

UNIVERSITY OF GHANA

INSTITUTE FOR ENVIRONMENT AND SANITATION STUDIES

**ASSESSMENT OF HOUSEHOLD WASTE SEGREGATION USING
THE THEORY OF PLANNED BEHAVIOR: A CASE STUDY OF WA
MUNICIPAL IN THE UPPER WEST REGION**

BY

JOYCE LEGIBO

(10704087)

**A THESIS SUBMITTED TO THE INSTITUTE FOR ENVIRONMENT
AND SANITATION STUDIES, UNIVERSITY OF GHANA, LEGON IN
PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD
OF MASTER OF PHILOSOPHY IN ENVIRONMENT SANITATION
STUDIES DEGREE**

JULY 2021

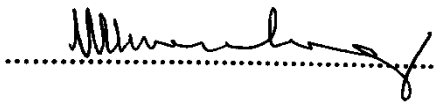
DECLARATION

I do hereby declare that this work is as a result of my own research and has not been presented by anyone for any academic award in this or any other university.



CERTIFICATION

I hereby certify that this project work was supervised in accordance with procedures laid down by the University.



14/07/2023

DR. WIAFE AKENTENG

DATE

(SUPERVISOR)



14/07/2023

Dr. TED Y. ANNANG

DATE

(CO-SUPERVISOR)



DEDICATION

I dedicate this research work to my family.



ACKNOWLEDGEMENT

I wish to express a heartfelt gratitude to my supervisor, DR. WIAFE AKENTENG for his guidance and constructive comments throughout the study. I also wish to thank my family and friends for the support given me throughout my studies.



TABLE OF CONTENT

Contents	Page
DECLARATION.....	i
CERTIFICATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT.....	iv
TABLE OF CONTENT.....	v
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xii
LIST OF ABBREVIATIONS.....	xiii
ABSTRACT.....	xiv
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background of the Study.....	1
1.2 Problem Statement.....	7
1.3 General Aim/Objective of the Study.....	8
1.3.1 Specific Objectives.....	8
1.4 Research Questions.....	9
1.5 Significance of the Study.....	9
1.6 Scope and Delimitations of the Study.....	10
1.7 Chapter Disposition.....	11

CHAPTER TWO: LITERATURE REVIEW	13
2.0 Chapter Overview	13
2.1 Waste Management	13
2.2 Waste Segregation.....	15
2.2.1 Types of Waste Segregation	15
2.2.2 Waste Segregation in Ghanaian Context	17
2.3 Theoretical Framework	20
2.3.1 Theory of Planned Behavior	20
2.4 Conceptual Clarifications.....	22
2.4.1 Attitude in Waste Segregation.....	22
2.4.2 Subjective Norm in Waste Segregation.....	23
2.4.3 Perceived Behavioral Control in Waste Segregation	24
2.4.4 Intention to Segregate Waste.....	25
2.4.5 Waste Segregation Behavior	26
2.4.6 Application of TPB to Waste Management and Segregation.....	28
2.5 Empirical Literature	29
2.5.1 Attitude, Intention and Behavior	29
2.5.2 Subjective Norm, Intention and Behavior	31
2.5.3 Perceived Behavioral Control, Intention and Behavior.....	34
2.5.4 Intention and Waste Segregation Behavior	37

2.5.5 Mediating Role of Intention to Segregate Waste.....	39
2.6 Conceptual Framework	43
CHAPTER THREE: METHODOLOGY	44
3.0 Chapter Overview	44
3.1 Philosophical Paradigm.....	44
3.2 Research Approach	47
3.3 Research Design.....	47
3.4 Study Area/Setting	48
3.5 Population.....	49
3.6 Sample Size	49
3.7 Sampling Techniques/Selection	51
3.8 Materials, Tools and Data for Analysis.....	52
3.8.1 Data Sources.....	52
3.8.2 Description of Measurement Scales/Variables.....	53
3.8.3 Validity of the Study Variables	54
3.8.4 Reliability of the Scales.....	55
3.9 Method of Data Analysis	56
3.9.1 Structural Equation Modelling (SEM)	56
3.9.2 Mediation Analysis.....	57
3.9.3 Bootstrapping Technique.....	58

