An investigation into North-West University, Potchefstroom Campus students' perceptions towards the environmental effects of single-use plastics

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DECLARATION

I, Jordan Ashleigh Thomas, declare that

An investigation into North-West University, Potchefstroom Campus students' perceptions towards the environmental effects of single-use plastics

is exclusively my own academic work. All academic sources and academic resources used in this study have been acknowledged through proper referencing and that this work has not been submitted anywhere else for the awarding of a degree.

DEDICATION

To the endless cups of coffee and migraine medication. To the frustration and doubt. To the moments that truly tested my core. And to the completion of this pursuit. I have learnt, I have grown, and I have so much more to come.

And to the one person specifically, I dedicate this to you, my beloved husband, Edward. Your unwavering support, boundless patience, and endless encouragement have been my greatest gift and source of strength throughout this journey. Your belief in me, even on the days I doubted every ounce of myself, has been an inspiration to me in what unconditional love really looks like. Thank you for standing by my side, for sharing in my dreams that have become ‘our’ dreams, and for being my partner in every sense of the word. This accomplishment is as much yours as it is mine.

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I would also like to give a special thanks to my parents and family as a whole for their unending support and understanding throughout this arduous journey. Your prayers are what sustained me throughout. I can't thank you all enough.

Lastly, I would like to thank God. This accomplishment has come with hard times but Your guidance and light, day by day, has played a critical role in maintaining the ultimate goal in sight.

ABSTRACT

This study investigated the perceptions of undergraduate students of the North-West University (NWU) towards the environmental effects of single-use plastics (SUPs). It also determined students' perceptions towards the negative effects of SUPs. A quantitative research approach was employed, using a survey as the research design, and a questionnaire for data collection. Quota sampling was applied, with gender, race and faculty as the quota categories. The data analysis was conducted using IBM-SPSS, with the results presented as descriptive statistics. A factor analysis was conducted on six factors: knowledge of pollution matters, attitudes towards environmental protection, willingness to participate in environmental activism, willingness to combat the negative effects of SUPs, environmentally adaptive behaviour and protective attitudes towards the environment. These factors were tested against four variables: gender, geographic location, socio-economic background and faculty. The results of the data analysis showed that students were generally knowledgeable about plastic pollution, environmental issues, the effects of climate change and the negative effects of SUPs. It was also found that students desired greater levels of environmental education within their academic programmes. The students exhibited generally positive attitudes towards environmental protection, and their value orientations had a strong influence on their attitudes towards environmental protection. The students showed a reluctance to participate in environmental activism, but a willingness to participate in educational campaigns that relate to environmental issues. The data analysis further showed that students are willing to adopt more environmentally conscious behaviours but indicated that they have difficulty changing their habits. The results showed that external influences could aid students, making them more likely to act in environmentally conscious ways. The results also indicated a need for better environmental education. The factor analysis identified a significant relationship between the students' faculty and their environmental perceptions, highlighting the need for better environmental education policies among the faculties of the NWU Potchefstroom Campus (PC).

KEY TERMS

North-West University

Plastic pollution

Single-use plastics

Students

Environmental pollution

Environmental perceptions

Theory of planned behaviour

Socioecological theory

LIST OF ABBREVIATIONS

NWU	North-West University
PC	Potchefstroom Campus
SUP	Single-use plastic
SEM	Socioecological model/theory
TPB	Theory of planned behaviour
TRA	Theory of reasoned action
PBC	Perceived behavioural control
MP	Microplastic
NP	Nanoplastic
PCA	Principal component analysis
KMO	Kaiser-Meyer-Olkin
MSA	Measure of sampling adequacy

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CHAPTER 1 RESEARCH PROPOSAL

1.1 Introduction

With the ever-growing global population, the accumulation of plastic materials has become prevalent in many aspects of daily life, as well as within industries (Tokiwa, Calabia, Ugwu and Aiba, 2009:3722). Single-use plastics (SUPs) epitomize today's throwaway culture. The United Nations Environment Programme (2018:vi) reports that just 9% of all plastic ever produced has been recycled. Single-use plastics, alternatively named disposable plastics, are commonly used for packaging and include items intended to be used only once before being discarded, often without being recycled (Prata, Da Costa, Lopes, Duarte and Rocha-Santos, 2019; UNEP, 2018:2; Webb, Arnott, Crawford and Ivanova, 2013). Single-use plastics include among other items, grocery bags, food packaging, bottles, straws, beverage containers, medication packaging, cups and cutlery (UNEP, 2018:2). The low recycling rate has raised concerns about the effects that plastic pollution has on the environment and human communities, with many recent studies addressing these concerns (Manzoor, Sharma, Sofi and Dar, 2020; Prata *et al.*, 2019; Van Raamsdonk, Van Der Zande, Koelmans, Hoogenboom, Peters, Groot, Peijnenberg and Weesepoel, 2020).

According to Tokiwa *et al.* (2009:3722) the most conventional SUPs, including polyethylene, polypropylene, polyvinyl-chloride, polycarbonate and polyethylene terephthalate, are recyclable. However, Tokiwa *et al.* (2009) note that although some of these SUPs are recyclable, they are non-biodegradable, leading to an increasing accumulation of plastic particles in the environment and within local communities. Over time, the plastic slowly breaks down into smaller pieces of plastic called microplastics (MPs) and nanoplastics (NPs) (Amobonye, Bhagwat, Raveendran, Singh and Pillai, 2021:1). These MPs and NPs pose a threat to the health and growth of plant and animal species, and human communities. Most of these SUPs, MP and NP particles, and chemicals end up in landfills, oceans, waterways, agricultural land and even the air we breathe (UNEP, 2018:6).

Although the rapid rate of production and use of plastic have their downsides, SUPs bring a level of ease to everyday human consumption and travel, such as takeaway cups for beverages, water bottles, sweets and readymade meals. Crawford and Quinn (2017:40) argue that the trend of using non-biodegradable plastics will continue, due to the expense of creating biodegradable plastics. Crawford and Quinn (2017:40) further state that 16% of all municipal waste in South Africa is plastic, with most of these plastics typically being discarded within twelve months of being manufactured. Crawford and Quinn (2017:40) estimate that 15−40% of all discarded plastics end

up being released into the ocean, often leading to the compromise and degradation of sea life and coral colonies, in turn, negatively impacting food resources for human, animal and plant species worldwide.

It is believed that plastic bags and containers, including Styrofoam (non-biodegradable polystyrene) containers, can take thousands of years to degrade into MPs or NPs. These MP and NP particles are present in the air we breathe as well as in farmable soil and water-systems (Crawford & Quinn, 2017:40; Webb *et al.*, 2013). Prata *et al.* (2019) state that the human body has three routes of exposure to MPs, namely, inhalation, ingestion of food and dermal contact with products containing MPs. Furthermore, Prata *et al.* (2019) found that, after exposure to MPs, the negative effects of such exposure may include oxidative stress, cytotoxicity, chronic inflammation, metabolic issues, immune function disruption and neurodegenerative diseases, as well as serving as vectors for potentially harmful microorganisms and toxic chemicals.

The toxic chemicals used during the manufacturing processes of plastic products pose a threat to various ecosystems and communities in the environment (Manzoor *et al.*, 2020:31). Manzoor *et al.* (2020:34) reported that the discharge of these synthetic materials and by-products of the production of plastics are released into the surrounding environment through emissions to air, water runoff and dumping, which is extremely harmful to both human communities and ecosystems. Prata *et al.* (2019) found that MP pollution causes decreased feeding activity through reduced predatory performance in wildlife ecosystems and a decrease in the digestive capacities of plants and animals. This will result in a decrease in nutrient intake and as a result, potentially lower-quality food sources (Prata *et al.*, 2019; Van Raamsdonk *et al.*, 2020). Pollution, and by extension SUPs, has been shown to cause serious harm to human communities and environmental ecosystems. Within these human communities, various social spheres are affected, highlighting the widespread impact of SUP pollution. The context for the present study relates to the perceptions of North-West University (NWU), Potchefstroom Campus (PC) students towards the negative effects of SUPs.

This study investigated the perceptions of students at the NWU, PC to the negative effects of SUPs. The responses from students included perceptions, attitudes and planned behaviours. The study resulted in a deeper understanding of student responses and the factors associated with these perceptions, attitudes and planned behaviours. The study contributed to the field of environmental sociology by providing information about the effects that perceptions and social factors have on planned behaviour, specifically concerning SUPs. This study provides a new perspective on how the next generation of consumers will form their perceptions of SUPs. The outcomes of this study will aid policy formulation at the NWU, PC regarding the use of SUPs. The

study further aimed to determine if and how students' perceptions towards SUPs can be influenced. Five social spheres were considered in this study: Value Orientation, Awareness of Pollution, Media, Role Models and Exposure to Pollution, to assess their influence on students' perceptions of SUPs.

1.2 Problem Statement

Given the ever-growing volume of SUPs produced and consumed, understanding the behaviours and perceptions of individuals and social groups becomes critical if future behaviour and perceptions are to be changed to encourage more environmentally protective behaviour (Browne, Crump, Niven, Teuten, Tonkin, Galloway and Thompson, 2011; Sierra-Vargas & Teran, 2012). The World Health Organisation (2019) reported serious negative effects of SUPs. Similarly, Beggs and Zhang (2018) list asthma, obesity, neurodevelopmental issues, gastrointestinal issues and cancer as some of the possible illnesses linked to SUPs. Plastic pollution has grown exponentially in the past 50 years (Crawford & Quinn, 2017). As the threat of plastic pollution has increased, the perceptions and behaviours regarding the dangers and negative effects of plastic have become more important. By studying the behaviours and perceptions of individuals, this study provides insights into the factors that influence and relate to how individuals interact and engage with SUPs.

While multiple studies over the past ten years have shown the increased consumption and dangers of plastic (Beggs & Zhang, 2018; Browne *et al.*, 2011; Prata *et al*, 2019; Sierra-Vargas & Teran, 2012; Webb *et al.*, 2013;), little has changed in the actual habits and behaviours of consumers, with plastic use and pollution still growing rapidly every year (Crawford & Quinn, 2017). For this reason, university students were chosen as the focus of this study because they represent a new generation that is developing its own consumer habits. Individuals within this generation will eventually teach these habits to their own children. These students will in the future bring about the next generation and teach them their consumer habits. It is therefore important that the current generation teaches the next generation environmentally responsible consumer habits and develops their perceptions towards SUPs. With a growing body of evidence suggesting a link between plastics (SUPs, MPs and NPs) and harmful environmental and health effects (Crawford & Quinn, 2017:40; Manzoor *et al.*, 2020; Prata *et al.*, 2019; Webb *et al.*, 2013), more insight is needed into the responses of society to these negative effects, and how the perceptions and consumer behaviours of individuals are shaped and altered. With students being the leaders of the next generation, this study realised the importance of gaining insights into the perceptions of students towards the negative effects of SUPs from undergraduate students at the NWU, PC.

Student sampling is an important research activity (Henry, 2008). As Henry (2008:115) states, social problems are also students' problems, and in some cases, student samples can reflect the characteristics of broader, more diverse populations. Henry (2008) further argues that many unexpected phenomena can often be observed in student populations making them valuable for research. Further recommendations on how to make the study more relevant to larger communities are provided later in the dissertation after the results. The student sample at the NWU, PC also represents a diverse group of individuals from multiple ethnic, social and economic backgrounds, which is relevant to larger non-student communities. Students at the NWU will help provide an internal micro-system scale view of how perceptions influence behaviours and vice versa. This was achieved through asking questions based on their interactions with the five social spheres. The problem that this study addresses is that there is a need for a greater understanding of how future leaders will perceive waste disposal, particularly concerning the environmental challenges the world is facing. With the ongoing increase in plastic production, use and improper disposal, which is not environmentally sustainable, the health risks will outweigh the convenience they provide. Therefore, examining what shapes students' perceptions of SUPs is essential for understanding potential future behaviours towards environmental responsibility.

1.3 Research Objectives

The objective of this study was to investigate the various perceptions of NWU, PC undergraduate students towards the environmental effects of SUPs in the context of social factors that may influence their environmental ethics.

1.3.1 Secondary Research Objectives

- To identify and consult the relevant academic literature on the theory of planned behaviour (TPB) and its influence on the socioecological model (SEM).
- To consult the relevant academic literature on the negative effects of SUPs, MPs and NPs, and to describe a central theoretical argument and explain its relevancy and applicability to the chosen social factors.
- To describe the relevance of the research methodology, i.e. a quantitative study approach, in the present study.
- To accurately depict and explain the research findings relating to the perceptions of students towards SUPs collected throughout the research.

- To provide a comprehensive and accurate description of the potential relationships between the chosen social factors and students' perceptions and behaviours towards the negative effects of SUPs

- To summarize the results of the study, detail all relevant and non-relevant correlations and make applicable recommendations for further studies of SUPs.

1.4 Research Question

The research question for this research study was as follows:

What are ***students' perceptions towards the negative effects of SUPs***, among undergraduate students at the NWU, PC ***and what social factors*** are associated with them?

1.4.1 Secondary Research Questions:

- What academic literature addresses the TPB and its influence on the SEM in shaping students' perceptions and behaviours towards SUPs? Additionally, what academic literature can be identified and consulted that discusses the negative effects of SUPs, MPs and NPs. Finally, can a central theoretical argument be described and its relevance and applicability to the chosen social factors be explained?

- Based on a quantitative study approach, what research methodology can be used in the research study?

- What findings can be depicted and explained through the research study?

- What potential correlates can be identified and accurately described between the chosen social factors and students' perceptions towards the negative effects of SUPs?

- What conclusions, that detail all relevant and non-relevant correlates, can be drawn from the results?

- What recommendations for further studies can be made from the research that pertains to SUPs?

1.5 The Central Theoretical Argument

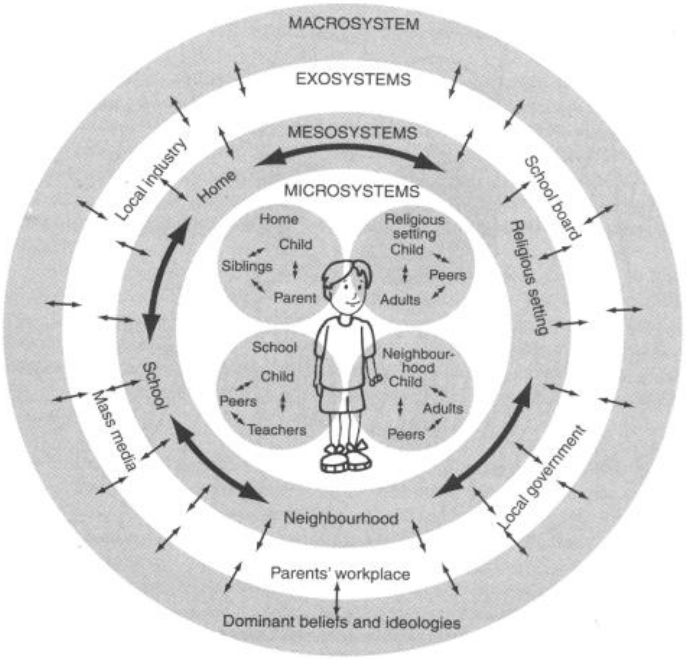
This study applied two sociological theories: the socioecological theory and the TPB. These theories were used as the theoretical backbone of the study and guided the different parts of the research process. These theories and how they relate to sociological research are explained

below. The application of these two theories was critical in this study to help determine the perceptions of students towards the negative effects of SUPs at the NWU, PC.

1.5.1 Introduction to The Socioecological Theory

The socioecological theory was founded by Urie Bronfrenbrenner between 1974 to 1977. Bronfenbrenner's Ecological Framework for Human Development applies SEMs to human development. Bronfenbrenner posited that for human development to be fully understood and studied, the immediate surroundings as well as larger environment of the individual need to be considered (Bukatko & Daehler, 2003:29). Bronfenbrenner's theory states that development and socialisation are influenced by the environment of the individual (Härkönen, 2007:6). This environment is a comprehensive concept that includes different ecological forces and systems that function and exist at different levels, but are interrelated through bidirectional and reciprocal relationships (Bukatko & Daehler, 2003:29). Härkönen (2007:7) states that there are three important assumptions in this theory: 1) the individual must have an active influence on their environment; 2) the environment must compel the individual to adapt to the continuous conditions and restrictions that are present and 3) the environment is assumed to consist of different sized entities that exist one inside the other, classified as micro-, meso-, exo- and macrosystems.

Figure 1.1: Socioecological theory systems



Source: Härkönen (2007:15)

The microsystem is the most immediate and direct setting that has an impact on the individual (Bukatko & Daehler, 2003:30). This system encompasses household members, the physical residence and direct social and educational factors, such as school, teachers, the local neighbourhood and neighbourhood friends (see Figure 1.1) (Bukatko & Daehler, 2003:30). Härkönen (2007:7) states that the microsystem includes the individuals' development in a face-to-face setting with certain physical or material features present. This system was linked to an individual's value orientation by Hartsell (2006) who emphasized that direct interaction between parents, the home environment, the surrounding environment and peers shape an individual's value orientation and behavioural development. In this system, value orientation is defined by the values a person learns from their immediate surroundings, such as their parents or their household norms.

According to Bukatko and Daehler (2003:30), the mesosystem includes all the interrelationships between different microsystems. Härkönen (2007:10) states that a mesosystem is comprised of linkages and processes that exist between two or more settings that contain the individual (see Figure 1.1). Therefore, the mesosystem is a system of microsystems involving the individual (Bukatko & Daehler, 2003:30; Härkönen, 2007:10). In the context of this study, this system can include the awareness of pollution on an individual's behaviour and a determination of how these mesosystems have influenced the individual's response to the negative effects of SUPs. The extent of their exposure to pollution could be influenced by the interactions between two systems, such as their social contacts, field of study or the environmental conditions on their campus. These factors may either align harmoniously or lead to conflict, ultimately shaping the individual's exposure through the dynamic interaction between the two systems.

Härkönen (2007:11) defines the exosystem as the linkages and processes between two or more microsystems, with at least one of them not generically linked to the individual (see Figure 1.1). Bukatko and Daehler (2003:30) state that the exosystem consists of developmental influences on the individual that are created by direct or indirect impacts on microsystems that influence the individual. Examples of this are social, economic, religious, political or welfare influences that can either directly or indirectly influence the individual or someone important to the individual (Bukatko & Daehler, 2003:30). In this system the influence of media is defined by the different media they are exposed to in settings such as their household, social circle or field of study. This is because social and economic circumstances often dictate the type of area and knowledge an individual is exposed to, and as such they form part of the media exposure and influence an individual may experience.

The macrosystem is the broadest context for interrelations between the individual and different systems (Bukatko & Daehler, 2003:30). The macrosystem includes aspects such as the cultural, legal, economic and political systems present in the individuals' life (Bukatko & Daehler, 2003:30; Härkönen, 2007:13). Similarly, this sphere encompasses the societal and cultural norms and traditions within which the individuals' behaviour and development will be judged (Bukatko & Daehler, 2003:30; Härkönen, 2007:13). These systems can have a direct or indirect influence on the individuals' development, without the individual necessarily having a reciprocal influence on the system in question (Härkönen, 2007:13; Hertler, Figueredo, Peñaherrera-Aguirre, Fernandes, Fernandes, and Woodley of Menie, 2018). The macrosystem in the context of this study can include the major role models in an individual's life. An individual's role models are present in each of the preceding spheres and as such the macrosystem is a composition of all the preceding spheres and how they have influenced the individual. In this context, an individual's awareness of pollution can be influenced by the legal and political parameters the country has in place in relation to pollution, their effects and the extent of the negative impacts of pollution within the country. The economic, societal, legal and cultural differences in the macrosystem mean that individuals who live in different areas (a more affluent city) or areas with different legal jurisdictions will have different influences on their awareness of pollution and their role models. This is because macrosystems differ from each other because of all the microsystems that are contained within them and no two will be the same for any two individuals.

Additionally, Bronfenbrenner formulated the chronosystem in 1995 to acknowledge the temporal dimension of an individual's development (Bukatko & Daehler, 2003:30). This research was also incorporated into the present study by studying the aforementioned social spheres during different stages of an individual's development. The essence of this theory states that SEMs have multiple levels of influence (such as individual, interpersonal, organisational, community and public policy) on an individual throughout their developmental stages. Furthermore, this theory argues that behaviours shape and are shaped by the social environment. The chosen social factors were therefore further analysed and explanations were obtained using this theory to understand how these systems affected these social factors.

1.5.2 Introduction to The Theory of Planned Behaviour

The TPB was developed by Icek Ajzen and was published as a chapter of a book in 1985, in which it was argued that intentions are the basis behind actions. The TPB can therefore be used to predict and explain social and psychological behaviours (Ajzen, 1985).

The TPB is based on the principle of the theory of reasoned action (TRA) (Ajzen, 1985). The TRA is used to predict and explain volitional behaviour, by studying the referents and determinants of

the perceived volitional behaviour (Ajzen, 1985). The TRA argues that volitional behaviour is determined by the intent of an individual to perform or not perform a certain behaviour (Ajzen, 1985). The TPB then broadens the principles of TRA and suggests that an individual's social behaviour or their performance of a social action, is determined by weighing internal and external factors and their intent, skills and ability to control or ensure that the action is performed successfully (Ajzen, 1985, Conner & Armitage, 1998). Ajzen (1985) suggests that many relevant social behaviours can be accurately predicted by studying the intentions behind this posited action. Furthermore, Ajzen (1985) states that the intention behind the behaviour is controlled by the individual's general perception towards the behaviour and the perceived social norms that relate to the behaviour. Conner and Armitage (1998) argue that by studying the differences between behavioural and normative beliefs, volitional behaviour can be accurately explained and predicted. Ajzen (1985) and Conner and Armitage (1998) argue that a consideration should be made before the behavioural action takes place and that a person will weigh the advantages of success against the advantages of failure and then determine if the referents that motivate them to act suggest that they should attempt the action. The TRA is then the basis of the TPB, which then expands the TRA, enabling the underlying intentions driving the intentions behind social and psychological behaviours to be investigated (Conner & Armitage, 1998). Willis, Lee, Reynolds, and Klik (2020) report that the TPB can use different background factors (that affect or relate to the subject group) to reliably indicate whether they influence the intentions or behaviours of individuals or groups. Furthermore, Willis *et al.* (2020) argue that the TPB can include a wide range of variables, such as education, exposure to media and immediate elemental circumstances, for use as an indicator of their intentions and perceptions. This is then an ideal theory to use for studying whether the chosen social factors (value orientation, awareness of pollution, exposure to media, role models and exposure to pollution) affect students' perceptions towards SUPs.

In this study, the TPB was used to study the perceptions of NWU, PC students towards SUPs regarding the chosen social factors and within the relevant spheres of the SEM. The application of the TPB not only generated unique insights regarding the social factors but also facilitated the expansion and interpretation of data collected from the SEM during the study of students' perceptions and among the different social factors that influenced an individual's social environment. Willis *et al.* (2020) state that one drawback of the TPB is that it overlooks certain social groups that may influence the subject. Using the TPB in conjunction with the SEM, this limitation was overcome, with the study also including data from different social spheres (as mentioned above) that influence the subject.

In this study, the analysis of the data was connected to the SEM and TPB. These two analyses were integrated with each other to determine whether there were relevant correlations between the relevant social spheres and the intentions of the individual in relation to the chosen social factors.

Several assumptions regarding the theories applied were made in the research.

1.5.3 Assumptions

The relationship between these assumptions lies in the idea that the social spheres an individual was raised in and is currently living in changes their perceptions towards SUPs, and an individual's planned behaviour similarly changes their perceptions towards SUPs. A more positive association between an individual's social spheres and planned behaviours was assumed to result in a stronger association with SUPs.

The assumptions of this study concerning the social factors were as follows:

- It was assumed that there was an association between an individual's perceptions of the negative effects of SUPs and both their planned behaviour system and the social spheres of the SEM. It was also assumed that a stronger planned behaviour and certain relevant social spheres carried a more positive association with the negative effects of SUPs.

- It was assumed that there was an association between an individual's value orientation and their perception of the negative effects of SUPs. It was also assumed that certain types of value orientations carried more positive associations with the negative effects of SUPs.

- It was assumed that there was an association between an individual's awareness of pollution and their perception of the negative effects of SUPs. It was also assumed that a greater awareness of pollution carried more positive associations with the negative effects of SUPs.

- It was assumed that there was an association between an individual's exposure to media and their perception of the negative effects of SUPs. It was also assumed that a greater exposure to media sources regarding the environment carried a more positive association with the negative effects of SUPs.

- It was assumed that there was an association between an individual's role models and their perception of the negative effects of SUPs. It was also assumed that environmentally aware role models carried more positive associations with the negative effects of SUPs.

- It was assumed that there was an association between an individual's exposure to pollution and their perception of the negative effects of SUPs. It was assumed that greater exposure to pollution carried a more positive association with the negative effects of SUPs.

1.6 Research Methodology

1.6.1 Background to the Literature Review

Multiple sources of literature were used to inform and guide this study. The literature focused on the negative effects of SUPs, the behaviours and perceptions of students relating to SUPs, and related social factors. Relevant literature pertaining to the central theoretical argument of this study was also consulted. Furthermore, relevant literature regarding research design, research approaches, data collection techniques, data sampling, study limitations and ethical considerations were also consulted to ensure the study was properly guided and best suited to ensure it could successfully answer the research questions. The literature that was used to research and inform this study were peer-reviewed articles, books, reports and similar sources of information that had specific relevance to environmental sociology, sociology and relevant scientific methods. It was ensured that the literature had specific relevance to the field of sociology to avoid using accepted scientific processes from other fields of research that were not relevant to this type of research. The following databases were also consulted: NEXUS, ResearchGate, Taylor & Francis, JSTOR, Academia.edu and the NWU Library Database.

1.6.2 Background to the Research Approach

The research approach followed that of a quantitative study. Quantitative research was used to obtain data on the relevant social spheres and their pertinence to the perceptions held by students towards SUPs. A survey was conducted to obtain quantitative data regarding social spheres. The questionnaire also included baseline questions to determine a respondent's suitability for inclusion in the analysis regarding the TPB and SEM. The quantitative data was analysed to determine whether there was a correlation between the central theoretical argument and the chosen social factors. The two theories were integrated to determine whether there were correlations between the relevant social spheres and the intentions of the individual concerning the chosen social factors.

The research design followed a quantitative approach, whereby theories were tested through the analysis of relationships among different variables (Creswell & Creswell, 2018). Quantitative research consists of a fixed structure of an introduction, literature review and theories, methods, results and conclusions (Creswell & Creswell, 2018). Quantitative study design methods emphasise objective measurements with mathematical, statistical or numerical analyses of data collected through methods such as surveys, questionnaires, polls or by manipulating existing statistics (Babbie, 2016). Using a quantitative study allows the researcher to search for relationships or correlations between different variables or in the case of this study, different social factors and different sociological theories (Babbie, 2016). This study also used descriptive statistics to assist the quantitative study design. According to Babbie (2016), descriptive statistics summarise sets of sample observations. This research design has built-in procedures against bias and methods for controlling counterfactual or alternative explanations found in the data (Creswell & Creswell, 2018).

The selected research designs and methods flowed from a theoretical model that specifically incorporated the influence of contextual factors on perceptions, and thus allowed the researcher to study the influence of factors embedded in the living and study environments (contexts) on perceptions regarding the use of SUPs. Additionally, the theoretical model identified different contexts and could therefore be used as a guide to identify the different contexts that may influence students' perceptions regarding the use of SUPs, as well as determining the measures used in the questionnaire.

1.6.3 Background to the Research Design

The research design for this study was a survey. Surveys are one of the oldest tools for gathering data in sociology (Babbie, 2016:247). Bryman (2012) defines survey research as a cross-sectional design using tools such as a structured questionnaire to collect data at a single point in time with more than one variable, which are then used to detect patterns of association. Surveys are frequently used for observing a sample of respondents by administering a standardised questionnaire to them (Babbie, 2016). According to Babbie (2016) and Bryman (2012), surveys are an excellent tool for measuring perceptions and orientations in samples where the population is large. In the case of this study where there is a large population and perceptions are being investigated, surveys are an appropriate research design. Surveys are a data collection technique where a respondent is asked to answer multiple questions with the intent to gather information regarding a specific topic and determine whether there are recurring patterns in the data (Babbie, 2016; Bryman, 2012). There are multiple ways to construct a survey, but for this study, an interview with a structured questionnaire was chosen to collect data. All respondents were

interviewed and asked to answer the same questions using the same scale of responses for each question.

1.6.4 Research Data Collection Techniques

A questionnaire is a set of questions for the respondent to answer. It is an instrument designed to specifically elicit information that is relevant to the topic being studied (Babbie, 2016). Face-to-face interviews enable the researcher to interview the respondent personally. This method of interviewing is commonly used because it provides a way for the researcher to determine whether the respondent is comfortable and to ensure that the respondent is being truthful in their answers.

The use of structured questionnaires through face-to-face interviews provided the data used in this study. The questionnaires were a set of questions with a choice of answers, created for the purposes of a survey or statistical study. A comfortable setting was provided for both the interviewer and respondent, which was anticipated to make the respondent more likely to give honest and accurate answers to the questions. In this study, the researcher conducted in-person interviews with the participants, ensuring they were comfortable. A simple scale sheet was used to ensure that respondents could easily answer the questions.

1.6.5 Sampling

The sample population that was used in this study was a group of 250−300 undergraduate students at NWU, PC, selected through quota sampling using a non-probability stratified sampling method with purposive sampling within distinct categories.

Sampling, according to Turner (2020), is a process in which a subset of the population is selected to be studied. Quota sampling refers to a procedure where the number of respondents in each of several categories is determined in advance and the final selection of respondents is left to the interviewers, who then proceed until the quota for each category is filled (Babbie, 2016). For this study, a quota was set for the collection of quantitative data through a survey. The quota sampling applied in this study was defined by categories of males, females, ethnicities and faculties. The criteria for this sampling were as follows: (1) an individual should be an undergraduate student of the NWU, PC; (2) an individual should be one of the four races indicated below Table 1.1, (3) an individual should be male or female; and (4) an individual should be studying for a degree within one of the eight faculties indicated below Table 1.1. These criteria were set to ensure an accurate reflection of the NWU, PC population.

Henry (2008) reported that despite the challenges associated with student sampling, it remains a valuable component of research. Student sampling is cost-efficient and easily accessible to most

researchers, and students are not very different from non-students (Henry, 2008). Furthermore, Henry (2008) notes that some social problems are also experienced by students, and as such they in some ways also reflect larger groups in society. Studying students as social communities is therefore important and scientifically relevant to the larger communities that they are currently within or will be part of in the future (Henry, 2008). Ashraf & Merunka (2016) stated that while there is a risk in making generalisations from student samples, it is still possible to gain useful insights from this type of sampling. Ashraf and Merunka (2016) further argued that undergraduate students are a valuable resource and when their sampled experiences are used with discretion, they represent a valuable source of knowledge. Ashraf and Merunka (2016) state that if a researcher is conscious of the demographics and psychology of the students being sampled, the researcher can obtain relevant results from the data.

Table 1.1: The undergraduate students of the NWU, PC

POPULATION: 2022 Potchefstroom campus undergraduate contact students (19/05/2022)

	Total			Humanities		Natural and Agricultural Sciences		Theology		Education sciences		Economic and management sciences		Law		Engineering		Health sciences	
	Total	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total	18309	7448	10861	716	1808	1343	856	73	108	792	2162	1749	1850	513	852	1095	330	1167	2895
African	8052	3054	4998	541	1247	508	408	42	87	465	880	448	641	215	359	234	89	601	1287
White	8822	3848	4974	139	429	768	405	27	18	215	992	1197	1082	244	406	825	227	433	1415
Coloured	1180	432	748	34	126	39	27	4	3	107	276	74	95	40	78	25	11	109	132
Asian	255	114	141	2	6	28	16	0	0	5	14	30	32	14	9	11	3	24	61

The NWU, PC has a total of 18,309 students, with 7,448 males and 10,861 females, split across eight faculties and four self-identified race categories. The race categories are African, White, Coloured and Asian. The faculties are Humanities, Natural and Agricultural Sciences, Theology, Education Sciences, Economic and Management Sciences, Law, Engineering and Health Sciences.

Table 1.2 Calculated and idealised samples of undergraduate students at the NWU, PC

QUOTA SAMPLE: 2022 Potchefstroom campus undergraduate contact students

	Total			Humanities		Natural and Agricultural Sciences		Theology		Education sciences		Economic and management sciences		Law		Engineering		Health sciences	
	Total	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total	270	112	158	11	26	20	12	1	1	12	32	27	28	8	12	16	4	17	43
African	120	47	73	8	18	8	6	1	1	7	13	7	10	3	5	4	1	9	19
White	129	56	73	2	6	11	6	0	0	3	15	18	16	4	6	12	3	6	21
Coloured	19	9	10	1	2	1	0	0	0	2	4	2	1	1	1	0	0	2	2
Asian	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1

The calculated and idealised quota sample for this study of NWU, PC students was 112 males and 158 females, resulting in a total of 270 students. The idealised sample for the ethnicities was 120 African students, 129 White students, 19 Coloured students and 2 Asian students. The idealised sample for faculties was 37 Humanities students, 32 Natural and Agricultural Sciences students, 2 Theology students, 44 Education sciences students, 55 Economic and management sciences students, 20 Law students, 20 Engineering students and 60 Health sciences students.

This sample represented the idealised sample and changed slightly after data collection had been completed.

1.6.6 Background to the Data Analysis

The IBM-SPSS software was used for all statistical analysis in this study. The quantitative data analysis procedures were determined from the literature review, which enabled the selection of appropriate analytic or statistical metrics for data analysis and the correct choice of instrumentation (Miles, Huberman and Saldaña, 2014). Descriptive statistics were compiled to express correlations in the data in a readable and expressive manner. The correlations were used to understand the perceptions of students regarding the environmental effects of SUPs. These statistics are presented and explained in the findings chapter.

1.6.7 Background to the Ethical Considerations

The ethical principles that guided this study ensured that there was no possibility of harm to participants, informed consent was received from participants, there was no invasion of privacy, there was no deception of participants and the researcher's personal bias had minimal influence on the study. Van den Scott (2020:775) states that the researcher must ensure that ethics are considered throughout the study from start to finish, and through every step of the study.

Harm to participants does not only mean physical harm. Harm consists of several aspects, namely: physical harm, harm to a participant's development, loss of self-esteem, stress, discomfort and requiring participants to perform reprehensible acts (Bryman, 2012:135). Ethics training should ensure that no harm befalls the participant, either during or after the study (Van den Scott, 2020). Therefore, as part of the ethics training and the literature reviewed for this study (Handbook of Research Ethics and Scientific Integrity, *see Van den Scott, 2020 for reference*), the researcher had a firm grasp on these ethical considerations as well as a well-founded source of ethics. As such, their behaviour was always ethical towards the respondents.

The issue of informed consent largely relates to ensuring that respondents are fully and completely aware of what the study is about and that there are no hidden agendas pursued by the study or researcher. This is usually achieved through using informed consent forms. Consent forms give respondents the opportunity to be fully informed of the nature of the research and the implications of their participation before they take part in the research (Bryman, 2012:140). This was ensured in this study by providing an informed consent form at the start of the questionnaire. Respondents had to give their consent orally or by signature for the interview to proceed. The consent form was also approved by the NWU ethics committee.

Invasion of privacy is an issue that varies from person to person because what may be an invasion of privacy to one, may not be the same for another. As a researcher, it is important to consider that some questions asked on questionnaires or during interviews are sensitive and thus require sensitivity and discretion when being asked. It is important to ensure that the respondent does not feel attacked, uncomfortable or judged. This can be achieved by ensuring that none of the disclosed information given by the respondent is used for any other purpose than that set out in the informed consent form (Bryman, 2012:142). The Ethics Committee of the NWU ensures that the researcher is held accountable for the security of the data collected and that it will not be used for any other purpose than the study. The personal data will not be shared with anyone, and only the questions' answers will be shared with the supervisor and the other researchers. This means that the respondent's identity and personal information will not be seen by anyone other than the interviewer.

Deception refers to when researchers try to represent their work as something that it is not. An example of this is when researchers perform experiments whereby the respondent is made to believe something that is actually only being produced in their minds by the researcher. According to Erikson (1967:369) deception is said "to damage the reputation of sociology in the larger society and close off promising areas of research for future investigators". To ensure that this does not happen, the researcher attended the NWU, Faculty of Humanities – Ethics Training Course and thereby ensured that participants were not misled or misinformed and that the data was not misinterpreted. To ensure that deception did not occur, the researcher ensured that the respondents were interviewed in a private space where they were comfortable and able to be truthful. The researcher ensured that the respondents knew they would not be judged or made to feel bad for their responses and that any answer they gave would not change how the researcher viewed or treated them. Furthermore, to avoid deception from occurring, the researcher avoided talking to the respondents about topics not relevant to the interview, or topics that may influence how the respondent may think about certain questions. The researcher aimed to only answer direct questions the respondent asked and avoided answering implied or leading questions.

Van den Scott (2020) states that the privacy of the individual is an important part of the ethical considerations that need to be made. As such, the data was not tied to the individual's name or identity. After the data had been stored in a database, the individuals' data was discarded, and therefore could not be traced back to the individual, ensuring their anonymity. The researcher ensured that the individuals' responses and data remained confidential and private by conducting the surveys in private and storing the data in a protected location.

Van den Scott (2020:773) uses the term reflexivity to describe the important practice by which sociological researchers reflect on their roles as researchers and assess how their biases can influence research. To ensure that the researcher could be held accountable for the study, the researcher ensured that how the data was collected, analysed and presented were conducted in accordance with the research professionality expected at the NWU. Furthermore, the researcher ensured that their personal beliefs were not presented in the study and that the researcher assumed an objective approach throughout the study.

Furthermore, no empirical research may be conducted without the permission of the NWU ethical committee. This research study was approved by the NWU ethics committee.

1.7 Limitations

Limitations in a research study identify any potential weaknesses that could affect the results. According to Saunders, Lewis and Thornhill (2009), the research methodology serves as the foundation of a research study. The main purpose of quantitative research is the quantification of data wherein, the research data is used to explain a social phenomenon within a specific sample or population. Quantitative research allows for the generalisation of the research results by measuring the views and responses of the sample population. Every methodology is made up of two broad phases, namely, planning and execution (Younus, 2014). Thus, it is evident that there is a likelihood for a set of limitations to occur, which are beyond the researcher's control (Simon, 2011). Limitations are possible weaknesses or constraints that are placed on the study that can hinder or negatively affect the progress and procession of the study. These limitations are as follows.

1.7.1.1 Improper Representation of the Target Population

Improper representation of the target population may hinder a researcher's desired objectives and aims. This was important to consider in the present study because the representation of the subjects was dependent on the demographics and faculty distributions of the NWU, PC. This could have led to miscalculations in the collected data, creating false records in the results collected and conclusions drawn (Saunders *et al.*, 2009). This would result in the potential for the study to not accurately reflect the population of the NWU, PC, and as such it would not be relevant to the NWU, PC. It can be argued that quota sampling only reflects the population in terms of their superficial characteristics (in this case the genders, race and faculties) and may not accurately reflect all the types of people in the population (Bryman, 2012:204). This is because, in quota sampling, the researcher decides who they want to approach and as such the sample may be skewed by the researcher's own biases (Bryman, 2012). Bryman (2012) also states that because

quota sampling is a non-random method of selection, it is impossible to calculate the possible ranges of values of the population. To combat this, the interviewer remained self-aware in how they chose respondents and ensured that their own bias did not influence their choice of respondent. Additionally, the interviewer needed to verify that each respondent fitted within the criteria set for the quota sample.

1.7.1.2 Inability to Control the Environment

Sometimes researchers face problems in controlling the environment in which the respondents provide their answers to the questions (Baxter, 2008). Thus, researchers often attempt to conduct the research over a relatively short period to ensure that the answers provided by the respondents are not affected by any form of bias or distractions (e.g. a noisy area). If the researcher cannot provide a suitable environment for the respondent, the respondent may not feel comfortable enough to be entirely truthful in their responses for fear of judgement or discomfort. By providing a private and quiet environment, the researchers ensured that the respondents were comfortable and that the respondent's answers could be accurately logged.

