence return/recycling intentions, including subjective norms, awareness consequences, and convenience. Among the hypotheses rejected, attitudes, perceptions of behavioral control, and moral norms have no significant impact on return or recycling intentions. As well, return intentions contribute to reselling, reusing, disposing, and donating. The return intention was the best predictor of reuse. Understanding the perspective of consumers in reverse logistics will enrich the literature. It contains insights that can help governments and organizations better understand consumers' return/recycling intentions in order to formulate effective recycling strategies.

Ahmed et al. (2020) affirmed that currently, there are many concerns and questions surrounding plastic waste management and trends related to plastics use. We also looked into future priorities, challenges, and waste management opportunities related to plastics use. Efforts to plan waste management in Abbottabad cannot be effective without reliable national data on waste generation and composition. On a regional level, waste generation data was collected, along with the physical composition of waste, sorting, and separation efficiency, as well as the amount of waste generated per capita in selected residences. Waste dump points in Abbottabad were quantified by weight according to plastic waste (PW). During the past year, 0.00102 tonnes per person were generated in peri-urban areas, while 0.0704 tonnes per person were generated in urban areas. An annual production of 59920.506t of PW was projected by 1.5 million people in Abbottabad. Solid waste (SW) should be diverted to more environmentally friendly recycling and recovery options, especially PW. Solutions include reducing materials, designing for end-of-life recycling,

increasing recycling capacity, and reducing litter. Together with industry, scientists, and policymakers, the public, industry, and scientists can best ensure the effectiveness of such measures.

Ahsan et al. (2020) concluded that among the products that we use on a daily basis, plastic bags are among the most prevalent. Currently, we are investigating the common causes for its use and public perception of its environmental effects, including pollution of land, air, and water. Participants concurred that plastic bags are being used more and less, but they also recommended cloth bags as an alternative solution. An assessment of this problem, identification of its causes, and alternative solutions based on local perspectives could be useful to assess the severity and identify possible solutions.

Iqbal et al. (2022) declared that in accordance with other developing countries, the government of Pakistan places little priority on its Solid Waste Management sector, whereas it gives only priority 3 to its Sustainable Development Goals agenda. The SWM sector has been strengthened continuously over the past decade, but these efforts have focused solely on manual sweeping and waste collection with no waste treatment or disposal methods included. Enhance sector waste management regimes based on Nationally Determined Contributions (NDCs) and Sustainable Development Goals (SDGs), the country's current waste management model was analyzed. Eleven major cities in Pakistan were assessed for waste management using waste-aware benchmarking indicators. Using a case study approach, several municipal and waste management companies were examined for their strengths and weaknesses, and for interventions aimed at reducing greenhouse gas emissions (GHG) by 2030. SWM will become more self-sufficient through the proposed interventions from an environmental and economic perspective, generating revenue to cover up to 29% of the operational costs.

Akmal and Jamil (2021a) said that as urbanization accelerates in developing countries, plastic waste production dramatically increases, causing serious socioeconomic and ecological problems. Achieving effective waste management is essential to preventing hazardous effects on human health and the environment. Local governments and municipalities in Pakistan are facing a daunting challenge in handling municipal waste, which predominantly consists of household and commercial waste. For local environmental policies, waste management is a top priority because it is both inadequately provided and inappropriately disposed of. As a result of the high external cost of waste management, not all households may be able to take advantage of refuse collection, and some households may be forced to pay additional fees. A sample of heterogeneous households was analyzed for the health consequences of improper waste disposal. Ineffective waste management practices can cause significant damage, according to the study. According to the survey results, irregular disposal near residents leads to illnesses such as malaria, dengue, and asthma in those living within 100 meters. Furthermore, 75.9% of household waste is not segregated, which indicates households do not know about waste hazards. Another option would be for local governments to subsidize waste collection and disposal services, or for outsourcing companies to provide these services.

Akmal and Jamil (2021b) revealed that Environmental, health, and living conditions are being negatively impacted by municipal waste management, which has become a global concern. Due to households' failure to adopt sustainable waste management practices, waste production has increased. Historically, studies on household waste management have tended to focus on socioeconomic aspects without considering behavioral and environmental factors. Structured equation modeling was used to examine four constructs in this study: defensive attitude,

environmental knowledge, environmental quality, and waste disposal. Using a multi-stage sampling technique, 849 households from the Islamabad-Rawalpindi region were interviewed. Taking into consideration the structural model, it has been found that environmental knowledge and defensive behavior are positively associated with household health.