3.10.1 Pilot Study	59
3.10.2 Data Collection Procedure	60
3.11 Ethical Consideration	60
3.12 Conclusion.....	61
CHAPTER FOUR: DATA ANALYSIS.....	62
4.0 Chapter Overview	62
4.1 Background	62
4.2 Data Screening and Examination	62
4.2.1 Missing Value Analysis.....	63
4.2.2 Test of Data Normality	63
4.3. Demographic Profile of Respondents	65
4.3.1 Gender of Respondents.....	65
4.3.2 Age of Respondents.....	66
4.3.3 Education of Respondents	66
4.3.4 Marital Status of Respondents.....	67
4.3.5 Family Size	68
4.3.7 Position of Respondents in Family	69
4.4 Correlation Analysis.....	69
4.4.1 Analysis of Structural Equation Modelling (SEM)	71
4.4.2 Model Validity Analysis.....	72

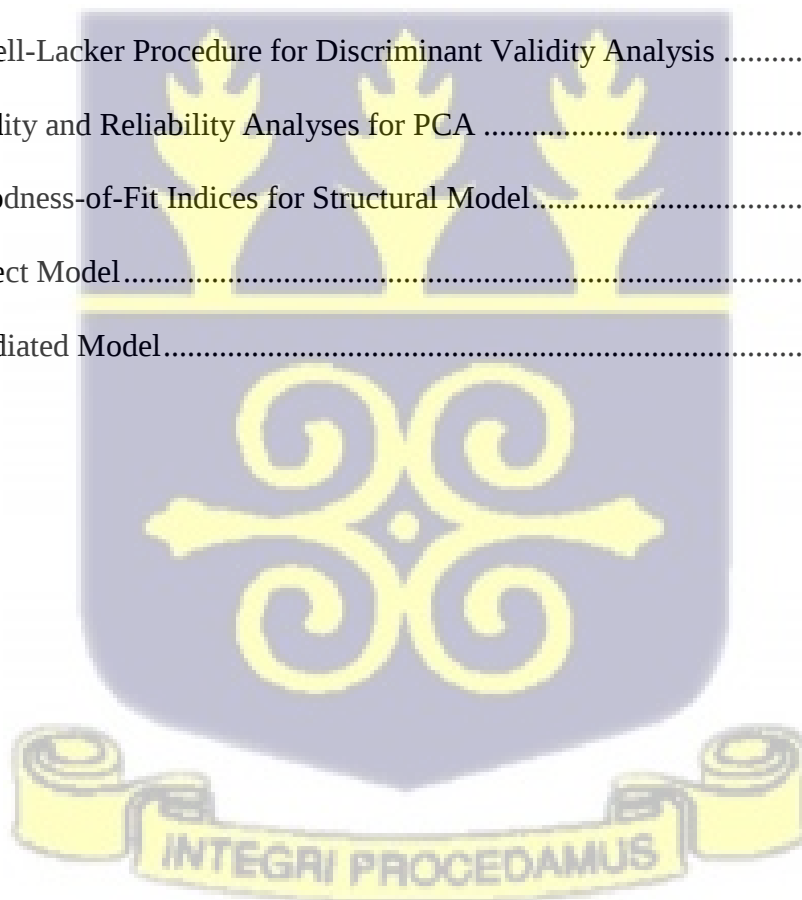
4.4.3 Model Reliability Analysis	74
4.5 Structural Model Analysis.....	75
4.5.1 Validation Test of the Baseline Structural Models.....	75
4.6 Direct Model Analysis	77
4.6.1 Objective One: Attitude, Intention and Behavior	79
4.6.2 Objective Two: Subjective Norm, Intention and Behavior	79
4.6.3 Objective Three: Perceived Behavior Control, Intention and Behavior.....	80
4.7 Mediated Model Analysis	80
4.7.1 Objective Four Mediation Analysis.....	82
4.8 Final Conceptual Framework.....	84
CHAPTER FIVE: DISCUSSIONS, SUMMARY, RECOMMENDATIONS AND	
CONCLUSION	86
5.0 Chapter Overview	86
5.1 Discussion of Findings.....	86
5.1.1 Attitude, Intention and Waste Segregation Behavior	86
5.1.2 Subjective Norm, Intention and Waste Segregation Behavior	89
5.1.3 Perceived Behavior Control, Intention and Waste Segregation Behavior.....	92
5.1.4 Mediation Role of Intention to Segregate Waste.....	94
5.2 Summary of findings.....	97
5.3 Limitations of the Study.....	97

5.4 Implications for Further Studies.....	99
5.5 Contributions of the Study	100
5.6 Recommendations	102
5.6.1 Recommendations for Practice	102
5.6.2 Recommendations for Policy.....	105
5.6.3 Recommendations for Theory	106
5.7 Conclusion.....	108
REFERENCES.....	109
APPENDICES.....	125
Appendix A: Questionnaire.....	125