1.7.1.3 Expensive and Time-Consuming Research

Quantitative research is difficult due to the large amounts of data that need to be collected and often a lot of time is required to plan, implement and perform the analysis required. Quantitative research is planned carefully to ensure that the study sample accurately reflects the population and that the designation of demographics is correct and relevant to the study (Morgan & Smircich, 1980). This ensures the accumulation of large numbers of responses from respondents on a particular issue, within a particular time period. However, expenses and time remain as limitations due to some respondents not arriving at particular times, thus resulting in rescheduling which usually means that the researcher has to re-hire a particular interview room or travel to the destination. To resolve this issue, this study's quantitative data collection formed part of the 2022 NWU, PC Sociology Postgraduate project, which minimised time and cost issues for the study. Due to this limitation, the quota sample was limited to 270 students to ensure that the data could be collected in a timely and cost-efficient manner. Unfortunately, the interviewers' control over the cost and time of the interviews was limited, and as such any additional time and costs required were the responsibility of the interviewer and not the subject.

1.7.1.4 Inaccuracy of Respondent Answers

A limitation that runs across every research study is that of respondents not being truthful. In many cases, respondents do not answer questions accurately or truthfully. This may be due to

respondents becoming bored due to the lengthy time a questionnaire survey may take or due to the similarity of questions, as well as respondents not feeling comfortable enough to provide honest answers for fear of criticism, judgement or embarrassment. Although researchers can attempt to combat these situations, not all can be avoided. Thus, when these situations occur, the questionnaire results are invalid and unusable. This further results in a reduced population sample, restricting the opportunities for the generalisation of the research study. To combat this limitation, the questions were made as simple as possible while the required data was still collected. Participants' responses that provided quantitative data were structured to ensure that they were accurate and simply understood. To further overcome this limitation, interviews were conducted in a private, quiet and comfortable environment to ensure the respondent felt at ease during the interview.

1.8 Significance of the research

Throughout this study, the students' perceptions of the environmental effects of SUPs at the NWU, PC were determined and could then be further studied. The different relevant social spheres that influence students' perceptions of the environmental effects of SUPs could also be determined and were further studied to determine how and when students' perceptions are created and how they could potentially be changed. This study was a necessary step towards a better understanding of South Africa's SUP problem, which has resulted in a major pollution issue. The research focused on the root of people's perceptions concerning the negative effects of SUPs. Future research could attempt to better understand the influential factors that create the perceptions and behavioural patterns of students towards SUPs, with the aim of effecting changes in these attitudes and behaviours. The results of the study will provide future researchers with important information about students' perceptions and behavioural patterns relating to SUPs, which will inform future research on SUPs, socioecological theory, and the TPB, and will also inform policy creation at the NWU.

CHAPTER 2 LITERATURE REVIEW

This chapter identifies and summarises the relevant academic literature pertaining to the TPB and its integration within the SEM. It also considers the relevant academic literature pertaining to the negative effects of SUPs, MPs and NPs, and presents the central theoretical argument of this study and its applicability and relevance to the chosen social factors.

2.1 The Negative Effects of Single-use Plastics, Microplastics and Nanoplastics

Andrady and Neal (2009) report that polymers were used by humans as early as 1600 BC when ancient Mesoamericans started processing natural rubber into items such as bands, figurines and balls. Since then, humans have used plastics and rubbers such as natural polymers, waxes, resins and natural rubber (Andrady & Neal, 2009). The age of modern thermoplastics only began in 1839 when vulcanised rubber was invented, and polystyrene was discovered (Andrady & Neal, 2009). Crawford and Quinn (2017:19) state that while many of the popular modern plastics were created in the 1930s and 1940s, the Second World War played a large role in their advancement and popularity. Some of the most commonly used plastics were developed during the war, such as polyethylene (one of the most common plastics), which was developed for proximity fuses; acrylonitrile butadiene styrene (currently used to create Legos), which was designed for bulletproof sheets; and poly methyl methacrylate (currently used in faux leather), which was used to create taillights in cars (Crawford & Quinn, 2017:19). According to Crawford and Quinn (2017:19-20), due to the development of cheaper alternative plastics such as polyethylene plastic food containers (such as Tupperware which was trademarked in 1946 and Styropor in 1949), plastics started replacing glass and other materials as the preferred method of serving, storing and containing food and beverages at home and in the food industry. During the 1950s and 1960s, great advances were made in developing new types of plastics, which resulted in plastics being used in an increasing variety of products and services, and their use revolutionised many industries (Crawford and Quinn, 2017:20-21).

As early as 1941, the potential applications of plastic were described as “almost inexhaustible”, although plastic production was less than a million tons per year (Thompson, Swan, Moore and Vom Saal, 2009). Andrady and Neal (2009) report that during the first 50 years of the twentieth century, 15 different classes of polymers were newly synthesised. Crawford and Quinn (2017:25) and Mulder (1998:106) argued that from 1963 the plastic industry started rapidly progressing due to manufacturers attempting to develop better quality plastics with more uses. Crawford and Quinn (2017:25) state that this resulted in plastics being created with characteristics that could be used for insulation, as well as certain plastics being created whose strength rivalled certain

metals (Mulder, 1998:106). With the advent of carbon fibre-reinforced polymers, manufacturers started replacing certain metals for more convenient, improved strength-to-weight ratio and cheaper plastic alternatives (Crawford and Quinn, 2017:25). Between 1963 and 1989, a surge in dynamic research led to substantial advances in plastics research, resulting in many new plastics being created. By 1989, these new were being used for medical equipment, sterilisation, packaging, large-scale electronics, computers, household electronics and devices, housing insulation and construction, lightweight waterproofing and clothing production (Crawford & Quinn, 2017:25-28).

Thompson *et al.* (2009) stated that plastics are versatile materials. This versatility accompanied by their inexpensive production systems, lightweight composites and strength and durability made them popular across multiple industries (Thompson *et al.*, 2009). Crawford and Quinn (2017:29) argue that plastics (especially in the construction industry) were becoming increasingly popular during this period due to the cheaper material costs, as well as cheaper and less complicated production methods, while also providing other advantages in the physical construction process. Thompson *et al.* (2009) argue that these advantages included their resistance to corrosion and their exceptional thermal and electrical insulation properties. Crawford and Quinn (2017:28) further state that as early as 1976, plastics were deemed the most used material in the world.

The plastics manufacturing process causes direct pollution of ecosystems through synthetic discharges, harmful by-products and air pollution. Plastic particles are deposited into the environment through water runoff and dumping (Manzoor *et al.*, 2020:31). Mannheim (2021) reports that the life cycle of plastics can be split into different stages, with production being the first stage. Mannheim (2021) conducted a study on the life cycle of plastics, in which the production stage of plastic products was studied under the actual operating conditions, from the raw material extraction process to the end-stage product. Mannheim (2021) found that the plastic production process can produce water and air pollution, as well as fossil fuel depletion, and also reported that the pollution related to the energy and water consumption in the production stage should also be included among the environmental impacts of plastic pollution. Mannheim (2021) states that the air, ground and marine pollution potential of plastic production is substantial, but that certain processes can lower the pollution potential of plastic production by 6−7%. Harding, Dennis, Von Blottnitz and Harrison (2007) state that for the production of a bio-degradable plastic such as poly-β-hydroxybutyric acid (PHB), the pollution levels for every 1,000 kg produced are: 1,960 kg of carbon dioxide released into the atmosphere, acidification related emissions of 21.8 kg of sulphur dioxide, and eutrophication related emissions of 5.19 kg of phosphates. Furthermore, Harding *et al.* (2007), state that the largest contributors to pollution during the PHB life cycle assessment arise from the generation of electricity and steam raising. Harding *et al.*

(2007) similarly report that steam raising made substantial contributions to global warming, acidification, abiotic depletion and photochemical oxidation. The plastic pollution issue is therefore not limited to the plastics being produced and their potential as future pollutants but also includes the pollution created by their production processes and the volume of plastics being produced (Harding *et al.*, 2007; Mannheim, 2021).

In 1941 global plastic production was less than a ton per year but global plastic demand had increased to 245 million tons per year by 2008 (Andrady & Neal, 2009). By 2018, global plastic production had almost doubled to 350−400 million tons per year (Walther, Yen and Hu, 2021). Walther *et al.* (2021) estimated that up to 12.7 million tons of this plastic end up in the ocean each year, with the rest of it being recycled, landfilled, incinerated or entering other ecosystems. When these plastics enter the environment, they can cause death or injury to fauna and flora, damage to ships and structural damage to freshwater, oceanic and coastal ecosystems (Walther *et al.,* 2021).

Tokiwa *et al.* (2009) reported that a wide range of plastic products and materials are used and integrated into multiple industries and the daily lives of a rapidly growing global population. Single-use plastics are often used for packaging that will only be used once before being thrown away rather than recycled (Prata, Da Costa, Lopes, Duarte and Rocha-Santos, 2019; UNEP, 2018:2; Webb *et al.,* 2013). These throwaway plastic items include food packaging, bottles and bottle caps, straws, medication packages, cutlery, plastic plates and cups and grocery bags (UNEP, 2018:2). Macleod, Arp, Tekman, and Jahnke (2021) report that an important distinction has to be made in plastic pollution between readily reversible pollution and poorly reversible pollution. Readily reversible pollution is pollution that can be reversed at the local scale by cleanup projects, public campaigns and improved waste collection infrastructure (Macleod *et al.*, 2021). Poorly reversible pollution refers to pollution that reaches areas that are difficult, expensive or time consuming to reach as well as the weathering of plastics (the process of plastic pieces breaking into smaller pieces or fragmenting into MPs and NPs (Amobonye *et al.,* 2021:1; Macleod *et al.*, 2021). Due to the rate of plastic waste production and the time these materials can remain in the environment, plastics are considered poorly reversible pollutants (Macleod *et al.*, 2021).

Plastic pollution can be defined as the accumulation of plastic products in the environment that negatively affects human health and environmental habitats (Moore, 2023). There are three ways the human body can be exposed to MPs: inhalation, dermal contact and ingestion (Prata *et al.,* 2019). According to Prata *et al.* (2019), the negative effects of exposure to MPs in humans include chronic inflammation, immune function issues, oxidative stress, metabolic issues, cytotoxicity and neurodegenerative diseases, and they also serve as vectors for toxic chemical exposure and

harmful microorganisms. The amount of plastic produced in 1950 was around 2 million tons per year, but this amount had increased to around 460 million tons per year by 2019 (Ritchie & Roser, 2022). Ritchie and Roser (2022) report that by 2010, almost 32 million tons of plastic waste was at risk of being exposed to the marine environment and that 8 million tons of the annual plastic waste produced that year had already ended up in the ocean. Furthermore, in 2015 the rate of plastic disposal was 55%, with plastic recycling only accounting for 20% and plastic incineration accounting for 25% (Ritchie & Roser, 2022). The trend of producing and using these non-biodegradable plastics will continue due to the higher costs associated with producing biodegradable plastics (Crawford & Quinn, 2017:40).

According to Macleod *et al.* (2021), plastic pollution can be found worldwide in almost every type of habitat, including the Arctic and the deep ocean. Furthermore, Macleod *et al.* (2021) estimate that the amount of plastic pollution released into water and marine environments in 2020 (i.e. rivers, lakes and oceans) was between 9 and 23 million metric tons and that pollution loads in terrestrial habitats could be between 13 to 25 million metric tons per year. This annual pollution loading is expected to double by 2025 (Macleod *et al.*, 2021). Ritchie and Roser (2022) report that from 1950 to 2015 only 6% of the total global plastic production was recycled while 55% was simply discarded. Of the many SUPs that are produced and used, many of the most common types are recyclable, including polypropylene, polyvinylchloride, polycarbonate, polyethylene and polyethylene terephthalate (Tokiwa *et al.*, 2009:3722). Although these materials are recyclable, they are not biodegradable, with Tokiwa *et al.* (2009) emphasising that the permeation of these particles in communities and the environment is a great cause for concern. The low rate of recycling is therefore even more worrying. The effects of plastic pollution on the environment and human communities have become more of a concern because of this low rate of recycling with many new studies investigating the short- and long-term effects plastics have on the environment (Manzoor, Sharma, Sofi and Dar, 2020; Prata *et al.*, 2019; Van Raamsdonk, Van Der Zande, Koelmans, Hoogenboom, Peters, Groot, Peijnenberg and Weesepoel, 2020).

Macroplastics are plastics that are buoyant, larger than 0.5 cm in diameter and susceptible to weathering and fragmentation into MPs and NPs (Macleod *et al.*, 2021; Ritchie & Roser, 2022). Non-biodegradable plastics such as Styrofoam and similar materials such as plastic bags and containers can take thousands of years to fully degrade into MPs and NPs, while releasing particles and chemicals into the air, water-systems and farmable soil (Crawford & Quinn, 2017; Webb *et al.*, 2013). According to Ritchie and Roser (2022), 2.51 million tons of macroplastics were emitted to surface oceans in 2020 with 2.28 million tons of MPs present in surface oceans. Of the global plastic waste emitted into marine habitats, Africa is the second highest contributor, being responsible for nearly 8% of the total waste emitted into oceans in 2019 (Ritchie & Roser,

2022). It is speculated that between 80% and 90% of the plastic waste in Africa is mismanaged and is at risk of polluting terrestrial, lake, river and marine ecosystems (Okeke, Olagbaju, Okoye, Addey, Chukwudozie, Okoro, Deme, Ewusi-Mensah, Igun, Ejeromedoghene, Odii, Oderinde, Iloh and Abesa, 2022). Okeke *et al.*, (2022) further stated that Africa has the largest e-waste and waste dumpsites in the world and that five African countries constitute the 20 highest contributors to marine plastic pollution.

Rochman, Browne, Underwood, Van Franeker, Thompson and Amaral-Zettler (2016) stated that the effects of plastic waste on the marine environment are damaging and dangerous to many different ecosystems. Rochman *et al.* (2016) found that macroplastics and MPs had effects on a wide variety of animal life, causing external wounds, reduced population sizes of certain animals, perforated guts, internal wounds, biochemical and cellular changes and death in multiple different species. Plastics have also been shown to be a carrier of living species, and following a single tsunami more than 200 species were shown to have colonised debris that could lead to species invasions in other ecosystems (Macleod *et al.*, 2021). The ingestion of plastic particles has shown a variety of negative effects on megafaunal species, such as chemical toxicity, impaired feeding, reproduction, growth and oxygen consumption rates (Macleod *et al.*, 2021). Similarly, plastic pollution has been observed to cause reductions in predation rates in predators and decreased feeding rates in wildlife systems (Manzoor *et al.*, 2020; Prata *et al.*, 2019).

Macleod *et al.*, (2021) reported that plastic pollution directly affects the geophysical balance in the environment through the amount of plastics that are incinerated and in turn releases greenhouse gasses into the atmosphere. Furthermore, Macleod *et al.* (2021) warned that the indirect effects that plastic pollution has on this balance are potentially even greater than the direct effects. Plastic pollution indirectly affects the carbon cycle and disrupts the homeostasis of the marine carbon pump (Macleod *et al.*, 2021). The accumulation of neutrally buoyant microplastics in ocean water columns could disrupt the food supply and health of many marine creatures and MPs on the seabed can affect bacterial communities, which in turn would mean lower conversion rates of carbon into food for phytoplankton communities (Macleod *et al.*, 2021). This means that less carbon would be converted into oxygen, resulting in higher carbon levels in the atmosphere, adding to the dangers of global warming (Macleod *et al.*, 2021). Increases in plastic pollution can have long-term effects on the properties of soil, such as its capability to hold water, the diversity and activity of microbes, the structure of the soil and nutrient availability in the soil (Macleod *et al.*, 2021). The threat of MPs and NPs on human and environmental health has been recognised by the UNEP (2018:6), which has reported that these particles and the chemicals they release are already found in landfills, waterways, agricultural land, oceans and the air. It is estimated that 15−40% of plastic produced and discarded, will eventually be released into the ocean, which in

turn ends up compromising sea life and coral colonies, ultimately negatively affecting the food resources humans consume (Crawford & Quinn, 2017).

Statistics from 2010 show that South Africa produces 0.24 kg of plastic waste per person per day, while the country was ranked 18th in the world in terms of the mismanagement of plastic waste in 2019 (Ritchie & Roser, 2022). Similarly, by 2019, South Africa was emitting 4,226 tons of plastic waste per year into the oceans, or about 0.07 kg per person per year (Ritchie & Roser, 2022). According to Crawford and Quinn (2017), 16% of all municipal waste is plastic, with most plastics discarded within a year of being produced. In a study of over 30 bridges along the Orange−Vaal River system, MPs were found at every location (Weideman, Perold and Ryan, 2020). It is estimated that the Orange River system alone transports 1.7 tons of MPs into the Atlantic Ocean every year (Weideman *et al.,* 2020). Multiple studies over the last two decades have shown that even with the increase in plastic consumption and the dangers of plastic pollution, consumer behaviour and habits have not changed significantly and that the use of plastics and their pollution loadings are still showing rapid growth (Beggs & Zhang, 2018; Browne *et al.*, 2011; Prata *et al.*, 2019; Sierra-Vargas & Teran, 2012; Webb *et al.*, 2013).

2.2 Perceptions of Plastic Pollution

Pahl, Richter, and Wyles (2020) report that the plastic pollution problem is solely an anthropogenic issue, meaning that people are the sole reason for the problem. Furthermore, Pahl *et al.* (2020) argue that because of the underlying psychological principles in humans, it is necessary to study these behaviours, decisions and social dynamics to get a better understanding of plastic pollution and how to manage and reduce it. Soares, Miguel, Venâncio, Lopes and Oliveira (2021) argue that studying and understanding social perceptions of plastic pollution can play an important role in engaging society to provide solutions to the plastic pollution problem. Soares *et al.* (2021) found that sociodemographic variables and variables related to the perceived effects of plastic pollution could predict an individual's pro-environmental behaviour. Miguel, Santos, Venâncio, and Oliveira (2024) found that in a study of over 1,000 respondents in Portugal, 71% believed that the presence of plastics in the environment was increasing. Similarly, Miguel *et al.* (2024) found that over 80% of respondents perceived plastics as a serious threat, with around 77% of respondents stating that they were personally worried about the effects of plastic pollution. Miguel *et al.* (2024) state that although these respondents feel a personal concern for plastic pollution, they do not believe that other people share that same concern. Miguel *et al.* (2024) found that there was a statistically significant link between the concerns about plastic pollution, the perception that plastic pollution is rising and the perception that other people around them would care for the environment. The statistical tests showed that people aged 61 and older were the group with the

least concern about plastic pollution, the least perception that pollution is rising, and the greatest belief that people around them would care for the environment. This indicates that this age group had the lowest perception of the dangers of plastic pollution, and was also the age group with the biggest belief that others will care for the environment, so they do not have to (Miguel *et al.*, 2024). This suggests that people with a higher perception of the effects of plastic pollution will be more concerned about the environment and more likely to act on this concern (Miguel *et al.*, 2024).

Arulnayagam (2020) found that most of the respondents were willing to change their behaviours but found that a lack of other variables outside their control made it difficult for them to reduce their SUP use. Arulnayagam (2020:12) argues that the value of studies of the perceptions of SUPs is that they help to understand the public's willingness to change their behaviours. Furthermore, Arulnayagam (2020:12) also argues that through understanding social perceptions, tangible results can be achieved concerning reducing the use of SUPs. Miguel *et al.* (2024) also found a significant link between education and perceptions regarding plastic pollution. Miguel *et al.* (2024) found that higher levels of education were linked with a higher regard for the environment and the perception that plastic pollution is increasing and is dangerous. Dalu, Cuthbert, Muhali, Chari, Manyani, Masunungure, and Dalu (2020) argue that the awareness of the effects of pollution by students and educators plays an important role in their environmental behaviour/habits. Furthermore, Dalu *et al.* (2020) also argue that more details of the negative effects of plastic pollution need to be taught to learners at school, to help them understand and shape their perceptions of the environment.

Soares *et al.* (2021) argue that there is a need to further study the perceptions, behaviours and attitudes related to plastic pollution to obtain a deeper insight into plastic consumption behaviours. Miguel *et al.* (2024) found that 18- to 25-year-olds had a greater relative knowledge of plastic pollution than other age groups.

2.3 The Socioecological Model and the Theory of Planned Behaviour

This section will discuss the two different theories used in this study. It will describe and explain the theories, the key concepts within them, and why these theories apply to this study. The section will also end with an explanation of how the two theories were integrated in the context of the study.

2.3.1 Socioecological Model/Theory

Härkönen (2007) developed an ecological framework for human development that uses SEMs. This theory stemmed from Bronfenbrenner (2005), who noticed that by looking at social

addresses (i.e. the environment of the individual) and the person−context model (i.e. personal attributes of the individual) a better model can be created. Using these concepts in conjunction with each other, a new model was created that not only considers the environmental aspects of the individual but also their personal attributes and how the different aspects from both sides share interrelationships with each other. This socioecological theory or SEM suggests that to fully understand human development, the environment surrounding the individual must be considered (Bukatko & Daehler, 2003). The SEM states that the individual's environment is shaped and influenced by development and socialisation (Härkönen, 2007:6-7). Socialisation, according to Damon, Lerner and Eisenberg (2006:7), includes an individual's motivation and ability to acquire individual and shared cultural competencies, at an emotional, cognitive and social level. Socialisation thus forms part of how an individual reacts and learns how to respond to their environment and forms part of their autonomous regulation (Damon, Lerner, and Eisenberg, 2006) Bukakto and Daehler (2003:501) argue that a child can influence their environment by better socialising. By negotiating (interactions that teach new social, cognitive and emotional competencies) with parents or other influential characters, an individual can learn to change the environment they are in using these new competencies (Bukatko & Daehler, 2003:500-501; Damon *et al.,* 2006). Bronfenbrenner (2005) used this to create a new model that takes these and other principles to create a framework where positive social development or lack thereof can be studied from a more ecological perspective rather than a biopsychological approach. There are three important assumptions of this theory: 1) the individual must be an active influence in their environment, whether intentional or not; 2) the individual must be compelled by their environment to adapt to the restrictions and continuous conditions present; and 3) the environment is comprised of different sized entities (called systems or spheres) that are interrelated through reciprocal and bidirectional relationships, with these systems classified by their sizes: micro-, meso-, exo- and macrosystems (Bukatko & Daehler, 2003; Härkönen, 2007:6). There are three assumptions made in this theory that need to be considered (Bukatko & Daehler, 2003; Härkönen, 2007).

The first assumption states that all individuals have an influence on the environment whether intentionally or not; even when trying to not actively influence their environment, they inadvertently influence it (Bukatko & Daehler, 2003; Härkönen, 2007). Härkönen (2007:7) states that within the microsystem, the influences come in two forms, from the individual or towards the individual. This means that the active influence on the environment is reciprocal between the individual and their environment and that even no action from the individual is still considered to be an action within that sphere (Härkönen, 2007).

The second assumption states that the environment must compel the individual to adapt to the restrictions placed on them by the environment. In this type of systems theory, Bukatko and Daehler (2003:499-500) argue that individuals will attempt to remain in an equilibrium or homeostasis within their home life. Given the ever-changing nature of society, individuals will be forced to make changes to their behaviour to maintain their home equilibrium (Bukatko & Daehler, 2003). This means that whether they remove themselves from their environment or make changes to their behaviour, their environment compels them to change.

The third assumption states that there are interrelated relationships between the individual and the different systems, with the relationships being reciprocal or bi-directional. There are differences in the nature of the interactions between them and there is no guarantee that the interactions between two different spheres and the individual or other groups are the same (Härkönen, 2007). This assumption means that there are relationships where the individual affects a sphere, where a sphere affects the individual, or where two spheres interact with each other and indirectly affect the individual and many others (Härkönen, 2007). For example, this assumption can mean that a change in the individual's macrosystem, while not directly affecting their environment, will have some effect on the individual, either direct or indirect (Härkönen, 2007). Townsend and Foster (2011) found that the macrosystem affected students' healthy eating behaviours, even though the students did not have direct interaction with or were influenced by the macrosystem. While these assumptions might seem to ignore individuals who attempt to avoid interaction with or influence from their environment, in the context of this study, the assumptions do still include those who do this. Therefore, at least at the microsystem level, these assumptions are still valid. This means that even individuals who strive to avoid interacting with or influencing their environment inadvertently impact it through their actions

The microsystem is defined by Bronfenbrenner (2005:148) as the interpersonal relationships, roles and activities that are experienced by a developing individual in any face-to-face situation with particular physical and material features as well as comprising other persons with distinctive or defining characteristics of systems of belief, personality and temperament. The physical and material features could be sex, age and health status, while the material features could be an individual's cognitive ability, for example, the ability to recognize that they are at risk of heat illness while in the sun (Bernhardt & Amiri, 2024:4). Furthermore, Poleshuck, Perez-Diaz, Wittink, ReQua, Harrington, Katz, Juskiewicz, Stone, Bell and Cerulli (2019:1002) reported that important aspects in this sphere can include the relationships between the individual and their friends, neighbours and family members. The microsystem is the most direct and immediate setting that affects the individual and includes the household's members, the house they live in, and any direct educational and social circumstances such as the school, its teachers, the neighbourhood and

the individuals' friends in the neighbourhood (Bukatko & Daehler, 2003:30). The bi-directional influences at this level have the greatest impact on the individual and set up the individuals core environment as a reference point for the rest of their life (Bukatko & Daehler, 2003:499).

The mesosystem is compromised of the processes and links that take place between multiple settings that contain the developing individual (Bronfenbrenner, 2005:148). The mesosystem is defined by the interrelationships of different microsystems or is simply a system of interrelated microsystems containing the individual (Bronfenbrenner, 2005:148; Bukatko & Daehler, 2003:30; Härkönen, 2007:10). Poleshuck *et al.* (2019) state that the mesosystem is representative of the larger community in which the individual and their environment are located. Furthermore, Poleshuck *et al.* (2019), state that this can include systems like the healthcare system or healthcare providers within the system. Bernhardt and Amiri (2024:4) stated that the mesosystem is comprised of the network and social system of others involved with the individual. This system can include an individual's education level or socioeconomic status within the social system (Bernhardt & Amiri, 2024). For example, Bernhardt and Amiri (2024) found that an individual's socioeconomic status can influence their ability to access healthcare systems when suffering from heat illness, and that their education level can constrain their options to avoid jobs that put them at risk of heat illnesses.

The exosystem can be defined as the processes and linkages between multiple settings, with at least one of these settings not ordinarily containing the individual, but is a location where events take place that will affect or influence the individual's immediate setting (Bronfenbrenner, 2005:148). This system is comprised of microsystems that have direct or indirect influences on the individual's development, such as economic, political or social influences that affect the individual and their immediate setting (Bukatko & Daehler, 2003). Bernhardt and Amiri (2024) explained that this system consists of different groups or microsystems that have come together to provide a predetermined function. They further explain that this can include workplace settings where the individual is exposed to the elements and that this organization may or may not have requirements in place to protect the individual from the elements (Bernhardt & Amiri, 2024). The exosystem is therefore also known as the organizational system (Bernhardt & Amiri, 2024). In a study on healthy eating in schools, Townsend and Foster (2011) found that the school at an organisational level (exosystem), explained more dependant variables affecting unhealthy eating than the school at the community level (microsystem). This suggested that the programs on healthy eating that the school implemented had an influence on children's healthy eating habits even though it was not a part of their direct community (Townsend & Foster, 2011).

The macrosystem is broadly explained by Bronfenbrenner (2005:149-150) as a blueprint for society as it relates to specific “cultures, subcultures and other broader social context”. The macrosystem is defined by the micro-, meso- and exosystems that characterise a specific culture, its subcultures and its other social contexts with reference to the developmentally instigative resources, opportunity structures, hazards, lifestyles, belief systems and the social interchange norms that form these systems (Bronfenbrenner, 2005:150). The macrosystem includes the cultural, legal, political and economic systems that are present in an individual’s life. These can have direct or indirect influences on the individual, without the need for a reciprocal influence from the individual (Bukatko & Daehler, 2003:30; Härkönen, 2007:10; Hertler *et al.*, 2018). Stanley and Kuo (2022:8) showed how this system is used in social research, by examining a study that used SEM to research how parental involvement affects family−school communication. The study found that children educated through collaborative efforts by their parents had better family−school communication, than those who were taught through traditional authoritarian approaches (Stanley & Kuo, 2022:8).

The chronosystem, as reported by Bronfenbrenner (2005), is a social sphere added to socioecological theory to account for different time periods in an individual’s life. Socioecological theory suggests that different spheres may have different degrees of influence on an individual at different times in their life. This suggests, for example, that the macrosystem might have a more prominent role in an individual’s life when they are a student in university than it had when they were a young child. In this study, this system was also included and investigated. Bronfenbrenner (2005) also introduced substructures in the chronosystem, namely, micro-time, meso-time and macro-time. The micro-time substructure refers to the duration and quality of time spent between the individual and their families, schools and communities, which directly affects the student’s development and learning (Stanley & Kuo, 2022:9). The meso-time substructure is defined by the extent of interactions between stakeholders over time (Stanley & Kuo, 2022:9). This substructure helps us to understand the outcomes of partnerships and social cohesion on different time scales, such as days, weeks, months or years (Stanley & Kuo, 2022:9). The macro-time substructure is defined by the factors that affect the stakeholders over generations or a lifetime (Stanley & Kuo, 2022). Stanley and Kuo (2022) further reported that this substructure can be used to address the macrosystem’s intrinsic concepts (such as the economic, cultural and social dimensions) in the expected changes over a specified period. Stanley and Kuo (2022:9) showed how this chronosystem can be used, using the example of measuring the expected changes in education between individuals from Generation Z and Millennials. Their study showed that students from different generations had different goals and levels of willingness to change industries during their careers (Stanley & Kuo, 2022:9).

The SEM's spheres provide a broad spectrum of systems that influence an individual's perceptions of the negative effects of plastic pollution. Socioecological theory is an excellent method for determining which systems have the most influence on an individual and can be used to propose potential future studies of these systems. Using this theory, this study considered not only the individual's perceptions but also which social factors had the most influence on the individuals' perceptions. The SEM can inform this and future studies by highlighting which social factors have the biggest impact on students' perceptions of the negative effects of SUPs.

This theory examines the individual and then branches outward to better understand the larger social settings that affect the individual and which parts of these social settings have the largest effects on the individual.

2.3.2 The Theory of Planned Behaviour

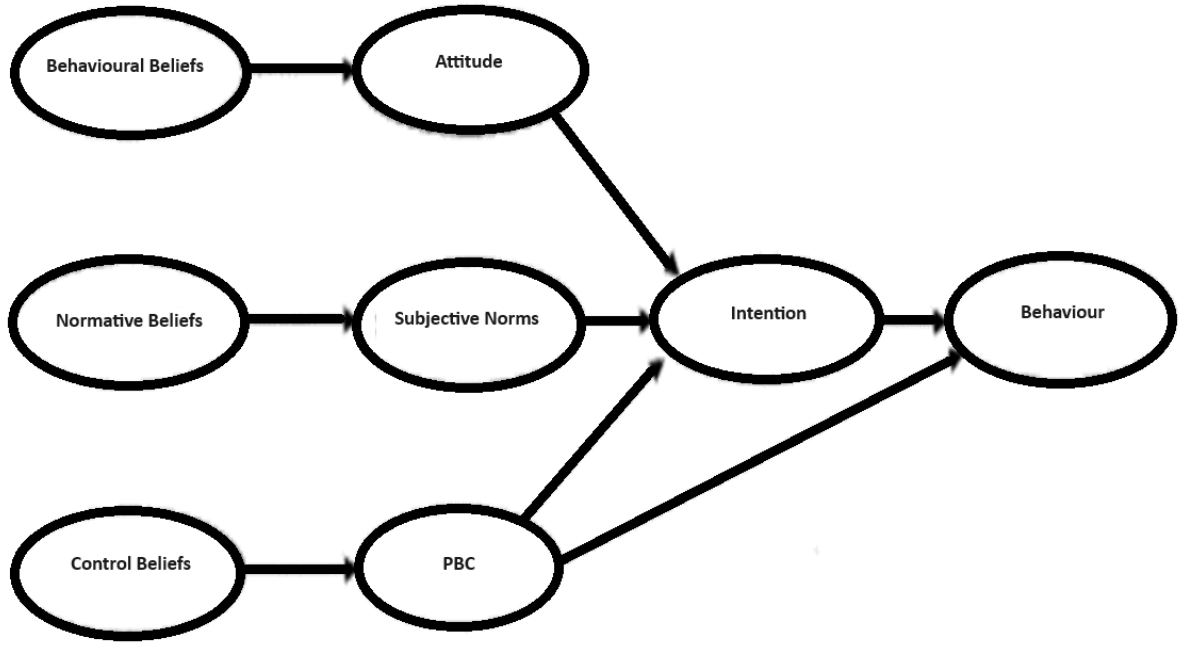
The TPB states that to determine, explain and predict the behaviour of individuals, the intentions behind the action need to be studied (Ajzen, 1985; Armitage & Conner, 2001). The TPB was developed by Icek Ajzen, in 1980 and built on the TRA (developed in 1975) by incorporating the notion that perceived behavioural control (PBC) should also be considered when studying the actions of people (Ajzen, 1985; Armitage & Conner, 2001). Perceived behavioural control is defined as the perception held by an individual that they have control over the intentions, actions and outcomes of their actions (Ajzen, 1991). Alternatively, it is defined as an individual's perception of the difficulty or ease of performing the action or behaviour they are considering (Ajzen, 1991:183). The TRA explains and predicts volitional behaviour by studying the relevant determinants and referents behind an individual's perceived volitional control (Ajzen, 1985). The TRA argues that volitional behaviour is determined by an individual's willingness to or not to engage in a certain behaviour and that this is determined by their intent to do so (Ajzen, 1985). The TRA was developed as an improvement of the information integration theory, and to create an improved theory for studying the connection between attitude and behaviour (Fishbein & Ajzen, 1975). Fishbein and Ajzen (1975) wrote a book with the intent of providing a diverse base of empirical and theoretical literature on the topic of the attitude−behaviour concept, and to make it easy to read and understand, even when the reader does not have a background in attitude research. This led to them creating the TRA and publishing it in the aforementioned book as a theory that can be widely and easily used and applied to study attitudes and behaviours (Fishbein & Ajzen, 1975).

The TPB takes the principles of the TRA and adds to it, suggesting that the individual's social behaviour is determined by their intent, ability to weigh internal and external factors, and by the skills and the ability they have to control an action to ensure a successful outcome (Ajzen, 1985; Armitage & Conner, 2001; Conner & Armitage, 1998). The TPB thus added the concepts of control belief and PBC to the TRA (Armitage & Conner, 2001). Control beliefs are the set of beliefs that lead to the PBC (Armitage & Conner, 2001). Perceived behavioural control then influences not just the individual's intent, but also their behaviour itself (Armitage & Conner, 2001:472). The element of PBC was included to help predict and explain actions that are not actually in the individual's volitional control but are perceived to be (Armitage & Conner, 2001). In a study of energy conservation, Arya and Chaturvedi (2020), used the TPB and PBC to research people's energy-saving behaviour. By asking subjects to respond to statements such as "I can reduce my energy use quite easily" to determine the individual's PBC, Arya and Chaturvedi (2020) included PBC measurements in the attitude and subjective norm measurements of their TPB research model.

Figure 2.2.1 shows how the TPB is structured from behavioural beliefs, normative beliefs and control beliefs and how they lead to intent and behaviour (Armitage & Conner, 2001:472). Behavioural beliefs are the individual's personal intention to perform an action and are weighted by their attitude (or the degree to which they feel positive or negative towards that action) (Armitage & Conner, 2001). Behavioural beliefs can be described as the belief an individual holds that exercising will improve their physical fitness (Ajzen & Schmidt, 2020). Normative beliefs are the beliefs held by the individual that were formed by the norms in their environment with the subjective norms giving weight to the influence it has on their behavioural intention (Armitage & Conner, 2001). There are two types of normative beliefs: injunctive and descriptive normative beliefs (Ajzen & Schmidt, 2020). Injunctive normative beliefs are the subjective probabilities or expectations that a specific individual or group would approve or disapprove of the behaviour (Ajzen & Schmidt, 2020). These individuals or groups can be friends, family, partners, supervisors, or others close to the individual (Ajzen & Schmidt, 2020). Descriptive normative beliefs are the perceptions of whether other important people in the individual's life are also engaging in these behaviours (Ajzen & Schmidt, 2020). Both beliefs make up the overall perceived pressure the individual feels from society to engage in certain behaviours and subjective norms (Ajzen & Schmidt, 2020). Control beliefs are the beliefs that lead to PBCs, or the beliefs an individual has that they can control the outcome of a proposed action (Armitage & Conner, 2001). Control beliefs relate to the presence of factors that can impede or facilitate the behaviour (Ajzen & Schmidt, 2020). These control factors include the skills, resources and ability needed to perform the behaviour successfully (Ajzen & Schmidt, 2020). Control beliefs are thus

defined as the individual's subjective perception of the probability that a certain inhibiting or facilitating control factor will be present in the situation where the behaviour takes place (Ajzen and Schmidt, 2020).

Figure 2.2.1: The Theory of Planned Behaviour



Source: Armitage and Conner (2001: 472)

The TPB uses these three beliefs to determine the attitudes, subjective norms and PBC of the individual (Ajzen & Schmidt, 2020). These are used to predict the intentions and behaviour of the individual according to the TPB (Ajzen & Schmidt, 2020). The TPB considers the differences between normative and behavioural beliefs to explain and predict volitional behaviour (Conner & Armitage, 1998). The perception towards the behaviour and the perceived social norms of the individual that relate to the behaviour is what determines the intention that leads to the behaviour (Ajzen, 1985). Generally, in the TPB, positive attitudes and supporting subjective norms will motivate the individual to perform the behaviour, given that the PBC also supports the attitude and subjective norms (Ajzen & Schmidt, 2020: 21). Ajzen and Schmidt (2020) argue that to some extent, the PBC moderates the attitudes and subjective norms of the individual when their intent is forming. Willis *et al.* (2020) argues that the TPB uses different relating factors of the group or individual to reliably predict and explain how these factors affect the group or individual's intentions and their behaviour. Furthermore, Willis *et al.* (2020) stated that a broad range of factors can be used as indicators to be studied, such as media exposure, education and their immediate environmental circumstances. In a study of religious entrepreneurial behaviour, Agu, Okereafor, Omotosho, Okocha and Uche (2023) used the TPB and found that multiple factors such as

economic status, employer/employee relationships and support from others were factors that influenced their religious entrepreneurial behaviours. Using the TPB, Ogiemwonyi, Harun, Hossain and Karim (2023), found that green culture (i.e. the culture of protecting the environment through behaviour) and attitudes were the two biggest social factors that contributed to environmentally "green" behaviour.

The TPB is therefore an excellent method for studying different social factors and how they affect perceptions and behaviours. The TPB will help determine which social factors have the largest influence on an individual's behaviour. In this study, this theory was used to study different social factors in the context of different social spheres, and the degree of relevancy each of these factors had within these social spheres. The TPB can determine which social factors are the most relevant within the most relevant social spheres as determined by the SEM and will therefore indicate which of these should be studied in future research.

2.3.3 Integrating the Socioecological Model and Theory of Planned Behaviour

The purpose of using two theories in this study was so that one could inform the other. As such, this study used the TPB enclosed within the SEM. In this way, the TPB helped to inform the data collected within the SEM. This means that if data was collected from within the microsystem of the SEM, the TPB could be used to better explain the data within that system. In the context of this study, this might mean that where the data suggested that a specific type of mesosystem had a large influence on students' perceptions towards the negative effects of SUPs, the TPB could be used to determine which of the chosen social factors had the largest influence on the individuals' perception. Using the TPB framed within the SEM is a useful approach that has been used in sociological, psychological and health studies in recent studies. Hiensch, Peeters, Jansen, Van der Wall, Backx, Velthuis and May (2020); McCormick, Porter, You, Yuhas, Reid, Thatcher and Zoellner (2021); Ngwenya, Nkosi, Mchunu, Ferguson, Seeley and Doyle (2020); and Willems, Verbestel, Calders, Lapauw and De Craemer (2023) obtained positive results using this approach. These studies found that using the TPB to determine specific factors within larger socioecological systems made it possible to better and more accurately determine which factors had the largest influence on an individual's actions. For example, McCormick *et al.* (2021) used the SEM and TPB to study the factors associated with sugar-sweetened beverages among adolescents and found that multiple factors from both the TPB and SEM were indicators for the increased consumption of these beverages. Behavioural intentions (TPB), PBC, caregiver rules (microsystem/SEM) and home availability (microsystem/SEM) were some of the factors identified as strong indicators of the increased consumption of sugar-sweetened cooldrinks among the adolescents (McCormick *et al.*, 2021). Ngwenya *et al.* (2020) used constructs from the TPB and

SEM to study the factors that influence the use of and access to health services by youth in rural KwaZulu-Natal, and identified multiple behavioural (TPB) and social (SEM) factors that greatly influenced the youth's access and utilisation of health services. They found that normative beliefs (TPB) had a large influence within the mesosphere (SEM) when it came to young people's use of and access to health services (Ngwenya *et al.*, 2020).