Basuhi et al. (2021) concluded that it is becoming increasingly difficult to manage post-consumer plastic waste in the U.S. due to the current low rate of recycling of end-of-life plastics. The present paper presents an integrated approach to evaluating the energy recovery, fuel recovery, and mechanical recycling benefits of plastic waste management. The key drivers of greenhouse gas emissions, savings, and economic viability of three composite treatment scenarios are analyzed in different tech-economic contexts. Net greenhouse gas savings and net revenue are not favorable at current collection volumes. Inefficiency beyond the collection bottleneck is revealed if collection rates are scaled up to a hypothetical 100% level. Increasing collection volumes simply won't be enough to offset GHG emissions, or be economically feasible. Waste-to-energy efficiency can be improved, plastics can be converted to fuel with high yields, and design for recycling considerations can be incorporated. Electricity costs, fuel prices, and virgin resin costs are major factors determining a treatment process's financial viability. Analyzing the problem gives us an idea of how much investment and policy is necessary. According to estimates, the United States would need to spend 17–21 billion dollars collecting and treating postconsumer plastic. Sustainability requires an understanding of the complexity of post-consumer plastic waste streams.

Iqbal (2021) discovered that in addition to collecting and transporting solid waste, segregating it, recycling/reusing and disposal it, Institute of Business Management, Karachi has also implemented best management practices. On the university's campus, color-coded bins are available in sufficient numbers. In order to collect, transport, and dispose of waste, the Institute employs an adequate amount of people. Having conducted our study, we estimate that the IoBM campus generates approximately 2,033 kg of solid waste each month (24.5 tons). In addition to plastic waste, paper waste, and metal waste, university facilities generate approximately 32.3% organic waste. Using economic analysis, it is estimated that you can recycle and repurpose inorganic solid waste each year for 252,012 Pakistani rupees. According to the study, organic waste, including food and yard waste, is capable of producing about 500 kilograms of good-quality compost each month, which can be used in the cultivation of plants. Integrated solid waste management can be achieved by improving waste collection, segregation, resale, and composting.

Mukheed (2021) promoted that in developing countries, plastic pollution has serious negative effects on the environment and human health. In Pakistan, little research has been conducted on air and water pollution caused by plastics. Municipalities are currently managing solid waste in an informal manner, which is not sufficient, and as population and industrialization increase, the problem will become more acute. Plastic pollution must be managed separately by addressing the knowledge gap and improving existing conditions. Gherheş et al. (2022) presented that Strategies and policies can be implemented more effectively by reducing, reusing, collecting, and recovering recyclables. At Politehnica University of Timisoara, students participated in a quantitative analysis of their recycling and selective collection behaviors, which included plastic containers, paper, aluminum, and batteries, iron packaging waste, electronic equipment, used cooking oil, and printer toner, and their responses to environmental concerns.

Nawaz et al. (2021) said that Recycling is one tool to implement sustainability in low-income countries, so we aim to explore how informal and formal waste management can be integrated. In this study, stakeholders are engaged in a stakeholder-led approach to evaluate both formal and

informal recycling value chains. Pakistan's poor recycling and collection of municipal solid waste and its lack of a circular economy are compelling reasons to believe that it is far from being a circular economy. In order to resolve this issue, formal and informal recycling processes should be integrated effectively. Using an inductive qualitative research approach, we assess the formal and informal waste recycling system in Lahore, one of Pakistan's most populated cities. Including 25 interviews with managers of private and public companies, waste pickers, and scrap dealers in the target area, all stakeholder groups are equally represented. A lack of funds and systematic planning prevents Pakistan's recycling industry from receiving any form of support. It has been demonstrated in several empirical studies that the formal sector cannot dispose of the total amount of waste produced properly. Stakeholders in the informal sector recycle MSW by using innovative approaches. Because informal stakeholders play an important role in stealing and reselling, they are underrepresented in the formal sector.