LIST OF TABLES

Table 3. 1: Summary of result showing Pilot Study	59
Table 4. 1: Results Showing Univariate and Multivariate Test of Normality	64
Table 4. 2: Summary of Results showing Age of Respondents.....	66
Table 4. 3: Summary of results showing Educational Qualification of Respondents	67
Table 4. 4: Summary of results showing Marital Status of Respondents	68
Table 4. 5: Summary of results showing Position	69
Table 4. 6: Correlation Analysis	70
Table 4. 7: Summary of Results Showing Factor Analysis of the Study Variables	72
Table 4. 8: Fornell-Lacker Procedure for Discriminant Validity Analysis	74
Table 4. 9: Validity and Reliability Analyses for PCA	75
Table 4. 10: Goodness-of-Fit Indices for Structural Model.....	76
Table 4. 11: Direct Model.....	78
Table 4. 12: Mediated Model.....	81



LIST OF FIGURES

Figure 2 1: Conceptual Framework	43
Figure 4. 1: Summary of Results showing Gender of Respondents.....	65
Figure 4. 2: Summary of results showing Family Size	68
Figure 4. 3: Direct Model.....	77
Figure 4. 4: Mediated Model.....	81
Figure 4. 5: Final conceptual Framework	84



LIST OF ABBREVIATIONS

AVE	Average Value Extracted
CFA	Confirmatory Factor Analysis
EFA	Exploratory Factor Analysis
EPA	Environmental Protection Agency
ERDF	European Regional Development Fund
ERDF	European Regional Development Fund
LCA	Life Cycle Assessments
NAT	Norm-Activation-Theory
PPP	Public-private-partnership
PPP	Public-Private-Partnership
SEM	Structural Equation Modelling
SPSS	Statistical Product and Services Solution
SSNIT	Social Security and National Insurance Trust
TPB	Theory of Planned Behavior
USA	United States of America
VBN	Value-Belief-Norm
WMD	Waste Management Department
WMD	Waste Management Department



ABSTRACT

This study sought to find out how dimensions of the theory of planned behavior (attitude, subjective norm, perceived behavior control, intention) influence household waste segregation. A cross sectional survey design was conducted in the Upper West Region of Ghana (Wa) using structured questionnaire. Members of households in the Wa Municipality were sampled using stratified, purposive and convenience sampling techniques from three different strata. The Structural Equation Modelling (SEM) was used to analyse the data and test the hypothesized relationships among the variables. The IBM SPSS version 21.0 and AMOS version 21.0 were used to facilitate the data analysis process. The findings revealed that attitude to household waste segregation and intention did not significantly predict waste segregation behavior. Subjective norm in household waste segregation significantly improves intention to segregate and behavior in household waste segregation. Perceived behavioral control in household waste segregation significantly improves intention to segregate and actual behavior in household waste segregation. The findings also showed that intention to segregate mediates the relationship between subjective norm, perceived behavior control and waste segregation behavior. However, intention to segregate does not mediate the relationship between attitude towards waste segregation and waste segregation behavior. The study therefore concludes that intention to segregate, subjective norm in segregation, perceived behavior control are important factors in the management of waste at the household level.



CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Waste management is a prevailing issue in the midst of high waste generation rates in most communities. Globally, the World cities generated 2.01 billion tones solid waste annually (Gu et al., 2019). This translates to 0.74kg per person per day. With rapid population growth and urbanization, annual solid waste generation is expected to increase by 70% from 2020 levels to 3.40 billion tones by 2050 (Pakpour, et al., 2014). Almost every country in the world face challenges with waste management issues but compared to developed countries, developing countries face more serious challenges in waste management (Serge-Kubanza & Simatele, 2020). Solid waste issues have become the concern of authorities over the world due to rapid growth in rural areas, urbanization and high population rate of growth (Zhu & Huang, 2011), already congested landfills (Bartelings & Sterner, 1999), ever increasing food consumption (Ng, et al., 2019) and production materials diversity (Gu et al., 2015).