2.4 The Central Theoretical Argument and the Chosen Social Factors

This study used the SEM and the TPB as the theoretical basis of the study, with one informing the other as explained earlier. The chosen social factors that were used were Value Orientation, Awareness of pollution, Exposure to Media, Role models and Exposure to pollution. These factors were chosen to provide a broad range of socio-demographic variables, they can be easily applied to the chosen demographic and studying them will pose little risk to the respondents. Each of these factors also aligned with the spheres of the SEM theory and could be used as indicators for the TPB theory. Thus, these factors were chosen because they could be used in conjunction with the two theories being used. Oturai, Pahl and Syberg (2022) report that studying perceptions and behaviours can be an effective tool in affecting plastic consumption through improvements in "waste handling" and obtaining a better understanding of plastic pollution from a sociological viewpoint. The two theories being used, and the social factors chosen were specifically geared towards exploring societal perceptions and behaviours. Using these two theories, the stud, attempted to determine which socioecological systems had an effect on students' perceptions towards the negative effects of SUPs; and which TPB beliefs, actions and PBCs were most strongly related to the social factors. Using the TPB within the scope of the SEM, the most relevant social factors within the different social spheres could be highlighted to show which spheres had the most relevant effect on the perceptions towards SUPs.

The following subsections explain the five different social factors that were chosen for this study. The subsections also explain how they relate to the two theories being used in the study.

2.4.1 Value Orientation

According to Maye, Kirwan and Brunori (2019), individual values play a role in shaping the ethical considerations associated with the use of SUPs. Maye *et al.* (2019) found that the presence of values of responsibility towards the environment was connected to individuals being more likely to use reusable coffee cups rather than single-use cups. Furthermore, Maye *et al.* (2019) found that individual values that formed larger ethical values played an important role in corporate policies on SUPs. UNEP (2018) found that countries where environmental values are taught are more likely to implement strategies that combat pollution. Kim and Koo (2020:9) found a positive

correlation between pro-environmental behaviour and an individual's value orientation. Kim and Koo (2020:9) also found that egoistic, biospheric and social-altruistic values in individuals can influence their attitudes and behaviours towards the environment. Furthermore, Kim and Koo (2020:9-10) argue that the expected positive or negative effects and empathic concerns stemming from environmental behaviours are linked to their value orientation, and as such their value orientation directly affects their willingness/unwillingness to protect the environment. O'Brien and Thondhlana (2019) took this a step further and argued that pro-environmental values are an absolute prerequisite for involvement in environmental programmes, and that no person will form part of an environmental programme without pro-environmental values. O'Brien and Thondhlana (2019) also argued that certain value orientations and values result in pro-environmental actions. Furthermore, O'Brien and Thondhlana (2019) argued that the most effective way to promote pro-environmental behaviour is to create incentive-based programmes that promote the value orientations that result in pro-environmental actions.

In the context of this study, this social factor formed part of the microsystem. The research aimed to investigate whether this factor influenced the students' perceptions of the negative effects of SUPs. As mentioned in the studies above, this social factor also played a part in the students' behaviours towards the environment and as such formed part of the TPB. This factor was examined through the TPB and SEM to determine the scale of the effect it had on the students' perceptions of the negative effects of SUPs.

2.4.2 Awareness of Pollution

Van Rensburg *et al.* (2020:6) suggest that a higher awareness of pollution results in a lower tendency to use SUPs. Van Rensburg *et al.* (2020) argue that individuals with a higher awareness of environmental pollution problems will be less likely to pollute or use SUPs. UNEP (2018:19) states that awareness programmes are a key element in reducing plastic pollution. UNEP (2018:19) further argues that a higher awareness of plastic pollution in a community leads to higher success rates in future strategies for minimising plastic use. Soares *et al.* (2021) argue that an awareness of the effects of plastic pollution is strongly associated with pro-environmental behaviour. Similarly, Miguel *et al.* (2024) found that awareness of pollution had a strong correlation with respondents' concerns for the environment. Dalu *et al.* (2020) found that primary and high school students were being taught about the dangers of plastic pollution, but that there was a need for further and more in-depth teaching to help improve students' knowledge and awareness of the effects of plastic pollution. Dalu *et al.* (2020) similarly stated that environmental programs should be developed with a focus on teaching students about the interactions between natural habitats and human activity. Furthermore, Miguel *et al.* (2024) found that a higher

awareness of pollution correlated with a stronger concern for the environment. Arulnayagam (2020) found that studying the public's awareness of pollution helped inform government policy regarding the management of plastic pollution.

This social factor has an effect on people's attitudes or perceptions towards the environment and as such fits in with the behavioural beliefs (attitude) of the TPB. Similarly, this factor fits into the micro- and mesosystems of the SEM. It will be used to inform the study by studying how this social factor affects the behavioural beliefs and aforementioned systems in the contexts of the TPB and SEM.

2.4.3 Media

Czajkowski, Hanley and Nyborg (2017) stated that in the case of recycling, societal norms and pressures contribute to the environmental habits of individuals. Henderson and Green (2020:4) concluded that media exposure plays an important role in people's perceptions and attitudes towards plastic pollution. Henderson and Green (2020) also concluded that while most of their participants had been exposed to the realities of plastic pollution through the media, in many of the participant's responses the media had created the perception that while plastic pollution is a threat, it is a far-away threat that is not present in their area. Henderson and Green (2020:5) further stated that most of the media coverage portrays marine plastic pollution as large areas of floating plastics and as such many of the participants were not informed of the dangers of MPs and NPs, with many participants not even aware of their existence. Furthermore, Henderson and Green (2020:5) found that the most provoking tactic used by the media was that of using photos of so-called charismatic animals choking and suffering due to the ingestion of plastic pollutants. Contrary to Henderson and Green (2020), Ho, Liao and Rosenthal (2014) found that media dependency and media attention were related to positive intentions for green buying behaviours. Furthermore, Ho *et al.* (2014) state that interaction with and dependency on mass-media consumption is positively correlated with environmentally friendly behaviour. Hamid, Ijab, Sulaiman, Anwar and Norman (2017) state that social media can be used as an environmental tool to improve environmental behaviours and teach new green behaviours to students. Wang and Zhang (2021) state that the media serves as a watchdog over the pollution practices of firms by putting pressure on them in the public eye. Furthermore, Wang and Zhang (2021) found that firms whose pollution practices are in the public eye are more likely to make green acquisitions (investments in sustainable and/or natural industries), especially when their profitability indicators are lowered.

This social factor fits into the spheres of the SEM and as stated above influences the behaviours of people in line with the TPB. In this study, the media was researched in the context of the SEM

and TPB to determine the scale of influence it had on students' perceptions of the negative effects of SUPs.

2.4.4 Role Models

Henderson and Green (2020:6) state that the influence of role models had a large impact on the participation and acceptance of possible solutions to reducing SUPs. Sandu, Takacs, Suaria, Borgogno, Laforsch, Löder, Tweehuysen, and Florea (2020) state that using people who are respected and known by individuals to act as pro-environmental role models in educational programmes is an effective way to promote these behaviours in people. Furthermore, Sandu *et al.* (2020) state that having persons in similar local, demographics acting as role models is an effective way to encourage local citizens to participate in protests and pro-environmental demonstrations. Unfortunately, the opposite is also true, with Löfström, Richter, and Nesvold (2021) stating that role models that portray negative environmental behaviours are just as effective in creating dangerous environmental behaviours in the individuals who look up to them. Furthermore, Löfström *et al.* (2021) argue that choosing positive role models is an important responsibility for all individuals to combat the negative effects of plastic pollution. Henderson and Green (2020:10) also stated that government and government institutions as statutory bodies play an important role in setting a precedent for the population to follow, as well as implementing and enforcing the laws and practices designed to help protect against plastic pollution.

In this study, role models as a social factor were researched in the context of the SEM and TPB to determine to what extent they affect students' perceptions of the negative effects of SUPs. This enabled a determination of the importance of having role models with pro-environmental behaviours in students' lives.

2.4.5 Exposure to Pollution

Wray-Lake, Flanagan and Osgood (2009) state that environmental pollution affects the attitudes and behaviours of individuals, and argued that the amount of exposure to pollution affects their perceptions and habits. Van Rensburg *et al.* (2020) argue that a higher level of exposure to plastic pollution leads to a higher concern for environmental issues and reduced use of SUPs. Werder, Sandler, Richardson, Emch, Kwok, Gerr and Engel (2019) similarly found that participants who had previous exposure to plastic pollution were more likely to adjust their environmental behaviours in future to avoid the negative effects they experienced themselves. Multiple studies have suggested that exposure to plastic pollution affects individuals' actions and habits towards environmental issues (Eyu & Aliu, 2013; Van Rensburg *et al.*, 2020; Wray-Lake *et al.*, 2009). These studies suggest that individuals with higher levels of exposure to pollution will be more

likely to have more positive environmental perceptions, and will be more environmentally friendly and vice-versa (Eyu & Aliu, 2013; Wray-Lake *et al.*, 2009). Kerber and Kramm (2022) found that exposure to visible pollution is related to higher degrees of pro-environmental behaviours. In their study relating to the perceptions of plastic pollution, Kerber and Kramm (2022) found that a higher exposure to plastic pollution and ineffective plastic waste governance were linked to a higher degree of awareness about the risks of plastic pollution as well as a higher degree of awareness about effective and ineffective waste governance systems. This indicates the importance of studying exposure to pollution as a social factor that influences society's perceptions and awareness of the risks relating to the dangers of plastic pollution.

This social factor was an indicator of the TPB and a representation of the micro- and macrosystems of the SEM. By studying this factor, the effects that exposure to pollution has on students' perceptions of the negative effects of SUPs could be determined.

By focusing on the spheres of the SEM and using the indicators of the TPB, this study aimed to determine how students' perceptions of the negative effects of SUPs are formed and which of these spheres and factors had the largest effect.

CHAPTER 3 RESEARCH METHODOLOGY

3.1.1 Introduction

This study followed a quantitative research approach. Using quantitative research, the study investigated students' perceptions towards the environmental effects of SUPs, at the NWU, PC. This study also used quantitative data collection methods, in this case a survey, to gather data. The survey gathered quantitative data regarding social spheres. The questionnaire included baseline questions to help aid the analysis concerning the TPB and SEM. The analysis of the quantitative data was used to determine whether there was a relevant correlation between the chosen social factors and the central theoretical argument. The TBP and SEM were integrated and used to identify any relevant correlations between the relevant social spheres and the reasoned actions and intentions of individuals towards the chosen social factors. Creswell and Creswell (2023:72) state that a quantitative theory is a set of interrelated variables, propositions, and definitions that present a systematic view of phenomena by specifying the relationships between variables to explain and predict natural phenomena. In this definition, a quantitative theory needs a purpose and a procedure (Creswell & Creswell, 2023). In the case of this study the purpose was to explain the perceptions of students towards the environmental effects of SUPs and the procedure was to study the relationships between the different social factors that were chosen. In this way, this research could be classified as a quantitative approach, with the goal of interpreting and explaining the perceptions of students.

3.1.2 Research Approach

Quantitative research explains phenomena by collecting numerical data and analysing it through mathematical and statistical methods (Sukamolson, 2007). Sukamolson (2007) also defines quantitative research as social research that uses empirical methods and statements. According to Goertzen (2017), quantitative research has six key characteristics: numbers are used to deal with information; the data is quantified and measurable; the research aims are to be objective; statistical analysis is used to evaluate findings; variables represent the complex problems and results are compared, generalised and summarised. The different types of quantitative research include survey research, experimental research, casual-comparative research and correlational research (Sukamolson, 2007). In this quantitative study, a survey research design was applied. Ponto (2015) defines surveys as a method for gathering information from a sample of people through asking questions and collecting their responses. Survey research collects information through responses to a questionnaire from a sample of individuals (Sukamolson, 2007). This type

of research is reliant on effective sampling and questionnaire design to measure, with statistical precision, the characteristics of a population (Sukamolson, 2007).

Quantitative research has multiple different approaches that can divided into two classifications; experimental and non-experimental (Edmonds & Kennedy, 2017). This study will be a non-experimental quantitative study. Some examples of different approaches in non-experimental quantitative research are an observational approach, an ex-post facto approach, and a survey approach (Edmonds & Kennedy, 2017). According to Edmonds and Kennedy (2017), the survey approach is the most widely used method of non-experimental research. This study followed a cross-sectional design to present the data of the study at one particular point in time.

The quantitative approach enables theories to be tested by the examination of relationships between different variables (Creswell & Creswell, 2018). The fixed structure of a quantitative research study consists of the following: Introduction, Literature Review and Theories, Methodology and Research Design, Results and Conclusions (Creswell & Creswell, 2018). A quantitative study uses statistical, numerical or mathematical analyses of data that was collected through questionnaires, surveys, polls or existing data (Babbie, 2016). A quantitative design means that theories can be tested or verified, variables to be studied are identified, variables are related to each other in hypotheses or questions, standards for reliability and validity are used, and information is observed and measured numerically (Creswell & Creswell, 2023). A quantitative study allows a researcher to study or search for correlations between different defined variables and in the case of this study for correlations between different sociological theories and social factors (Babbie, 2016). According to Creswell & Creswell (2018), this type of research design has built-in methods to protect against bias and methods for controlling alternative or counterfactual explanations found in the data.

These methods and research designs flowed from a theoretical model that deliberately incorporated the influence of contextual factors on perceptions, and as such enabled the research to study the influence of factors that are imbedded in the living and study environments (contexts) on the perceptions of SUPs. This theoretical model identified the different contexts and as such enabled the identification of the different relevant contexts that pertain to students' perceptions of the use of SUPs, as well as helping to identify relevant measures that can be used in the survey. The theoretical model incorporates the TPB and the SEM. Questions were designed to relate either to the different social spheres of the SEM or the respondents planned behaviour aspects. Questions relating to the TPB were designed to determine the aspects of an individual's reasoned action or planned behaviour and their relationship to their perceptions of the effects of SUPs. Questions relating to the SEM were designed to determine respondents' relation to the chosen

social factors as they each represented aspects of the different spheres of the SEM. A pilot study was conducted to improve the reliability and validity of the questions. Questions that were unreliable or did not receive valid responses were modified to more effectively reflect the theoretical model on which the questions were based.

3.1.3 Research Design

The research design for this study was a survey. In sociology, surveys are one of the oldest tools available for researchers to collect data (Babbie, 2016:247). A survey is a quantitative research method that uses a questionnaire with questions that relate to the research subject (Gürbüz, 2017). Survey research has a cross-sectional design that uses tools, such as a structured questionnaire, to collect data with more than one variable at a single point in time, which are then used to detect patterns of association (Bryman, 2012). Babbie (2016) states that surveys are frequently used to observe a sample of respondents by administering a standardised questionnaire to them. Surveys are an excellent method for sampling a large population and for studying orientations and perceptions (Babbie, 2016; Bryman, 2012). Gürbüz (2017) states that for a survey to be accurate and useful, it needs to adhere to the following criteria: the variables created by the researcher must be measurable in an understandable form; the respondents must not influence the survey; the answers by respondents must be truthful and accurate; the respondents must have the correct understanding of the questions; the respondents must not know the hypotheses and purpose of the research; and the status of the interview and interviewer must not influence the respondents. In quantitative research, a survey design gives a quantitative description of the attitudes, opinions and trends of a population, or tests for associations between variables of that population (Creswell & Creswell, 2023). Survey design can be longitudinal or cross-sectional and uses questionnaires or structured interviews to collect data and generalise from a sample to the population (Creswell & Creswell, 2023). Furthermore, Creswell and Creswell (2023) state that survey designs can help answer three types of questions: descriptive questions, questions about the relationship between variables and questions about predictive relationships. This study will study descriptive questions and the relationship between variables.

According to Gürbüz (2017), the disadvantages of using a face-to-face survey method are: any faulty behaviour by the interviewer can affect the interview; paid pollsters may fill in the survey with false information; reaching respondents may be time-consuming; and it does not control the interviewers' personal bias. The advantages of this type of survey, according to Creswell and Creswell (2023), are: this method is more flexible than others when it comes to providing control and clarifying questions; it provides the opportunity to provide cooperation with the respondent; it

provides the opportunity to make observations; it provides the opportunity to ask respondents questions for more detailed information; and it provides high answering rates.

Gürbüz (2017) states that four important errors need to be avoided when doing survey research. These four errors are content, sampling, measurement and non-response errors (Creswell & Creswell, 2023; Gürbüz, 2017). A content error occurs when the sample of the survey is not stratified and does not accurately represent the population (Gürbüz, 2017). This means that the generalisability of the results is reduced (Gürbüz, 2017). There are three types of sampling errors. The first type of sampling error arises when the researcher is unable to reach the target sample (Gürbüz, 2017). The second type occurs when respondents incorrectly withdraw or are incorrectly withdrawn from the survey sample (Creswell & Creswell, 2023; Gürbüz, 2017). The third type arises when respondents intentionally hide accurate data (Gürbüz, 2017). A measurement error then happens at the data collection stage (Creswell & Creswell, 2023). This type of error is noted when respondents give conflicting answers to questions that should be similar to each other (Creswell & Creswell, 2023). This error means that there might be mistakes with the interviewer, the chosen survey method, or the respondents. A non-response error is when respondents refuse to answer the questions given to them (Creswell & Creswell, 2023; Gürbüz, 2017). All four of these errors need to be addressed before, during and after the survey process to ensure that the data collected is accurate and relevant (Gürbüz, 2017).

Surveys are an appropriate research design for this study where there is a large population and perceptions are being studied. Surveys are a data collection technique where a respondent answers multiple questions with the intent to gather data on a topic and determine whether patterns are found in the data (Babbie, 2016; Bryman, 2012). There are multiple methods available to create a survey (Babbie, 2016). In this study the method selected was an interview with a structured questionnaire. Respondents took part in an interview where they were asked the same set of questions based on the same scale of answers for all questions.

3.1.4 Research Data Collection Techniques

A questionnaire is a list of questions that is completed for or by a respondent to obtain their opinion on the listed questions (Roopa & Rani, 2012). Questionnaires enable a researcher to collect quantitative data in a standardised manner to ensure that there is internal consistency and coherence for the analysis (Roopa & Rani, 2012). Gürbüz (2017) states that there are seven steps in formulating a questionnaire: 1. Identify the necessary information; 2. Choose the type of interview; 3. Determine the contents of the individual questions; 4. Create the questionnaire and eliminate all questions respondents do not or cannot answer; 5. Determine the structure of the questions; 6. Choose the question forms (e.g., closed-ended questions or multiple-choice

questions); 7. List the questions appropriately. Furthermore, Gürbüz (2017) argued that a good questionnaire should have a simple appearance and should be in an easily understandable form. Questionnaires should have a sufficient number of questions to gather data, easily understandable questions and the questions should follow each other appropriately and understandably (Gürbüz, 2017). The questions should be appropriate to the purpose of the study, objective, relevant to the subject and should not affect the respondents (Gürbüz, 2017). Gürbüz (2017) reports that conducting a pilot study before the final survey is crucial for refining the questionnaire.

Questionnaires need to have a definite purpose or objective that is stated from the outset that relates to the objective of the research and should clearly indicate how the findings will be used (Rooma & Rani, 2012). Creswell and Creswell (2023) stated that questionnaires are useful due to the inexpensiveness of their design and administration. Rooma and Rani (2012) further state that questionnaires are most useful when the participants are ensured that their identity and privacy will be hidden and protected, which will ensure that respondents answer honestly. Rooma and Rani (2012) argue that a questionnaire has seven requisites for it to be considered a good questionnaire: a simple and single specific language; ask only one answer on one dimension; yield honest and accurate answers; accommodate all contingencies for every response; mutually exclusive options for responses; create variability in the responses; and minimise social desirability (Rooma & Rani, 2012).

There are four diverse styles of questionnaire designs for a survey: contingency questions; matrix questions; closed-ended questions; and open-ended questions (Creswell & Creswell, 2023). Contingency questions are only asked after the respondent gives a particular answer to a previous question, which is done to avoid asking questions that do not apply to certain respondents (Rooma & Rani, 2012). Matrix questions are an array of questions down the side of a page with the same response categories along the top (Creswell & Creswell, 2023). This type of array forms a matrix that saves space on the questionnaire page and makes it easier for the respondent to answer multiple questions with the same response categories (Rooma & Rani, 2012). Closed-ended questions are questions with a fixed set of answers (Rooma & Rani, 2012). Most scale-based questions are closed-ended questions (Rooma & Rani, 2012). The different types of closed-ended questions include simple yes or no questions; multiple-choice questions; and scaled questions (Rooma and Rani, 2012). Open-ended questions are questions with no fixed answers and are completely open to the respondent's replies (Rooma & Rani, 2012).

The credibility of the questionnaire is extremely important according to Rooma and Rani (2012). The reliability of the questionnaire tests the extent to which the measurement delivers consistent

results (Rooma & Rani, 2012). The validity, according to Rooma and Rani (2012), tests the degree to which the questionnaire measures what it is supposed to measure. There are three aspects of a reliability test: inter-interviewer reliability, test-retest reliability and internal consistency reliability (Rooma & Rani, 2012). Inter-interviewer reliability considers the degree to which different interviewers deliver a consistent interpretation of the phenomenon being studied (Rooma & Rani, 2012). Test-retest reliability assesses the consistency of responses through a Cronbach Alpha test, with a value of 80% or above being considered acceptable (Rooma & Rani, 2012). This test determines whether the questionnaire items reflect the same chosen construct (Rooma & Rani, 2012). If the questionnaire is considered unreliable, then it cannot be considered valid and validity testing would be redundant (Creswell & Creswell, 2023; Rooma & Rani, 2012). Internal consistency reliability considers how reliable the questionnaire is by estimating how consistent the results for different questions are for the same construct (Creswell & Creswell, 2023; Rooma & Rani, 2012). This test is similarly performed by conducting a Cronbach's alpha test, with a score of 80% or above being acceptable (Rooma & Rani, 2012). There are four criteria for validity in questionnaire design: content validity; face validity; criterion validity; and construct validity (Rooma & Rani, 2012). Content validity, according to Rooma and Rani (2012), is the extent to which the questionnaire represents the aspects of a certain social concept. The researcher is responsible for deciding whether their tool has content validity (Rooma & Rani, 2012). Face validity tests the appropriateness of the questions and that they are getting the responses in the way they want to measure them (Rooma & Rani, 2012). This can be done through a pilot study to help improve the face credibility of the questionnaire (Rooma and Rani, 2012). The criterion validity tests the effectiveness of the tool in predicting the outcomes of the constructs it measures (Rooma & Rani, 2012). Construct validity, according to Rooma and Rani (2012), is the extent to which the questionnaire conforms with industry standards or the existing ideas and hypotheses concerning the measured constructs.

Questionnaire design requires careful thought, consideration and effort (Creswell and Creswell, 2023). The development of a questionnaire, according to Rooma and Rani (2012), requires multiple stages: initial considerations; question content, response format and phrasing of questions; sequence and layout of questions; revision or pilot study; and the final questionnaire. The questionnaire in the present study was designed following this format, with a pilot study conducted to improve the questions, phrasing, layout, reliability and validity of the questionnaire. The initial considerations were as follows: the questions need to be determined by the theoretical model; the questions need to be easily understood; the answer scheme needs to be easily understandable; the answers need to be easily used in a statistical analysis; the privacy and identity of the respondents need to be assured; and the setting for the questionnaire needs to be

private. The content of the questions was determined through the theoretical model and the phrasing and response formats were determined through known questionnaire designs, including matrix questions, closed-ended questions and Likert scale questions. The sequence and layout of the questions were designed to be easily read, understood and answered. The answer scale was also given to the respondent to ensure that they could explain any misunderstandings the respondent might have. The pilot study was conducted to help improve the questionnaire and revise the questions and aspects of the questionnaire that caused trouble. After this revision, interviewers were also instructed on how to correctly administer the survey to respondents to avoid any confusion on their part and how to correctly explain the questions to respondents. The questionnaire was then finalised and the interviewers administered the survey. The survey was conducted by the Sociology Department's honours and master's program students to ease the burden of data collection.

3.1.5 Population and Sampling

3.1.5.1 Population

In a research context, a population can be defined as a group from which a researcher wants to ascertain information (Banerjee & Chaudhury, 2010). In descriptive statistics, however, the custom is to define a study population, meaning that a restriction, such as gender, sex, or geographic location, is used to create a study population (Banerjee & Chaudhury, 2010). The researcher will then make observations on a sample taken from the study population (Banerjee and Chaudhury, 2010). The study population was defined as the, "2022 undergraduate students from the NWU, PC".

Table 3.1: The undergraduate students at NWU. PC

POPULATION: 2022 Potchefstroom campus undergraduate contact students (19/05/2022)

	Total			Humanities		Natural and Agricultural Sciences		Theology		Education sciences		Economic and management sciences		Law		Engineering		Health sciences	
	Total	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total	18309	7448	10861	716	1808	1343	856	73	108	792	2162	1749	1850	513	852	1095	330	1167	2895
African	8052	3054	4998	541	1247	508	408	42	87	465	880	448	641	215	359	234	89	601	1287
White	8822	3848	4974	139	429	768	405	27	18	215	992	1197	1082	244	406	825	227	433	1415
Coloured	1180	432	748	34	126	39	27	4	3	107	276	74	95	40	78	25	11	109	132
Asian	255	114	141	2	6	28	16	0	0	5	14	30	32	14	9	11	3	24	61

As of May 19, 2022, the student population of the NWU, PC was 18,309 students, with 7,448 males and 10,861 females, split across eight faculties and four self-identified race categories. The race categories were African, White, Coloured and Asian. The faculties were Humanities, Natural and Agricultural Sciences, Theology, Education Sciences, Economic and Management Sciences, Law, Engineering and Health Sciences.

3.1.5.2 Sampling

A sample is defined as a subset of a population (Banerjee & Chaudhury, 2010). Turner (2020) defines sampling as the selection of a subset of the population that will be studied. Quota sampling is a procedure where several categories are specified in advance with the selection of a set number of respondents and the final selection of respondents are chosen by the interviewer, until the quota for each category is filled (Babbie, 2016). Quota sampling is a type of non-random sampling, where the interviewer can choose who to interview, as long as they fit into the predetermined categories (Moser & Stuart, 1953). When undertaking quota sampling, the researcher should be mindful of who they interview to not create a bias while filling the quota categories (Babbie, 2016). After the researcher has determined the quota categories, the weights given to them need to be an accurate representation of the true population (Babbie, 2016). Babbie (2016) states that in field research conducted on a formal group (such as this study where the group was the undergraduate students of the NWU, PC) the logic of quota sampling is useful. In the case of this study, accurate information about the population was available and as such the quota sample was an accurate representation of the group.

This study's quota categories were gender, race and faculty. The criteria for this study and the sampling were that the respondent had to be an undergraduate student of the NWU, PC. To fit in the quota sampling they needed to indicate their gender and race, and to be studying a degree in one of the faculties listed in the following paragraph. The application of these criteria ensured that the sample accurately reflected the selected categories of the NWU, PC population. The sample population for this study was 270 undergraduate students of the NWU, PC. This sample was gathered through quota sampling that used non-probability stratified sampling with purposive sampling within the different categories.

Table 3.2: The calculated and idealised samples of NWU, PC undergraduate students

QUOTA SAMPLE: 2022 Potchefstroom campus undergraduate contact students

	Total			Humanities		Natural and Agricultural Sciences		Theology		Education sciences		Economic and management sciences		Law		Engineering		Health sciences	
	Total	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total	270	112	158	11	26	20	12	1	1	12	32	27	28	8	12	16	4	17	43
African	120	47	73	8	18	8	6	1	1	7	13	7	10	3	5	4	1	9	19
White	129	56	73	2	6	11	6	0	0	3	15	18	16	4	6	12	3	6	21
Coloured	19	9	10	1	2	1	0	0	0	2	4	2	1	1	1	0	0	2	2
Asian	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1

The calculated and idealised quota sample for this study of NWU, PC students was 112 males and 158 females, comprising a total of 270 students. The idealised sample for the ethnicities was 120 African students, 129 White students, 19 Coloured students and two Asian students. The idealised sample for faculties was 37 Humanities students, 32 Natural and Agricultural Sciences students, two Theology students, 44 Education sciences students, 55 Economic and

management sciences students, 20 Law students, 20 Engineering students and 60 Health sciences students.

Table 3.3: The realised sample for 2022 NWU, PC undergraduate contact students

REALISED SAMPLE: 2022 Potchefstroom campus undergraduate contact students																			
	Total			Humanities		Natural and		Theology		Education sciences		Economic and		Law		Engineering		Health sciences	
	Total	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total	270	115	155	11	26	20	13	1	1	16	30	27	28	7	11	15	5	18	41
African	121	51	70	8	18	8	6	1	1	8	12	9	10	3	5	4	1	10	17
White	127	54	73	2	6	11	7	0	0	5	14	16	16	4	5	11	4	5	21
Coloured	19	9	10	1	2	1	0	0	0	2	4	2	1	0	1	0	0	3	2
Asian	3	1	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1

The realised sample for the study of NWU, PC students was 115 males and 155 females, comprising a total of 270 students. The realised sample for ethnicities was 121 African students, 127 White students, 19 Coloured students and three Asian students. The realised sample for faculties was 37 Humanities students, 33 Natural and Agricultural Sciences students, two Theology students, 46 Education Sciences students, 55 Economic and Management Sciences students, 18 Law students, 20 Engineering students and 59 Health Sciences students. The small differences in the realised and idealised samples were likely due to the difficulties of assessment and communication of the exact quotas between the interviewers. The realised sample was, however, only marginally different from the idealised sample, and as such was still representative of the population.

Despite the challenges associated with student sampling, Henry (2008) argues that it is still an important and valuable component of research. It is cost-efficient and easily accessible to many researchers, and Henry (2008) also considers that students are not dissimilar to non-students. Henry (2008) argues that many social problems for non-students are also social problems for many students and that in this way they also reflect the larger groups of society. As such, the study of students as social communities is important and scientifically relevant to the communities that these students will eventually form part of (Henry, 2008). While there are risks in generalising from student samples, Ashraf and Merunka (2016) argued that there are still valuable insights to be gained from this type of sampling. Ashraf and Merunka (2016) stated that undergraduate students are a valuable resource and that when they are used with discretion, they still hold valuable knowledge. If the researcher is conscious of the psychology and demographics of the students being sampled, the study can still obtain pertinent results from the data (Ashraf & Merunka, 2016).

3.1.6 Data Analysis

The statistical analyses in this study were conducted using IBM-SPSS software. The literature review determined which quantitative data analysis methods, statistical and analytical metrics and

instrumentation should be used (Miles, Huberman and Saldaña, 2014). The relevant correlations within the data were expressed through the calculation of descriptive statistics in an expressive and readable format. Descriptive statistics were also used to aid the quantitative research design. Babbie (2016) defines descriptive statistics as statistics that summarise sets of sample observations. Correlations were used to help understand the perceptions of the students concerning the environmental effects of SUPs. The statistics are explained and clearly presented in the results section.

A factor analysis was conducted for six of the ten questions and descriptive statistics were used for the remaining questions. Factor analysis is a vague term for various techniques for processing data, and is mainly used in the biological and social sciences (McDonald, 2014:1). McDonald (2014) states that factor analysis was developed to analyse mutual relationships between "a number of measurements made on a number of measurable entities". Yong and Pearce (2013:80) state that a factor analysis assumes that observable and measurable variables can be reduced to fewer latent variables that are unobservable but share a common variance. These unobservable variables are hypothetical constructs that relate to all the variables and are used to represent them (Yong & Pearce, 2013). Researchers typically use an exploratory factor analysis to determine how many factors influence the variables and to analyse which of the variables fit together (McDonald, 2014). Factor analysis is used for large data sets with many variables and can assemble common variables into descriptive statistics (McDonald, 2014; Yong & Pearce, 2013). This means that these variables can be sorted into smaller underlying concepts that help to facilitate interpretations of the data (McDonald, 2014). To test whether the variables are eligible for factor analysis, the Kaiser−Meyer−Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity were conducted to ensure the factor analysis delivered reliable results (Yong & Pearce, 2013). The Cronbach Alpha statistic was also used to determine the reliability of the data on each of the factors as well as all the questionnaires. A two-tailed Spearman's Rho test was also conducted as a non-parametric measurement of the correlations between all the questions. A Spearman's Rho test is simply a measure of the strength of the association between two variables (Hauke & Kossowski, 2011).

3.1.7 Ethical Considerations

Creswell and Creswell (2023) state that the consideration of ethical issues is the cornerstone of writing good research. Ethical issues arise during all stages of the research process, meaning they are present prior to the study, at the start of the study, during the data collection and analysis and during the reporting of the results (Creswell & Creswell, 2023). Before the present study commenced, the researcher read the NWU's code of ethics for research as well as Van den

Scott's (2020) "Handbook of Research Ethics and Scientific Integrity" on good ethical practices in research to ensure the study would avoid any ethical problems that may have appeared during the course of the research. The study was also approved by the NWU ethics committee before the research began.

Some of the ethical issues that should be considered before a study commences include professional standards, university ethics approval, participant permission and the burden of the research on participants (Creswell & Creswell, 2023; Van den Scott, 2020). To avoid making the study a burden for the participants, the interviews were conducted at their leisure, at times and locations that were comfortable for them.

Ethical issues at the beginning of a study include disclosing the purpose of the research and obtaining informed consent (Van den Scott, 2020). To ensure that the participants gave their permission and informed consent to be part of the study, all questionnaires had a section that explained the purpose of the study, how the data would be used and stored and a confirmation that they would remain completely anonymous following the publication of the study. The participants had to sign this section to ensure informed consent was given and that they were not being misled by the researcher. Participants were told that they could end the interview at any point, that their data would then not be used in the study and that they were under no obligation to partake in the study.

During the collection of data or in the case of this study, during the interviews, the interviewer had to ensure that all participants were treated equally, that all participants were suitable for the study and all deception of any kind was avoided (Creswell & Creswell, 2023; Van den Scott, 2020). All participants were treated with respect irrespective of their backgrounds or differences. All interviews were conducted in similar locations and similar settings, with all participants being offered snacks and breaks during the interview. Participants were assured that they would not be judged no matter their responses to the questions and that they should feel free to answer as honestly as possible without having to fear judgment. To ensure that all participants were suitable for the study, they needed to be a part of the aforementioned quota sample, and if they did not fit into any of the categories, they were thanked for their time, the interview was stopped and their data was removed. Any sensitive information was properly protected, and the participants were also informed of this fact and assured that their data would not be made public. The interviewer was clear and concise in the language used and made sure to explain any questions the participants had to their satisfaction. This ensured that no deception of the respondent occurred.

During the analysis of the data, the interviewer needs to ensure that they do not side with the participants, respect the anonymity of the respondents and avoid only publishing data with

positive results (Van den Scott, 2020). The interviewer did not side with any of the participants but remained impartial with the sole intent of analysing the data as it was presented. All viable data was used and published to ensure no positive bias was reflected in the results. Respondents' personal data was not used in the data analysis, rather they were assigned a number to ensure that all data published cannot be traced back to them. The data and questionnaire are also safely stored electronically at the NWU, PC through their data management and privacy protection policies.

Plagiarism, falsification of data or findings, misleading language and data sharing are all important ethical issues a researcher faces when reporting and sharing their study (Creswell & Creswell, 2023). All relevant references to others' work are included to ensure that credit is not taken by the researcher for work they did not do to ensure no plagiarism is prevalent. This study was subject to the NWU's plagiarism laws and must comply with the NWU's Harvard format for referencing. All results and findings were based solely on the collected data and no other data was added by the researcher to skew the findings. All results and findings were reported honestly. All language used in the results and findings was ensured to be clear, concise and straightforward to avoid any misleading statements. Bias-free language is used to ensure that a researcher's personal bias does not contaminate the results and findings. Data sharing is not allowed without ensuring that the data has been formatted to protect the respondent's privacy and identity.

This section outlined the research methodology adopted in the study. It confirmed that the study followed a quantitative research approach and explained what this research approach entailed. It explained the use of a survey as the research design for the study and provided an overview of surveys as a data collection method. The research data collection technique that was chosen, was a questionnaire, and an explanation was given of how questionnaires are designed and how they can be used successfully. This section outlined the population of the NWU, PC and what the idealised sample looked like. It also explained the sampling techniques used and provided details of the realised sample. The section also described the data analysis that was applied and detailed what methods were used. Finally, this section outlined the possible ethical considerations for the study and what was done to address them.

CHAPTER 4 RESULTS

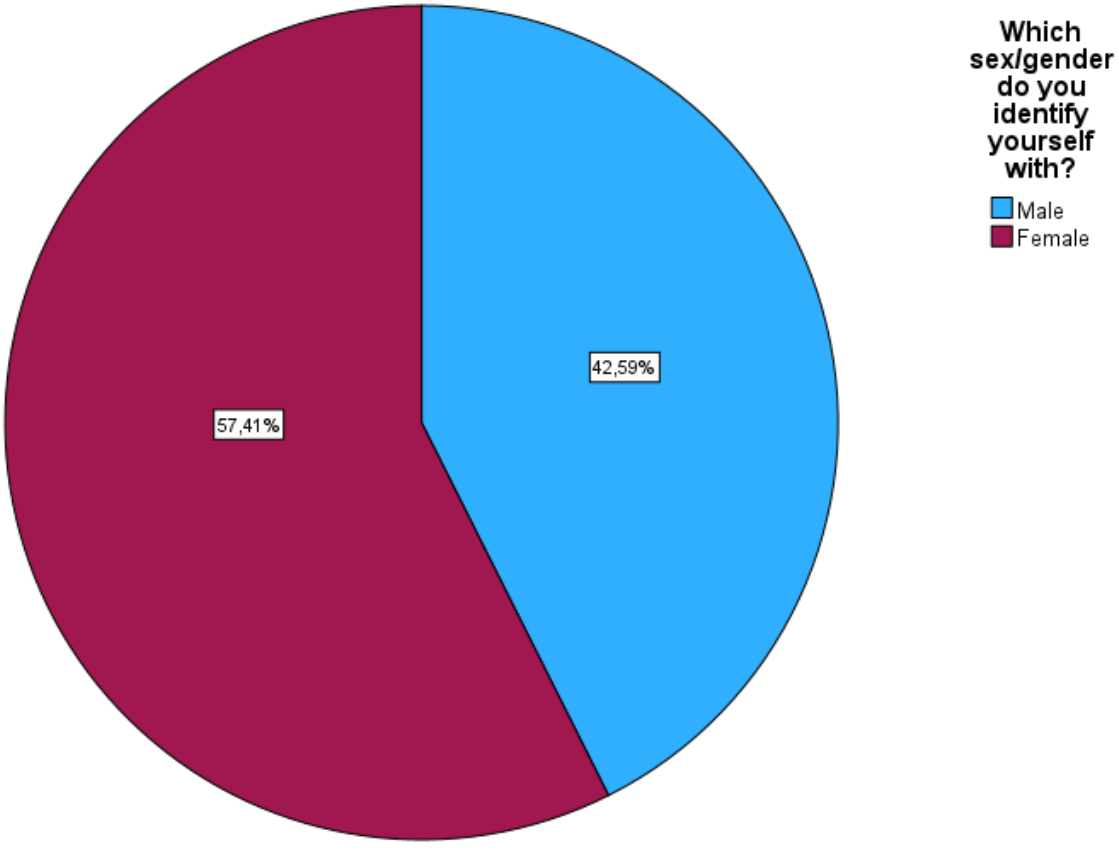
4.1 Introduction

This chapter presents the key findings from the research conducted on students' perceptions of the negative effects of SUPs. The chapter provides a clear and detailed analysis of the data collected. The findings are organized thematically, corresponding to the survey questions from the data collection questionnaire. This chapter also describes the potential correlations, accurately and wholly, between the chosen social factors and students' attitudes and behaviours towards the negative effects of SUPs.