Rhein and Sträter (2021) stated that Plastic pollution will be reduced globally as more companies convert from a linear to a circular economy in order to reduce their plastic pollution. In conjunction with the New Plastics Economy Global Commitment, the various plastic strategies are incorporated into sustainability reports in order to provide a codification of both international commitments and initiatives. In spite of this, no critical evaluation has been conducted to determine whether these voluntary commitments are significantly contributing to alleviating the plastic crisis or facilitating the transition to a circular economy. A qualitative analysis of ten international consumer goods manufacturers' commitments is presented in this paper, where we examine their understanding of the circular economy concept itself and the three key concepts associated with it: reduction, reuse, and recycling. Reduction and reuse are also part of recycling, which has no uniform definitions. As a result, commitments should be analyzed strictly based on clear definitions, which isn't the case currently.

Hameed et al. (2022) confirmed that Plastic-made or plastic-packaged products are a fundamental part of modern life. By combining the theory of planned behavior (TPB) and social influence theory (SIT), we examined whether there are possible factors contributing to the scrubbing of plastic waste in the country. To achieve this objective, the purposive sampling method was used to select 353 samples. A partial least square structural equation modeling technique was used to analyze the data. The study found that attitudes toward recycling, subjective norms, and perceived control over behavior determine consumer recycling behavior. As well as informational and normative social influences (NSI), recycling intentions are greatly influenced by NSI. Moreover, recycling intentions are the best predictor of plastic waste recycling behavior. Using the study's findings, officials and organizations can encourage consumers to make environmental choices.

Khattak et al. (2022) disclosed that analyzing how perceptions and attitudes of Pakistani university students affect their behavior towards sustainability and concepts related to sustainability. In order to carry out the research, the University of Science and Technology conducted a survey among departments at the primary level. The sample of students analyzed included undergraduates and postgraduates from the university's many departments. KAP (Knowledge, Attitude, and Practice) is a model that establishes relationships between perceptions, attitudes, and practices. In order to develop a sustainability index, we took different groups of questions and aggregated them. Questions about each of the sustainability domains are gathered and analyzed to produce the overall sustainability index. A respondent's history of taking an environment-related course affects sustainability. Thus, the Government should engage youth in implementing sustainable environmental policies by encouraging their participation and involvement.

Owojori et al. (2022) concluded that a student's involvement and contribution are highly valued by higher education institutions. In this way, the environmental knowledge of students in academic institutions makes a significant contribution to the solution of solid waste problems and other environmental problems in communities. There is an enormous gap between rural and urban transitions towards sustainable development in higher education institutions. The purpose of this study was to examine students' knowledge, attitudes, and perceptions about solid waste management at a rural educational institution. Furthermore, the study aimed to gain a better understanding of how the institution manages solid waste, as well as make recommendations for how to move toward a circular economy.

Wang et al. (2022) provided that it has become increasingly difficult to sustain human life and nature because of unsustainable production and consumption. Consequently, practitioners around the world have focused on sustainability issues and adopted environmentally friendly strategies. In addition to contributing to environmental pollution, single-use cups are also a source of waste. In this study, university students were asked whether they would be using reusable drink cups on campus. It has been incorporated into the theory of planned behavior (TPB) model to accommodate moral norms, green university initiatives, environmental concerns, and moral norms.

Yusuf & Fajri (2022) showed that educating children about waste contributes to increasing their knowledge of waste. This study examines the environmental education process at higher educational institutions that utilize a variety of waste management policies and programs. A study was conducted at Syiah Kuala University, Indonesia, to analyze the behavior and engagement of students and their knowledge of the environment. Further, this paper examines waste management-related behaviors, engagement, and environmental knowledge among students enrolled in campus programs.

Bilal et al. (2023) stated that Environmental and health hazards are posed by microplastic pollution (MP). Particles of these types can also be found in different mountain ranges and glaciers where human populations are sparse. In addition to glaciers, rain, and municipal and industrial effluents, MPs reach river ecosystems through a variety of routes. Several studies have demonstrated that MP pollution of the Swat River is negatively affecting water quality, sediment, and fish in the Swat River due to the Hindu Kush Mountain Range. The anthropogenic activities of marine ecosystems and those of freshwater ecosystems are associated, and freshwater ecosystems are as susceptible as marine ecosystems to those activities. Consequently, raising awareness about the marine ecosystem, educating the public about ecotourism, reducing plastic use, and implementing strict rules and regulations could be effective ways to prevent anthropogenic pollution.