Literature has revealed that there is low level recycling of waste for both developed and developing countries. For instance, the recycling rates of Turkey and Iran are below 10%, while those in the United States (US), the United Kingdom (UK), France, and Italy are merely 30% to 40% (Environmental Protection Agency, 2012; European Environment Agency, 2013; Pakpour et al., 2014). Although, waste segregation at source has been acknowledged an efficient strategy for recycling, its full potential and benefits are yet to be realized. The rate of public participation in waste segregation has continued to remain low in most parts of the world and even worse in developing countries due to poor perception and attitude towards it. This is more evident by the

less researches conducted on the influencing and limiting factors of household solid waste sorting behavior (Pakpour et al., 2014; Wang et al., 2018) in the African context.

Available data shows that 125 million tonnes of solid waste was generated in Africa in 2012, out of which 81 million tonnes (65%) was from sub-Sahara Africa. This is expected to increase to 244 million tonnes per year by 2025 (Pakpour et al., 2014). With the waste collection rate of 55% (68 million tonnes), the municipal solid waste generated are not properly managed. Although coverage varies between cities, the average collection rate is expected to increase to only 69% by 2025 (Ghani et al., 2013). With only 4% recycling rate, opportunities to develop secondary resources from waste is still underexplored in Africa. As a result of under exploration, useful resources which could have been reintroduced into the economy to support manufacturing and reduce the economic burden on product imports are not harnessed. Recycling strategies such as separation at source is on a very low average in Africa (Ghani et al., 2013; Viljoen et al., 2021).

The case of Ghana is no different as residents especially the urban poor are always mostly negatively impacted by poor waste management. In recent times, Ghana's annual solid waste generation was estimated to be around 12 million tonnes in 2020 (Obuobi et al., 2022), while the recycling rate, estimated at 5% to 10% of the total waste generated in Ghana was relatively low as at 2021 (Oduro-Appiah et al., 2021). It's worth noting that waste generation and recycling can vary over time due to population growth, urbanization, and changes in consumption patterns (Magazzino & Falcone, 2022). According to Mir et al. (2021) it is common sense to embrace recycling with all of its benefits, but then challenges which include, inadequate budget, low public awareness, lack of political will, weak legislature and lack of enforcement hinder this move. There are a few companies such as 'Jekora' which collect food waste from selected restaurants and hotels

for composting as well as paper waste for recycling into new products (Oteng-Ababio, 2010). They produce compost from organic waste and new plastic products from some plastic waste while exporting those of no use to them (Asase, 2011). It is noted that, there are some forms of source separation of municipal solid waste in Ghana but that is mainly on plastics for sale to plastic manufacturing to recycle or to local business people for reuse (Oteng-Ababio, 2011). These kind of dealings are by the informal sector to supplement their income. Source separation is essential for successful recycling. Attempting to recycle without source separation will cause leachates to contaminate some of the end products of recycling such as compost.

Waste management refers to the systematic handling, collection, treatment, and disposal of waste materials to minimize their impact on human health and the environment (Zhang et al., 2019). Waste is unwanted residue that is perceived to be of negative value (to the producer). Waste results from production and consumption and is related to the lifestyle of the consumer. This old fashion way of defining waste has been criticized based on the emerging idea that there is nothing really wasteful (Mumtaz et al., 2010). This position argue that one's waste is another's raw material. An essential aspect of waste management is waste segregation or separation, which involves categorizing different types of waste into specific groups based on their characteristics. Waste segregation is the process by which waste is separated into different elements based on their characteristics (Xu et al., 2017). This practice allows for more efficient waste treatment processes and the recovery of valuable resources. Effective waste segregation and separation are vital steps toward sustainable waste management. By sorting waste at the source and promoting recycling and responsible disposal practices, we can reduce the volume of waste sent to landfills, conserve resources, minimize pollution, and move closer to a circular economy that values waste as a valuable resource.

Waste segregation involves sorting waste into different categories based on their characteristics (Xu et al., 2017). This is important because different types of waste require specific treatment methods and disposal techniques. Some common categories of waste separation include organic waste, recyclable waste, hazardous waste, e-waste, medical waste, construction and demolition waste, and non-recyclable/general waste (Mumtaz et al., 2010). Organic waste can be composted or used for anaerobic digestion, while recyclable waste can be recycled or reused to conserve resources. Hazardous waste requires specialized handling and treatment to minimize risks. E-waste should be collected separately for proper recycling or disposal. Medical waste needs proper segregation to prevent the spread of infections. Construction and demolition waste can be sorted and recycled to reduce strain on landfills. Non-recyclable/general waste includes materials that cannot be easily recycled or composted and are disposed of through methods like landfilling or waste-to-energy conversion.