4.2 Descriptive Statistics of the Samples

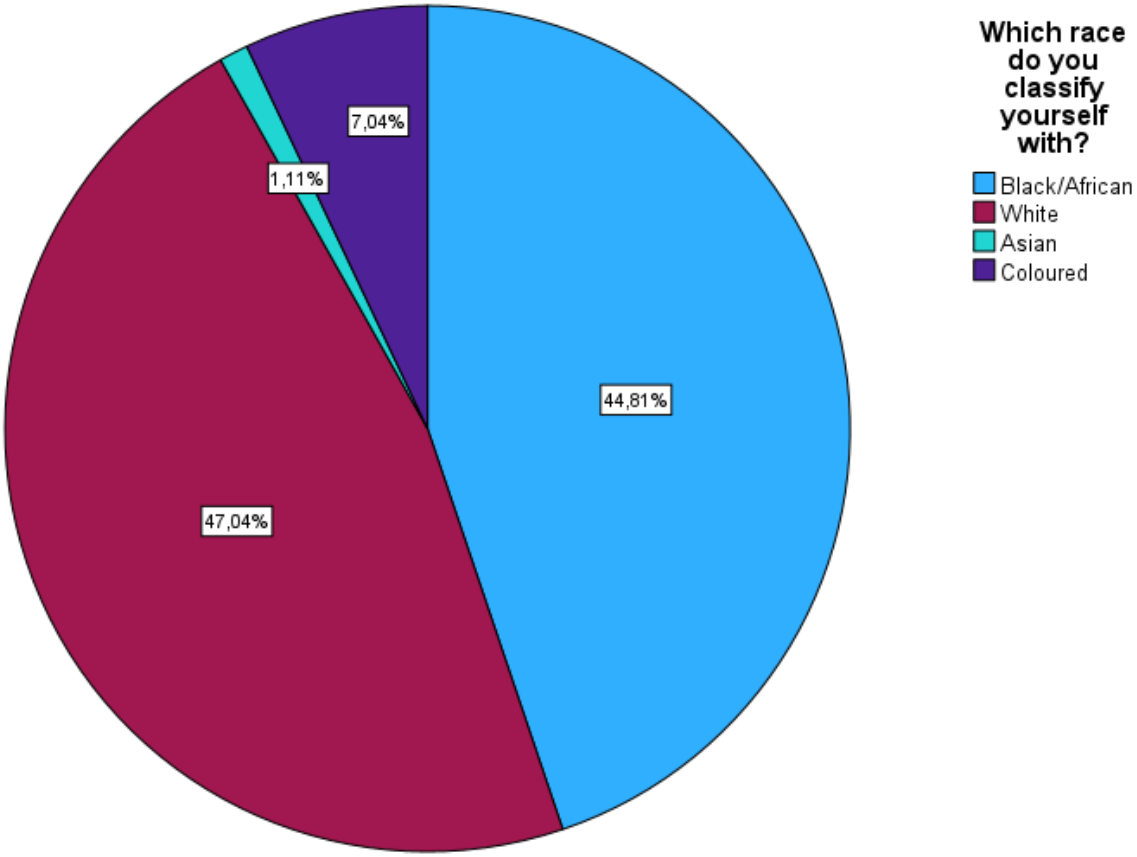
The quota sampling was constructed to fulfil three categories to ensure an accurate representation of the student population. The three categories that were chosen were gender, race and faculty.

Figure 4.2.1 Pie chart of participant genders



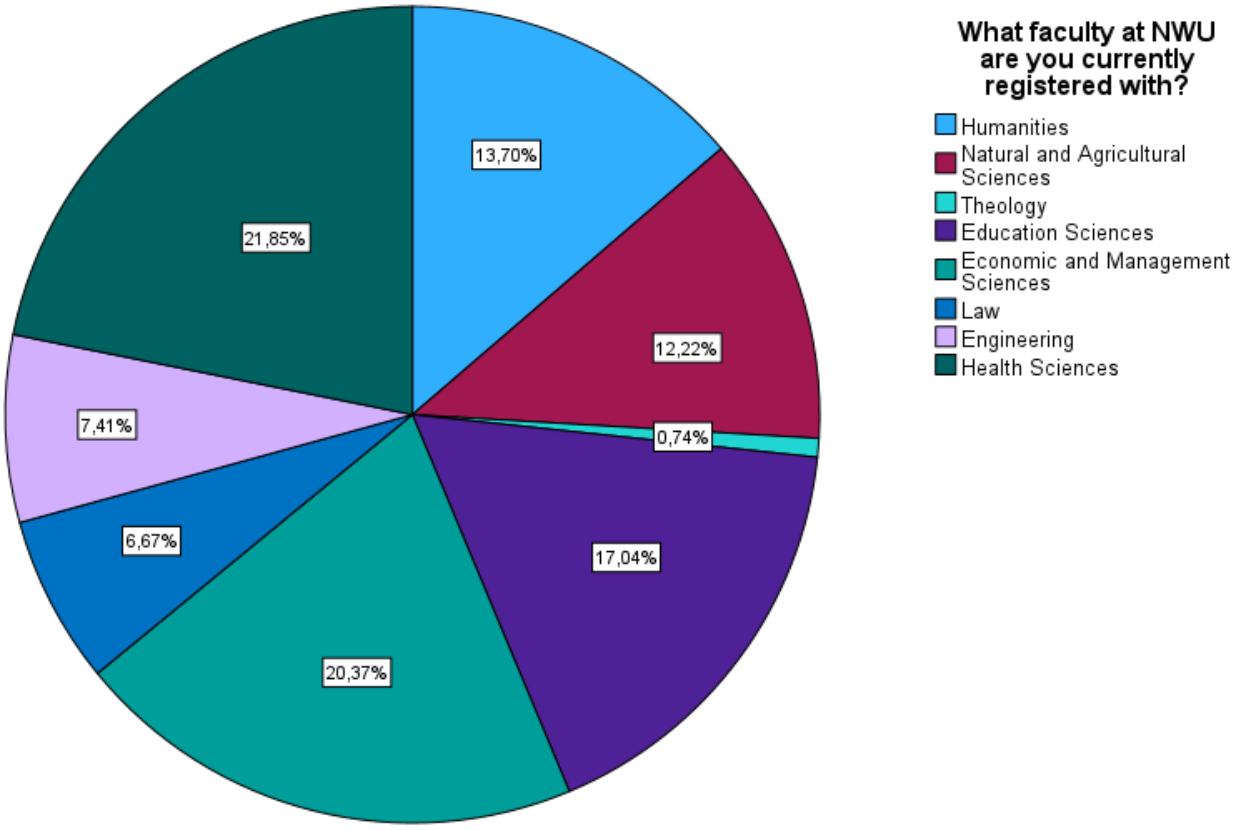
The quota sample for gender was 112 males and 158 females, while the realised sample, as shown in Figure 4.2.1, was 115 males and 155 females. The realised and quota samples were very similar and were representative of the larger population.

Figure 4.2.2 Pie chart of participant races



The quota sample for race was 120 African, 129 White, 19 Coloured and two Asian students. The realised sample was slightly different, as shown in Figure 4.2.2, with 121 African, 127 White, 19 Coloured and three Asian students. The realised sample was very similar to the quota sample, and as such was still representative of the larger NWU, PC undergraduate population.

Figure 4.2.3 Pie chart of participant faculty registrations



The quota sample for faculty was 37 from Humanities, 32 from Natural and Agricultural Sciences, two from Theology, 44 from Education Sciences, 55 from Economic and Management Sciences, 20 from Law, 20 from Engineering and 60 from Health Sciences. The realised sample, as shown in Figure 4.2.3, was slightly different with 37 from Humanities, 33 from Natural and Agricultural Sciences, two from Theology, 46 from Education Sciences, 55 from Economic and Management Sciences, 18 from Law, 20 from Engineering and 59 from Health Sciences. The realised and quota samples were similar enough that the realised sample was still representative of the larger population.

4.3 Descriptive Statistics Related to the Perceptions of Single-use Plastics

This section focuses on the descriptive statistics for each of the questions from the questionnaire. The data was analysed using SPSS. The results were analysed and explained for every sub-question in all questions.

4.3.1 Question 37 Knowledge of Pollution Matters

Table 4.3.1 Question 37 Knowledge of pollution matters

	No Knowledge		Very Little Knowledge		Some Knowledge		Fair Knowledge		Thorough Knowledge		Total	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q37.1 The effects of plastic pollution?	5	1,9%	14	5,2%	70	25,9%	116	43,0%	65	24,1%	270	3.82
Q37.2 Single-use plastics and what they are?	12	4,4%	26	9,6%	85	31,5%	97	35,9%	50	18,5%	270	3.54
Q37.3 The negative effects of single-use plastics?	13	4,8%	31	11,5%	89	33,0%	84	31,1%	53	19,6%	270	3.49
Q37.4 Environmental issues such as pollution?	4	1,5%	12	4,4%	52	19,3%	104	38,5%	98	36,3%	270	4.04
Q37.5 The effects of climate change on the environment?	4	1,5%	14	5,2%	57	21,1%	92	34,1%	103	38,1%	270	4.02

For Question 37.1, 1.9% of the respondents answered that they had no knowledge of the effects of plastic pollution. Additionally, 5.2% had very little knowledge, 25.9% had some knowledge, 43% had fair knowledge and 24.1% had thorough knowledge. of the effects of plastic pollution. Therefore, 31.1% answered that they had very little to some knowledge and 67.04% answered that they had fair to thorough knowledge of the effects of plastic pollution. The NWU, PC students were therefore quite knowledgeable about the effects of plastic pollution. The mean score of 3.82 indicated that the average level was between some and fair knowledge, but closer to fair knowledge.

For Question 37.2, 4.4% of the respondents answered that they had no knowledge of what SUPs are. Additionally, 9.6% had very little knowledge, 31.5% had some knowledge, 35.9% had fair knowledge and 18.5% had thorough knowledge. The fact that 41.1% had very little to some knowledge and 54.4% had fair to thorough knowledge indicates that there were limits to the level of knowledge of respondents regarding what SUPs are.

For Question 37.3, 4.8% of respondents possessed no knowledge of the negative effects of SUPs. 11.5% had very little knowledge, 33% had some knowledge, 31.3% had fair knowledge and 19.6% had thorough knowledge. Therefore 44.4% answered that they had very little to some knowledge of the negative effects of SUPs while 50.7% answered that they had fair to thorough knowledge. The respondents seemed to be not very knowledgeable about the negative effects of SUPs.

For Question 37.4, 1.5% of respondents had no knowledge of environmental issues such as pollution, 4.4% had very little knowledge, 19.3% had some knowledge, 38.5% had fair knowledge and 36.3% had thorough knowledge. Respondents were therefore quite knowledgeable about environmental issues such as pollution given that 74.81% answered that they possessed a fair to thorough knowledge of the topic. The mean score of 4.04 indicated that on average the respondents had fair knowledge.

For Question 37.5, 1.5% of respondents had no knowledge of the effects of climate change on the environment, 5.2% had very little knowledge, 21.1% had some knowledge, 34.1% had fair knowledge and 38.1% had thorough knowledge. Given that 72.22% of respondents answered they had a fair to thorough knowledge of the topic it could be concluded that the respondents were quite knowledgeable about the effects of climate change on the environment.

From Table 4.3.1 it could be concluded that the respondents were knowledgeable about the effects of plastic pollution, environmental issues such as pollution and the effects of climate change on the environment. They were also knowledgeable about what SUPs are and their negative effects but were less knowledgeable than they were about the other environmental issues.

Table 4.3.1 shows similar results to a previous study of the awareness of pollution in schools by Dalu *et al.* (2020). Dalu *et al.* (2020) also found that respondents were taught about matters relating to pollution and when asked about them, most respondents had some or fair knowledge or awareness about matters relating to pollution, but few respondents had an in-depth knowledge or awareness of the issue. Dalu *et al.* (2020) concluded that for environmental programmes to be successful, a high level of awareness and knowledge of plastic pollution is needed among the public. This question shows the need to increase the number of programmes that focus on teaching students more about the environment and plastic pollution.

4.3.2 Question 38 Learning About Environmental Issues

Table 4.3.2 Question 38 Learning about environmental issues

	Yes		To some extent		No		Total	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q38.1 My degree includes study units that relate to or address environmental issues.	104	40,5%	98	38,1%	55	21,4%	257	1.82
Q38.2 My field of study motivates me to take part in activities related to climate change.	64	25,3%	92	36,4%	97	38,3%	253	2.13
Q38.3 I have gained knowledge of issues relating to the environment or climate change through talking to people and/ or reading/ online media, outside of class.	145	55,1%	82	31,2%	36	13,7%	263	1.59
Q38.4 I have not learnt about environmental issues informally outside of class.	26	10,2%	48	18,9%	180	70,9%	254	2.61
Q38.5 I would like to learn more about environmental issues in my academic programme.	119	46,5%	88	34,4%	49	19,1%	256	1.73

Question 38.1 asked respondents whether their degree includes study units that relate to or address environmental issues. The results showed that 40.5% of the respondents responded with yes, 38.1% responded with to some extent and 21.4% responded with no. Most respondents agreed that their degrees included study units that were related to or addressed environmental issues.

Question 38.2 asked respondents if their field of study motivated them to take part in activities related to climate change. The results showed that 25.3% of the respondents answered yes, while 36.4% answered to some extent and 38.3% answered no. The respondents' field of study did not necessarily motivate them to take part in activities related to climate change.

Question 38.3 asked respondents if they have gained knowledge of issues related to the environment or climate change through talking to people and/or reading online media outside of class. The results showed that 55.1% of the respondents answered yes, while 31.2% answered to some extent and 13.7% answered no. The respondents obtained their knowledge of issues relating to the environment or climate change through engagement with other people or social media.

Question 38.4 asked respondents if they had not learnt about environmental issues informally outside of class. The results showed that 10.2% answered yes, while 18.9% answered to some extent and 70.9% answered no. From this question, it could be concluded that informal relationships are important for respondents when learning about environmental issues.

Question 38.5 asked respondents if they would like to learn more about environmental issues in their academic programme. The results showed that 46.5% of respondents answered yes, while 34.4% answered to some extent and 19.1% answered no. Most respondents prefered to learn about environmental issues in their academic programme.

From Table 4.3.2 it could be concluded that respondents answered positively that study units in their studies included environmental issues, that they gained knowledge of issues relating to the environment or climate change through talking to people and/or reading/online media outside of class, and that they would like to learn more about environmental issues in their academic programme. However, respondents were more negative about whether their field of study motivated them to participate in activities related to climate change. Table 4.3.2 also indicates that many respondents learn about environmental issues informally outside of class.

The results from Table 4.3.2 were similar to the results reported by Dalu *et al.* (2020) which showed the need for a better education regarding environmental issues. The results in Table 4.3.2 also correspond with those of Green (2020), who found that many respondents have been affected by the media when it relates to their knowledge or perceptions towards plastic pollution. The results in Table 4.2.2 show that students learned about environmental issues from their studies, informally outside of class and through the media, but they did not feel that their studies motivated them to participate in activities relating to climate change. This was similar to the results of other studies, suggesting the need for better educational policies that relate to environmental issues.

4.3.3 Question 39 Attitude Towards Environmental Protection

Table 4.3.3 Question 39 Attitudes towards environmental protection

	No Extent		Very Small Extent		Some Extent		Fairly Large Extent		Very Large Extent		Total	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q39.1 I care about the environment because of my religious principles.	44	16,3%	25	9,3%	66	24,4%	89	33,0%	46	17,0%	270	3.25
Q39.2 Everyone should respect the environment because it affects all of us.	1	0,4%	4	1,5%	14	5,2%	74	27,4%	177	65,6%	270	4.56
Q39.3 I am willing to participate in saving the environment, because it will benefit us in the long run if we do.	1	0,4%	7	2,6%	33	12,2%	86	31,9%	143	53,0%	270	4.34
Q39.4 I care about the environment because my parents/guardians care about the environment.	30	11,1%	31	11,5%	64	23,7%	74	27,4%	71	26,3%	270	3.46
Q39.5 I do not think Single-use plastics such as lollipop sticks, takeaway containers, or plastic bottle caps contribute greatly to environmental pollution.	98	36,3%	62	23,0%	57	21,1%	33	12,2%	20	7,4%	270	2.31
Q39.6 I value the opinions (in relation to environmental issues) of celebrities and my own role models as important.	40	14,8%	52	19,3%	84	31,1%	58	21,5%	36	13,3%	270	2.99

Q39.7 I adhere to a value system that values the protection of the environment as important.	4	1,5%	12	4,4%	64	23,7%	99	36,7%	91	33,7%	270	3.97

Question 39.1 asked respondents whether they care about the environment because of their religious principles. The results showed that 16.3% of respondents answered to no extent, 9.3% to a very small extent, 24.4% to some extent, 33% to a fairly large extent and 17% to a very large extent. This means 33.7% were influenced to a very little or some extent and 50% were influenced to a fairly large or very large extent. The majority of respondents therefore viewed their religious principles as applicable to their care about the environment.

Question 39.2 asked if everyone should respect the environment because it affects all of us. The results showed that 0.4% of respondents agreed to no extent, 1.5% to a very small extent, 5.2% to some extent, 27.4% to a fairly large extent and 65.6% to a very large extent. Therefore, a significant 93% of respondents agreed to a large extent that everyone should respect the environment because it affects all of us.

In Question 39.3 about willingness to participate in saving the environment, 0.4% agreed to no extent, 2.6% to a very small extent, 12.2% to some extent, 31.9% to a fairly large extent and 53% to a very large extent. Most respondents (84.9%) agreed to be willing to participate in saving the environment because it will benefit them in the long run if they do.

Question 39.4 concerns whether the respondents care about the environment due to their parents or guardians. In this question, 11,1% answered to no extent, 11,5% to a very small extent, 23,7% to some extent, 27,4% to a fairly large extent and 26,3% to a very large extent. Parents and guardians therefore played a role in the respondents' views on caring about the environment, with 53.7% of the respondents indicating that their parents or guardians had a large influence on their care for the environment.

Question 39.5 tested respondents' agreement about whether they think SUPs, such as lollipop sticks, takeaway containers, or plastic bottle caps, **do not** contribute greatly to environmental pollution. 36,3% of respondents answered to no extent, 23,0% to a very small extent, 21,1% to some extent, 12,2% to a fairly large extent and 7,4% to a very large extent. As this statement is negative, it must be interpreted in reverse. This means that 59.3% of respondents agreed that SUPs, such as lollipop sticks, takeaway containers, or plastic bottle caps, contribute greatly to environmental pollution.

Question 39.6 considers how respondents evaluate the opinions of celebrities and their role models on environmental issues. Among the respondents, 14,8% said to no extent, 19,3% to a very small extent, 31,1% to some extent, 21,5% to a fairly large extent and 13,3% to a very large extent. From these statistics, it could be concluded that celebrities and role models did influence respondents but not decisively.

Question 39.7 asked whether the respondents adhere to a value system that values the protection of the environment as important. Question 39.7 showed that 1.5% of respondents agreed to no extent, with 4.4% to a very small extent, 23.7% to some extent, 36.7% to a fairly large extent and 33.7% to a very large extent. The fact that 70.4% agreed to a fairly or very large extent demonstrated that respondents adhered to a value system that values the protection of the environment as important.

In general, the results from Table 4.3.3 suggested that students hold positive attitudes towards environmental protection. The results also suggested that celebrities and role models did not have a great effect on the students' attitudes towards environmental issues. This was in contrast to the results of Henderson and Green's (2020) study, which found that role models had a large impact on the perceptions of solutions to reducing SUPs.

4.3.4 Question 40 Willingness to Participate in Environmental Activism

Table 4.3.4 Question 40 Willingness to participate in environmental activism

	No Extent		Very Small Extent		Some Extent		Fairly Large Extent		Very Large Extent		Total	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q40.1 I am willing to participate in protest action to help save the environment.	40	14,8%	35	13,0%	85	31,5%	62	23,0%	48	17,8%	270	3.16
Q40.2 I would like to participate in awareness and educational campaigns about environmental issues to help save the environment.	20	7,4%	30	11,1%	88	32,6%	74	27,4%	58	21,5%	270	3.44

Q40.3 I would not mind speaking at events to encourage others to reduce their use of Single-use plastics (such as plastic bags or plastic bottles).	40	14,8%	57	21,1%	80	29,6%	53	19,6%	40	14,8%	270	2.99
Q40.4 I would be willing to join activists against single-use plastics.	32	11,9%	51	18,9%	74	27,4%	73	27,0%	40	14,8%	270	3.14

Question 40.1 asked respondents about their willingness to participate in environmental protest actions. The answers showed that 14.8% of respondents were not willing to participate in protest action, 13% agreed to a very small extent, 31.5% to some extent, 23% to a fairly large extent and 17.8% to a very large extent. This means that 44.5% responded that they were willing to participate in environmental protest actions to a very small or some extent and 40.8% were willing to a fairly or very large extent. Willingness to participate in environmental protest actions was therefore limited.

Question 40.2 asked respondents about their desire to participate in awareness and educational campaigns about environmental issues to help save the environment. The results showed that 7.4% of respondents indicated to no extent, 11.1% to a very small extent, 32.6% to some extent, 27.4% to a fairly large extent and 21.5% to a very large extent. As with question 40.1, respondents here were also quite divided about their willingness to participate in campaigns. Those who were willing to a very small or some extent represented 43.7% of total respondents while those who responded that they were willing to a fairly or very large extent accounted for 48.9% of the total.

Question 40.3 asked whether respondents would not mind speaking at events to encourage the reduction of SUP use. The results showed that 14.8% of respondents said to no extent, 21.1% to a very small extent, 29.6% to some extent, 19.6% to a fairly large extent and 14.8% to a very large extent. The fact that 14.8% of respondents were not willing at all, with 50.7% willing to a very or some extent, and 34.4% willing to a fairly or very large extent, indicates some reluctance among respondents to speak at events to encourage others to reduce SUPs use.

Question 40.4 asked about respondents' willingness to join activism against SUPs and produced a similar diverse response from the respondents as the above questions. The results showed that 11.9% of respondents were not willing to join activists against SUP use, 18.9% were willing to a very small extent, 27.4% to some extent, 27.0% to a fairly large extent and 14.8% to a very large extent. This means that 46.3% of respondents said they were willing to a very small or some extent, with 41.85% of respondents willing to a fairly or very large extent to join activists against SUPs.

From Table 4.3.4, respondents indicated a limited willingness to participate in protest action to help save the environment, to speak at events to encourage others to reduce their use of SUPs (such as plastic bags or plastic bottles) and to join activists against SUPs. In contrast, respondents were more likely to participate in awareness and educational campaigns about environmental issues to help save the environment. The answers to this question indicated that many respondents were willing to participate in environmental activism; however the majority of the respondents were reluctant to participate or are only willing to some extent. This concurred with Arulnayagam (2020), who argued that a lack of environmental education programs, will lead to a lower willingness to participate in environmental activism. Miguel *et al.* (2024) and Arulnayagam (2020) argued that by increasing awareness and education of environmental issues, the public's perceptions of environmental programmes will increase.

4.3.5 Question 41 Relating to Others on the Negative Effects of Single-use Plastics

Table 4.3.5 Question 41 Relating to others on the negative effects of SUPs

	No Extent		Very Small Extent		Some Extent		Fairly Large Extent		Very Large Extent		Total	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q41.1 There are people that I greatly admire and identify with that speak on environmental issues like single-use plastics.	47	17,4%	65	24,1%	53	19,6%	71	26,3%	34	12,6%	270	2.93
Q41.2 I have seen TV shows/Documentaries where people speak on actions that people should take to reduce their use of single-use plastics.	23	8,5%	32	11,9%	81	30,0%	82	30,4%	52	19,3%	270	3.40

Q41.3 I follow people on social media who take action against climate change or practices that are harmful to the environment.	60	22,2%	54	20,0%	75	27,8%	43	15,9%	38	14,1%	270	2.80
Q41.4 I follow news on social Media's that specifically report on current environmental issues.	56	20,7%	52	19,3%	77	28,5%	52	19,3%	33	12,2%	270	2.83

Question 41.1 asked whether respondents have people they admire and identify with who speak on environmental issues like SUPs. The results showed that 17.4% of respondents indicated to no extent, 4,1% to a very small extent, 19,6% to some extent, 26,3% to a fairly large extent and 12,6% to a very large extent. Because 17.4% of respondents agreed to no extent, 43.7% to a very small or some extent and 38.89% to a fairly large or very large extent it could be concluded that on average role models had only a partial influence on the respondents.

Question 41.2 asked whether respondents had seen documentaries or TV shows that discussed the actions that people should take to reduce their SUP use. The results showed that 8.5% of respondents indicated to no extent, 11.9% to a very small extent, 30.0% to some extent, 30.4% to a fairly large extent and 19.3% to a very large extent. As in previous questions, the respondents were quite divided on this matter, with 41.85% agreeing to a very small or some extent, and 49.63% of respondents agreeing to a fairly large or very large extent. It was therefore clear that TV shows and documentaries are influential, but not generally important among the respondents.

Question 41.3 asked whether the respondents follow people on social media who act against climate change or practices that are harmful to the environment. From the responses, it was clear that the respondents were not generally followers of climate activists on social media. For example, 22.2% said to no extent, 20.0% to a very small extent, 27.8% to some extent, 15.9% to a fairly large extent and 14.1% to a very large extent. Thus, in Question 41.3, 47.8% agreed to a very small or some extent, and 30% agreed to a fairly large or very large extent.

Question 41.4 asked the respondents whether they follow news on social media that specifically reports on current environmental issues. Again the respondents did not indicate a general strong interest in environmental issues on social media. The results showed that 20.7% of respondents answered to no extent, 19.3% to a very small extent, 28.5% to some extent, 19.3% to a fairly

large extent and 12.2% to a large extent. This means that in Question 41.4, 47.8% agreed to a very small or some extent, and 31.5% agreed to a fairly large or very large extent.

These questions indicated that the influence of role models and social media concerning environmental issues on respondents were not generally important. Respondents differed in the impact of role models and social media concerning environmental issues. Table 4.3.5 indicates that most respondents were only influenced to some extent by role models and media regarding environmental topics. This conflicts with the literature review, in which it was found that role models and media have a noticeable effect on the environmental perceptions of respondents in previous studies (Hamid *et al.*, 2017; Henderson & Green, 2020; Löfstrom, Richter, & Nesvold, 2021).

4.3.6 Question 42 How Those Close to You Communicate About Environmental Issues

Table 4.3.6 Question 42 How those close to you communicate about environmental issues

My close friends or family…	No Extent		Very Small Extent		Some Extent		Fairly Large Extent		Very Large Extent		Total	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q42.1 ...often talk about environmental issues.	40	14,9%	67	24,9%	84	31,2%	47	17,5%	31	11,5%	269	2.86
Q42.2 ...[they] encourage me to use less single-use plastics because SA already has pollution issues.	57	21,1%	76	28,1%	67	24,8%	43	15,9%	27	10,0%	270	2.66
Q42.3 ...[they] encourage me to use less electricity power to reduce the negative impact on the atmosphere.	30	11,2%	48	17,8%	82	30,5%	58	21,6%	51	19,0%	269	3.19

Q42.4 … [they] are very knowledgeable about environmental issues such as global warming.	29	10,8%	47	17,5%	99	36,8%	48	17,8%	46	17,1%	269	3.13

Question 42.1 asked whether close friends or family often talk about environmental issues. The results showed that 14.9% of the respondents said to no extent, 24.9% to a very small extent, 31.2% to some extent, 17.5%to a fairly large extent and 11.5% to a very large extent. With 14.87% of respondents agreeing to no extent and 56.13% to a very small or some extent it could be concluded that environmental issues are not widely talked about among close friends or family. Only 29% agreed to a fairly large or very large extent.

Question 42.2 asked whether friends or family encouraged the respondents to use fewer SUPs because SA already has pollution issues. The results showed that 21.1% of respondents said to no extent, 28.1% to a very small extent, 24.8% to some extent, 15.9% to a fairly large extent and 10,0% to a very large extent. As in the previous question, the substantial percentage of 21.1% of respondents that indicated to no extent and the 52.9% who answered to a very small or some extent, demonstrated a lack of encouragement to use less SUPs from friends or family. Only 25.9% agreed to a fairly large or very large extent regarding an influence from friends or family.

Question 42.3 considered whether friends or family encouraged the respondents to use less electricity to reduce the negative impact on the atmosphere. The results showed that 11.2% of the respondents said to no extent, 17.8% to a very small extent, 30.5% to some extent, 21.6% to a fairly large extent and 19.0% to a very large extent. This means that 11.2% of respondents answered to no extent, while 48.3% of respondents answered to a very small or some extent, and 40.6% of respondents answered to a fairly large or very large extent. This indicates that the respondents differed strongly on their experiences in this regard.

Question 42.4 asked whether friends or family were very knowledgeable about environmental issues such as global warming. In this case, 10.8% of respondents said to no extent, 17.5% said to a very small extent, 36.8% to some extent, 17.8% to a fairly large extent and 17.1% to a very large extent. Again, as in the previous question, because 10.8% of respondents agreed to no extent, while a large 54.3% agreed to a very small or no extent, and 34.9% agreed to a fairly large or very large extent, the conclusion was that the respondents have a diversity of opinions.

From Table 4.3.6, it was evident that students had differing experiences regarding how those close to them communicate about environmental issues. There was no clear pattern regarding how those close to them communicated about environmental issues. This differed from Dalu *et al.,* (2020), who argued that how those around you perceive environmental issues would often affect how you perceive environmental issues.

4.3.7 Question 43 Willingness to Combat the Impact of the Negative Effects of Single-use Plastics

Table 4.3.7 Question 43 Willingness to combat the impact of the negative effects of SUPs

	No Extent		Very Small Extent		Some Extent		Fairly Large Extent		Very Large Extent		Total	
I am willing to	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q43.1… make use of environmentally friendly biodegradable products (such as paper bags), even if they are more expensive to help combat pollution.	11	4,1%	23	8,5%	69	25,6%	81	30,0%	86	31,9%	270	3.77
Q43.2… use wooden or wire clothes hangers, rather than plastic ones to reduce my plastic use.	6	2,2%	26	9,6%	59	21,9%	85	31,5%	94	34,8%	270	3.87
Q43.3… ensure I only use recyclable household products, e.g. glass bottles, cloth shopping bags.	6	2,2%	21	7,8%	87	32,2%	91	33,7%	65	24,1%	270	3.70

Q43.4…boycott the use of products sold in plastic and polystyrene packaging for any type of food to reduce my single-use plastics use.	25	9,3%	51	18,9%	95	35,2%	65	24,1%	34	12,6%	270	3.12
Q43.5… to stop using plastic straws, even where alternative straws (paper, metal, bio-degradable) are not available.	25	9,3%	39	14,4%	82	30,4%	69	25,6%	55	20,4%	270	3.33
Q43.6…support the banning of plastic and polystyrene in exchange for the use of reusable takeaway containers at my local takeaway shop.	17	6,3%	30	11,2%	79	29,4%	73	27,1%	70	26,0%	269	3.55
Q43.7…to buy my own metal drinking straws to use where paper ones are not available.	19	7,1%	32	11,9%	75	27,9%	73	27,1%	70	26,0%	269	3.53
Q43.8…stop buying water or drinks sold in plastic bottles.	52	19,3%	51	19,0%	66	24,5%	67	24,9%	33	12,3%	269	2.92

Question 43.1 assessed willingness to buy bio-degradable products to combat the negative effects of SUPs. The least common answer was to no extent, with only 4.1% responding as such. To a very small extent made up only 8.5% of responses, to some extent 25.6% and to a fairly large extent 30%. The most common answer was to a very large extent, with 31.85% of respondents giving this answer. The mean score of 3.77 indicated that the average answer lay between to some extent and a fairly large extent (but more towards a fairly large extent), with 55.5% of respondents answering with one of these two answers. The grouping of this question showed that to a fairly large or very large extent accounted for 61.9% of responses. This means

that respondents were quite willing to make use of environmentally friendly biodegradable products (such as paper bags), even if they are more expensive to help combat pollution.

Question 43.2 asked about the respondents' willingness to use wooden or wire hangers instead of plastic ones, with the least common answer being to no extent with only 2.2% of respondents giving this answer. To a very small extent (9.6%) and to some extent (21.9%) were the second and third least common answers, respectively. To a fairly large extent (31.5%) was the second most common answer and the most common answer was to a very large extent, with 34.8% of respondents giving this response. The results showed that 66.3% of respondents were willing, to a fairly large or very large extent, to change to the use of wooden or wire hangers.

Question 43.3 asked about the respondents' willingness to only use recyclable household products, with to no extent (2.2%) being the least common answer and to a very small extent (7.8%) being the second lowest common answer. The second most common answer (32.2%) was to some extent and the most common answer was to a fairly large extent (33.7%). Furthermore, 24.1% answered to a very large extent. To a fairly large or very large extent accounted for 57.8% of the responses, which indicated a willingness among respondents to use recyclable household products.

Question 43.4 asked respondents about their willingness to boycott products sold in plastic packaging, such as polystyrene, to reduce the effects of SUPs. To no extent and to a very small extent had the least responses with 28.2% of respondents giving these responses. To some extent was the most prevalent answer with 35.19% of respondents giving this answer. To a fairly large extent and to a very large extent garnered the most responses with 36.7% of respondents giving one of these responses. This indicates that 71.85% of respondents were willing, to some extent or more, to boycott products sold in plastic packaging to reduce the negative effects of SUPs. Respondents have some willingness to boycott plastic packaging, or the products sold in them.

Question 43.5 asked about respondents' willingness to stop using plastic straws, even where alternative straws were not available. The least frequent responses were to no extent and to a very small extent with 23.7% of the respondents giving one of these two answers, while to some extent had the most single responses (30.37%). To a fairly large extent and to a very large extent combined accounted for 45.93% of responses. Similarly to question 43.4, this shows that a significant group of respondents were willing to some extent to stop using plastic straws, with almost 46% of respondents willing to a great degree to stop using plastic straws, even when alternative straw options were not available.

Question 43.6 asked respondents about their willingness to support banning plastic and polystyrene in exchange for the use of reusable takeaway containers at their local takeaway shop. Only 17.5% of respondents answered to no extent or to a very small extent. To some extent was the largest singular response with 29.4% of respondents giving this response, while 53.1% of respondents answered to a fairly large or to a very large extent. This indicates that the vast majority of respondents are willing to support such an initiative, with the majority of respondents showing a great degree of support for this type of initiative.

Question 43.7 asked about the willingness of respondents to buy their own metal drinking straws to use when paper straws are not available. To no extent and to a very small extent had the lowest number of responses, with only 18.96% of respondents giving this answer. The number of responses indicating to some extent was 27.88%. To a fairly large extent and to a very large extent combined had the largest number of responses, accounting for 53.16% of the total. This indicated that a majority of respondents were willing to buy their own metal straws to use when paper straws were not available.

Question 43.8 asked about respondents' willingness to stop buying water or drinks sold in plastic bottles. To no extent and to a very small extent accounted for a large group of 38.29% of respondents, while 24.54% of respondents gave to some extent as their answer. The largest singular response was to a fairly large extent with 24.91% of respondents giving this answer. To a very large extent accounted for 12.3% of responses. This indicates that there was a divide among respondents on this issue, with a significant number of responses spread across all the response categories.

The answers to this question revealed that most respondents were willing to take action to protect the environment. Although the respondent's answers differed regarding the use of plastic bottles, most were willing to stop buying water or drinks sold in plastic bottles to at least some extent. Table 4.3.7 shows that the average response was to a fairly large extent for most of the questions. This indicates that most respondents were willing to combat the negative effects of SUPs to a fairly large extent. This agreed with the literature review, from which it was apparent that the age group of 18–25-year-olds were the most likely group to have positive environmental perceptions and a greater willingness to combat the effects of plastic pollution (Miguel *et al.*, 2024; Soares *et al.*, 2021).

4.3.8 Question 44 Environmentally Adaptive Behaviour

Table 4.3.8 Question 44 Environmentally adaptive behaviour

	No Extent		Very Small Extent		Some Extent		Fairly Large Extent		Very Large Extent		Total	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q44.1 I am willing to recycle paper, cardboard, bottles and cans in future even if it takes more effort.	2	0,7%	17	6,3%	45	16,7%	97	35,9%	109	40,4%	270	4.09
Q44.2 I am willing to take part in environmental discussions to increase my knowledge and awareness about the negative effects of single-use plastics.	7	2,6%	32	11,9%	65	24,1%	91	33,7%	75	27,8%	270	3.72
Q44.3 I find it hard to change my habits relating to the use of single-use plastics.	17	6,3%	50	18,5%	82	30,4%	68	25,2%	53	19,6%	270	3.33
Q44.4 The government should support with funding the switch to reusable plastics.	2	0,7%	13	4,8%	53	19,6%	68	25,2%	134	49,6%	270	4.18

Question 44.1 asked the respondents how willing they are to recycle paper, cardboard, bottles and cans in the future even if it requires more effort. The results showed that 0.7% of respondents said to no extent, 6,3% to a very small extent, 16,7% to some extent, 35,9% to a fairly large extent and 40,4% to a very large extent. To some extent, to a very small extent and to no extent made up 23.7% of the responses, with to a fairly large extent and very large extent accounting for the remaining 76.3% of the responses. This indicates that the majority of the respondents would be

willing to a great degree to recycle to recycle paper, cardboard, bottles and cans in the future, even if it takes more effort.

Question 44.2 asked about the respondents' willingness to take part in environmental discussions to increase their knowledge and awareness of the negative effects of SUPs. Among the respondents, 2,6% indicated to no extent, 11.9% to a very small extent, 24.1% to some extent, 33.7% to a fairly large extent and 27.8% to a very large extent. To no extent, to a very small extent and to some extent accounted for 38.52% of responses, while to a fairly large extent and to a very large extent made up the remaining 61.48% of responses. This indicates that the majority of respondents would be willing to attend discussions on environmental issues to increase their awareness and knowledge of the negative effects of SUPs.

Question 44.3 asked if the respondent found it hard to change their habits relating to the use of SUPs. The results showed that 6.3% indicated to no extent, 15.8% to a very small extent, 30.4% to some extent, 25.2% to a fairly large extent and 19.6% to a very large extent. The combined responses to no extent and to a very small extent therefore accounted for 24.81% of the respondents, while 30.37% answered to some extent. The largest group of respondents (44.81%) answered to a fairly large extent or to a very large extent. This indicates that the respondents had a diverse ability to change their habits regarding SUP use.

Question 44.4 asked whether the respondent agreed that the government should provide funding to switch to reusable plastics. To no extent (0.7%), to a very small extent (4.8%) and to some extent (19.6%), had the fewest responses with only 25.1% of all respondents giving one of these answers, while 74.81% of respondents answered to a fairly large extent or to a very large extent. This indicates that the majority of respondents believe to a great degree that the government should hold more responsibility in aiding the switch from SUPs to reusable plastics.

This question indicated that the majority of respondents were willing to recycle and to take part in discussions to increase their environmental knowledge. However, many of the respondents also said they found it difficult to change their environmental habits. The majority believed the government should take more responsibility in helping to switch from SUPs to more sustainable alternatives. This concurred with the results reported by Arulnayagam (2020), who found that respondents were willing to change their behaviours, but other variables outside of their control made it difficult to change their habits.