Coco Chin et al. (2023) expressed that in addition to excessive plastic production, consumption, and waste disposal, plastic pollution is also a result of improper waste management. KAP (knowledge, attitudes, and practices) studies are useful in identifying problems and challenges in the area of plastic pollution because they determine people's knowledge, attitudes, and practices. It is crucial that policymakers recognize problems and challenges so that plans can be devised or interventions can be implemented accordingly. According to the research findings, Malaysians' attitudes, practices, and knowledge of plastic pollution vary according to socio-demographic factors. Manzoor et al., (2023) confirmed that there has been a growing concern about waste as a serious environmental issue. Air pollution occurs when plastic is burned or disposed of openly. Besides affecting soil and water, it also affects the atmosphere. There is a disturbance in the ecosystem and overall environment caused by this practice. The presence of micro plastics is recognized as a threat to human health since they enter living creatures' bodies through food

chains. Although a number of countries have put limits on the use of plastic, they are not sufficient to eliminate pollution caused by plastic. There is a possibility of reusing and recycling plastic. The issue of plastic waste management has been studied extensively in order to find sustainable solutions, especially for energy recovery. It examines the issues surrounding plastic waste in Pakistan, including issues related to the environment or human health. Pakistan must also implement sustainable solutions based on the findings of this study. A new generation of technologies is recommended for converting waste into energy in this study.

## Material and Methods

A structured questionnaire was developed and targeted a sample size of 300 students from various departments of Ghazi University. In the first stage, 10 different departments were randomly selected from Ghazi University. In the second stage, 30 students were chosen from each department using a convenient sampling technique

## Results and Discussions

**Table 1: Frequency and percentage distribution of the respondents regarding their demographic characteristics**

| **Age** | **F** | **%** |
|---|---|---|
| 20-25 years | 215 | 275 |
| 26-30 years | 75 | 25 |
| **Gender** | **F** | **%** |
| Female | 292 | 97.3 |
| Male | 8 | 2.6 |
| Total | 300 | 100.0 |
| **Status** | **F** | **%** |
| Single | 264 | 88.0 |
| Married | 36 | 12.0 |
| Total | 300 | 100.0 |
| **Language** | **F** | **%** |
| Urdu | 96 | 32.0 |
| Punjabi | 12 | 4.0 |
| Saraiki | 180 | 60.0 |
| Other | 12 | 4.0 |
| Total | 300 | 100.0 |
| **Occupation** | **F** | **%** |
| Govt. Job | 48 | 16.0 |
| Private Job | 84 | 28.0 |
| Farmer | 132 | 44.0 |

| | | |
|---|---|---|
| Self-Business | 36 | 12.0 |
| Total | 300 | 100.0 |

The age distribution of the respondents shows that a vast majority, 91.6% (275 out of 300), were between 20-25 years old. The remaining 8.3% (25 out of 300) were aged between 26-30 years. This age breakdown suggests that the study's findings are primarily reflective of younger students' perceptions, attitudes, and practices concerning plastic waste management and environmental conservation. The data reveals that the majority of the respondents in the study were female, accounting for 97.3% (292 out of 300) of the sample. Male respondents made up only 2.6% (8 out of 300). This significant gender disparity indicates that the findings and insights derived from this research predominantly reflect the perceptions, attitudes, and practices of female students regarding plastic waste management and environmental conservation. The table presents the marital status of respondents from a questionnaire survey focused on students' roles in environmental conservation through plastic waste management. Out of 300 participants, the majority (88.0%) is single, while a smaller portion (12.0%) are married. These percentages remain consistent when considering valid and cumulative percentages, indicating a predominantly single student population engaging in the study.

The table summarizes the mother tongue distribution of respondents from a survey on students' roles in environmental conservation through plastic waste management. Among the 300 participants, the majority (60.0%) speak Saraiki, followed by 32.0% who speak Urdu. A smaller portion of respondents (4.0%) speak Punjabi, and another 4.0% speak languages categorized as 'other.' These percentages are consistent when considering both valid and cumulative percentages, indicating a diverse linguistic background with a predominant representation of Saraiki-speaking students. The table displays the distribution of respondents' occupations in a survey on students' roles in environmental conservation through plastic waste management. Out of 300 participants, 44.0% are farmers, 28.0% hold private jobs, 16.0% are in government jobs, and 12.0% are self-employed in business. These percentages are consistent across valid and cumulative categories, highlighting a significant representation of farmers among the respondents.