Solid waste management in the Wa Municipality like any other urban area in Ghana, is major a challenge (Alhassan et al., 2018). From waste generation, it is collected for disposal at the waste dumpsite, with no sorting whatsoever. Waste collection and disposal services are offered by Zoomlion Ghana limited, which cannot be afforded by most households due to service charges. Most of the waste generated are dumped in nearby open spaces, burned or buried. Due to population growth and urbanization, the Wa Municipality has experienced tremendous expansion leading to the exhaustion of space around these dumpsites for residence (Owusu et al., 2013). Same population growth, urbanization and other factors influencing increases in waste generation has further compounded the problem. Soon enough, it will be almost impossible to find space for dumping of generated waste.

The option for a sustainable waste management is source separation of waste for effective recycling. Currently, there are scrap dealers who go round gathering plastic and metal waste from waste dumps and also from people who have separated them from their waste to sell to them for supplementary income (Alhassan et al., 2018). There are also people, mostly women who are interested in used plastic bottles for their local drink business. Other local manufacturers into iron pots and others may find materials of usefulness to them from the waste stream. All of these together only affect the volume of the waste by a little fraction. The organic waste component which is highest is carried to the dumpsite. Successful waste recycling programmes produce many benefits, including environmental, sanitary, social, economic and educational (Owusu et al., 2013). Waste management programmes “reduce the use of raw materials and the amount of waste carried to landfills or incinerators in developing countries, they are able to create job opportunities and income” (Ma, Hipel, Hanson, Cai & Liu, 2018, p 340).

The recyclable component of household solid waste can reach 89.3% (Gu et al., 2015) and household alone contribute about 70% of our municipal solid waste. Hence, increased waste sorting at the household level can facilitate the conservation of natural resources and reduction in the demand for landfill space. Moreover, it is one of the elements of achieving a circular economy and is a core strategy to advance sustainability (Owusu et al., 2013). The waste management challenges faced in the city of Wa though major, is not comparable in terms of severity to those of the major cities such as Accra, Kumasi, and others of Ghana. By every reasoning, Wa is sure to face even serious challenges with its waste management in the nearest future if the situation is not tackled. This research is therefore intended to investigate into the factors that influence waste sorting behavior at the household level.

The Theory of Planned Behavior (TPB) is applied to waste management and waste segregation to understand the psychological factors that influence behavior. It helps identify individuals' attitudes, subjective norms, and perceived behavioral control related to waste management. By understanding attitudes, interventions can be designed to address misconceptions and promote the benefits of proper waste management. Social norms can be targeted to encourage behavior aligned with positive social expectations. Perceived behavioral control factors, such as access to facilities and knowledge, can be addressed to enhance individuals' ability to perform waste management practices. Applying TPB enables the development of targeted interventions, educational campaigns, and policy changes to promote sustainable waste management and achieve desired waste segregation outcomes. The TPB is a psychological theory that helps explain and predict human behavior based on individuals' attitudes, subjective norms, and perceived behavioral control. In the context of waste management and waste segregation, the Theory of Planned Behavior can provide insights into understanding and influencing individuals' behaviors towards proper waste management practices. The TPB states that “attitude toward behavior, subjective norms, and perceived behavioral control, together shape an individual's behavioral intentions and actual behaviors” (Pakpour et al., 2014, p 985). Attitude is one's mind set or opinion about a particular behavior. Subjective norm is an individual's perception about a particular behavior which is influenced by significant others, while perceived behavioral control is an individual's perceived ease or difficulty of performing the particular behavior.

In the context of waste management and waste segregation, TPB can help understand and influence individuals' behaviors. Attitudes towards waste management can affect participation in waste segregation. Subjective norms, influenced by social pressures, shape individuals' waste segregation practices. Perceived behavioral control, including access to recycling facilities and

knowledge, impacts willingness to engage in waste management. By considering these factors, interventions can be designed to promote proper waste segregation, including shaping positive attitudes, establishing supportive social norms, and providing resources and education for better control over waste management practices. It is in light of this background that this study seeks to examine the role of the tenants of the theory of planned behavior on household waste segregation behavior in the Wa Municipality in the Upper West Region of Ghana.

1.2 Problem Statement

Due to rising complications with production, consumption, waste generation and environmental pollution issues coupled with fact that earth's resources are getting exhausted, there is the need for an urgent call to order in the area of waste management (Owusu et al., 2013; Asase, 2011; Adjei, 2013; Oteng-Ababio, 2018). The contemporary approaches to waste management talks about considering the resource value of waste, thus from waste to energy, circular economy among others which are in line with sustainable development. According to Oteng-Ababio (2018) recycling is an effective waste management approach. Successful waste recycling programs produce many benefits, including environmental, sanitary, social, economic and educational. They reduce the use of raw materials and the amount of waste carried to landfills or incinerators and, in developing countries, they are able to create job opportunities and income (Grimberg & Blauth, 1998).