4.3.9 Question 45 Protective Attitude Towards the Environment

Table 4.3.9 Question 45 Protective attitudes towards the environment

	No Extent		Very Small Extent		Some Extent		Fairly Large Extent		Very Large Extent		Total	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Mean
Q45.1 I tend to make use of recycling bins on campus and in town.	15	5,6%	7	2,6%	65	24,1%	73	27,0%	110	40,7%	270	3.95
Q45.2 I tend to pick up garbage lying around.	29	10,8%	33	12,3%	72	26,8%	68	25,3%	67	24,9%	269	2.69
Q45.3 I make use of recycled products when available.	11	4,1%	24	8,9%	75	27,9%	91	33,8%	68	25,3%	269	3.67
Q45.4 I respect the environment and am therefore selective in what I buy or do, always considering how it will impact the environment.	20	7,4%	43	15,9%	90	33,3%	72	26,7%	45	16,7%	270	3.29
Q45.5 I have given up using fresh products that are packed in plastic or polystyrene packaging.	76	28,1%	78	28,9%	71	26,3%	33	12,2%	12	4,4%	270	2.36
Q45.6 I sort my waste (glass, batteries, plastics and vegetables) and ensure it gets into recycling.	88	32,6%	72	26,7%	56	20,7%	32	11,9%	22	8,1%	270	2.36
Q45.7 I avoid using plastics that cause harm to the environment.	53	19,6%	69	25,6%	78	28,9%	38	14,1%	32	11,9%	270	2.73

Question 45.1 asked whether the respondent uses recycling bins around campus and in town. To no extent (5.6%) and to a very small extent (2.6%) were the least frequently given responses, accounting for only 8.2% of the responses. To some extent had a slightly larger number of responses (24.1%), while to a fairly large extent (27%) and to a very large extent (40.7%) had the most responses, with 67.7% of respondents giving these responses. This indicates that most respondents were willing to recycle if there were bins available to them.

Question 45.2 asked the respondents whether they tended to pick up garbage lying around. To no extent (10.8%) and to a very small extent (12.3%) had the fewest responses with only 23.1% giving this response. To some extent had more responses (26.77%), while to a fairly large extent (25.3%) and to a very large extent (24.9%) had the most responses with 50.2% of the total responses. This indicates that the majority of respondents picked up garbage to at least some extent.

Question 45.3 asked the respondents whether they made use of recycled products when available. Similarly to the previous two questions, to no extent (4.1%) and to a very small extent (8.9%) had the least responses, accounting for a total of 13%. To some extent had 27.88% of all responses, while to a fairly large extent (33.8%) and to a very large extent (25.3%) had the most responses with 59.1%. This again indicates that if it is made available to them, the majority of respondents will adopt environmentally friendly practices.

Question 45.4 asked the respondents whether they respect the environment and are therefore selective in what they buy or do, always considering how it will impact the environment. To no extent (7.4%) and to a very small extent (15.9%) had the fewest responses with 23.3% of the respondents giving this answer, with to some extent accounting for 33.3% of the responses. To a fairly large extent (26.7%) and to a very large extent (16.7%) had the most responses with 43.4% of respondents giving this response. Respondents were therefore divided about their selectiveness in buying patterns concerning a product's environmental effects.

Question 45.5 asked the respondents whether they have given up using fresh products that are packed in plastic or polystyrene packaging. Most respondents responded with to no extent (28.1%) or to a very small extent (28.9%), accounting for 57% of all responses. To some extent had 26.3% of the responses, while to a fairly large extent (12.2%) or to a very large extent (4.4%) had the fewest responses with only a combined 16.6%. Respondents had therefore not given up using fresh products packaged in SUPs.

Question 45.6 asked the respondents whether they sort their waste (glass, batteries, plastics and vegetables) and ensure it enters the recycling stream. The results showed that 59.3% of respondents answered to no extent (32.6%) or to a very small extent (26.7%). To some extent accounted for 20.74% of responses, while to a fairly large extent (11.9%) and to a very large extent (8.1%) had the fewest responses with only 20% of respondents not sorting their waste.

Question 45.7 asked the respondents whether they avoid using plastics that cause harm to the environment. The results showed that 45.2% answered to no extent (19.6%) or to a very small extent (25.6%). To some extent accounted for 28.89% of responses, while to a fairly large extent (14.1%) and to a very large extent (11.9%) combined accounted for 26% of responses. Respondents did not seem to avoid plastics that cause harm to the environment.

The results in Table 4.3.9 suggest that when the respondents were aided by an external influence (e.g. recycling bins on campus) their behaviour was more environmentally friendly, but when they were at home and the effort and responsibility fell directly on them, they did not act in the same environmentally friendly manner. This indicated the need for external help from companies and government institutions to lessen the effort it takes for a household to recycle. This was a similar result to that reported by Arulnayagam (2020) where respondents found it difficult to change their environmental habits without external help.

4.3.10 Question 46 Experiences Relating to the Environment

Table 4.3.10 Question 46 Experiences relating to the environment

	Yes		No		
	Count	Row N %	Count	Row N %	Count
Q46.1 I have been taught to value the environment since childhood and therefore that littering is wrong.	250	92,6%	20	7,4%	270
Q46.2 My primary school did not tolerate littering.	252	93,3%	18	6,7%	270
Q46.3 My high school enforced punishment when littering.	192	71,1%	78	28,9%	270
Q46.4 I have been pressured to become more environmentally responsible by my peers, for example not to use single-use plastics.	109	40,4%	161	59,6%	270
Q46.5 Members of my family have been directly affected by plastic pollution.	45	16,7%	225	83,3%	270

Q46.6 I have personally been affected by plastic pollution.	42	15,6%	228	84,4%	270

Question 46.1 asked the respondents if they had been taught to value the environment since childhood, and that therefore littering is wrong. An overwhelming amount of the respondents, (92.6%) answered yes, with the remaining 7.4% answering no. This indicated that the majority of respondents have been taught since childhood to respect and protect the environment.

Question 46.2 asked the respondents if their primary school did not tolerate littering. The vast majority of the respondents (93.3%) answered yes, with only 6.7% answering no. This indicated that most of the respondents were taught in school that littering is wrong and that schools teach them to some extent to protect the environment.

Question 46.3 asked the respondent if their high school enforced punishment when littering. Yes, was the most common answer (71.1%), with 28.9% answering no. This indicated that their high schools may have been more tolerant of littering than primary schools.

Question 46.4 asked the respondents whether they had ever been pressured to become more environmentally responsible by their peers. Only 40.4% answered yes, while 59.6% answered no. This indicated that most respondents did not experience pressure from peers to be more environmentally friendly.

Question 46.5 asked the respondents whether members of their families had ever been directly affected by plastic pollution. A small amount (16.7%) answered yes, with the majority 83.3% answering no. Respondents' direct exposure to the effects of plastic pollution was therefore still limited.

Question 46.6 asked the respondents whether they had personally been affected by plastic pollution. The majority (84.4%) answered no, with the minority (15.6%) answering yes. Most respondents had therefore not directly experienced the effects of plastic pollution.

The results from Table 4.3.10 indicated that from childhood, students have been taught to value the environment and have been punished when they did not follow these teachings. The results also showed that very few students have been pressured by their peers to be more environmentally conscious. The results also revealed that very few students or their friends and family have been directly affected by plastic pollution. This was similar to the results reported by Arulnayagam (2020), Miguel *et al.*, (2024) and Dalu *et al.* (2020), with all three studies reporting that education from a young age is essential in forming positive environmental perceptions.

The results from the contextual social factors (Questions 38, 41, 42, 46) showed that there was a need for better educational policies regarding environmental issues. While many students were taught about valuing the environment from childhood, there was a clear need for better environmental education regarding plastic pollution and other environmental issues. Students also reported that they did not feel that their studies motivated them sufficiently to participate in environmental protection activities and that their peers did not pressure them to be more environmentally friendly. The results showed that while the media affected students' knowledge and perceptions of SUPs, their environmental perceptions were only affected by the media and role models to some extent. The results showed that students differed greatly in how they relate to others when it concerns environmental issues. Furthermore, very few students reported substantial direct impacts of plastic pollution on themselves and their immediate circles.

The results from the perceptions towards SUPs (Questions 37, 39, 40, 43, 44, 45) were as follows. Students were fairly knowledgeable about pollution matters and the effects of climate change. They were somewhat knowledgeable about the effects of SUPs but showed a need for better education and awareness campaigns to increase their exposure and awareness of the negative effects of SUPs and other environmental issues. The students generally had a positive attitudes towards environmental protection but were generally not willing to participate in environmental activism. They were, however, more willing to participate in educational campaigns to increase their knowledge and awareness of environmental issues. Celebrities and other role models did not have a great effect on the students' attitudes towards environmental issues. Students were willing to take personal action to protect the environment, such as recycling and attending environmental discussions to increase their knowledge. The students were willing to act against the negative effects of SUPs and to reduce their use of SUPs. The majority of students however found it difficult to change their environmental habits. This suggests the need for external aids to help the students improve their environmental habits, with the results showing that the students' environmental habits were improved when aided by external influences (e.g. recycling bins). The results showed that the majority of the students believe that the government needs to play a larger role in assisting people to switch from SUPs to more sustainable alternatives. The results indicate a need for changes in government policy and corporate involvement to ease the burden of environmentally friendly behaviours from the people. The results showed that the students are willing to behave in a more environmentally friendly manner, but that they need help in doing so.

4.4 Factor Analysis

Section 4.4 details the factor analysis conducted to construct factors concerning students' perceptions of SUPs.

4.4.1 Question 37 Factor Analysis – Students' Level of Knowledge of Pollution Matters

A principal component analysis (PCA) was used to reduce the items in question 37 to latent constructs. The analysis was therefore conducted on the five items related to the students' levels of knowledge related to pollution. The responses to Question 37 were: 1) no knowledge, 2) very little knowledge, 3) some knowledge, 4) fair knowledge and 5) thorough knowledge. A KMO and Bartlett's test were conducted to test the validity of the factor analysis of Question 37. A KMO value of over 0.6 and Bartlett's significance value of below 0.05 would reveal a substantial correlation in the data. The KMO test value was 0.795 (Appendix Table 1), which indicated that the sample size was adequate for a factor analysis. The p-value of the Bartlett's test of sphericity returned a value smaller than 0.000 (Appendix Table 1), suggesting that the correlation between statements was sufficient for a factor analysis (Field, 2005:652). This indicated that while there was a substantial correlation, the validity of this factor was not at the preferred level, but was still acceptable given that it was above 0.7. In the anti-image correlations, the measure of sampling adequacy (MSA) values exceeded 0.6 (Appendix Table 2). The total variance explained by the factor was 72.461% (Appendix Table 3). One factor comprising all five items related to the level of knowledge about pollution was extracted (Appendix Figure 1 and Appendix Table 4). A scree plot was used to show the linear combination of all variables. This was constructed to determine how many factors contained the largest proportion of information in the five variables (Eiselen & Uys, 2021: 67). The factors that contained the largest proportion of information were the ones with eigenvalues larger than 1. From Appendix Figure 1, it is apparent that only a single variable's eigenvalue was larger than 1, implying that the factor solution yielded only one factor. The factor loadings on the level of knowledge about pollution factors ranged from 0.890 to 0.826 (Appendix Table 4). Cronbach's alpha was used to test the reliability of the factor analysis. The Cronbach's alpha determines the extent to which the variables are collectively correlated to the factor by calculating the reliability of the scale (Eiselen & Uys, 2021: 73). For the PCA to be considered reliable, the Cronbach's alpha value needs to be larger than 0.7. The transformation in student life factor had a Cronbach's alpha coefficient of 0.903 (Appendix Table 5), which indicated that the result was reliable. The Kolmogoroy–Smirnov and Shapiro–Wilk tests indicated that data was not normally distributed (Appendix Table 6). The mean score for the factor was 3.78, indicating that the respondents generally held some to fair knowledge about pollution matters (Appendix Table 7).

4.4.2 Question 39 factor analysis – students' attitudes towards environmental protection

A PCA was used to reduce the items in question 39 to latent constructs. The analysis was therefore conducted on the four items related to the students' attitudes towards the environment. The scale of Question 39 was: 1) no extent, 2) very small extent, 3) some extent, 4) fairly large extent and 5) very large extent. The initial factor analysis showed that questions 39.1, 39.4 and 39.5 had to be excluded. Both KMO and Bartlett's tests were conducted to test the suitability of the factor analysis of Question 39. The KMO test result was 0.688 (Appendix Table 15), which indicated the sample size was adequate for a factor analysis but not at the level expected. The p-value of the Bartlett's test of sphericity returned a value smaller than 0.000 (Appendix Table 15), suggesting that the correlation between statements was sufficient for a factor analysis. This indicates that while the data was adequate for a factor analysis, there was no substantial correlation. In the anti-image correlations, the MSA values exceeded 0.6 (Appendix Table 16). The total variance explained by the factor was 57.988% (Appendix Table 3). One factor with all four items related to the students' attitudes towards the environment was extracted (Appendix Figure 2 and Appendix Table 17). From Appendix Figure 2 it is apparent that only a single variable's eigenvalue was larger than 1, implying that the factor solution yielded only one factor. The factor loadings on the extent of attitudes towards the environment factor ranged from 0.869 to 0.522 (Appendix Table 17). The Cronbach's alpha was used to test the reliability of the factor analysis. The transformation in the student life factor had a Cronbach's alpha coefficient of 0.706 (Appendix Table 18), which indicated that the result was reliable. The Kolmogoroy–Smirnov and Shapiro–Wilk tests indicated that the data was not normally distributed (Appendix Table 19). The mean score for the factor was 3.76, meaning that the respondents held positive attitudes towards the environment to some or a fairly large extent (Appendix Table 20).

4.4.3 Question 40 Factor Analysis – Students' Willingness to Participate in Environmental Activism

A PCA was used to reduce the items in question 40 to latent constructs. The analysis was therefore conducted on the four items related to the students' perceptions towards environmental activism. The scale of Question 40 was: 1) no extent, 2) very small extent, 3) some extent, 4) fairly large extent and 5) very large extent. Both KMO and Bartlett's tests were conducted to test the validity of the factor analysis of Question 40. The KMO test result was 0.840 (Appendix Table 21), which indicated that the sample size was adequate for a factor analysis. The p-value of the Bartlett's test of sphericity returned a value smaller than 0.000 (Appendix Table 21), suggesting that the correlation between statements was sufficient for a factor analysis. This indicates that

there was a substantial correlation. In the anti-image correlations, the MSA values exceeded 0.6 (Appendix Table 22). The total variance explained by the factor was 76.801% (Appendix Table 23). One factor with all four items related to the students' perceptions towards environmental activism was extracted (Appendix Figure 3 and Appendix Table 24). From Appendix Figure 3, it is apparent that only a single variable's eigenvalue was larger than 1, implying that the factor solution yielded only one factor. The factor loadings on the extent of perceptions towards the environmental activism factor ranged from 0.904 to 0.854 (Appendix Table 24). The Cronbach's alpha was used to test the reliability of the factor analysis. The transformation in the student life factor had a Cronbach's alpha coefficient of 0.898 (Appendix Table 25), which indicated that the result was reliable. The Kolmogoroy–Smirnov and Shapiro–Wilk tests indicated that the data was not normally distributed (Appendix Table 26). The mean score for the factor was 3.1824, meaning that the respondents held positive perceptions towards environmental activism to some or a fairly large extent (Appendix Table 27).

4.4.4 Question 43 Factor Analysis – Students' Willingness to Combat the Impact of the Negative Effects of Single-use Plastics

A PCA was used to reduce the items in question 43 to latent constructs. The analysis was therefore conducted on the eight items related to the students' willingness to combat the negative effects of SUPs. The scale of Question 43 was: 1) no extent, 2) very small extent, 3) some extent, 4) fairly large extent and 5) very large extent. Both KMO and Bartlett's tests were conducted to test the validity of the factor analysis of Question 43. The KMO test result was 0.903 (Appendix Table 41), which indicated that the sample size was adequate for a factor analysis. The p-value of the Bartlett's test of sphericity returned a value smaller than 0.000 (Appendix Table 41), suggesting that the correlation between statements was sufficient for a factor analysis. This indicated that there was substantial correlation. In the anti-image correlations, the MSA values exceeded 0.6 (Appendix Table 42). The total variance explained by the factor was 60.837% (Appendix Table 43). One factor with all eight items related to the students' willingness to combat the negative effects of SUPs was extracted (Appendix Figure 6 and Appendix Table 44). From Appendix Figure 6, it is apparent that only a single variable's eigenvalue was larger than 1, implying that the factor solution yielded only one factor. The factor loadings on the extent of students' willingness to combat the negative effects of SUPs factor ranged from 0.847 to 0.732 (Appendix Table 44). The Cronbach's alpha was used to test the reliability of the factor analysis. The transformation in the student life factor had a Cronbach's alpha coefficient of 0.907 (Appendix Table 45), which indicated that the result was reliable. The Kolmogoroy–Smirnov and Shapiro–Wilk tests indicated that the data was not normally distributed (Appendix Table 46). The mean

score for the factor was 3.4736, meaning that the respondents' willingness to combat the negative effects of SUPs was to some or a fairly large extent (Appendix Table 47).

4.4.5 Question 44 Factor Analysis – Students' Environmentally Adaptive Behaviour

A PCA was used to reduce the items in question 44 to latent constructs. The analysis was therefore conducted on the four items related to the students' perceptions of environmental behaviours. The scale of Question 40 was: 1) no extent, 2) very small extent, 3) some extent, 4) fairly large extent and 5) very large extent. Both KMO and Bartlett's tests were conducted to test the validity of the factor analysis of Question 44. The KMO test result was 0.661 (Appendix Table 48), which indicated the sample size was adequate for factor analysis. The p-value of the Bartlett's test of sphericity returned a value smaller than 0.000 (Appendix Table 48), suggesting that the correlation between statements was sufficient for a factor analysis. This indicated that there was a relevant and reliable correlation. In the anti-image correlations, the MSA values exceeded 0.54 (Appendix Table 49). The total variance explained by the factor was 52.614% (Appendix Table 50). One factor with all four items related to the students' perceptions of environmental behaviours was extracted (Appendix Figure 7 and Appendix Table 51). From Appendix Figure 7, it is apparent that only a single variable's eigenvalue was larger than 1, implying that the factor solution yielded only 1 factor. The factor loadings on the extent of perceptions of environmental behaviours factor ranged from 0.872 to 0.281 (Appendix Table 51). The Cronbach's alpha was used to test the reliability of the factor analysis. The transformation in the student life factor had a Cronbach's alpha coefficient of 0.642 (Appendix Table 52), which indicated that the result was moderately reliable. The Kolmogoroy–Smirnov and Shapiro–Wilk tests indicated that the data was normally distributed (Appendix Table 53). The mean score for the factor was 3.9975, meaning that the respondents held positive perceptions of environmental behaviours to some or a fairly large extent (Appendix Table 54).

4.4.6 Question 45 Factor Analysis – Students' Protective Attitudes Towards the Environment

A PCA was used to reduce the items in question 45 to latent constructs. The analysis was therefore conducted on the seven items related to the students' environmental habits. The scale of Question 45 was: 1) no extent, 2) very small extent, 3) some extent, 4) fairly large extent and 5) very large extent. Both KMO and Bartlett's tests were conducted to test the validity of the factor analysis of Question 45. The KMO test result was 0.822 (Appendix Table 55), which indicated the sample size was adequate for a factor analysis. The p-value of the Bartlett's test of sphericity returned a value smaller than 0.000 (Appendix Table 55), suggesting that the correlation between statements was sufficient for a factor analysis. This indicated that there was substantial

correlation. In the anti-image correlations, the MSA values exceeded 0.7 (Appendix Table 56). The total variance explained by the factor was 51.051% (Appendix Table 57). One factor with all seven items related to the students' perceptions towards environmental activism was extracted (Appendix Figure 8 and Appendix Table 58). From Appendix Figure 8, it is apparent that only a single variable's eigenvalue was larger than 1, implying that the factor solution yielded only one factor. The factor loadings on the extent of environmental behaviours factor ranged from 0.815 to 0.580 (Appendix Table 58). The Cronbach's alpha was used to test the reliability of the factor analysis. The transformation in the student life factor showed a Cronbach's alpha coefficient of 0.837 (Appendix Table 59), which indicates that the result was reliable. The Kolmogoroy–Smirnov and Shapiro–Wilk tests indicated that the distribution was normally distributed (Appendix Table 60). The mean score for the factor was 3.1099, meaning that the respondents engaged in pro-environmental behaviours to some or a fairly large extent (Appendix Table 61).

4.5 Testing of the Relationships Between Variables: Gender, Geographic Location, Socio-Economic Backgrounds, Faculty and their Relationships with Perceptions of Single-use Plastic Usage

In this section the relationships between geographic location, socio-economic backgrounds, gender, faculty and the level of knowledge of environmental matters, attitudes towards environmental protection, willingness to engage in environmental activism, willingness to combat the impact of the negative effects of SUPs, environmentally adaptive behaviour and protective attitudes towards the environment. This section reports the use of a factor analysis to determine whether there were statistically significant differences between the students' genders, geographic locations, socio-economic backgrounds and faculties and the abovementioned factors.

Table 4.5.1 Geographic Frequencies

In which type of geographical location did you mainly grow up in?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Big city, e.g. Johannesburg/Pretoria/Cape Town/Bloemfontein/Port Elizabeth/Durban, etc.	89	33,0	33,0	33,0

	Small city, e.g. Polokwane/Vaal Triangle/Vereeniging/Rustenburg/Mafikeng/Potchefstroom/Klerksdorp/ Mbombela/George, etc.	84	31,1	31,1	64,1
	Town e.g. Bethlehem/Wolmaransstad/Coligny/Kroonstad/Viljoenskroon/Vryburg/Standerton/Thabazimbi/Lichtenburg, etc.	59	21,9	21,9	85,9
	Village/Traditional settlement/Farm in a rural area	31	11,5	11,5	97,4
	Other	7	2,6	2,6	100,0
	Total	270	100,0	100,0	

Table 4.5.1 shows that the students from large cities accounted for almost one-third (32.96%) of the total. Students from small cities numbered only slightly less than big cities (31.11%). The remaining 35.93% of students came from towns, villages, or other geographic locations.

Table 4.5.2 Socio-economic background frequencies

Which scenario best describes the ability of your family's household to provide in your needs?					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	Cannot or rarely provides the basics – has help from other sources, e.g. food parcels or social grants	8	3,0	3,0	3,0

	Struggling to make ends meet (does not always manage to cover basic needs)	10	3,7	3,7	6,7
	Just manages to make ends meet (cover basic needs)	27	10,0	10,0	16,7
	Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	86	31,9	32,0	48,7
	Well off (lives a comfortable, privileged life, but not excessively)	97	35,9	36,1	84,8
	Affluent (more than just comfortable, but not extremely rich)	33	12,2	12,3	97,0
	Extremely rich	8	3,0	3,0	100,0
	Total	269	99,6	100,0	
Missing	System	1	0,4		
Total		270	100,0		

4.5.1 Geographic Location

This section investigates the relationship between the geographic location where the students grew up and their level of knowledge of environmental matters, attitudes towards environmental protection, willingness to engage in environmental activism, willingness to combat the impact of the negative effects of single-use plastics, environmentally adaptive behaviour and protective attitudes towards the environment.

4.5.1.1 Geographic Location and Knowledge of Pollution Matters

In this subsection, the difference in the mean subsections of students' knowledge of pollution matters between geographic locations was investigated. Table 4.5.3 presents the descriptive statistics.

Table 4.5.3 Descriptive statistics for geographic location and knowledge of pollution matters

Descriptives								
F37_Plastic_knowledge								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Big city, e.g. Johannesburg /Pretoria /Cape Town /Bloemfontein /Port Elizabeth /Durban, etc.	89	3,7685	0,87951	0,09323	3,5833	3,9538	2,00	5,00
Small city, e.g. Polokwane /Vaal Triangle /Vereeniging /Rustenburg /Mafikeng /Potchefstroom /Klerksdorp /Mbombela /George, etc.	84	3,7881	0,80681	0,08803	3,6130	3,9632	1,00	5,00
Town e.g. Bethlehem /Wolmaransstad /Coligny /Kroonstad /Viljoenskroon /Vryburg /Standerton /Thabazimbi /Lichtenburg, etc.	59	3,7322	0,85146	0,11085	3,5103	3,9541	1,00	5,00
Village /Traditional settlement /Farm in a rural area	31	3,8387	0,84130	0,15110	3,5301	4,1473	1,40	5,00
Total	263	3,7749	0,84174	0,05190	3,6727	3,8771	1,00	5,00

In the above table, the students' knowledge of pollution matters mean scores are between 3.73 and 3.84 for all geographic locations. This indicates that most students leaned towards a "fair knowledge" of pollution matters in all the geographic locations and there was no meaningful difference in their level of knowledge. An ANOVA was conducted to determine whether there was a statistically significant difference in the mean scores.

Table 4.5.4 ANOVA for geographic location and knowledge of pollution matters

ANOVA					
F37_Plastic_knowledge					
	Sum of squares	df	Mean square	F	Sig.

Between groups	0,252	3	0,084	0,117	0,950
Within groups	185,382	259	0,716		
Total	185,634	262			

Table 4.5.4 shows the ANOVA results. The ANOVA p-value was 0.950>0.05. This indicates that there was no significant difference between the mean scores of students' knowledge of pollution matters among different geographic locations. It could be concluded that students from different geographic locations shared the same level of knowledge of pollution matters, which tended towards "fair knowledge".

4.5.1.2 Geographic Location and Attitudes Towards Environmental Protection

In this subsection the difference in the mean scores of students' attitudes towards environmental protection between different geographic locations is investigated. Table 4.5.5 presents the descriptive statistics.

Table 4.5.5 Descriptive statistics for geographic location and attitudes towards the environment

Descriptives

F39_Attitude_Plastic

	N	Mean	Std. deviation	Std. error	95% Confidence interval for the mean		Minimum	Maximum
					Lower bound	Upper bound		
Big city, e.g. Johannesburg /Pretoria /Cape Town /Bloemfontein /Port Elizabeth /Durban, etc.	89	3,8052	0,73865	0,07830	3,6496	3,9608	1,00	5,00
Small city, e.g. Polokwane /Vaal Triangle /Vereeniging /Rustenburg /Mafikeng /Potchefstroom /Klerksdorp /Mbombela /George, etc.	84	3,7619	0,72176	0,07875	3,6053	3,9185	2,00	5,00

Town e.g. Bethlehem /Wolmaransstad /Coligny /Kroonstad /Viljoenskroon /Vryburg /Standerton /Thabazimbi /Lichtenburg, etc.	59	3,7260	0,64902	0,08450	3,5569	3,8951	2,00	5,00
Village /Traditional settlement /Farm in a rural area	31	3,7688	0,71838	0,12902	3,5053	4,0323	2,33	5,00
Total	263	3,7693	0,70817	0,04367	3,6833	3,8553	1,00	5,00

In the above table, students' attitudes towards protecting the environment had mean scores between 3.72 and 3.81 for all geographic locations. This indicates that students agreed "to a fairly large extent" on their attitudes towards protecting the environment, with no overall differences in their attitudes. The ANOVA determined whether there was a statistically significant difference in the mean scores.

Table 4.5.6 ANOVA for geographic location and attitudes towards environmental protection

ANOVA					
F39_Attitude_Plastic					
	Sum of squares	df	Mean square	F	Sig.
Between groups	0,230	3	0,077	0,152	0,929
Within groups	131,165	259	0,506		
Total	131,395	262			

Table 4.5.6 shows the ANOVA results for geographic location and attitudes towards environmental protection. The ANOVA's p-value was 0.929>0.05. This indicates that there was no significant difference between the mean scores of students' attitudes towards protecting the environment among students from different geographic locations. It could be concluded that the students from the different geographic locations shared the same attitudes towards protecting the environment. Their attitude was generally towards "fairly large extent".

4.5.1.3 Geographic Location and Willingness to Participate in Environmental Activism

This subsection evaluates the differences in mean scores for students from different geographic locations and their willingness to participate in environmental activism. Table 4.5.7 shows the descriptive statistics.

Table 4.5.7 Descriptive statistics for geographic location and environmental activism

Descriptives

F40_Activism_Plastic

	N	Mean	Std. deviation	Std. error	95% Confidence interval for the mean		Minimum	Maximum
					Lower bound	Upper bound		
Big city, e.g. Johannesburg/ Pretoria /Cape Town /Bloemfontein /Port Elizabeth /Durban, etc.	89	3,2640	1,11317	0,11800	3,0296	3,4985	1,00	5,00
Small city, e.g. Polokwane /Vaal Triangle /Vereeniging /Rustenburg /Mafikeng /Potchefstroom /Klerksdorp /Mbombela /George, etc.	84	3,2351	1,14620	0,12506	2,9864	3,4839	1,00	5,00
Town e.g. Bethlehem /Wolmaransstad /Coligny /Kroonstad /Viljoenskroon /Vryburg /Standerton /Thabazimbi /Lichtenburg, etc.	59	2,9322	0,98461	0,12819	2,6756	3,1888	1,00	5,00
Village /Traditional settlement /Farm in a rural area	31	3,3790	0,93735	0,16835	3,0352	3,7229	1,00	5,00
Total	263	3,1939	1,08135	0,06668	3,0626	3,3252	1,00	5,00

In Table 4.5.7, the mean scores ranged from 3.23 to 3.38, except for the town location, which had a mean score of 2.9322. This shows that the locations other than the town agreed more with “some extent” and leaned towards “fairly large extent”. An ANOVA was conducted to determine whether the mean score for students from towns was statistically different from the mean scores of the students from other locations.

Table 4.5.8 ANOVA for geographic location and environmental activism

ANOVA					
F40_Activism_Plastic					
	Sum of squares	df	Mean square	F	Sig.
Between groups	5,684	3	1,895	1,632	0,182
Within groups	300,677	259	1,161		
Total	306,360	262			

The result given in Table 4.5.8 had a p-value of 0.182. This was larger than the 0.05 marker. Therefore, there was no significant difference in the mean scores of the students' willingness to participate in environmental activism among students from different geographical locations. This indicates that the students from different geographical locations had a broadly similar willingness to participate in environmental activism. Students generally agreed to participate to "some extent".

4.5.1.4 Geographical Location and Willingness to Combat the Impact of the Negative Effects of Single-use Plastics

This subsection evaluates the differences in the mean scores of the willingness to combat the impact of the negative effects of SUPs among students from different geographic locations. Table 4.5.9 shows the descriptive statistics and mean scores for each geographic location.

Table 4.5.9 Descriptive statistics for geographical location and willingness to combat the impact of the negative effects of SUPs

Descriptives								
F43_Willing_combat_Plastics								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Big city, e.g. Johannesburg /Pretoria /Cape Town /Bloemfontein /Port Elizabeth /Durban, etc.	89	3,5646	0,91276	0,09675	3,3723	3,7569	1,00	5,00

Small city, e.g. Polokwane /Vaal Triangle /Vereeniging /Rustenburg /Mafikeng /Potchefstroom/ Klerksdorp /Mbombela /George, etc.	84	3,4792	0,87011	0,09494	3,2903	3,6680	1,75	5,00
Town e.g. Bethlehem /Wolmaransstad /Coligny /Kroonstad /Viljoenskroon /Vryburg /Standerton /Thabazimbi /Lichtenburg, etc.	59	3,3877	0,92286	0,12015	3,1472	3,6282	1,38	5,00
Village /Traditional settlement /Farm in a rural area	31	3,4315	0,87013	0,15628	3,1123	3,7506	1,88	5,00
Total	263	3,4819	0,89416	0,05514	3,3734	3,5905	1,00	5,00

The mean scores for small city, town and village were similar with values between 3.38 and 3.48, while big city had a mean of 3.56. This indicates that students from a big city indicated “fairly large extent” more than the other three options when asked about their willingness to combat the negative effects of SUPs. An ANOVA was conducted to determine whether there was a significant difference between the mean scores for students from a large city and students from other geographic locations. Table 4.5.10 shows the results of the ANOVA.

Table 4.5.10 ANOVA for geographic location and willingness to combat the negative effects of SUPs

ANOVA					
F43_Willing_combat_Plastics					
	Sum of squares	df	Mean square	F	Sig.
Between groups	1,212	3	0,404	0,502	0,681
Within groups	208,265	259	0,804		
Total	209,477	262			

The ANOVA results showed that there was no significant difference in the mean scores of students from a big city and students from other geographical locations. The p-value of the ANOVA was 0.681>0.05, indicating that there was no statistically significant difference in the willingness to combat the impact of the negative effects of SUPs among students from different

geographic locations. It could be concluded that students from different geographic locations generally had the same willingness to combat the impact of the negative effects of SUPs, which was between “some extent” and “fairly large extent”.

4.5.1.5 Geographic Location and Environmentally Adaptive Behaviour

This subsection focuses on the differences in the mean scores of environmentally adaptive behaviour among students from different geographic locations. Table 4.5.11 presents the descriptive statistics and mean scores of each location concerning the students' environmentally adaptive behaviours.

Table 4.5.11 Descriptive statistics for geographic location and environmentally adaptive behaviour

Descriptives								
F44_Environ_behav_Plastics								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Big city, e.g. Johannesburg /Pretoria /Cape Town /Bloemfontein /Port Elizabeth /Durban, etc.	89	4,1199	0,81533	0,08642	3,9481	4,2916	2,00	5,00
Small city, e.g. Polokwane /Vaal Triangle /Vereeniging /Rustenburg /Mafikeng /Potchefstroom/ Klerksdorp /Mbombela /George, etc.	84	4,0119	0,72523	0,07913	3,8545	4,1693	2,00	5,00
Town e.g. Bethlehem/ Wolmaransstad /Coligny /Kroonstad /Viljoenskroon /Vryburg /Standerton /Thabazimbi /Lichtenburg, etc.	59	3,8870	0,89830	0,11695	3,6529	4,1211	1,67	5,00
Village /Traditional settlement /Farm in a rural area	31	3,9677	0,79515	0,14281	3,6761	4,2594	2,67	5,00
Total	263	4,0152	0,80537	0,04966	3,9174	4,1130	1,67	5,00

The different geographic locations had similar mean scores with values between 3.9 and 4.12, with only the town location having a lower mean score of 3.8870. This result occurred because students from towns, indicated “some extent” more frequently than students from the other three locations. An ANOVA was conducted to determine whether there was a statistically significant difference in the mean scores of students from towns and other geographic locations.

Table 4.5.12 ANOVA for geographic location and perceptions of environmental behaviours

ANOVA					
F44_Environ_behav_Plastics					
	Sum of squares	df	Mean square	F	Sig.
Between Groups	2,015	3	0,672	1,036	0,377
Within Groups	167,924	259	0,648		
Total	169,939	262			

Table 4.5.12 shows the ANOVA results. The test recorded a p-value of 0.377>0.05. This means that there was no significant difference in the mean scores of the students from different geographical locations. It could be concluded that students from different geographical locations largely displayed the same environmentally adaptive behaviour.

4.5.1.6 Geographic Location and Protective Attitudes Towards the Environment

This subsection evaluates the differences in the mean scores of protective attitudes towards the environment among students from different geographic locations. Table 4.5.13 shows the mean scores of the different locations in relation to the students' protective attitudes towards the environment.

Table 4.5.13 Descriptive statistics for geographic location and protective attitudes towards the environment

Descriptives								
F45_Environ_protect_attit_Plastics								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Big city, e.g. Johannesburg /Pretoria /Cape Town /Bloemfontein /Port Elizabeth /Durban, etc.	89	3,2825	0,81155	0,08602	3,1115	3,4535	1,00	5,00

Small city, e.g. Polokwane /Vaal Triangle /Vereeniging /Rustenburg /Mafikeng /Potchefstroom /Klerksdorp /Mbombela /George, etc.	84	3,0629	0,86524	0,09441	2,8752	3,2507	1,43	5,00
Town e.g. Bethlehem /Wolmaransstad /Coligny /Kroonstad /Viljoenskroon /Vryburg /Standerton /Thabazimbi /Lichtenburg, etc.	59	2,9847	0,77737	0,10120	2,7821	3,1872	1,00	4,86
Village /Traditional settlement /Farm in a rural area	31	3,1613	0,93149	0,16730	2,8196	3,5030	1,29	5,00
Total	263	3,1313	0,84007	0,05180	3,0293	3,2333	1,00	5,00

The mean scores of geographic locations were between 2.98 and 3.28, while town had a mean score of 2.9847. An ANOVA was conducted to determine whether there was a significant difference between these mean scores.

Table 4.5.14 ANOVA for geographic location and environmental behaviours

ANOVA					
F45_Environ_protect_attit_Plastics					
	Sum of squares	df	Mean square	F	Sig.
Between Groups	3,724	3	1,241	1,775	0,152
Within Groups	181,175	259	0,700		
Total	184,899	262			

Table 4.5.14 shows the results of the ANOVA. The ANOVA indicated that there was no significant difference between the mean scores of the different groups. The p-value of 0.152>0.05, indicated that the mean scores were not significantly different. It could be concluded that the environmental behaviours of students from different geographic locations were largely similar, with most respondents indicating “some extent”.

In general, there were no statistically significant differences found between geographic location and the six factors. This indicates that geographic location did not have any significant effect on

the students' knowledge of pollution matters, attitudes towards environmental protection, willingness to participate in environmental activism, willingness to combat the negative effects of SUPs, environmentally adaptive behaviours, or their protective attitudes towards the environment. Students from different geographic locations all had similar responses to these factors.

4.5.2 Socio-economic Background

This section investigates the relationship between a family's household ability to provide for their needs, and level of knowledge of environmental matters, attitudes towards environmental protection, willingness to engage in environmental activism, willingness to combat the impact of the negative effects of SUPs, environmentally adaptive behaviour and protective attitudes towards the environment.

4.5.2.1 Socio-economic Background and Knowledge of Pollution Matters

This subsection focuses on the differences in the mean scores of knowledge of pollution matters among students from different socio-economic backgrounds. Table 4.5.15 lists the descriptive statistics.

Table 4.5.15 Descriptive statistics for socio-economic background and knowledge of pollution matters

Descriptives								
F37_Plastic_knowledge								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Cannot or rarely provides the basics and struggling to make ends meet	18	4,0778	0,53639	0,12643	3,8110	4,3445	3,20	5,00
Just manages to make ends meet (cover basic needs)	27	3,7630	0,87712	0,16880	3,4160	4,1099	1,40	5,00

Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	86	3,7116	0,93889	0,10124	3,5103	3,9129	1,00	5,00
Well off (lives a comfortable, privileged life, but not excessively)	97	3,7773	0,76479	0,07765	3,6232	3,9315	1,00	5,00
Affluent and extremely rich	41	3,8585	0,87435	0,13655	3,5826	4,1345	2,00	5,00
Total	269	3,7874	0,83933	0,05117	3,6866	3,8881	1,00	5,00

Table 4.5.15 shows that the mean scores of all socio-economic backgrounds were between 3.71 and 3.86, except for “cannot or rarely provides the basics”, which had a mean score of 4.0778. Students from this socio-economic background indicated “thorough knowledge” more than those from the other socio-economic backgrounds. An ANOVA was conducted to determine whether the mean score for students from this background was significantly different from the mean score of students from other backgrounds.

Table 4.5.16 ANOVA for socio-economic background and knowledge of pollution matters

ANOVA					
F37_Plastic_knowledge					
	Sum of squares	df	Mean square	F	Sig.
Between Groups	2,245	4	0,561	0,794	0,530
Within Groups	186,552	264	0,707		
Total	188,797	268			

Table 4.5.16 shows the ANOVA results. The ANOVA revealed that there was no significant difference between the mean scores. The p-value of 0.530>0.05, indicated that there was no statistically significant difference between the mean scores of the different socio-economic backgrounds. It could be concluded that students from different socio-economic backgrounds had a largely similar knowledge of pollution matters, with most respondents indicating “fair knowledge”.

4.5.2.2 Socio-economic Background and Attitude Towards Environmental Protection

This subsection investigates the difference in mean scores between students' attitudes towards environmental protection between different socio-economic backgrounds. Table 4.5.17 shows the descriptive statistics.