The table 2 illustrates respondents' agreement levels regarding the impact of plastic pollution on environmental conservation from a survey on students' roles in environmental conservation through plastic waste management. Out of 300 participants, a majority (53.0%) strongly agree that plastic pollution affects environmental conservation, while 22.0% agree. Additionally, 15.0% are neutral on the matter, and 10.0% disagree. These percentages remain consistent across valid and cumulative categories, indicating that a significant portion of respondents recognize the detrimental effects of plastic pollution on environmental conservation. The table illustrates respondents' agreement levels regarding the impact of plastic pollution on environmental conservation from a survey on students' roles in environmental conservation through plastic waste management. Out of 300 participants, a majority (53.0%) strongly agree that plastic pollution affects environmental conservation, while 22.0% agree. Additionally, 15.0% are neutral on the matter, and 10.0% disagree. These percentages remain consistent across valid and cumulative

categories, indicating that a significant portion of respondents recognize the detrimental effects of plastic pollution on environmental conservation.

**Table 2: Frequency and percentage distribution of the respondents regarding their point of view on plastic pollution**

| **requires individual action for a healthy environment** | **F** | **%** |
|---|---|---|
| Strongly Agree | 76 | 25.3 |
| Agree | 144 | 48.0 |
| Neutral, | 80 | 26.7 |
| Total | 300 | 100.0 |
| **plastic waste is an effective way to reduce environment pollution** | **F** | **%** |
| Strongly Agree | 154 | 51.3 |
| Agree | 83 | 27.7 |
| Neutral, | 39 | 13.0 |
| Disagree | 24 | 8.0 |
| Total | 300 | 100.0 |
| **unnecessary plastic responsible for increasing issues in our Society** | **F** | **%** |
| Strongly Agree | 45 | 15.0 |
| Agree | 203 | 67.7 |
| Neutral, | 30 | 10.0 |
| Strongly Disagree | 22 | 7.3 |
| Total | 300 | 100.0 |
| **promoting environmental conservation** | **F** | **%** |
| Strongly Agree | 63 | 21.0 |
| Agree | 165 | 55.0 |
| Neutral, | 47 | 15.7 |
| Disagree | 14 | 4.7 |
| Strongly Disagree | 11 | 3.7 |
| Total | 300 | 100.0 |
| **improve environmental conservation** | **F** | **%** |
| Strongly Agree | 48 | 16.0 |
| Agree | 123 | 41.0 |
| Neutral, | 59 | 19.7 |
| Disagree | 18 | 6.0 |
| Strongly Disagree | 52 | 17.3 |
| Total | 300 | 100.0 |

The table presents the respondents' agreement levels on the necessity of individual action for environmental conservation to ensure a healthy environment. From the 300 participants in the survey on students' roles in environmental conservation through plastic waste management, 25.3% strongly agree that individual action is essential, while 48.0% agree. Additionally, 26.7% are neutral on this issue. These percentages indicate that a significant majority of respondents (73.3%) acknowledge the importance of individual efforts in environmental conservation. The table reflects respondents' views on the effectiveness of recycling plastic waste in reducing environmental pollution. Out of 300 participants, a majority (51.3%) strongly agree that recycling is an effective method, while 27.7% agree. Additionally, 13.0% are neutral on this topic, and 8.0% disagree.