Successful recycling is a direct achievement of sustainable goal (Pujara, Pathak, Sharma & Govani, 2019) however, the gateway to a successful sustainable recycling is separation of waste at source. Source separation is the best as it will prevent contamination of various components of the waste stream. For example, the organic component of the waste stream could get contaminated by leachates resulting in low quality compost and other products from recycling. If our solid waste

contain up to 86% recyclables, it is only common sense to recycle. Household solid waste alone contribute as much as 65 to 70 percent of our municipal solid waste in Ghana (Alhassan et al., 2018). A success at the household level will therefore lift so much burden. This research is therefore intended to find out factors that can influence waste segregation behaviors among households in the Wa Municipality.

The theory of planned behavior has been used widely in empirical studies in various disciplines even in waste management literature, however, not many have applied the theory of planned behavior in examining waste segregation behavior (Alhassan et al., 2018). From literature, the application of the theory of planned behavior in Ghana is scanty especially in waste segregation. Psychological tools are considered in waste management behaviors but not on segregation (Akulume & Kiwanuka, 2016). The study aims to assess waste segregation using the theory of planned behavior.

1.3 General Aim/Objective of the Study

The study seek to use the TPB as theoretical framework to examine the factors associated with household waste segregation behaviors.

1.3.1 Specific Objectives

- i. To examine if attitude influences households waste segregation (intention, behavior) in Wa Municipal.
- ii. To establish whether subjective norm influences waste segregation of households in Wa Municipal.
- iii. To find out if perceived behavioral control influences households' waste segregation in Wa Municipal.

- iv. To examine the mediating role of intention on the relationship between attitude (a), subjective norm (b), perceived behavioral control (c), and segregation behavior among households in Wa Municipal.

1.4 Research Questions

The study seeks to answer the following questions:

- i. Does attitude influence household's waste segregation (intention, behavior) in Wa Municipal?
- ii. Does subjective norm influence household's waste segregation in Wa Municipal?
- iii. To what extent does perceived behavioral control influence household's waste segregation in Wa Municipal?
- iv. Does intention to segregate mediate the relationship between attitude and household segregation behavior?
- v. Does intention to segregate mediate the relationship between subjective norm and household segregation behavior?
- vi. What is the mediating role of intention to segregate waste between perceived behavior control and household segregation behavior?

1.5 Significance of the Study

This study sought to investigate the household waste segregation behaviors of residence based on the application of the theory of planned behavior in the Wa Municipal of Ghana. The significance of this study is therefore examined based on its relevance to practice, policy and research. In terms of practice, it is expected that the findings of this study would contribute enormously to the Environment Protection Agency and other related stakeholders' knowledge on how household

waste segregation is influenced by planned behavior. It would guide owners, managers and officers responsible for waste management in firms to develop and implement waste segregation that will not only make economic value, but also make the environment safe and significantly contributions to the growth and expansion of their organisations or corporations in the waste management industry. Furthermore, the findings of this study would guide waste management practitioners to identify innovative ways of ensuring a proper fit between planned behaviors and segregation of waste.

With respect to policy, the findings of the study would serve as a guide in sharpening management's understanding on decision making and policy formulation concerning household waste segregation. Various policy makers and stakeholders, especially environmental and particularly in Ghana, such as environmental protection agency, waste management departments of district/municipal/metropolitan assemblies, Ministry of Trade and Industries, among others, would be guided by the findings of this study to formulate appropriate policies to ensure that proper waste management in Ghana.

In addition, the study seeks to contribute to the growth of literature in emerging economies, in the Sub-Saharan Africa (SSA) in general and in Ghana in particular on the waste segregation behaviors of community members. The findings are also expected to stimulate new researches in the area of waste segregation, waste recycling and waste management in general.

1.6 Scope and Delimitations of the Study

The scope of this study was on waste management (segregation) and the waste segregation behaviors of households within the Wa Municipality. This study is limited to household waste management behaviors in the Sub-Saharan Region of Africa, specifically in Ghana. The study

looked at households in the Wa Municipality and particularly members of the household present at the time of visit during data collection. On the other hand, this study did not include singles (unmarried) neither individuals of the households who were not at home at the time of visit.