Table 4.5.17 Descriptive statistics for socio-economic background and attitudes towards environmental protection

Descriptives								
F39_Attitude_Plastic								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Cannot or rarely provides the basics and struggling to make ends meet	18	3,6481	0,61007	0,14379	3,3448	3,9515	2,50	4,67
Just manages to make ends meet (cover basic needs)	27	3,9506	0,83948	0,16156	3,6185	4,2827	2,00	5,00
Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	86	3,6163	0,67740	0,07305	3,4710	3,7615	2,33	5,00
Well off (lives a comfortable, privileged life, but not excessively)	97	3,7801	0,65508	0,06651	3,6480	3,9121	2,50	5,00
Affluent and extremely rich	41	3,9837	0,80433	0,12562	3,7299	4,2376	1,00	5,00
Total	269	3,7670	0,71181	0,04340	3,6816	3,8525	1,00	5,00

Table 4.5.17 shows how students' attitudes towards environmental protection are linked to their socio-economic background. In terms of socio-economic backgrounds, most students had mean

scores between 3.6 and 3.8, while the “just manages to make ends meet” and “affluent or extremely rich” categories had mean scores of 3.9506 and 3.9837, respectively. This indicates that these two socio-economic backgrounds had fairly strong attitudes towards environmental protection while the other three had slightly weaker attitudes. An ANOVA was conducted to determine whether the differences in their mean scores were significant.

Table 4.5.18 ANOVA for socio-economic background and attitudes towards environmental protection

ANOVA					
F39_Attitude_Plastic					
	Sum of squares	df	Mean square	F	Sig.
Between Groups	5,061	4	1,265	2,555	0,039
Within Groups	130,729	264	0,495		
Total	135,790	268			

The ANOVA returned a p-value of 0.039<0.05, indicating that there was a significant difference in mean scores. To further investigate, pairwise multiple comparisons tests or post-hoc tests were calculated. To determine which post-hoc test is applicable, a test of homogeneity of variances was conducted.

Table 4.5.19 Tests of homogeneity of variances

Tests of homogeneity of variances					
		Levene statistic	df1	df2	Sig.
F39_Attitude_Plastic	Based on mean	0,4	4	264	0,809
	Based on median	0,372	4	264	0,828
	Based on median and with adjusted df	0,372	4	206,761	0,828
	Based on trimmed mean	0,33	4	264	0,858

The null hypothesis of equal population variances is rejected if the p-value is less than 0.05. Table 4.5.22 shows that the p-value of the homogeneity of variances was 0.809. This means that the null hypothesis of equal population variances cannot be rejected. Thus, the Scheffe post-hoc test was applied. The table below shows the results of the Scheffe post-hoc test.

Table 4.5.20 Multiple comparisons

Multiple comparisons							
Dependent Variable:							
(I) Family's household ability to provide in your needs			Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
						Lower bound	Upper bound
Scheffe	Cannot or rarely provides the basics and struggling to make ends meet	Just manages to make ends meet (cover basic needs)	-0,30247	0,21413	0,737	-0,9667	0,3618
		Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	0,03187	0,18240	1,000	-0,5340	0,5977
		Well off (lives a comfortable, privileged life, but not excessively)	-0,13192	0,18060	0,970	-0,6922	0,4283
		Affluent and extremely rich	-0,33559	0,19897	0,585	-0,9528	0,2816
	Just manages to make ends meet (cover basic needs)	Cannot or rarely provides the basics and struggling to make ends meet	0,30247	0,21413	0,737	-0,3618	0,9667
		Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	0,33434	0,15524	0,329	-0,1472	0,8159
		Well off (lives a comfortable, privileged life, but not excessively)	0,17055	0,15312	0,871	-0,3044	0,6455
		Affluent and extremely rich	-0,03312	0,17441	1,000	-0,5742	0,5079

	Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	Cannot or rarely provides the basics and struggling to make ends meet	-0,03187	0,18240	1,000	-0,5977	0,5340
		Just manages to make ends meet (cover basic needs)	-0,33434	0,15524	0,329	-0,8159	0,1472
		Well off (lives a comfortable, privileged life, but not excessively)	-0,16379	0,10423	0,650	-0,4871	0,1595
		Affluent and extremely rich	-0,36746	0,13355	0,112	-0,7818	0,0468
	Well off (lives a comfortable, privileged life, but not excessively)	Cannot or rarely provides the basics and struggling to make ends meet	0,13192	0,18060	0,970	-0,4283	0,6922
		Just manages to make ends meet (cover basic needs)	-0,17055	0,15312	0,871	-0,6455	0,3044
		Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	0,16379	0,10423	0,650	-0,1595	0,4871
		Affluent and extremely rich	-0,20367	0,13108	0,660	-0,6103	0,2030
	Affluent and extremely rich	Cannot or rarely provides the basics and struggling to make ends meet	0,33559	0,19897	0,585	-0,2816	0,9528
		Just manages to make ends meet (cover basic needs)	0,03312	0,17441	1,000	-0,5079	0,5742

		Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	0,36746	0,13355	0,112	-0,0468	0,7818
		Well off (lives a comfortable, privileged life, but not excessively)	0,20367	0,13108	0,660	-0,2030	0,6103
*. The mean difference is significant at the 0.05 level.							

The Scheffe post-hoc test indicated that there was no significant difference in mean scores between the categories. The p-values of the Scheffe test were all greater than the standard 0.05 value. This means that significant differences between the groupings could not be identified. Because ANOVA and the post-hoc test use different calculation strategies, discrepancies in whether differences are significant can occur.

4.5.2.3 Socio-economic Background and Willingness to Participate in Environmental Activism

This subsection evaluates the differences in the mean scores of willingness to participate in environmental activism among students from different socio-economic backgrounds. Table 4.5.21 lists the descriptive statistics of the different backgrounds.

Table 4.5.21 Descriptive statistics for socio-economic background and willingness to participate in environmental activism

Descriptives								
F40_Activism_Plastic								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Cannot or rarely provides the basics and struggling to make ends meet	18	3,2083	1,08211	0,25506	2,6702	3,7465	1,25	5,00

Just manages to make ends meet (cover basic needs)	27	3,5833	1,12018	0,21558	3,1402	4,0265	1,50	5,00
Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	86	3,3256	1,06348	0,11468	3,0976	3,5536	1,00	5,00
Well off (lives a comfortable, privileged life, but not excessively)	97	2,9871	1,02404	0,10398	2,7807	3,1935	1,00	5,00
Affluent and extremely rich	41	3,0793	1,16517	0,18197	2,7115	3,4470	1,00	5,00
Total	269	3,1840	1,08224	0,06599	3,0541	3,3139	1,00	5,00

Table 4,5,22 shows that the mean scores of most of the backgrounds were between 2.9 and 3.5, while “just manages to make ends meet” had a mean score of 3.58. Students from this background indicated “fairly large extent” more often than the students from other backgrounds. An ANOVA was conducted to determine whether the mean score of students from this background was significantly different from that of students from other backgrounds.

Table 4.5.22 ANOVA for socio-economic background and willingness to participate in environmental activism

ANOVA					
F40_Activism_Plastic					
	Sum of squares	df	Mean square	F	Sig.
Between groups	10,250	4	2,563	2,228	0,066
Within groups	303,641	264	1,150		
Total	313,891	268			

The ANOVA results in Table 4.5.22 show that there was no significant difference in the mean scores. The p-value of 0.066>0.05, indicates that there were no significant differences between

the mean scores for students of different backgrounds. It could be concluded that the students' willingness to participate in environmental activism was broadly similar, irrespective of their socio-economic background.

4.5.2.4 Socio-economic Background and Willingness to Combat the Impact of the Negative Effects of Single-use Plastics

This subsection evaluates the difference in the mean scores of the willingness to combat the impact of the negative effects of SUPs among students from different socio-economic backgrounds. The table below lists the descriptive statistics for the different socio-economic backgrounds.

Table 4.5.23 Descriptive statistics for socio-economic background and willingness to combat the impact of the negative effects of SUPs

Descriptives								
F43_Willing_combat_Plastics								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Cannot or rarely provides the basics and struggling to make ends meet	18	3,4028	0,87611	0,20650	2,9671	3,8385	1,75	5,00
Just manages to make ends meet (cover basic needs)	27	3,4676	1,09005	0,20978	3,0364	3,8988	1,38	5,00
Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	86	3,3997	0,79609	0,08584	3,2290	3,5704	1,88	5,00
Well off (lives a comfortable, privileged life, but not excessively)	97	3,4394	0,89543	0,09092	3,2590	3,6199	1,75	5,00

Affluent and extremely rich	41	3,7713	0,94782	0,14802	3,4722	4,0705	1,00	5,00
Total	269	3,4777	0,89572	0,05461	3,3702	3,5852	1,00	5,00

The “affluent and extremely rich” socio-economic background had a mean score of 3.77, while the other backgrounds had mean scores between 3.39 and 3.46. This means that students from the “affluent and extremely rich” background indicated a stronger willingness to combat the impact of the negative effects of SUPs than students from the other socio-economic backgrounds. An ANOVA was conducted to determine whether this was a statistically significant difference.

Table 4.5.24 ANOVA for socio-economic background and willingness to combat the impact of the negative effects of SUPs

ANOVA					
F43_Willing_combat_Plastics					
	Sum of squares	df	Mean square	F	Sig.
Between groups	4,304	4	1,076	1,348	0,252
Within groups	210,718	264	0,798		
Total	215,022	268			

The ANOVA results in Table 4.5.24 revealed that there was no significant difference in mean scores. The p-value of 0.252>0.05 indicated that there was no significant difference in the students’ willingness to combat the impact of the negative effects of SUPs. It could be concluded that students from different socio-economic backgrounds have broadly the same willingness to combat the impact of the negative effects of SUPs. Most students answered between “fairly large extent” and “some extent”.

4.5.2.5 Socio-economic Background and Environmentally Adaptive Behaviour

This section evaluates the differences in environmentally adaptive behaviour among students from different socio-economic backgrounds. Table 4.5.25 lists the descriptive statistics for the different socio-economic backgrounds.

Table 4.5.25 Descriptive statistics for socio-economic background and environmentally adaptive behaviour

Descriptives								
F44_Environ_behav_Plastics								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Cannot or rarely provides the basics and struggling to make ends meet	18	3,8519	0,93740	0,22095	3,3857	4,3180	1,67	5,00
Just manages to make ends meet (cover basic needs)	27	4,0247	0,89120	0,17151	3,6721	4,3772	1,67	5,00
Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	86	4,0078	0,82601	0,08907	3,8307	4,1848	2,00	5,00
Well off (lives a comfortable, privileged life, but not excessively)	97	3,9485	0,79253	0,08047	3,7887	4,1082	2,00	5,00
Affluent and extremely rich	41	4,1707	0,78217	0,12215	3,9238	4,4176	2,00	5,00
Total	269	4,0025	0,82004	0,05000	3,9040	4,1009	1,67	5,00

Table 4.5.25 shows that students from the “cannot or rarely makes ends meet” background had a mean score of 3.85, while the other backgrounds had mean scores between 3.94 and 4.17. This indicates that students from the “cannot or rarely makes ends meet” background indicated “some extent” more frequently than students from the other backgrounds in regard to their environmentally adaptive behaviour. An ANOVA was conducted to determine whether the difference in mean scores was statistically significant. Table 4.5.26 shows the ANOVA results for socio-economic background and environmentally adaptive behaviour

ANOVA					
F44_Environ_behav_Plastics					
	Sum of squares	df	Mean square	F	Sig.
Between groups	1,868	4	0,467	0,691	0,599
Within groups	178,353	264	0,676		
Total	180,221	268			

The ANOVA results in Table 4.5.26 revealed that there was no significant difference in mean scores. The p-value was 0.599>0.05, indicating that the difference in mean scores was not statistically significant. It could be concluded that students from different socio-economic backgrounds had broadly similar perceptions of environmentally adaptive behaviour, with most students answering “fairly large extent”.

4.5.2.6 Socio-economic Background and Protective Attitudes Towards the Environment

This subsection evaluates the differences in mean scores of students’ protective attitudes towards the environment from different socio-economic backgrounds. Table 4.5.27 presents the descriptive statistics of the different socio-economic backgrounds.

Table 4.5.27 Descriptive statistics for socio-economic background and protective attitudes towards the environment

Descriptives								
F45_Environ_protect_attit_Plastics								
					95% Confidence interval for the mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Cannot or rarely provides the basics and struggling to make ends meet	18	3,0476	0,89684	0,21139	2,6016	3,4936	1,57	4,43
Just manages to make ends meet (cover basic needs)	27	3,3527	0,89148	0,17157	3,0001	3,7054	1,67	5,00

Living an adequate life (generally has what is needed in terms of food, clothing, living costs, transport, etc.)	86	3,0199	0,88503	0,09543	2,8302	3,2097	1,00	5,00
Well off (lives a comfortable, privileged life, but not excessively)	97	3,0619	0,80202	0,08143	2,9002	3,2235	1,00	4,86
Affluent and extremely rich	41	3,3031	0,78194	0,12212	3,0563	3,5499	1,14	5,00
Total	269	3,1135	0,84472	0,05150	3,0121	3,2149	1,00	5,00

Table 4.5.27 shows that the mean scores were mostly between 3.01 and 3.06, while for two backgrounds the mean scores were between 3.30 and 3.35. This means that students from the "just manages to make ends meet" and "affluent and extremely rich" backgrounds responded with "fairly large extent" more often than students from the other backgrounds. An ANOVA was conducted to determine whether there was a significant difference between these two backgrounds and the other three.

Table 4.5.28 ANOVA for socio-economic background and protective attitudes towards the environment

ANOVA					
F45_Environ_protect_attit_Plastics					
	Sum of squares	df	Mean square	F	Sig.
Between groups	4,109	4	1,027	1,449	0,218
Within groups	187,123	264	0,709		
Total	191,233	268			

Table 4.5.28 shows that there was no significant difference in the mean scores. The p-value of 0.218>0.05, indicated that there was no reason to reject the null hypothesis. This indicates that the mean scores were assumed to be the same. It could be concluded that students from different socio-economic backgrounds have largely protective attitudes towards the environment.

The socio-economic background or the family's household ability to provide for their needs, did not have any significant relationship with the six factors tested in the study. There was a potentially significant relationship with students' attitudes towards environmental protection, but this could not be confirmed through the factor analysis. The students' socio-economic background had no significant relationship with their knowledge of pollution matters, willingness to participate in environmental activism, willingness to combat the negative effects of SUPs, environmentally adaptive behaviour, or their protective attitudes towards the environment.

4.5.3 Gender

This section investigates the relationship between gender and the level of knowledge of pollution matters, attitudes towards environmental protection, willingness to participate in environmental activism, willingness to combat the impact of the negative effects of SUPs, environmentally adaptive behaviour and protective attitudes towards the environment.

4.5.3.1 Gender and Knowledge of Pollution Matters

In this section, the analysis focused on the relationship between gender and knowledge of pollution matters. Table 4.5.29 shows the group statistics for gender regarding knowledge of pollution matters.

Table 4.5.29 Gender and knowledge of pollution group statistics

Group statistics					
Which sex/gender do you identify yourself with?		N	mean	Std. deviation	Std. error mean
F37_Plastic_knowledge	Male	115	3,7861	0,81034	0,07556
	Female	155	3,7819	0,86381	0,06938

The mean scores were 3.7861 for males and 3.7819 for females. The students' sex/gender self-identification did not lead to a difference in their knowledge of pollution matters. This was confirmed in Table 4.5.30 below, which presents the results of an independent Levene test and T-test.

Table 4.5.30 Independent samples T-test for gender and knowledge of pollution matters

Independent samples T-test											
	Levene's Test for Equality of Variances			t-test for Equality of Means							
						Significance				95% Confidence interval of the difference	
		F	Sig.	t	df	One-sided p	Two-sided p	Mean difference	Std. error difference	Lower	Upper
F37 Plastic knowledge	Equal variances assumed	0,768	0,382	0,040	268	0,484	0,968	0,00415	0,10356	-0,19975	0,20805
	Equal variances not assumed			0,040	253,742	0,484	0,968	0,00415	0,10259	-0,19788	0,20618

The p-value in the Levene's test was 0.382, i.e. greater than 0.05. This means that the null hypothesis that the variances were equal could not be rejected. The T-test results of the row in which equal variances were assumed must therefore be used. In this row, the p-value of the two-tailed t-test was 0.968. Because this value was greater than 0.05, it confirmed that there was no significant difference between the mean scores of the male and female students concerning their knowledge of pollution matters.

4.5.3.2 Gender and Attitude Towards Environmental Protection

In this section, the analysis focused on the relationship between gender and attitudes towards environmental protection. In Table 4.5.31, the group statistics for gender are displayed in relation to attitudes towards environmental protection.

Table 4.5.31 Gender and attitudes towards environmental protection group statistics

Group Statistics					
Which sex/gender do you identify yourself with?		N	Mean	Std. deviation	Std. error mean
F39_Attitude_Plastic	Male	115	3,7275	0,71850	0,06700
	Female	155	3,7903	0,70961	0,05700

The mean scores were 3.7275 for males and 3.7903 for females. The students' sex/gender self-identification did not lead to a difference in their attitudes towards environmental protection. This is affirmed in Table 4.5.32 below which displays the independent Levene test and T-test.

Table 4.5.32 Independent samples T-test for gender and attitudes towards environmental protection

Independent Samples Test											
		Levene's test for equality of variances		t-test for Equality of means							
						Significance				95% Confidence interval of the difference	
		F	Sig.	t	df	One-sided p	Two-sided p	Mean difference	Std. error difference	Lower	Upper
F39 Attitude Plastic	Equal variances assumed	0,130	0,719	-0,715	268	0,238	0,475	-0,06279	0,08780	-0,23566	0,11008
	Equal variances not assumed			-0,714	244,079	0,238	0,476	-0,06279	0,08796	-0,23605	0,11048

The p-value for Levene's test was 0.719, i.e., greater than 0.05. This means the null hypothesis that the variances were equal could not be rejected. The T-test results of the row in which equal variances were assumed must therefore be used. In this row, the p-value of the two-tailed t-test was 0.475. Because this was greater than 0.05, there was no significant difference between the mean scores of the male and female students concerning their attitudes towards environmental protection.

4.5.3.3 Gender and Willingness to Participate in Environmental Activism

In this section, the analysis focused on the relationship between gender and the students' willingness to participate in environmental activism. Table 4.5.33 presents the group statistics for gender in relation to the willingness to participate in environmental activism.

Table 4.5.33 Gender and willingness to participate in environmental activism group statistics

Group statistics					
Which sex/gender do you identify yourself with?		N	Mean	Std. deviation	Std. error mean
F40_Activism_Plastic	Male	115	3,0957	1,05682	0,09855
	Female	155	3,2468	1,09677	0,08809

The mean scores were 3.0957 for males and 3.2468 for females. The students' sex/gender self-identification resulted in a slight difference in the mean scores of their willingness to participate in

environmental activism. The statistical significance of this was tested with an independent Levene test and T-test with the results presented in Table 4.5.34.

Table 4.5.34 Independent samples T-test for gender and environmental activism

Independent samples T-test											
		Levene's test for equality of variances		t-test for Equality of Means							
						Significance				95% Confidence interval of the difference	
		F	Sig.	t	df	One-sided p	Two-sided p	Mean difference	Std. error difference	Lower	Upper
F40 Activism Plastic	Equal variances assumed	0,400	0,528	-1,137	268	0,128	0,257	-0,15112	0,13292	-0,41281	0,11057
	Equal variances not assumed			-1,143	250,553	0,127	0,254	-0,15112	0,13218	-0,41146	0,10921

The p-value for the Levene's test was 0.528, i.e. greater than 0.05. This means that the null hypothesis that the variances were equal could not be rejected. The T-test results of the row in which equal variances were assumed must therefore be used. In this row, the p-value of the two-tailed t-test was 0.257. Because this value was greater than 0.05, there was no significant difference between the mean scores of the male and female students with regard to their willingness to participate in environmental activism.

4.5.3.4 Gender and Willingness to Combat the Impact of the Negative Effects of SUPs

In this section, the analysis focused on the relationship between gender and willingness to combat the impact of the negative effects of SUPs. Table 4.5.35 shows the group statistics for gender in relation to willingness to combat the impact of the negative effects of SUPs.

Table 4.5.35 Gender and willingness to combat the impact of the negative effects of SUPs group statistics

Group statistics					
Which sex/gender do you identify yourself with?		N	Mean	Std. deviation	Std. error mean
F43_Willing_combat_Plastics	Male	115	3,4174	0,88418	0,08245
	Female	155	3,5153	0,90625	0,07279

The mean score was 3.4174 for males and 3.5153 for females. The students' sex/gender self-identification did not lead to a meaningful difference in their willingness to combat the negative effects of SUPs. This was confirmed in Table 4.5.36, which displays the results of the independent Levene test and T-test.

Table 4.5.36 Independent samples T-test for gender and willingness to combat the impact of the negative effects of SUPs

Independent samples T-test											
		Levene's test for equality of variances		t-test for equality of means							
						Significance				95% Confidence interval of the difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean difference	Std. Error difference	Lower	Upper
F43 Willing combat Plastics	Equal variances assumed	0,094	0,760	-0,887	268	0,188	0,376	-0,09793	0,11039	-0,31527	0,11941
	Equal variances not assumed			-0,890	248,993	0,187	0,374	-0,09793	0,10998	-0,31455	0,11869

The p-value in the Levene's test was 0.760, i.e., greater than 0.05. This means the null hypothesis that the variances were equal could not be rejected. The T-test results of the row in which equal variances were assumed were therefore used. In this row, the p-value of the two-tailed t-test was 0.376. Because this was greater than 0.05, there was no significant difference between the mean scores of the male and female students concerning their willingness to combat the impact of the negative effects of SUPs.

4.5.3.5 Gender and Environmentally Adaptive Behaviour

In this section, the analysis focused on the relationship between gender and environmentally adaptive behaviour. Table 4.5.37 shows the group statistics for gender concerning environmentally adaptive behaviour.

Table 4.5.37 Gender and environmentally adaptive behaviour group statistics

Group statistics					
Which sex/gender do you identify yourself with?		N	Mean	Std. deviation	Std. error mean
F44_Environ_behav_Plastics	Male	115	3,9159	0,88064	0,08212
	Female	155	4,0581	0,77399	0,06217

The mean values were 3.9159 for males and 4.0581 for females. The students' sex/gender self-identification did not lead to a difference in their perceptions of environmentally adaptive behaviours. This was confirmed in Table 4.5.38, which shows the independent Levene test and T-test results.

Table 4.5.38 Independent samples T-test for gender and perceptions of environmental behaviours

Independent samples T-test											
		Levene's test for equality of variances		t-test for equality of means							
						Significance				95% Confidence interval of the difference	
		F	Sig.	t	df	One-sided p	Two-sided p	Mean difference	Std. error difference	Lower	Upper
F44 Environ behav Plastics	Equal variances assumed	3,431	0,065	-1,406	268	0,080	0,161	-0,14212	0,10105	-0,34108	0,05683
	Equal variances not assumed			-1,380	226,936	0,084	0,169	-0,14212	0,10300	-0,34508	0,06083

The p-value for the Levene's test was 0.065, i.e. greater than 0.05. This means the null hypothesis that the variances were equal could not be rejected. The T-test results of the row in which equal variances were assumed were therefore used. In this row, the p-value of the two-tailed t-test was 0.161. Because this was greater than 0.05, there was no significant difference between the mean scores of the male and female students concerning their perceptions of environmentally adaptive behaviours.

4.5.3.6 Gender and Protective Attitudes Towards the Environment

In this section, the analysis focused on the relationship between gender and protective attitudes towards the environment. Table 4.5.39 presents the group statistics for gender concerning protective attitudes towards the environment.

Table 4.5.39 Gender and protective attitudes towards the environment group statistics

Group statistics					
Which sex/gender do you identify yourself with?		N	Mean	Std. deviation	Std. error mean
F45_Environ_protect_attit_Plastics	Male	115	3,1441	0,86969	0,08110
	Female	155	3,0845	0,82852	0,06655

The mean scores were 3.1441 for males and 3.0845 for females. The students' sex/gender self-identification did not lead to a meaningful difference in their protective attitudes towards the environment. This was confirmed in Table 4.5.40 below which presents the independent Levene test and T-test results.

Table 4.5.40 Independent samples T-test for gender and environmental behaviours

Independent samples T-test											
		Levene's test for equality of variances		t-test for equality of means							
						Significance				95% Confidence interval of the difference	
		F	Sig.	t	df	One-sided p	Two-sided p	Mean difference	Std. error difference	Lower	Upper
F45 Environ protect attit Plastics	Equal variances assumed	1,059	0,304	0,572	268	0,284	0,568	0,05961	0,10415	-0,14545	0,26468
	Equal variances not assumed			0,568	238,997	0,285	0,570	0,05961	0,10491	-0,14705	0,26628

The p-value for the Levene's test was 0.304, i.e. greater than 0.05. This means the null hypothesis that the variances were equal could not be rejected. The T-test results of the row in which equal variances are assumed were therefore used. In this row, the p-value of the two-tailed t-test was 0.568. because this was greater than 0.05, there was no significant difference between the mean scores of the male and female students concerning their protective attitudes towards the environment

Gender did not show any significant relationship with any of the six factors among the students of the NWU, PC. This means that gender did not have a significant influence on the students' environmental perceptions.

4.5.4 Faculty

This section investigates the relationship between the faculty in which the students were registered and their level of knowledge of pollution matters, attitudes towards environmental protection, willingness to participate in environmental activism, willingness to combat the impact of the negative effects of SUPs, environmentally adaptive behaviour and protective attitudes towards the environment.

4.5.4.1 Faculty and Knowledge of Pollution Matters

In this subsection the difference in mean scores of the knowledge of pollution matters for students in different faculties was evaluated. Table 4.5.41 lists the descriptive statistics.

Table 4.5.41 Descriptive statistics for faculty and knowledge of pollution matters

Descriptives								
F37_Plastic_knowledge								
					95% Confidence interval for mean			
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound	Minimum	Maximum
Humanities	37	3,8649	0,87693	0,14417	3,5725	4,1572	2,00	5,00
Natural and Agricultural Sciences	33	3,8545	0,67504	0,11751	3,6152	4,0939	2,60	5,00
Education Sciences	46	3,8043	0,74772	0,11025	3,5823	4,0264	1,00	5,00
Economic and Management Sciences	55	3,6655	0,96152	0,12965	3,4055	3,9254	1,00	5,00
Law	18	3,4222	1,05805	0,24939	2,8961	3,9484	1,00	5,00
Engineering	20	3,9700	0,71752	0,16044	3,6342	4,3058	2,00	5,00
Health Sciences	59	3,8169	0,80711	0,10508	3,6066	4,0273	2,00	5,00
Total	268	3,7799	0,83968	0,05129	3,6789	3,8808	1,00	5,00

In Table 4.5.41, the knowledge of pollution matters among students of different faculties was shown to have mean scores between 3.6−3.9, except for students in the Faculty of Law who had a mean score of 3.42. The students from the Faculty of Law tended to answer “some knowledge” of pollution matters, while students in all the other faculties tended towards a “fair knowledge” of pollution matters. An ANOVA was conducted to determine whether this difference between the mean score of the Faculty of Law students and the mean scores of the students from other faculties was significant.

Table 4.5.42 One-way ANOVA between faculty and knowledge of pollution matters

ANOVA					
F37_Plastic_knowledge					
	Sum of squares	df	Mean square	F	Sig.
Between Groups	4,305	6	0,718	1,018	0,414

Within Groups	183,946	261	0,705		
Total	188,251	267			

The ANOVA results are shown in Table 4.5.42. The ANOVA revealed no significant difference between the mean scores for knowledge of pollution matters among students from different faculties. The ANOVA had a p-value of 0.414, i.e. greater than 0.5. It could therefore be concluded that the students across the different faculties did not have a significantly different knowledge of pollution matters.

4.5.4.2 Faculty and Attitude Towards Environmental Protection

This subsection investigates the difference in mean scores between the students' attitudes towards environmental protection between the faculties. The following table presents the descriptive statistics.

Table 4.5.43 Descriptive statistics for faculty and attitudes towards environmental protection

Descriptives

F39_Attitude_Plastic

	N	Mean	Std. deviation	Std. error	95% Confidence interval for mean		Minimum	Maximum
					Lower bound	Upper bound		
Humanities	37	3,8964	0,84834	0,13947	3,6135	4,1792	1,00	5,00
Natural and Agricultural Sciences	33	3,7980	0,54448	0,09478	3,6049	3,9910	2,83	5,00
Education Sciences	46	3,7572	0,68286	0,10068	3,5545	3,9600	2,50	5,00
Economic and Management Sciences	55	3,7727	0,72815	0,09818	3,5759	3,9696	2,33	5,00
Law	18	3,2685	0,67189	0,15837	2,9344	3,6026	2,33	4,50
Engineering	20	3,5083	0,74629	0,16687	3,1591	3,8576	2,00	4,67
Health Sciences	59	3,8898	0,63849	0,08312	3,7234	4,0562	2,33	5,00
Total	268	3,7624	0,70913	0,04332	3,6772	3,8477	1,00	5,00

In the table above students' attitudes towards environmental protection are linked with the faculties they are registered in. Most faculties had a mean score of 3.7−3.9 indicating fairly strong

attitudes towards environmental protection. The faculties with a lower score were the Faculty of Law with a mean score of 3.3 and the Faculty of Engineering with a mean score of 3.5. Students in these faculties tended to answer “only to some extent” concerning positive attitudes towards environmental protection. An ANOVA was conducted to determine whether these differences were significant.

Table 4.5.44 ANOVA faculty and attitudes towards environmental protection

ANOVA					
F39_Attitude_Plastic					
	Sum of squares	df	Mean square	F	Sig.
Between Groups	7,353	6	1,225	2,520	0,022
Within Groups	126,911	261	0,486		
Total	134,264	267			

The ANOVA demonstrated that there was a significant difference between the mean scores. The p-value was 0.022<0.05. A pairwise multiple comparison or post hoc test were conducted to investigate this further. However, to determine what post hoc tests were applicable, a test of homogeneity of variances was first conducted.

Table 4.5.45 Tests of homogeneity of variances

Tests of homogeneity of variances					
		Levene statistic	df1	df2	Sig.
F39_Attitude_Plastic	Based on mean	0,758	6	261	0,604
	Based on median	0,658	6	261	0,684
	Based on median and with adjusted df	0,658	6	215,249	0,684
	Based on trimmed mean	0,700	6	261	0,649

The null hypothesis of equal population variances could be rejected if the p-value was less than 0.05. In the homogeneity of variances test above the p-value was 0.604. Therefore, the null hypothesis of equal population variances could not be rejected. The Scheffe post hoc test was therefore conducted.

Table 4.5.46 Multiple comparisons test

Multiple comparisons							
Dependent Variable:							
(I) Faculty of study			Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
						Lower bound	Upper bound
Scheffe	Humanities	Natural and agricultural sciences	0,09842	0,16696	0,999	-0,4989	0,6958
		Education Sciences	0,13915	0,15399	0,991	-0,4118	0,6901
		Economic and Management Sciences	0,12367	0,14827	0,994	-0,4068	0,6541
		Law	0,62788	0,20039	0,137	-0,0891	1,3448
		Engineering	0,38806	0,19353	0,674	-0,3043	1,0805
		Health Sciences	0,00657	0,14623	1,000	-0,5166	0,5297
	Natural and Agricultural Sciences	Humanities	-0,09842	0,16696	0,999	-0,6958	0,4989
		Education Sciences	0,04073	0,15908	1,000	-0,5284	0,6099
		Economic and Management Sciences	0,02525	0,15354	1,000	-0,5241	0,5746
		Law	0,52946	0,20433	0,351	-0,2016	1,2605
		Engineering	0,28965	0,19760	0,905	-0,4173	0,9966
		Health Sciences	-0,09185	0,15158	0,999	-0,6342	0,4505
	Education Sciences	Humanities	-0,13915	0,15399	0,991	-0,6901	0,4118
		Natural and Agricultural Sciences	-0,04073	0,15908	1,000	-0,6099	0,5284
		Economic and Management Sciences	-0,01548	0,13933	1,000	-0,5140	0,4830
		Law	0,48873	0,19387	0,388	-0,2049	1,1823
		Engineering	0,24891	0,18677	0,938	-0,4193	0,9171
		Health Sciences	-0,13258	0,13716	0,988	-0,6233	0,3581
	Economic and Management Sciences	Humanities	-0,12367	0,14827	0,994	-0,6541	0,4068

		Natural and Agricultural Sciences	-0,02525	0,15354	1,000	-0,5746	0,5241
		Education Sciences	0,01548	0,13933	1,000	-0,4830	0,5140
		Law	0,50421	0,18935	0,316	-0,1733	1,1817
		Engineering	0,26439	0,18208	0,909	-0,3870	0,9158
		Health Sciences	-0,11710	0,13070	0,992	-0,5847	0,3505
	Law	Humanities	-0,62788	0,20039	0,137	-1,3448	0,0891
		Natural and Agricultural Sciences	-0,52946	0,20433	0,351	-1,2605	0,2016
		Education Sciences	-0,48873	0,19387	0,388	-1,1823	0,2049
		Economic and Management Sciences	-0,50421	0,18935	0,316	-1,1817	0,1733
		Engineering	-0,23981	0,22655	0,980	-1,0504	0,5707
		Health Sciences	-0,62131	0,18776	0,095	-1,2931	0,0505
	Engineering	Humanities	-0,38806	0,19353	0,674	-1,0805	0,3043
		Natural and Agricultural Sciences	-0,28965	0,19760	0,905	-0,9966	0,4173
		Education Sciences	-0,24891	0,18677	0,938	-0,9171	0,4193
		Economic and Management Sciences	-0,26439	0,18208	0,909	-0,9158	0,3870
		Law	0,23981	0,22655	0,980	-0,5707	1,0504
		Health Sciences	-0,38150	0,18043	0,614	-1,0270	0,2640
	Health Sciences	Humanities	-0,00657	0,14623	1,000	-0,5297	0,5166
		Natural and Agricultural Sciences	0,09185	0,15158	0,999	-0,4505	0,6342
		Education Sciences	0,13258	0,13716	0,988	-0,3581	0,6233
		Economic and Management Sciences	0,11710	0,13070	0,992	-0,3505	0,5847
		Law	0,62131	0,18776	0,095	-0,0505	1,2931
		Engineering	0,38150	0,18043	0,614	-0,2640	1,0270

*. The mean difference is significant at the 0.05 level.

In the Scheffe post hoc test, no significant differences between mean scores were identified. This could be because of the different calculation strategies used in the ANOVA and the Scheffe post hoc test. It could also be due to the small sizes of the groups or the use of a high number of categories – in this case, six.

It could therefore be concluded that in general students have a slightly higher positive attitudes towards environmental protection than the students from the Faculty of Law. The ANOVA indicates that this may be a potentially significant difference, but the post hoc test did not confirm this.

4.5.4.3 Faculty and Willingness to Participate in Environmental Activism

In this subsection, the difference in the mean scores for willingness to participate in environmental activism among the students from different faculties was investigated. The following table presents the descriptive statistics.

Table 4.5.47 Descriptive statistics for faculty and willingness to participate in environmental activism

Descriptives						
F40_Activism_Plastic						
					95% Confidence interval for mean	
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound
Humanities	37	3,5676	1,07472	0,17668	3,2092	3,9259
Natural and Agricultural Sciences	33	3,2727	1,13771	0,19805	2,8693	3,6761
Education Sciences	46	3,3261	1,02993	0,15185	3,0202	3,6319
Economic and Management Sciences	55	2,8318	1,03532	0,13960	2,5519	3,1117
Law	18	2,7917	0,94031	0,22163	2,3241	3,2593
Engineering	20	2,2375	1,01137	0,22615	1,7642	2,7108
Health Sciences	59	3,5339	0,91851	0,11958	3,2945	3,7733
Total	268	3,1800	1,08337	0,06618	3,0497	3,3103

Table 4.5.48 shows the differences in the mean scores between the faculties in relation to the students' willingness to participate in environmental activism. The Faculty of Humanities and Faculty of Health Sciences had the highest mean scores, while the Faculty of Engineering, Faculty of Law and Faculty of Economic and Management Sciences had the lowest mean scores. An ANOVA was conducted to determine whether these differences were significant.

Table 4.5.48 ANOVA for faculty and willingness to participate in environmental activism

ANOVA					
F40_Activism_Plastic					
	Sum of squares	df	Mean square	F	Sig.
Between Groups	41,361	6	6,893	6,614	<0,001
Within Groups	272,015	261	1,042		
Total	313,376	267			

In the ANOVA the p-value was <0.001, i.e. less than 0.05. This indicates that the difference in mean scores was significant. To determine if there were significant differences between the faculties a post-hoc test had to be conducted. To determine which post-hoc test was applicable, a test of homogeneity of variances was initially performed.

Table 4.5.49 Test of homogeneity of variances

Test of homogeneity of variances					
		Levene statistic	df1	df2	Sig.
F40_Activism_Plastic	Based on mean	0,561	6	261	0,761
	Based on median	0,518	6	261	0,794
	Based on median and with adjusted df	0,518	6	248,604	0,794
	Based on trimmed mean	0,553	6	261	0,768

Table 4.5.49 shows that the p-value was 0.761. Therefore, the null hypothesis of equal population variances could not be rejected. This means that the Scheffe post-hoc test was applicable and was therefore conducted with the results shown in Table 4.5.50.

Table 4.5.50 Multiple comparisons test

Multiple comparisons					
Dependent variable:					
(I) Faculty of study			Mean difference (I-J)	Std. error	Sig.
Scheffe	Humanities	Natural and Agricultural Sciences	0,29484	0,24444	0,962
		Education Sciences	0,24148	0,22544	0,979
		Economic and Management Sciences	0,73575	0,21706	0,079
		Law	0,77590	0,29337	0,325
		Engineering	1,33007*	0,28333	0,002
		Health Sciences	0,03367	0,21408	1,000
	Natural and Agricultural Sciences	Humanities	-0,29484	0,24444	0,962
		Education Sciences	-0,05336	0,23289	1,000
		Economic and Management Sciences	0,44091	0,22479	0,697
		Law	0,48106	0,29914	0,858
		Engineering	1,03523*	0,28930	0,050
		Health Sciences	-0,26117	0,22192	0,966
	Education Sciences	Humanities	-0,24148	0,22544	0,979
		Natural and Agricultural Sciences	0,05336	0,23289	1,000
		Economic and Management Sciences	0,49427	0,20397	0,440
		Law	0,53442	0,28383	0,738
		Engineering	1,08859*	0,27344	0,017
		Health Sciences	-0,20781	0,20080	0,983
	Economic and Management Sciences	Humanities	-0,73575	0,21706	0,079
		Natural and Agricultural Sciences	-0,44091	0,22479	0,697
		Education Sciences	-0,49427	0,20397	0,440
		Law	0,04015	0,27722	1,000
		Engineering	0,59432	0,26657	0,549
		Health Sciences	-,70208*	0,19135	0,040
	Law	Humanities	-0,77590	0,29337	0,325

		Natural and Agricultural Sciences	-0,48106	0,29914	0,858
		Education Sciences	-0,53442	0,28383	0,738
		Economic and Management Sciences	-0,04015	0,27722	1,000
		Engineering	0,55417	0,33168	0,834
		Health Sciences	-0,74223	0,27489	0,299
	Engineering	Humanities	-1,33007*	0,28333	0,002
		Natural and Agricultural Sciences	-1,03523*	0,28930	0,050
		Education Sciences	-1,08859*	0,27344	0,017
		Economic and Management Sciences	-0,59432	0,26657	0,549
		Law	-0,55417	0,33168	0,834
		Health Sciences	-1,29640*	0,26415	0,001
	Health Sciences	Humanities	-0,03367	0,21408	1,000
		Natural and Agricultural Sciences	0,26117	0,22192	0,966
		Education Sciences	0,20781	0,20080	0,983
		Economic and Management Sciences	,70208*	0,19135	0,040
		Law	0,74223	0,27489	0,299
		Engineering	1,29640*	0,26415	0,001
*. The mean difference is significant at the 0.05 level.					

The Scheffe post-hoc test results indicated that there were multiple significant differences. The Faculty of Humanities and Faculty of Engineering; Faculty of Education Sciences and Faculty of Engineering; Faculty of Health Sciences and Faculty of Engineering; and Faculty of Health Sciences and Faculty of Economic and Management Sciences exhibited significant differences when their mean scores were compared. When compared to the mean scores in Table 4.5.47, it was concluded that the students of the Faculty of Humanities, Faculty of Education Sciences and Faculty of Health Sciences had significantly more willingness to be active in environmental activism than students in the Faculty of Engineering. Additionally, students in the Faculty of Health Sciences were significantly more willing to be active in environmental activism than those from the Faculty of Economic and Management Sciences.