These results show a strong consensus among respondents, with 79.0% acknowledging the positive impact of recycling on environmental pollution. The table shows respondents' views on whether the consumption of unnecessary plastic contributes to increasing issues in society. Among the 300 participants, 67.7% agree that it does, with an additional 15.0% strongly agreeing. Meanwhile, 10.0% are neutral, and 7.3% strongly disagree. These results highlight that a significant majority (82.7%) recognize the role of unnecessary plastic consumption in exacerbating societal problems. The table outlines respondents' opinions on the importance of awareness from educational institutes for promoting environmental conservation. Out of 300 participants, 55.0% agree that such awareness is essential, with 21.0% strongly agreeing. Additionally, 15.7% are neutral, while 4.7% disagree and 3.7% strongly disagree. These results indicate that a substantial majority (76.0%) view educational institutes' role in raising environmental awareness as crucial. The table presents respondents' views on whether avoiding plastic use can enhance environmental conservation. Among the 300 participants, 41.0% agree that not using plastic can help improve conservation efforts, with an additional 16.0% strongly agreeing. Meanwhile, 19.7% are neutral, 6.0% disagree, and 17.3% strongly disagree. These results indicate that a combined total of 57.0% believe that reducing plastic use positively impacts environmental conservation, while 23.3% do not support this view.

**Testing of Hypotheses**

Bi-variate analysis is used to examine the correlation between the two factors.

**Hypothesis: More will be awareness about plastic waste management in society; less will be usage of un-necessary plastic.**

**Table 3: Chi-Square Tests of Hypothesis 1**

| | **Value** | **Df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| Pearson Chi-Square | 71.628a | 6 | .000 |
| Likelihood Ratio | 78.326 | 6 | .000 |
| Linear-by-Linear Association | 19.110 | 1 | .000 |
| N of Valid Cases | 300 | | |

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.05.

The Chi-Square Tests results indicate a significant relationship between the belief that increasing the use of reusable items (such as bags and bottles) can impact environmental conservation and the belief that recycling plastic waste is an effective way to reduce environmental pollution. The Pearson Chi-Square value of 71.628 with 6 degrees of freedom and an asymptotic significance of .000 confirms that this relationship is statistically significant. Similarly, the Likelihood Ratio value of 78.326 supports this finding. The Linear-by-Linear Association value of 19.110 also indicates a significant linear relationship. With all cells having an expected count of at least 8.05, the test results are reliable and highlight a strong connection between promoting reusable items and the perceived efficacy of recycling in combating environmental pollution.

**Hypothesis: More will be the strict regulation of plastic disposal in society; less will be the plastic pollution.**

**Table 4: Chi-Square Tests of Hypothesis 2**

| | **Value** | **Df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| Pearson Chi-Square | 174.291a | 16 | .000 |
| Likelihood Ratio | 191.654 | 16 | .000 |
| Linear-by-Linear Association | 22.334 | 1 | .000 |
| N of Valid Cases | 300 | | |

a. 4 cells (16.0%) have expected count less than 5. The minimum expected count is 2.70.

In a study examining the relationship between implementing strict regulations on plastic disposal and reducing plastic use for environmental conservation, significant associations were found. The Pearson Chi-Square test ($\chi^2 = 174.291$, $p < 0.001$) indicates a strong correlation between the two variables. This suggests that respondents who support stricter regulations on plastic disposal are also more likely to agree that avoiding plastic use contributes to better environmental conservation. The Gamma value ($\Gamma = 0.361$, $p < 0.001$) reinforces this, showing a moderate positive association between these attitudes.

**Hypothesis: More will be awareness from educational institutes about plastic waste management; less will be use of plastic products.**

**Table 5: Chi-Square Tests of Hypothesis 3**

| | **Value** | **Df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| Pearson Chi-Square | 128.205a | 16 | .000 |
| Likelihood Ratio | 134.446 | 16 | .000 |
| Linear-by-Linear Association | 10.176 | 1 | .000 |
| N of Valid Cases | 300 | | |

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is 0.48.

The Chi-Square test results reveal a statistically significant relationship between buying in bulk to reduce plastic bag usage and reducing overall plastic product use. With a Pearson Chi-Square value of 128.205 and a p-value of .000, the association between these variables is highly significant. This suggests that the belief in bulk buying to reduce plastic bags is closely linked with attitudes towards reducing plastic product use. However, the high number of cells with expected counts less than 5 (40%) indicates some challenges in the data distribution, which may affect the robustness of the results.

## Conclusion

As a result of this research, we find that respondents are generally aware of plastic waste management and environmental conservation issues and are engaged in these topics. While there are areas for improvement, such as increasing the reduction of plastic use and supporting advanced

recycling systems, the overall sentiment is positive and supportive of efforts to combat plastic pollution. These insights can inform future policies, community programs, and educational campaigns to further enhance public participation and commitment to sustainable practices.

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