1.7 Chapter Disposition

This thesis is organized in five main chapters; introduction, literature review, methodology, results and discussions, and summary, conclusions and recommendations. Each chapter is explained in detail as follows: Chapter one provides an introduction to the study along with the background information and sets the pace by which the study was developed. Problem statement, purpose, research objectives and research questions were important highlights of the study. The significance of the study and the scope of the study were also essential ingredients of this chapter. Chapter Two presents a detailed review of relevant literature on the Theory of Planned Behaviors and the theoretical framework. The clarification of concepts and empirical literature, including the linkages between the variables were discussed. Based on the literature reviewed, hypotheses and a conceptual model were proposed to guide the study in this chapter.

Chapter Three details the methodology adopted in the data collection and analysis. This Chapter focuses on the research philosophy (paradigm), research approach, design, population, sample size, sampling techniques, data collection procedure, analytical procedures, measurement of each variable and validity and reliability issues of survey instruments are discussed here. The chapter also covers ethical issue as well as data collection challenges and their resolutions during the study. Chapter Four examines the model used and the hypotheses and the presentation of the results of the statistical findings. This Chapter presents a summary profile of the respondents, preliminary analyses of the analytical procedure adopted, examination of the hypothesised relationships and

discussion of the results. In this Chapter also, the final or revised conceptual model was presented. Finally, Chapter Five covers discussions of findings, summary of the study, conclusions and recommendations of the study. It also discusses implications of the study for stakeholders on environmental management and managerial issues in organisations, especially household waste management as well as suggestions for future studies are discussed in this Chapter.



CHAPTER TWO

LITERATURE REVIEW

2.0 Chapter Overview

Chapter two reviews both theoretical and empirical literature on the main variables of this study. The chapter begins by highlighting the concepts and study variables which relates to waste management with specific attention on household waste segregation behavior. Furthermore, the chapter further explains the theoretical framework of the study and how the aspects of theory of planned behavior relate to the household waste segregation. In addition, the chapter also looks at how each of the aspects of the theory of planned behavior (attitude, subjective norm, perceived behavior control and intention to segregation) relation with household waste segregation (behavior). Finally, a conceptual framework is proposed from which hypotheses are developed for testing.

2.1 Waste Management

Waste management refers to the systematic handling, collection, treatment, and disposal of waste materials. It involves various processes and strategies aimed at minimizing the negative impacts of waste on human health and the environment (Bernstad, 2014). The goal of waste management is to reduce the volume of waste generated, promote recycling and resource recovery, and ensure the safe and proper disposal of waste that cannot be reused or recycled. Waste management encompasses activities such as waste segregation, recycling, composting, landfilling, and waste-to-energy conversion (Alhassan et al., 2018). These activities help to control pollution, conserve resources, and mitigate the potential risks associated with improper waste disposal. Effective waste management practices involve the collaboration of government agencies, businesses,

communities, and individuals to promote sustainable waste reduction and environmentally responsible waste disposal methods.

Waste can be defined as any material that is discarded, which is of no value to the one who disposed of it (Alhassan et al., 2018). The waste management system consists of the whole set of activities related to handling, treating, disposing or recycling the waste materials. The purpose of waste management system is to make sure that the waste materials are removed from the source or location where they are generated and treated, disposed of or recycled in a safe and proper manner (Bernstad, 2014). Sustainable development is a major concern for developing nations as they strive to preserve their ecological balance along with economic growth (Oduro-Kwarteng, 2011). According to Boadi and Kuitunen (2014) it has been noticed that economic growth results in environmental degradation as it influences lifestyle practices and leads to increased consumption of goods thus generating the large volume of municipal solid waste. According to Bernstad (2014) recycling the recyclable fraction of municipal solid waste can reduce the threat.

In this study, the focus is centered on household waste. The study concentrates on household waste because it is the major contribution to municipal solid waste (Alhassan et al., 2018). Household alone contributes about 70% of municipal solid waste in the view of (Boadi & Kuitunen, 2014). This means that if household solid waste is well dealt with, up to 70% of our municipal solid waste problem will be solved. Household waste is also composed of up to 80% organic waste including other components of recyclables (Owusu-Sekyere et al., 2019). According to Oduro-Apiyah et al. (2013) introduction of proper waste management practices such as recycling will take care of a great percentage of our solid waste. With the current crisis in the area of solid waste management, the household level is a great target.