4.5.4.4 Faculty and Willingness to Combat the Impact of the Negative Effects of SUPs

This subsection investigates the difference in mean scores between the students' willingness to combat the impact of the negative effects of SUPs between different faculties. Table 4.5.51 lists the descriptive statistics.

Table 4.5.51 Descriptive statistics for faculty and willingness to combat the impact of the negative effects of SUPs

Descriptives						
F43_Willing_combat_Plastics						
					95% Confidence interval for mean	
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound
Humanities	37	3,6588	0,88812	0,14601	3,3627	3,9549
Natural and Agricultural Sciences	33	3,7083	0,85620	0,14904	3,4047	4,0119
Education Sciences	46	3,3478	0,89362	0,13176	3,0825	3,6132
Economic and Management Sciences	55	3,5205	1,01572	0,13696	3,2459	3,7950
Law	18	2,9583	0,65305	0,15392	2,6336	3,2831
Engineering	20	3,0563	0,95324	0,21315	2,6101	3,5024
Health Sciences	59	3,5763	0,77405	0,10077	3,3746	3,7780
Total	268	3,4729	0,89857	0,05489	3,3649	3,5810

Table 4.5.52 shows that most faculties had a mean score of 3.5 to 3.7, indicating a fairly strong willingness to combat the negative effects of SUPs. The other faculties had lower mean scores of between 2.9 and 3.3, indicating that students of the Faculty of Education Sciences, Faculty of Law and Faculty of Engineering only had some willingness to combat the impact of the negative effects of SUPs. An ANOVA was conducted to determine whether these differences were significant.

Table 4.5.52 ANOVA for faculty and willingness to combat the impact of the negative effects of SUPs

ANOVA					
F43_Willing_combat_Plastics					
	Sum of squares	df	Mean square	F	Sig.

Between groups	12,820	6	2,137	2,750	0,013
Within groups	202,765	261	0,777		
Total	215,585	267			

The ANOVA demonstrated that there were significant differences between the mean scores. The p-value was 0.013<0.05, indicating that there was a reason to reject the null hypothesis. To further investigate this, pairwise post hoc tests were conducted. To determine which post hoc test is applicable, a test of homogeneity of variances was conducted.

Table 4.5.53 Test of homogeneity of variances

Test of homogeneity of variances					
		Levene statistic	df1	df2	Sig.
F43_Willing_combat_Plastics	Based on mean	1,849	6	261	0,090
	Based on median	1,637	6	261	0,137
	Based on median and with adjusted df	1,637	6	251,511	0,137
	Based on trimmed mean	1,826	6	261	0,094

The p-value in Table 4.5.53 was 0.090>0.05. This means the null hypothesis of equal population variances could not be rejected. Therefore, the Scheffe post hoc test was applicable.

Table 4.5.54 Multiple comparisons test

Multiple comparisons					
Dependent variable:					
(I) Faculty of study			Mean difference (I-J)	Std. error	Sig.
Scheffe	Humanities	Natural and Agricultural Sciences	-0,04955	0,21104	1,000
		Education Sciences	0,31096	0,19464	0,862
		Economic and Management Sciences	0,13833	0,18741	0,997
		Law	0,70045	0,25329	0,269

		Engineering	0,60253	0,24462	0,418
		Health Sciences	0,08251	0,18484	1,000
	Natural and Agricultural Sciences	Humanities	0,04955	0,21104	1,000
		Education Sciences	0,36051	0,20107	0,781
		Economic and Management Sciences	0,18788	0,19408	0,988
		Law	0,75000	0,25827	0,213
		Engineering	0,65208	0,24977	0,342
		Health Sciences	0,13206	0,19160	0,998
	Education Sciences	Humanities	-0,31096	0,19464	0,862
		Natural and Agricultural Sciences	-0,36051	0,20107	0,781
		Economic and Management Sciences	-0,17263	0,17611	0,987
		Law	0,38949	0,24505	0,865
		Engineering	0,29158	0,23608	0,957
		Health Sciences	-0,22845	0,17337	0,942
	Economic and Management Sciences	Humanities	-0,13833	0,18741	0,997
		Natural and Agricultural Sciences	-0,18788	0,19408	0,988
		Education Sciences	0,17263	0,17611	0,987
		Law	0,56212	0,23934	0,481
		Engineering	0,46420	0,23015	0,668
		Health Sciences	-0,05582	0,16520	1,000
	Law	Humanities	-0,70045	0,25329	0,269
		Natural and Agricultural Sciences	-0,75000	0,25827	0,213
		Education Sciences	-0,38949	0,24505	0,865
		Economic and Management Sciences	-0,56212	0,23934	0,481
		Engineering	-0,09792	0,28636	1,000
		Health Sciences	-0,61794	0,23733	0,345
	Engineering	Humanities	-0,60253	0,24462	0,418
		Natural and Agricultural Sciences	-0,65208	0,24977	0,342
		Education Sciences	-0,29158	0,23608	0,957
		Economic and Management Sciences	-0,46420	0,23015	0,668
		Law	0,09792	0,28636	1,000
		Health Sciences	-0,52002	0,22806	0,520

	Health Sciences	Humanities	-0,08251	0,18484	1,000
		Natural and Agricultural Sciences	-0,13206	0,19160	0,998
		Education Sciences	0,22845	0,17337	0,942
		Economic and Management Sciences	0,05582	0,16520	1,000
		Law	0,61794	0,23733	0,345
		Engineering	0,52002	0,22806	0,520

The Scheffe post hoc test results are shown in Table 4.5.54 and revealed no significant differences in mean scores. This could be due to the different calculation strategies of the ANOVA and the Scheffe post hoc test. It could also be due to the small sizes of the groups or the use of a high number of categories − in this case, six categories were used.

Therefore, it could be concluded that in general, students overall had a higher willingness to combat the impact of the negative effects of SUPs than the students from the Faculty of Education Sciences, Faculty of Law and Faculty of Engineering. The ANOVA indicated that this difference may be significant, but the post hoc test did not confirm this.

4.5.4.5 Faculty and Environmentally Adaptive Behaviour

This subsection investigates the difference in mean scores between the students' environmentally adaptive behaviour between different faculties. The following table presents the descriptive statistics.

Table 4.5.55 Descriptive statistics for faculty and environmentally adaptive behaviour

Descriptives						
F44_Environ_behav_Plastics						
					95% Confidence interval for mean	
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound
Humanities	37	4,3423	0,82957	0,13638	4,0657	4,6189
Natural and Agricultural Sciences	33	4,0101	0,81430	0,14175	3,7214	4,2988
Education Sciences	46	3,9565	0,79383	0,11704	3,7208	4,1923
Economic and Management Sciences	55	3,8970	0,85796	0,11569	3,6650	4,1289
Law	18	3,6667	0,77544	0,18277	3,2810	4,0523

Engineering	20	3,5833	0,91687	0,20502	3,1542	4,0124
Health Sciences	59	4,1356	0,70335	0,09157	3,9523	4,3189
Total	268	3,9963	0,82233	0,05023	3,8974	4,0952

Table 4.5.55 shows the linkage between the students' environmentally adaptive behaviour and the faculties they were registered with. Most faculties had mean scores between 3.8 to 4.3, indicating fairly strong positive perceptions of environmental behaviours. The faculties with lower mean scores were the Faculty of Law with 3.67 and the Faculty of Engineering with 3.5833. Students in these faculties still had strong positive environmentally adaptive behaviours, but less so than the other faculties. An ANOVA was conducted to determine whether these differences are significant.

Table 4.5.56 ANOVA for faculty and environmentally adaptive behaviour

ANOVA					
F44_Environ_behav_Plastics					
	Sum of squares	df	Mean square	F	Sig.
Between Groups	11,564	6	1,927	2,977	0,008
Within Groups	168,988	261	0,647		
Total	180,552	267			

The ANOVA revealed that there were significant differences between the mean scores. The p-value was 0.008<0.05. This indicates that the null hypothesis could be rejected and further pairwise post hoc tests should be calculated. To determine which post hoc test was applicable, a test of homogeneity of variances was conducted.

Table 4.5.57 Test of homogeneity of variances

Test of homogeneity of variances					
		Levene statistic	df1	df2	Sig.
F44_Environ_behav_Plastics	Based on mean	0,855	6	261	0,529
	Based on median	0,811	6	261	0,562
	Based on median and with adjusted df	0,811	6	242,252	0,562

	Based on trimmed mean	0,874	6	261	0,514

Table 4.5.57 shows that a p-value of 0.529>0.05 was obtained. This indicates that the null hypothesis of equal population variances could not be rejected. Therefore, the Scheffe post hoc test was applicable.

Table 4.5.58 Multiple comparisons test

Multiple comparisons					
Dependent variable:					
(I) Faculty of study			Mean difference (I-J)	Std. error	Sig.
Scheffe	Humanities	Natural and Agricultural Sciences	0,33224	0,19266	0,811
		Education Sciences	0,38582	0,17769	0,582
		Economic and Management Sciences	0,44537	0,17109	0,345
		Law	0,67568	0,23123	0,206
		Engineering	0,75901	0,22332	0,077
		Health Sciences	0,20675	0,16874	0,959
	Natural and Agricultural Sciences	Humanities	-0,33224	0,19266	0,811
		Education Sciences	0,05358	0,18356	1,000
		Economic and Management Sciences	0,11313	0,17718	0,999
		Law	0,34343	0,23578	0,907
		Engineering	0,42677	0,22802	0,743
		Health Sciences	-0,12549	0,17491	0,998
	Education Sciences	Humanities	-0,38582	0,17769	0,582
		Natural and Agricultural Sciences	-0,05358	0,18356	1,000
		Economic and Management Sciences	0,05955	0,16077	1,000
		Law	0,28986	0,22371	0,946
		Engineering	0,37319	0,21552	0,808
		Health Sciences	-0,17907	0,15827	0,972
	Economic and Management Sciences	Humanities	-0,44537	0,17109	0,345
		Natural and Agricultural Sciences	-0,11313	0,17718	0,999
		Education Sciences	-0,05955	0,16077	1,000

		Law	0,23030	0,21850	0,981
		Engineering	0,31364	0,21011	0,897
		Health Sciences	-0,23862	0,15082	0,867
	Law	Humanities	-0,67568	0,23123	0,206
		Natural and Agricultural Sciences	-0,34343	0,23578	0,907
		Education Sciences	-0,28986	0,22371	0,946
		Economic and Management Sciences	-0,23030	0,21850	0,981
		Engineering	0,08333	0,26143	1,000
		Health Sciences	-0,46893	0,21667	0,586
	Engineering	Humanities	-0,75901	0,22332	0,077
		Natural and Agricultural Sciences	-0,42677	0,22802	0,743
		Education Sciences	-0,37319	0,21552	0,808
		Economic and Management Sciences	-0,31364	0,21011	0,897
		Law	-0,08333	0,26143	1,000
		Health Sciences	-0,55226	0,20820	0,321
	Health Sciences	Humanities	-0,20675	0,16874	0,959
		Natural and Agricultural Sciences	0,12549	0,17491	0,998
		Education Sciences	0,17907	0,15827	0,972
		Economic and Management Sciences	0,23862	0,15082	0,867
		Law	0,46893	0,21667	0,586
		Engineering	0,55226	0,20820	0,321
*. The mean difference is significant at the 0.05 level.					

The Scheffe post hoc test results in Table 4.5.58 did not reveal any significant differences between the mean scores. This could be due to the different calculation strategies of the ANOVA and Scheffe post hoc test. It could also be due to the large number of categories used or the small sizes of the groups.

It could therefore be concluded that in general students overall had stronger positive perceptions of environmentally adaptive behaviours than students from the Faculty of Law and Faculty of Engineering. The ANOVA indicated that there may be a significant difference in mean scores, but this was not confirmed by the post hoc test.

4.5.4.6 Faculty and Protective Attitudes Towards the Environment

In this subsection, the differences in mean scores in protective attitudes towards the environment among students from different faculties was investigated. Table 4.5.59 presents the descriptive statistics.

Table 4.5.59 Descriptive statistics for faculty and protective attitudes towards the environment

Descriptives						
F45_Environ_protect_attit_Plastics						
					95% Confidence interval for mean	
	N	Mean	Std. deviation	Std. error	Lower bound	Upper bound
Humanities	37	3,5212	1,01364	0,16664	3,1833	3,8592
Natural and Agricultural Sciences	33	3,1818	0,65977	0,11485	2,9479	3,4158
Education Sciences	46	3,2319	0,78011	0,11502	3,0002	3,4635
Economic and Management Sciences	55	2,9974	0,86613	0,11679	2,7633	3,2316
Law	18	2,5714	0,87241	0,20563	2,1376	3,0053
Engineering	20	2,5786	0,69442	0,15528	2,2536	2,9036
Health Sciences	59	3,1453	0,71649	0,09328	2,9586	3,3320
Total	268	3,1054	0,84232	0,05145	3,0041	3,2067

Table 4.5.60 shows the differences in the mean scores between the faculties as they related to the students' protective attitudes towards the environment. The Faculty of Humanities, Faculty of Natural and Agricultural Sciences, Faculty of Education Sciences and Faculty of Health Sciences had the highest mean scores for protective attitudes towards the environment. The Faculty of Economic and Management Sciences, Faculty of Law and Faculty of Engineering had the lowest mean scores for protective attitudes towards the environment. An ANOVA was conducted to determine whether these differences were significant.

Table 4.5.60 ANOVA for faculty and protective attitudes towards the environment

ANOVA					
F45_Environ_protect_attit_Plastics					
	Sum of squares	df	Mean square	F	Sig.

Between Groups	19	6,00	3,124	4,77700	<,001
Within Groups	171	261,00	0,654		
Total	189	267,00			

The ANOVA had a p-value was <0.001, i.e. less than 0.05. Therefore, it could be concluded that the difference in the mean scores was significant. To determine which differences between faculties were significant, a post hoc test was conducted. To determine which post hoc test was applicable, a test of homogeneity of variances was conducted.

Table 4.5.61 Test of homogeneity of variances

Test of homogeneity of variances					
		Levene statistic	df1	df2	Sig.
F45_Environ_protect_attit_Plastics	Based on mean	3	6,0	261,000	0,016
	Based on median	2	6,0	261,000	0,024
	Based on median and with adjusted df	2	6,0	245,746	0,024
	Based on trimmed mean	3	6,0	261,000	0,016

In the test of homogeneity of variances, the p-value was 0.016<0.05. This means that the null hypothesis of equal population variance could be rejected. Equal population variances could therefore be assumed and for that reason, the Dunnett's T3 post hoc test was applied.

Table 4.5.62 Multiple comparisons test

Multiple comparisons				
Dependent Variable: F45_Environ_protect_attit_Plastics				
Dunnett t (2-sided) a				
(I) Faculty of study		Mean difference (I-J)	Std. error	Sig.
Natural and Agricultural Sciences	Humanities	-0,33942	0,19363	0,315
Education Sciences	Humanities	-0,28935	0,17858	0,393
Economic and Management Sciences	Humanities	-0,52383*	0,17195	0,013
Law	Humanities	-0,94981*	0,23240	<,001

Engineering	Humanities	-0,94266*	0,22444	<,001
Health Sciences	Humanities	-0,37596	0,16959	0,124
(I) Faculty of study		Mean Difference (I-J)	Std. Error	Sig.
Humanities	Natural and Agricultural Sciences	0,33942	0,19363	0,305
Education Sciences	Natural and Agricultural Sciences	0,05007	0,18449	1,000
Economic and Management Sciences	Natural and Agricultural Sciences	-0,18442	0,17807	0,791
Law	Natural and Agricultural Sciences	-0,61039	0,23696	0,050
Engineering	Natural and Agricultural Sciences	-0,60325*	0,22917	0,043
Health Sciences	Natural and Agricultural Sciences	-0,03654	0,17579	1,000
(I) Faculty of study		Mean difference (I-J)	Std. Error	Sig.
Humanities	Education Sciences	0,28935	0,17858	0,413
Natural and Agricultural Sciences	Education Sciences	-0,05007	0,18449	1,000
Economic and Management Sciences	Education Sciences	-0,23448	0,16158	0,530
Law	Education Sciences	-,66046*	0,22483	0,019
Engineering	Education Sciences	-,65331*	0,21660	0,015
Health Sciences	Education Sciences	-0,08661	0,15906	0,990
(I) Faculty of study		Mean difference (I-J)	Std. Error	Sig.
Humanities	Economic and Management Sciences	0,52383*	0,17195	0,014
Natural and Agricultural Sciences	Economic and Management Sciences	0,18442	0,17807	0,836
Education Sciences	Economic and Management Sciences	0,23448	0,16158	0,547
Law	Economic and Management Sciences	-0,42597	0,21960	0,242
Engineering	Economic and Management Sciences	-0,41883	0,21116	0,222
Health Sciences	Economic and Management Sciences	0,14788	0,15158	0,869

(I) Faculty of study		Mean difference (I-J)	Std. Error	Sig.
Humanities	Law	0,94981*	0,23240	<,001
Natural and Agricultural Sciences	Law	0,61039*	0,23696	0,042
Education Sciences	Law	0,66046*	0,22483	0,016
Economic and Management Sciences	Law	0,42597	0,21960	0,178
Engineering	Law	0,00714	0,26274	1,000
Health Sciences	Law	0,57385*	0,21775	0,036
(I) Faculty of study		Mean difference (I-J)	Std. Error	Sig.
Humanities	Engineering	0,94266*	0,22444	0,000
Natural and Agricultural Sciences	Engineering	0,60325*	0,22917	0,038
Education Sciences	Engineering	0,65331*	0,21660	0,013
Economic and Management Sciences	Engineering	0,41883	0,21116	0,169
Law	Engineering	-0,00714	0,26274	1,000
Health Sciences	Engineering	0,56671*	0,20925	0,031
(I) Faculty of study		Mean difference (I-J)	Std. Error	Sig.
Humanities	Health Sciences	0,37596	0,16959	0,136
Natural and Agricultural Sciences	Health Sciences	0,03654	0,17579	1,000
Education Sciences	Health Sciences	0,08661	0,15906	0,992
Economic and Management Sciences	Health Sciences	-0,14788	0,15158	0,873
Law	Health Sciences	-0,57385*	0,21775	0,048
Engineering	Health Sciences	-0,56671*	0,20925	0,039
* The mean difference is significant at the 0.05 level.				
a. Dunnett t-tests treat one group as a control and compare all other groups against it.				

The Dunnett's post hoc test in Table 4.5.62 revealed significant differences between the mean scores for protective attitudes towards the environment between students from the Faculty of Humanities and Faculty of Economic and Management Sciences; Faculty of Humanities and Faculty of Law; Faculty of Humanities and Faculty of Engineering; Faculty of Natural and Agricultural Sciences and Faculty of Engineering; Faculty of Education Sciences and Faculty of Law; Faculty of Education Sciences and Faculty of Engineering; Faculty of Law and Faculty of Natural and Agricultural Sciences; Faculty of Health Sciences and Faculty of Engineering; and Faculty of Health Sciences and Faculty of Law. When these results were compared to the

descriptive statistics in Table 4.5.59, the following conclusions were made. Students from the Faculty of Humanities had significantly more positive protective attitudes towards the environment than students from the Faculty of Economic and Management Sciences, Faculty of Law and Faculty of Engineering. Students from the Faculty of Natural and Agricultural Sciences had significantly more positive protective attitudes towards the environment than students from the Faculty of Engineering and Faculty of Law. Students from the Faculty of Education Sciences had significantly more positive protective attitudes towards the environment than students from the Faculty of Law and Faculty of Engineering. Students from the Faculty of Health Sciences had significantly more positive protective attitudes towards the environment than students from the Faculty of Law and Faculty of Engineering.

The factor analysis from this section showed that the students' faculty had no significant relationship with their knowledge of pollution matters. The results did, however, show that there was a potentially significant relationship between faculty and students' attitudes towards environmental protection, willingness to combat the negative effects of SUPs and their environmentally adaptive behaviours, but this could not be confirmed. The analyses identified significant relationships between the faculty and students' willingness to participate in environmental activism and their protective attitudes towards the environment. In general, the results showed that there was a significant relationship between faculty and the students' environmental perceptions, with students from the Faculty of Law and Faculty of Engineering showing the least positive environmental perceptions.

4.6 General conclusion

The results showed that students are taught from a young age to value the environment and have a fair knowledge of pollution matters. The analyses indicated the need for better educational campaigns to raise awareness and spread knowledge about the environment and the effects of plastic pollution. It was also concluded that the effects of media, celebrities, and role models were not very influential concerning students' environmental perceptions, but media exposure did increase their knowledge of pollution matters to some extent. The results also indicated that students believed that their studies did not motivate them enough to take part in climate change and environmental protection activities. In general, the students held positive attitudes towards environmental protection. The students were, however, hesitant to participate in protest action to protect the environment. They were more willing to participate in awareness and educational campaigns about environmental issues to help save the environment. Students were willing to take personal action against the negative effects of SUPs, but many found it difficult to switch from SUPs to more sustainable alternatives. The students were willing to change their

environmental behaviours but again found it difficult to change their habits, and they believed that the government should take greater responsibility in easing the burden to switch to more environmentally friendly behaviours (e.g. more recycling bins, better alternatives to SUPs). The results emphasised that external influences that assist environmentally friendly behaviours are essential for the students to behave in a more environmentally friendly manner. The results suggest that government and corporate assistance is needed to combat the negative effects of SUPs and to assist the students in developing stronger environmental protection and environmentally friendly behaviours.

The results from the analyses between the four variables (geographic location, socio-economic background, gender and faculty) and the students' environmental perceptions or their knowledge of pollution matters, attitudes towards environmental protection, willingness to participate in environmental activism, willingness to combat the negative effects of SUPs, environmentally adaptive behaviour, and protective attitudes towards the environment produced the following results. Geographic location did not show any meaningful or significant relationship with the students' environmental perceptions. Socio-economic background did not have any significant influence on the students' environmental perceptions. Socio-economic background had a potentially significant relationship with the students' attitudes towards environmental protection, but this could not be confirmed. Gender did not have any significant relationships with the students' environmental perceptions. Faculty showed multiple potentially significant relationships with the students' environmental perceptions and there were two confirmed significant relationships between faculty and the students' willingness to participate in environmental activism and their protective attitudes towards the environment. There was a significant relationship between faculty and the students' environmental perceptions. There was a potentially significant relationship between the faculty and students' attitudes towards environmental protection, willingness to combat the negative effects of SUPs, and their environmentally adaptive behaviour. These are very important aspects of a student's environmental perceptions, as well as their environmental habits. In general, faculty had a significant relationship with the students' environmental perceptions and habits, with students from the Faculty of Law and Faculty of Engineering having the least favourable environmental perceptions and habits. The other faculties had more favourable environmental perceptions in almost all six of the environmental perception factors when compared with the Faculty of Law and Faculty of Engineering.

The students had generally favourable perceptions towards the environment. They confirmed that they value the environment to some extent and that they believe it needs to be protected in the future. Their perceptions towards the environment were positive, however, they indicated a need for external help in changing to and maintaining environmentally friendly habits and behaviours.

They also indicated a strong need for better environmental education at the university level. While their perceptions of the environment were generally positive, the results indicated that to put these perceptions into practice, many students struggle to involve themselves directly in combatting the negative effects of SUPs. They indicated that with help, many of them would be more willing to fight against the negative effects of SUPs.

CHAPTER 5 CONCLUSION

5.1 Introduction

This chapter draws conclusions from the literature review and results of the study. It will discuss the relevance of the results and the potential insights that can be gained from them. The limitations of the study are discussed and recommendations for future studies are made.

5.2 Background and Research Objectives

The objective of this study was to investigate the various perceptions of undergraduate students towards the environmental effects of SUPs at the NWU, PC in the context of different social factors. Relevant academic literature regarding the TPB, SEM, SUPs, MPs and NPs was reviewed to determine a broad understanding of the key elements of the study. The central theoretical argument was comprised of the TPB within the context of the SEM. The methodology that was used was a quantitative research approach with a survey as a data-gathering method. The population chosen was the undergraduate students of the NWU, PC with a sample of 270 students chosen to represent the population. The data analysis was conducted using IBM-SPSS. A factor analysis was applied to six of the nine questions to investigate the relationship between the factors and gender, geographic location, socio-economic background and faculty the students belonged to.

5.3 Main findings of the study

This subsection will highlight the main findings from the results presented in Chapter 4. The subsection will discuss the results of the data analysis of each question as well as the factor analyses that were conducted to further investigate the collected data.

The students were asked ten sets of questions relating to their experiences, attitudes and perceptions of the environment. The conclusions drawn from the answers to these questions are discussed below.

Question 37 (Level of knowledge of pollution matters) showed that students were knowledgeable about plastic pollution, environmental issues and the effects of climate change on the environment. It also showed that students were knowledgeable about SUPs and the negative effects of SUPs. Question 38 (Learning about environmental issues) confirmed that students learnt about environmental issues from their studies, by talking to people and interacting with the media. It also revealed that students would like to learn more about the environment from their

academic programmes. The study also found that the students' perceptions and knowledge of plastic pollution were affected by their exposure to the media. From Question 39 (Attitudes towards environmental protection) it was found that students had largely positive attitudes towards environmental protection. The study found that students' value orientations played a role in their attitudes towards environmental protection and that role models had a small effect but not a decisive one. According to Question 40 (Willingness to participate in environmental activism) a large number of students were willing to participate in environmental activism, but the majority were reluctant to participate. However, the majority of students were willing to join and participate in awareness and educational campaigns concerning environmental issues. From Question 41 (Relating to others on the negative effects of SUPs) it was found that when it comes to the negative effects of SUPs, the students' relationships with other people did not have a great effect on their knowledge or perceptions. It found that role models and social media did not have a great influence on how the students relate to environmental issues. This stands in contrast with the results for Question 39. This could indicate that students relate to role models and social media more when it concerns the negative effects of SUPs, than when forming their attitudes towards environmental protection. Question 42 (How those close to you communicate about environmental issues) asked about how the close family and friends of students communicate on environmental issues. It was found that there were differing experiences among the students. The majority of students' close family and friends did not talk about environmental issues or encourage them to be more environmentally conscious. In Question 43 (Willingness to combat the impact of the negative effects of SUPs) the majority of students were willing to undertake environmentally conscious behaviours and actions to protect the environment. The study found that to a large extent, students were willing to combat the negative effects of SUPs. Question 44 (Environmentally adaptive behaviour) found that the majority of students were willing to adapt their behaviours to more environmentally conscious behaviours. It also found that the majority of students were willing to take part in environmental discussions to increase their knowledge of environmental issues. However, it was apparent that many students found it difficult to change their behaviour and habits regarding the environment. Question 45 (Protective attitudes towards the environment) asked about students' protective attitudes and behaviours towards the environment and found that students act in a more environmentally protective manner when aided by an external influence and are less protective of the environment when not. The research showed that with the aid of recycling bins students are more environmentally conscious than when they have to recycle by themselves. Question 46 (Experiences relating to the environment) asked about being taught to value the environment from childhood and whether they were punished at school for littering. Most students had positive responses. The majority of students, however, answered that they are not pressured by their peers to be more environmentally responsible. Only

a small minority of students said that they or their family members have been affected by plastic pollution.

A PCA was conducted on questions 37, 39, 40, 43, 44 and 45 to create factors to test against gender, geographic location, faculty and socio-economic background (variables). Question 37 addressed the students' level of knowledge of pollution matters. Question 39 addressed the students' attitudes towards environmental protection. Question 40 addressed the students' willingness to participate in environmental activism. Question 43 addressed the students' willingness to combat the impact of the of the negative effects of single-use plastics. Question 44 addressed the students' environmentally adaptive behaviour. Question 45 addressed the students' protective attitudes towards the environment.

The testing of the relationship between students' geographic locations and their knowledge of pollution matters, attitudes towards environmental protection, willingness to participate in environmental activism, willingness to combat the impact of the negative effects of SUPs, environmentally adaptive behaviour, or their protective attitudes towards the environment did not reveal any significant relationships.

It was also concluded that there were no significant relationships between the students' socio-economic backgrounds and their knowledge of pollution matters, attitudes towards environmental protection, willingness to participate in environmental activism, willingness to combat the negative effects of SUPs, environmentally adaptive behaviour, and their protective attitudes towards the environment. The results indicated a possible relationship between socio-economic background and attitudes towards environmental protection, but this could not be confirmed.

The analysis for gender revealed no significant relationships with the students' knowledge of pollution matters, attitudes towards environmental protection, willingness to participate in environmental activism, willingness to combat the negative effects of SUPs, environmentally adaptive behaviour, and protective attitudes towards the environment and their gender.

The analysis further found no significant differences between the faculties and the students' knowledge of pollution matters. The results showed that there might be a significant difference between the students' attitudes towards environmental protection and their faculty, but this could not be confirmed. It could be concluded that the students from the Faculty of Law had a generally less positive attitudes towards environmental protection than the other faculties. The study found that students from the Faculty of Humanities, Faculty of Education Sciences, and Faculty of Health Sciences were significantly more willing to participate in environmental activism than students from the Faculty of Engineering. The study also found that students from the Faculty of

Health Sciences were significantly more willing to participate in environmental activism than students from the Faculty of Economic and Management Sciences. The study found that there were potentially significant differences in the students' willingness to combat the impact of the negative effects of SUPs and the faculties, but this could not be confirmed. It could be concluded that students from the Faculty of Education Sciences, Faculty of Law, and Faculty of Engineering were generally less willing to combat the impact of the negative effects of SUPs than students from the other faculties. The ANOVA results showed that there might be significant differences between the faculties and the students' environmentally adaptive behaviour, but this could not be confirmed. In general, it could be concluded that the students from the Faculty of Law and Faculty of Engineering displayed less positive perceptions of environmentally adaptive behaviours than those from the other faculties. The results showed that there were significant differences between the faculties and the students' protective attitudes towards the environment. Students from the Faculty of Humanities displayed significantly more positive protective attitudes than students from the Faculty of Economic and Management Sciences, Faculty of Law, and Faculty of Engineering. Students from the Faculty of Natural and Agricultural Sciences had significantly more positive protective attitudes than students from the Faculty of Law and Faculty of Engineering. Students from the Faculty of Education Sciences had significantly more positive protective attitudes than students from the Faculties of Law and Faculty of Engineering. Finally, students from the Faculty of Health Sciences had significantly more positive protective attitudes towards the environment than students from the Faculty of Law and Faculty of Engineering.

In general, the study revealed that the students had relatively positive perceptions towards the environment. However, the students displayed a lack of willingness to participate in environmental activism and highlighted a difficulty in changing their environmental behaviours and habits to more environmentally conscious behaviours. From the results, it could be concluded that there is a need for better educational and awareness campaigns at the university for students to increase their knowledge of environmental issues. The results also indicated a need for the NWU to better motivate and help students participate in environmental campaigns and actions. The results also showed that the students expect greater government and corporate involvement and responsibility in making the transition from SUPs to environmentally friendly alternatives and other environmental issues. It was also concluded that the faculty the student is registered with has a significant statistical relationship with students' environmental perceptions, and highlights the need for faculties to ensure that they include environmental education in their syllabus. Students from the Faculty of Law and Faculty of Engineering had consistently less positive environmental perceptions than students from the other faculties, which highlights the need for these faculties to improve their environmental education.

5.4 Contribution of the Study to the Research Field

The study found that students have generally favourable perceptions towards the environment. The students were somewhat knowledgeable about plastic pollution and the dangers of SUPs. The students showed a willingness to change their use of SUPs if presented with a feasible alternative. The relationship between the faculty the student was registered with and their perceptions towards the environment revealed a clear need for better environmental education and campaigns within the NWU's faculties. To a small extent, geographic location also had a potential relationship with the students' environmental perceptions, although further studies are required to determine the nature of this relationship. The students' environmental perceptions revealed a clear need for better understanding and awareness campaigns regarding the dangers of plastic pollution and SUPs. The students' reluctance to participate in environmental activism was a notable result of this study. The students showed a clear reluctance to participate in environmental activism in any form. It was clear that students did not believe that they needed to actively participate in environmental activism, but they would participate in educational activities relating to environmental issues. The study also showed that students were willing to change their environmental habits if there was external help from the government or an organisation (such as the NWU, PC). It was emphasised that without external help, the students would find it difficult to change their behaviours.

5.5 Limitations of the Study

The limitations of this study included the potential for an improper representation of the population through the sampling procedure. The realised sample was slightly different from the idealised sample but was considered to be close enough to still be an accurate representation. There was always the possibility that respondents were not giving accurate answers, which would limit the accuracy of the study. The interviews were conducted in private, quiet and safe environments where the respondent would feel comfortable enough to give honest answers. The inability to control the environment is also an important consideration when discussing the limitations of a study. To combat this, the study was conducted over a short period in environments where the respondent was comfortable. This short period also reduced the cost and time constraints on the researchers.

5.6 Recommendations and Implications for Future Research

- It is recommended that further importance is given to educating students about environmental issues and to encourage them to take part in environmental activism. As was stated in the literature review, the level of an individual's education and awareness

is directly linked to their level of environmental perception and activism. It is important to emphasise the dangers of environmental issues but also to educate students about possible solutions that they could personally be part of.

- It is also recommended that stronger awareness campaigns on the effects of SUPs be included in student life at the NWU, PC. From the results of the study, it was clear that students did not feel that they were sufficiently motivated in their academic life to take part in environmental campaigns. The NWU, PC should give more attention to this. The NWU, PC needs to motivate students more to take part in environmental campaigns, as well as making them more accessible to all students.
- Furthermore, it is recommended that the NWU, PC address the differences in their faculty's environmental perceptions. A clear environmental education policy that all faculties must adhere to is advised, or alternatively, clear environmental education policies should be created for each faculty. The disparity of environmental perceptions among the students from different faculties revealed a clear need for a revised environmental policy. Special attention should be given to the Faculty of Law and Faculty of Engineering. A revised curriculum that includes environmental education needs to be incorporated.
- Further research is required to determine why different faculties' students have different perceptions of the environment. Studies of why students' environmental perceptions are affected by their faculty to such a large extent need to be conducted. To address this issue, an in-depth study of the faculty's environment, policies and curriculum is recommended.
- It is also recommended that further research be conducted to determine what compels students to actively participate in environmental activism. The most notable finding of this study was the students' reluctance to participate in environmental activism. Further studies to determine the factors that influence students' willingness or reluctance to participate in environmental activism is recommended. This also highlights the need for current policies at the NWU, PC to adjust to make environmental activism campaigns more attractive and approachable to the students.

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ANNEXURES A:

Question 37

Appendix Table 1

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy.		0,795
Bartlett's test of sphericity	Approx. Chi-Square	1052,573
	df	10
	Sig.	0,000

Appendix Table 2

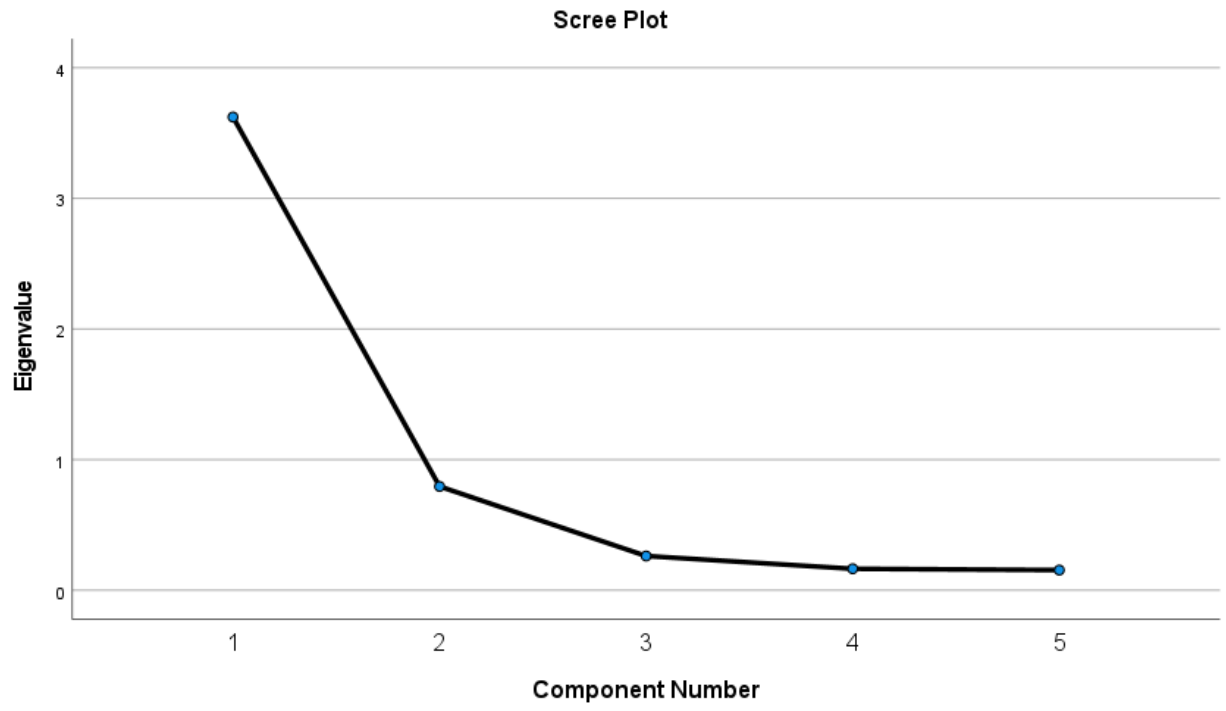
Anti-image matrices						
		The effects of plastic pollution?	Single-use plastics and what they are?	The negative effects of single-use plastics?	Environmental issues such as pollution?	The effects of climate change on the environment?
Anti-image correlation	The effects of plastic pollution?	.906[a]	-0,236	-0,127	-0,274	-0,232
	Single-use plastics and what they are?	-0,236	.752[a]	-0,718	0,005	-0,026
	The negative effects of single-use plastics?	-0,127	-0,718	.758[a]	-0,033	-0,011
	Environmental issues such as pollution?	-0,274	0,005	-0,033	.780[a]	-0,653
	The effects of climate change on the environment?	-0,232	-0,026	-0,011	-0,653	.786[a]
a. Measures of sampling sdequacy (MSA)						

Appendix Table 3

Total variance explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %

1	3,623	72,461	72,461	3,623	72,461	72,461
2	0,795	15,902	88,363			
3	0,262	5,249	93,612			
4	0,165	3,294	96,907			
5	0,155	3,093	100,000			
Extraction method: principal component analysis.						

Appendix Figure 1



Appendix Table 4

Component matrix[a]	
	Component
	1
The effects of plastic pollution?	0,890
Single-use plastics and what they are?	0,839
The negative effects of single-use plastics?	0,826
Environmental issues such as pollution?	0,851

The effects of climate change on the environment?	0,848
Extraction method: principal component analysis.	
a. 1 component extracted.	

Appendix Table 5

Reliability statistics		
Cronbach's alpha	Cronbach's alpha based on standardized items	No of Items
0,903	0,905	5

Appendix Table 6

Tests of normality						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
F37_Plastic_knowledge	0,102	270	0,000	0,949	270	0,000
a. Lilliefors significance correction						

Appendix Table 7

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
F37_Plastic_knowledge	270	1,00	5,00	3,7837	0,83992
Valid N (listwise)	270				

Question 38

Appendix Table 8

Statistics

		My degree includes study units that relate to or address environmental issues.	My field of study motivates me to take part in activities related to climate change.	I have gained knowledge of issues relating to the environment or climate change through talking to people and/ or reading/ online media, outside of class.	I have not learnt about environmental issues informally outside of class.	I would like to learn more about environmental issues in my academic programme.
N	Valid	257	253	263	254	256
	Missing	13	17	7	16	14

Appendix Table 9

My degree includes study units that relate to or address environmental issues.					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	Yes	104	38,5	40,5	40,5
	To some extent	98	36,3	38,1	78,6
	No	55	20,4	21,4	100,0
	Total	257	95,2	100,0	
Missing	Don't Know	13	4,8		
Total		270	100,0		

Appendix Table 10

My field of study motivates me to take part in activities related to climate change.					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	Yes	64	23,7	25,3	25,3
	To some extent	92	34,1	36,4	61,7
	No	97	35,9	38,3	100,0
	Total	253	93,7	100,0	
Missing	Don't Know	17	6,3		

Total	270	100,0		

Appendix Table 11

I have gained knowledge of issues relating to the environment or climate change through talking to people and/ or reading/ online media, outside of class.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Yes	145	53,7	55,1	55,1
	To some extent	82	30,4	31,2	86,3
	No	36	13,3	13,7	100,0
	Total	263	97,4	100,0	
Missing	Don't Know	7	2,6		
Total		270	100,0		

Appendix Table 12

I have not learnt about environmental issues informally outside of class.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Yes	26	9,6	10,2	10,2
	To some extent	48	17,8	18,9	29,1
	No	180	66,7	70,9	100,0
	Total	254	94,1	100,0	
Missing	Don't Know	16	5,9		
Total		270	100,0		

Appendix Table 13

I would like to learn more about environmental issues in my academic programme.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Yes	119	44,1	46,5	46,5
	To some extent	88	32,6	34,4	80,9
	No	49	18,1	19,1	100,0

	Total	256	94,8	100,0	
Missing	Don't Know	14	5,2		
Total		270	100,0		

Appendix Table 14

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. deviation
My degree includes study units that relate to or address environmental issues.	257	1	3	1,81	0,765
My field of study motivates me to take part in activities related to climate change.	253	1	3	2,13	0,789
I have gained knowledge of issues relating to the environment or climate change through talking to people and/ or reading/ online media, outside of class.	263	1	3	1,59	0,720
I have not learnt about environmental issues informally outside of class.	254	1	3	2,61	0,667
I would like to learn more about environmental issues in my academic programme.	256	1	3	1,73	0,764
Valid N (listwise)	226				

Question 39

Appendix Table 15

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy.		0,688
Bartlett's test of sphericity	Approx. Chi-Square	320,407

	df	6
	Sig.	0,000

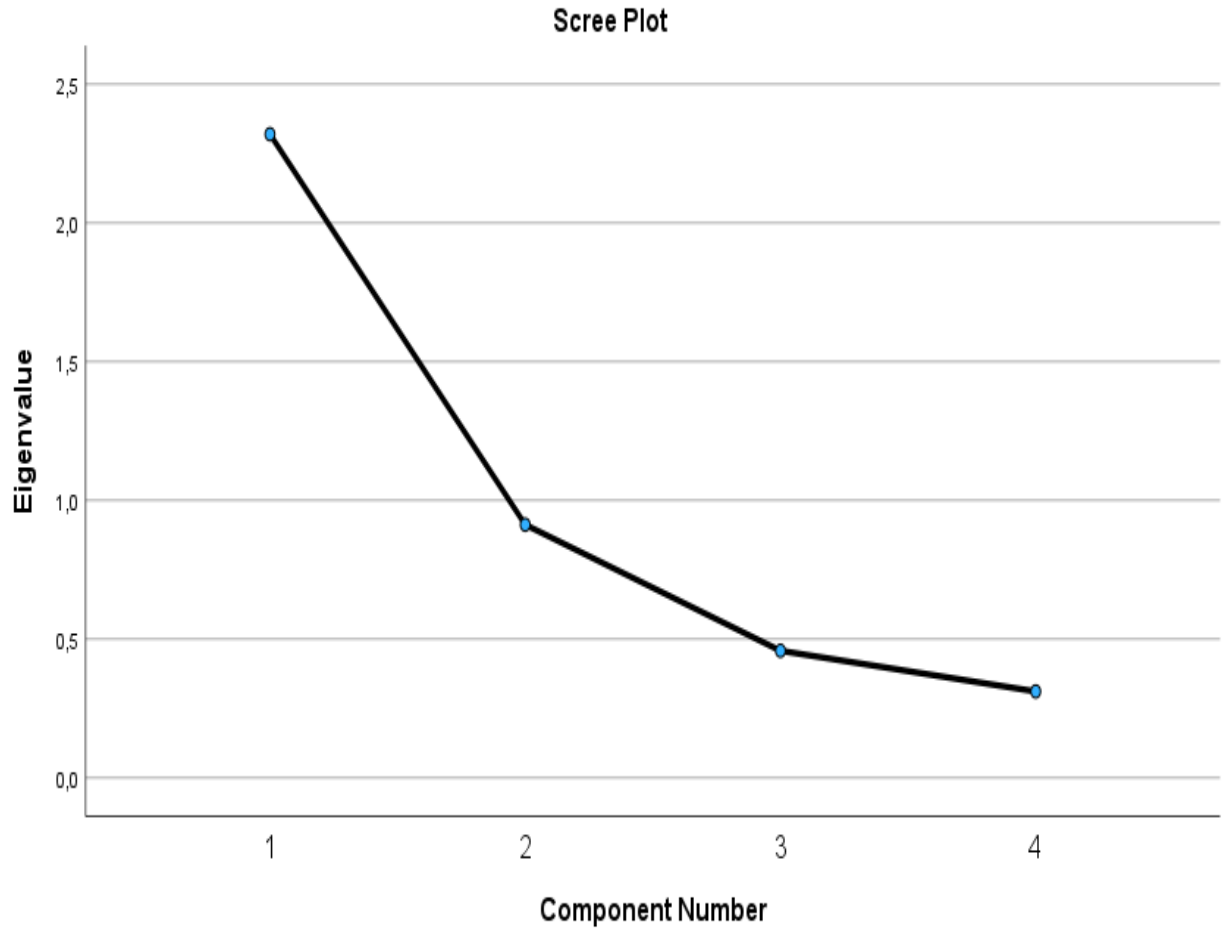
Appendix Table 16

Anti-image matrices					
		Everyone should respect the environment because it affects all of us.	I am willing to participate in saving the environment, because it will benefit us in the long run if we do.	I value the opinions (in relation to environmental issues) of celebrities and my own role models as important.	I adhere to a value system that values the protection of the environment as important.
Anti-image correlation	Everyone should respect the environment because it affects all of us.	,674[a]	-0,546	0,088	-0,147
	I am willing to participate in saving the environment, because it will benefit us in the long run if we do.	-0,546	,660[a]	-0,094	-0,369
	I value the opinions (in relation to environmental issues) of celebrities and my own role models as important.	0,088	-0,094	,692[a]	-0,315
	I adhere to a value system that values the protection of the environment as important.	-0,147	-0,369	-0,315	,738[a]
a. Measures of sampling adequacy (MSA)					

Appendix Table 17

Total Variance Explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	2,320	57,988	57,988	2,320	57,988	57,988
2	0,912	22,799	80,787			
3	0,458	11,439	92,226			
4	0,311	7,774	100,000			
Extraction method: principal component analysis.						

Appendix Figure 2



Appendix Table 17

Component matrix[a]

	Component
	1
Everyone should respect the environment because it affects all of us.	0,785
I am willing to participate in saving the environment, because it will benefit us in the long run if we do.	0,869
I value the opinions (in relation to environmental issues) of celebrities and my own role models as important.	0,522
I adhere to a value system that values the protection of the environment as important.	0,822
Extraction method: principal component analysis.	
a. 1 component extracted.	

Appendix Table 18

Reliability statistics		
Cronbach's alpha	Cronbach's alpha based on standardised items	No of Items
0,706	0,746	4

Appendix Table 19

Tests of normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
F39_Attitude_Plastic	0,085	270	0,000	0,977	270	0,000
a. Lilliefors significance correction						

Appendix Table 20

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
F39_Attitude_Plastic	270	1,00	5,00	3,7636	0,71276
Valid N (listwise)	270				

Question 40

Appendix Table 21

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy.		0,840
Bartlett's test of sphericity	Approx. Chi-Square	656,301
	df	6
	Sig.	0,000

Appendix Table 22

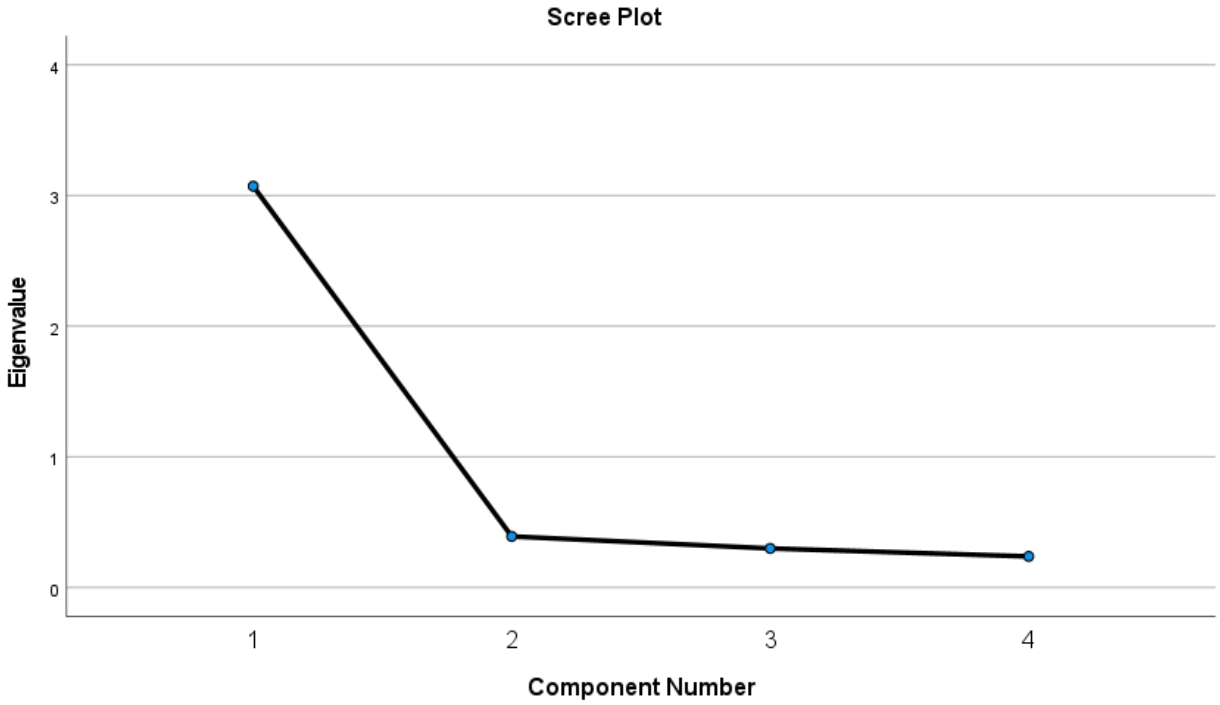
Anti-image Matrices					
		I am willing to participate in protest action to help save the environment.	I would like to participate in awareness and educational campaigns about environmental issues to help save the environment.	I would not mind speaking at events to encourage others to reduce their use of single-use plastics (such as plastic bags or plastic bottles).	I would be willing to join activists against single-use plastics.
Anti-image correlation	I am willing to participate in protest action to help save the environment.	.861[a]	-0,389	-0,151	-0,206
	I would like to participate in awareness and educational campaigns about environmental issues to help save the environment.	-0,389	.808[a]	-0,259	-0,388
	I would not mind speaking at events to encourage others to reduce their use of Single-use plastics (such as plastic bags or plastic bottles).	-0,151	-0,259	.870[a]	-0,334

	I would be willing to join activists against Single-use plastics.	-0,206	-0,388	-0,334	.831[a]
a. Measures of sampling adequacy (MSA)					

Appendix Table 23

Total variance explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3,072	76,801	76,801	3,072	76,801	76,801
2	0,391	9,775	86,575			
3	0,299	7,475	94,050			
4	0,238	5,950	100,000			
Extraction method: principal component analysis.						

Appendix Figure 3



Appendix Table 24

Component Matrix[a]	
	Component
	1
I am willing to participate in protest action to help save the environment.	0,856
I would like to participate in awareness and educational campaigns about environmental issues to help save the environment.	0,904
I would not mind speaking at events to encourage others to reduce their use of Single-use plastics (such as plastic bags or plastic bottles).	0,854

I would be willing to join activists against Single-use plastics.	0,890
Extraction method: principal component analysis.	
a. 1 component extracted.	

Appendix Table 25

Reliability statistics		
Cronbach's alpha	Cronbach's alpha based on standardised items	No of Items
0,898	0,899	4

Appendix Table 26

Tests of normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
F40_Activism_Plastic	0,074	270	0,001	0,967	270	0,000
a. Lilliefors significance correction						

Appendix Table 27

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
F40_Activism_Plastic	270	1,00	5,00	3,1824	1,08055
Valid N (listwise)	270				

Question 41

Appendix Table 28

KMO and Bartlett's test	
Kaiser-Meyer-Olkin measure of sampling adequacy.	0,774

Bartlett's test of sphericity	Approx. Chi-Square	481,878
	df	6
	Sig.	0,000

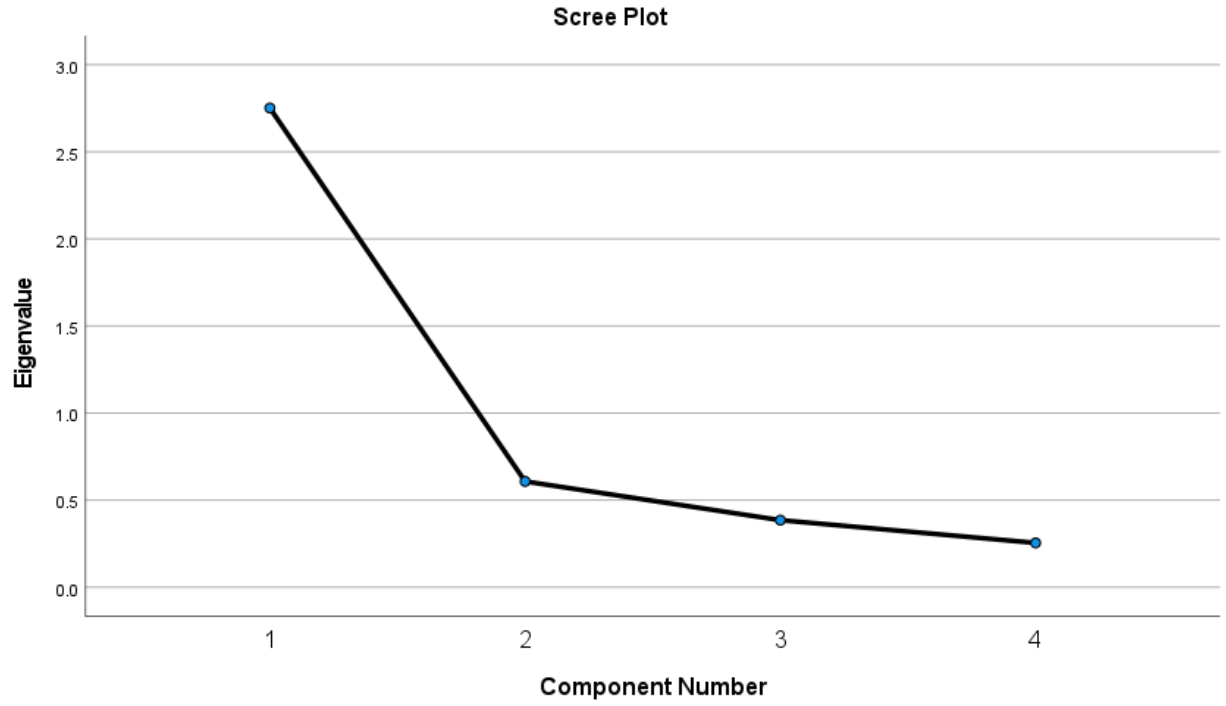
Appendix Table 29

Anti-image Matrices					
		There are people that I greatly admire and identify with that speak on environmental issues like single-use plastics.	I have seen TV shows/documentaries where people speak on actions that people should take to reduce their use of single-use plastics.	I follow people on social media who take action against climate change or practices that are harmful to the environment.	I follow news on social media that specifically report on current environmental issues.
Anti-image correlation	There are people that I greatly admire and identify with that speak on environmental issues like single-use plastics.	.815[a]	-0,359	-0,290	-0,168
	I have seen TV shows/documentaries where people speak on actions that people should take to reduce their use of single-use plastics.	-0,359	.828[a]	-0,200	-0,024
	I follow people on social media who take action against climate change or practices that are harmful to the environment.	-0,290	-0,200	.732[a]	-0,569
	I follow news on social media that specifically report on current environmental issues.	-0,168	-0,024	-0,569	.749[a]
a. Measures of sampling adequacy (MSA)					

Appendix Table 30

Total variance explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	2,752	68,795	68,795	2,752	68,795	68,795
2	0,608	15,197	83,992			
3	0,385	9,637	93,629			
4	0,255	6,371	100,000			
Extraction method: principal component analysis.						

Appendix Figure 4



Appendix Table 31

Component matrix[a]	
	Component
	1

There are people that I greatly admire and identify with that speak on environmental issues like single-use plastics.	0,840
I have seen TV shows/documentaries where people speak on actions that people should take to reduce their use of single-use plastics.	0,757
I follow people on social media who take action against climate change or practices that are harmful to the environment.	0,883
I follow news on social media that specifically report on current environmental issues.	0,832
Extraction method: principal component analysis.	
a. 1 component extracted.	

Appendix Table 32

Reliability statistics		
Cronbach's alpha	Cronbach's Aapha based on standardised items	No of Items
0,849	0,848	4

Appendix Table 33

Tests of normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
F41_Neg_effects_Plastic	0,070	270	0,003	0,974	270	0,000
a. Lilliefors significance correction						

Appendix Table 34

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
F41_Neg_effects_Plastic	270	1,00	5,00	2,9880	1,06048
Valid N (listwise)	270				

Question 42

Appendix Table 34

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy.		0,824
Bartlett's test of sphericity	Approx. Chi-Square	569,703
	df	6
	Sig.	0,000

Appendix Table 35

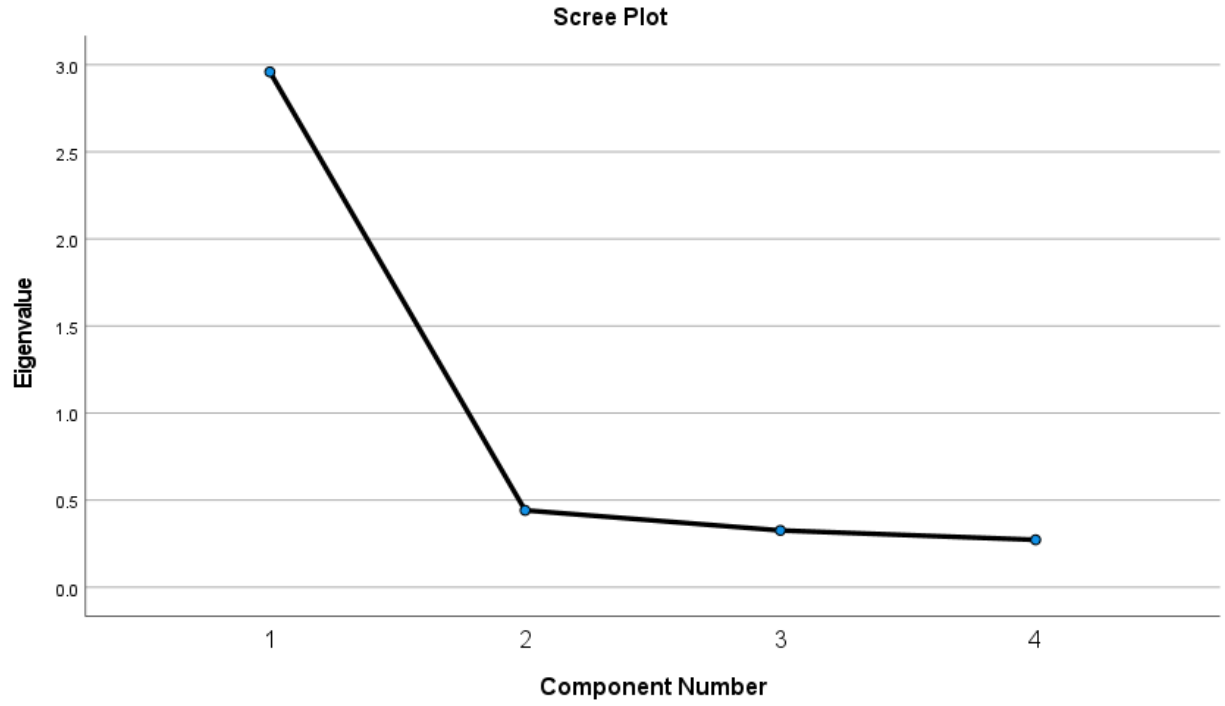
Anti-image matrices					
		...often talk about environmental issues.	...[they] encourage me to use less Single-use plastics because SA already has pollution issues.	...[they] encourage me to use less electricity power to reduce the negative impact on the atmosphere.	… [they] are very knowledgeable about environmental issues such as global warming.
Anti-image correlation	...often talk about environmental issues.	.806[a]	-0,455	-0,142	-0,307
	...[they] encourage me to use less Single-use plastics because SA already has pollution issues.	-0,455	.815[a]	-0,208	-0,221
	...[they] encourage me to use less electricity power to reduce the negative impact on the atmosphere.	-0,142	-0,208	.854[a]	-0,366

	… [they] are very knowledgeable about environmental issues such as global warming.	-0,307	-0,221	-0,366	.827[a]
a. Measures of sampling adequacy (MSA)					

Appendix Table 36

Total variance explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	2,959	73,978	73,978	2,959	73,978	73,978
2	0,442	11,045	85,024			
3	0,326	8,161	93,185			
4	0,273	6,815	100,000			
Extraction method: principal component analysis.						

Appendix Figure 5



Appendix Table 37

Component matrix[a]	
	Component
	1
...[they] often talk about environmental issues.	0,873
...[they] encourage me to use less Single-use plastics because SA already has pollution issues.	0,869
...[they] encourage me to use less electricity power to reduce the negative impact on the atmosphere.	0,828
… [they] are very knowledgeable about environmental issues such as global warming.	0,870
Extraction method: principal component analysis.	
a. 1 component extracted.	

Appendix Table 38

Reliability statistics		
Cronbach's alpha	Cronbach's alpha based on standardised items	No of Items
0,884	0,884	4

Appendix Table 39

Tests of normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
F42_Environ_issues_Plastic	0,085	270	0,000	0,970	270	0,000
a. Lilliefors significance correction						

Appendix Table 40

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
F42_Environ_issues_Plastic	270	1,00	5,00	2,9605	1,05807
Valid N (listwise)	270				

Question 43

Appendix Table 41

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy.		0,903
Bartlett's test of sphericity	Approx. Chi-Square	1227,147
	df	28
	Sig.	0,000

Appendix Table 42

Anti-image matrices								
	… make use of environmentally friendly biodegradable products (such as paper bags), even if they are more expensive to help combat pollution.	… use wooden or wire clothes hangers, rather than plastic ones to reduce my plastic use.	… ensure I only use recyclable household products, e.g. glass bottles, cloth shopping bags.	…boycott the use of products sold in plastic and polystyrene packaging for any type of food to reduce my single-use plastics use.	… to stop using plastic straws, even where alternative straws (paper, metal, bio-degradable) are not available.	…support the banning of plastic and polystyrene in exchange for the use of reusable takeaway containers at my local takeaway shop.	…to buy my own metal drinking straws to use where paper ones are not available.	…stop buying water or drinks sold in plastic bottles.

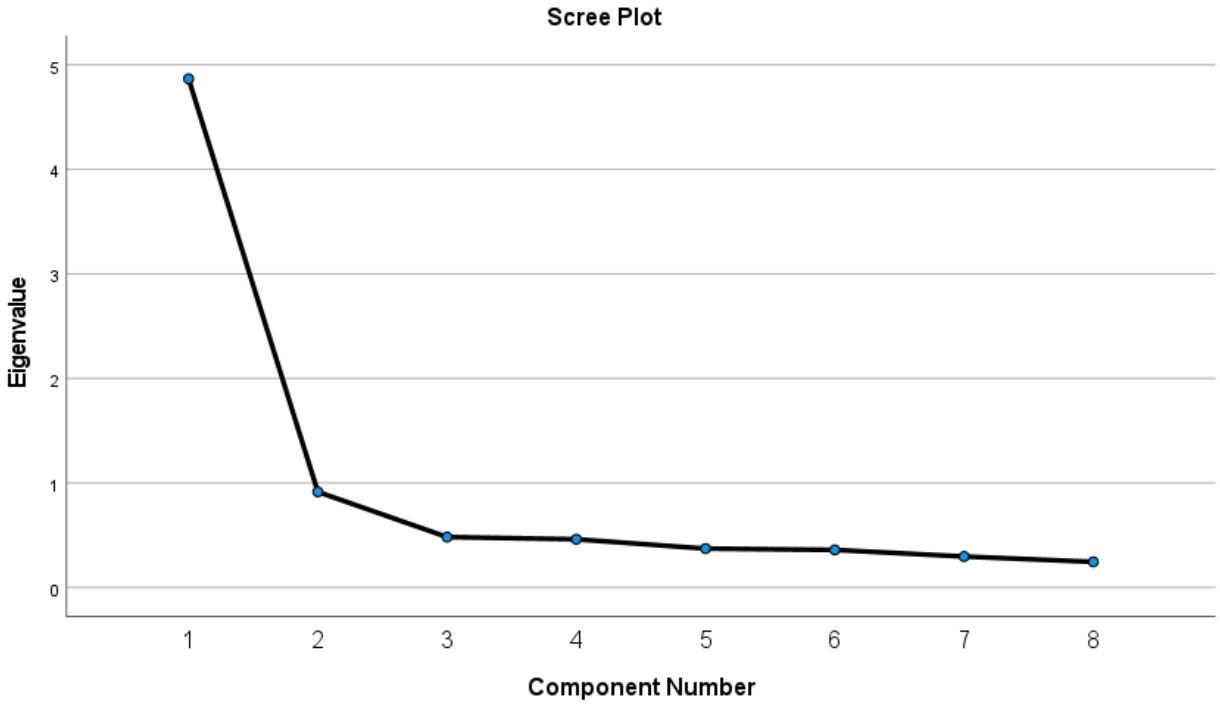
Anti-image Correlation	… make use of environmentally friendly biodegradable products (such as paper bags), even if they are more expensive to help combat pollution.	.913[a]	-0,185	-0,349	-0,027	-0,125	-0,070	-0,060	0,022
	… use wooden or wire clothes hangers, rather than plastic ones to reduce my plastic use.	-0,185	.893[a]	-0,288	-0,210	0,027	-0,197	-0,065	0,152
	… ensure I only use recyclable household products, e.g. glass bottles, cloth shopping bags.	-0,349	-0,288	.881[a]	-0,250	0,027	0,066	-0,086	-0,040
	…boycott the use of products sold in plastic and polystyrene packaging for any type of food to reduce my single-use plastics use.	-0,027	-0,210	-0,250	.901[a]	-0,198	-0,144	0,022	-0,344
	… to stop using plastic straws, even where alternative straws (paper, metal, bio-degradable) are not available.	-0,125	0,027	0,027	-0,198	.915[a]	-0,205	-0,323	-0,076

	…support the banning of plastic and polystyrene in exchange for the use of reusable takeaway containers at my local takeaway shop.	-0,070	-0,197	0,066	-0,144	-0,205	.924[a]	-0,189	-0,213
	…to buy my own metal drinking straws to use where paper ones are not available.	-0,060	-0,065	-0,086	0,022	-0,323	-0,189	.910[a]	-0,267
	…stop buying water or drinks sold in plastic bottles.	0,022	0,152	-0,040	-0,344	-0,076	-0,213	-0,267	.885[a]
a. Measures of sampling adequacy (MSA)									

Appendix Table 43

Total variance explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	4,867	60,837	60,837	4,867	60,837	60,837
2	0,915	11,439	72,275			
3	0,483	6,035	78,310			
4	0,461	5,768	84,078			
5	0,372	4,652	88,730			
6	0,360	4,497	93,228			
7	0,296	3,706	96,934			
8	0,245	3,066	100,000			
Extraction method: principal component analysis.						

Appendix Figure 6



Appendix Table 44

Component matrix[a]	
	Component
	1
… make use of environmentally friendly biodegradable products (such as paper bags), even if they are more expensive to help combat pollution.	0,734
… use wooden or wire clothes hangers, rather than plastic ones to reduce my plastic use.	0,732
… ensure I only use recyclable household products, e.g. glass bottles, cloth shopping bags.	0,763

…boycott the use of products sold in plastic and polystyrene packaging for any type of food to reduce my single-use plastics use.	0,847
… to stop using plastic straws, even where alternative straws (paper, metal, bio-degradable) are not available.	0,791
…support the banning of plastic and polystyrene in exchange for the use of reusable takeaway containers at my local takeaway shop.	0,807
…to buy my own metal drinking straws to use where paper ones are not available.	0,800
…stop buying water or drinks sold in plastic bottles.	0,759
Extraction method: principal component analysis.	
a. 1 component extracted.	

Appendix Table 45

Reliability statistics		
Cronbach's alpha	Cronbach's alpha based on standardised items	No of Items
0,907	0,908	8

Appendix Table 46

Tests of normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.

F43_Willing_combat_Plastics	0,073	270	0,001	0,975	270	0,000
a. Lilliefors significance correction						

Appendix Table 47

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
F43_Willing_combat_Plastics	270	1,00	5,00	3,4736	0,89657
Valid N (listwise)	270				

Question 44

Appendix Table 48

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy.		0,661
Bartlett's test of sphericity	Approx. Chi-Square	240,417
	df	6
	Sig.	0,000

Appendix Table 49

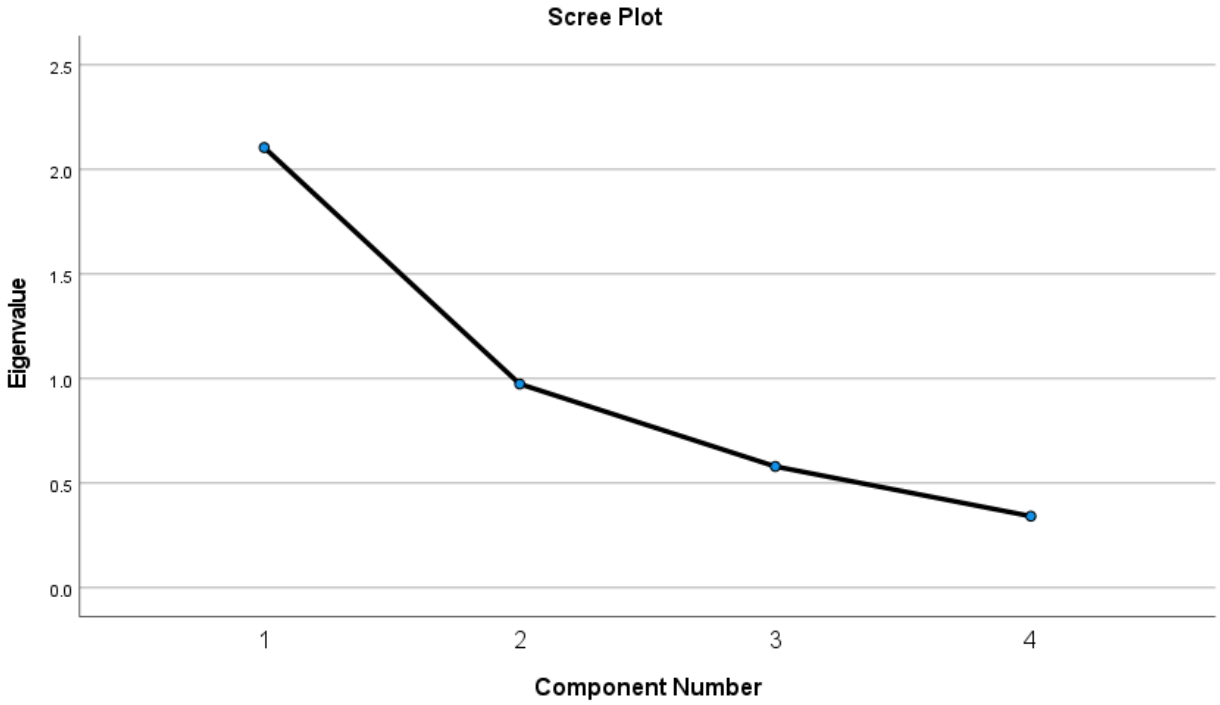
Anti-image matrices					
		I am willing to recycle paper, cardboard, bottles and cans in future even if it takes more effort.	I am willing to take part in environmental discussions to increase my knowledge and awareness about the negative effects of single-use plastics.	I find it hard to change my habits relating to the use of single-use plastics.	The government should support with funding the switch to reusable [lastics.
Anti-image Correlation	I am willing to recycle paper, cardboard, bottles and cans in future even if it takes more effort.	.639[a]	-0,544	0,106	-0,197

	I am willing to take part in environmental discussions to increase my knowledge and awareness about the negative effects of single-use plastics.	-0,544	.626[a]	-0,181	-0,294
	I find it hard to change my habits relating to the use of single-use plastics.	0,106	-0,181	.544[a]	-0,061
	The government should support with funding the switch to reusable plastics.	-0,197	-0,294	-0,061	.784[a]
a. Measures of sampling adequacy (MSA)					

Appendix Table 50

Total variance explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	2,105	52,614	52,614	2,105	52,614	52,614
2	0,974	24,348	76,962			
3	0,580	14,491	91,454			
4	0,342	8,546	100,000			
Extraction method: principal component analysis.						

Appendix Figure 7



Appendix Table 51

Component matrix[a]	
	Component
	1
I am willing to recycle paper, cardboard, bottles and cans in future even if it takes more effort.	0,827
I am willing to take part in environmental discussions to increase my knowledge and awareness about the negative effects of single-use plastics.	0,872
I find it hard to change my habits relating to the use of single-use plastics.	0,281
The government should support with funding the switch to reusable plastics.	0,763

Extraction method: principal component analysis.
a. 1 component extracted.

Appendix Table 52

Reliability statistics		
Cronbach's alpha	Cronbach's alpha based on standardised items	No of Items
0,642	0,660	4

Appendix Table 53

Tests of normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
F44_Environ_behav_Plastics	0,146	270	0,000	0,923	270	0,000
a. Lilliefors significance correction						

Appendix Table 54

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
F44_Environ_behav_Plastics	270	1,67	5,00	3,9975	0,82254
Valid N (listwise)	270				

Question 45

Appendix Table 55

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy.		0,822
Bartlett's Test of Sphericity	Approx. Chi-Square	691,125
	df	21
	Sig.	0,000

Appendix Table 56

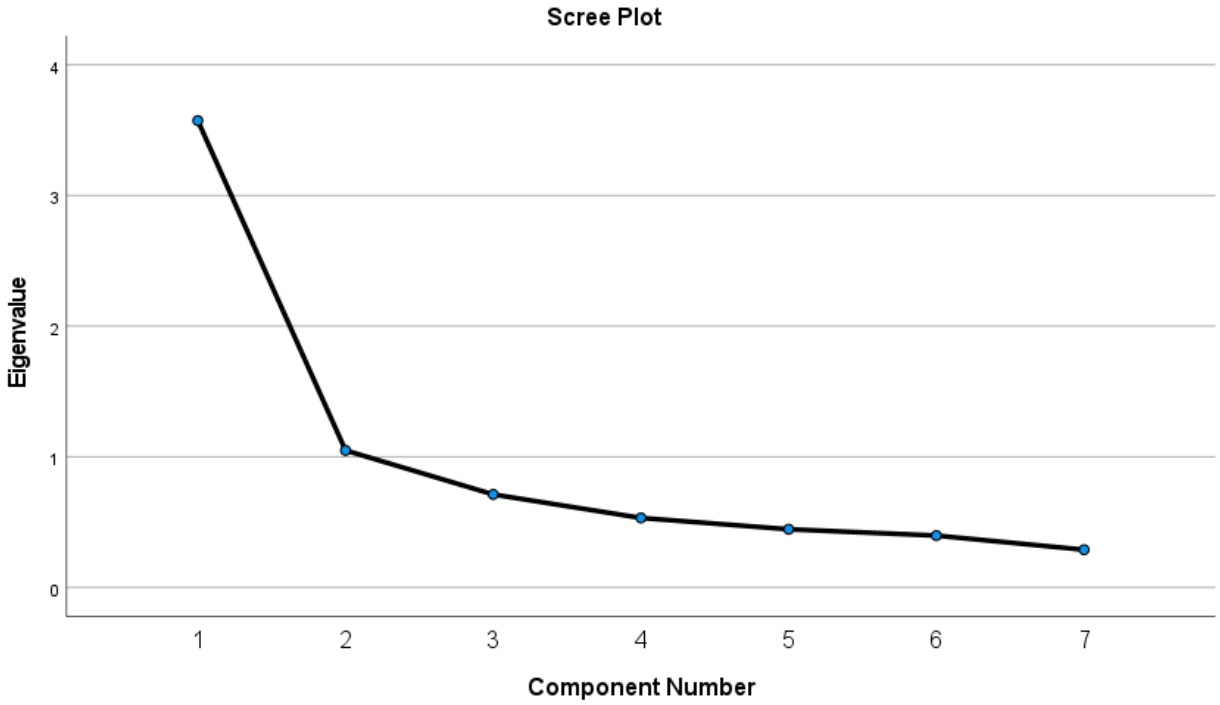
Anti-image matrices								
		I tend to make use of recycling bins on campus and in town.	I tend to pick up garbage lying around.	I make use of recycled products when available.	I respect the environment and am therefore selective in what I buy or do, always considering how it will impact the environment.	I have given up using fresh products that are packed in plastic or polystyrene packaging.	I sort my waste (glass, batteries, plastics and vegetables) and ensure it gets into recycling.	I avoid using plastics that cause harm to the environment.
Anti-image correlation	I tend to make use of recycling bins on campus and in town.	.897[a]	-0,082	-0,183	-0,078	0,067	-0,129	-0,117
	I tend to pick up garbage lying around.	-0,082	.828[a]	-0,373	-0,242	0,082	-0,193	-0,045
	I make use of recycled products when available.	-0,183	-0,373	.813[a]	-0,202	-0,014	0,138	-0,139
	I respect the environment and am therefore selective in what I buy or do, always considering how it will impact the environment.	-0,078	-0,242	-0,202	.833[a]	-0,334	0,069	-0,290
	I have given up using fresh products that are packed in plastic or polystyrene packaging.	0,067	0,082	-0,014	-0,334	.770[a]	-0,451	-0,124
	I sort my waste (glass, batteries, plastics and vegetables) and ensure it gets into recycling.	-0,129	-0,193	0,138	0,069	-0,451	.755[a]	-0,233

	I avoid using plastics that cause harm to the environment.	-0,117	-0,045	-0,139	-0,290	-0,124	-0,233	.881[a]
a. Measures of sampling adequacy (MSA)								

Appendix Table 57

Total variance explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3,574	51,051	51,051	3,574	51,051	51,051
2	1,049	14,991	66,042			
3	0,712	10,176	76,218			
4	0,532	7,606	83,825			
5	0,446	6,369	90,194			
6	0,397	5,677	95,871			
7	0,289	4,129	100,000			
Extraction method: principal component analysis.						

Appendix Figure 8



Appendix Table 58

Component matrix[a]	
	Component
	1
I tend to make use of recycling bins on campus and in town.	0,580
I tend to pick up garbage lying around.	0,732
I make use of recycled products when available.	0,690
I respect the environment and am therefore selective in what I buy or do, always considering how it will impact the environment.	0,815
I have given up using fresh products that are packed in plastic or polystyrene packaging.	0,701

I sort my waste (glass, batteries, plastics and vegetables) and ensure it gets into recycling.	0,671
I avoid using plastics that cause harm to the environment.	0,788
Extraction method: principal component analysis.	
a. 1 component extracted.	

Appendix Table 59

Reliability statistics		
Cronbach's alpha	Cronbach's alpha based on standardised items	No of Items
0,837	0,837	7

Appendix Table 60

Tests of normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
F45_Environ_protect_attit_Plastics	0,057	270	0,036	0,991	270	0,118
a. Lilliefors Significance Correction						

Appendix Table 61

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
F45_Environ_protect_attit_Plastics	270	1,00	5,00	3,1099	0,84522
Valid N (listwise)	270				