2.2 Waste Segregation

Household solid waste contains a variety of materials found in the home. These include plastic waste, paper waste, metals and tins, glass and ceramics, organic waste and hazardous waste. The best place to start making a difference is right in the home. You reduce, reuse, and recycle to decrease household waste (US EPA, 2020), since household waste has a great contribution to municipal solid waste. In Ghana, 65 to 70 percent of our municipal solid waste comes from the household (Oduro-Kwarteng, 2011). Given the significant contribution of household waste to municipal solid waste, it is crucial to adopt waste reduction practices at home. The principles of "reduce, reuse, and recycle" can help decrease household waste generation. This involves minimizing consumption, opting for reusable items, and recycling materials whenever possible. By practicing waste reduction and responsible waste management at the household level, individuals can contribute to the overall efforts in mitigating the environmental impact of municipal solid waste. In the context of Ghana, where a substantial portion of municipal solid waste originates from households, it becomes even more crucial to focus on waste management practices at the household level. By raising awareness, providing education on waste segregation and recycling, and encouraging responsible waste disposal, households can play a significant role in reducing the environmental burden and promoting a sustainable waste management system.

2.2.1 Types of Waste Segregation

- i. **Plastic waste:** plastic waste include bags, jars, containers, bottles and many other plastic products found in the household (Oduro-Apiah et al., 2017). Plastics are not biodegradable but many types of plastics can be recycled, it should therefore be separated from n waste so it can be recycled (Alhassan et al., 2018). A plastic bag can take anywhere from 500 to 1000 years to decompose in landfills. Plastic waste remains one of the biggest

environmental burdens posed on coastal and ocean environments. The Ocean Conservancy's 2018 Coastal Clean-up report indicates that during the 2017 effort to clean-up coastlines, plastic bags ranked as the fifth most picked up item. A total of 1,503,734 plastic bags were picked up during the 2017 International Coastal Clean-up day. Moreover, a plastic water bottle can take from 70 to 450 years to decompose. Almost every hour, nearly 250,000 plastic bottles are dumped. It is not surprising that plastic bottles constitute close to 50% of recyclable waste at landfills.

- ii. **Paper waste:** these include newspaper, cardboards, packaging material, tickets, sanitary pads and others (Owusu-Sekyere et al., 2018). This type of waste can easily be reused and recycled into new products. Usually, it takes two to six weeks in the landfill to completely decompose paper waste but this depends on the moisture levels within the landfills. For instance, train tickets as well as lorry tickets take at least 2 weeks to decompose. It is important to recycle paper waste as this exercise would help save landfill space and reduce the energy and virgin material usage demanded by making non-recycled paper.
- iii. **Metal and tins:** the various forms of this waste can be found in the home. Most metals are recyclable, so metal waste should be put in separate bins for recycling (Oduro-Apiyah et al., 2017). For example, aluminum cans take up to 200 years to degrade. Aluminum is one of the easiest and fastest recyclable materials that can be recycled and reused within 60 days. Preparing aluminum products from virgin metal consumes close to 100 times the power required to recycle aluminum, making recycling the more cost- and energy efficient option. Again, milk cartons are made with paperboard, as well as an insulating layer of polyethylene plastic and a dash of shelf-stable-friendly aluminium. When thrown away, milk cartons take approximately five years to decompose.

- iv. **Hazardous waste:** household leftover products that can catch fire, react or explode under certain conditions, or that are corrosive or toxic are household hazardous waste. Products such as paints, cleaners, oils, batteries and pesticides can contain hazardous ingredients and require special care when disposing them (US EPA, 2020). Zhang et al. (2017) the classification accuracy rate for waste textiles (73%), waste drugs (77%), waste batteries (69%), and electric waste (54%) is much lower.

2.2.2 Waste Segregation in Ghanaian Context

Due to the worrisome situation of the solid waste management in Ghana, the government was prompted to adopt policies and programme. This was to achieve a cost effective and provision of better service. The public-private-partnership (PPP) was instituted for this reason. The Local government Act (Act 462), has given the Waste Management Department (WMD) of district assemblies to provide solid waste management services (Ministry of Local Government and Rural Development 1999). But then, due to inadequate solid waste collection and low cost recovery by the waste management department of district assemblies, the PPP concept had to be conceived (Oduro-Kwarteng, 2011), towards improving revenue mobilization, quality service and an extension of coverage of solid waste management services (Post & Baud, 2003; Oteng-Ababio, 2010; Oduro-Kwarteng, 2011). The PPP's implementation affected solid waste management in the area of collection coverage even though the quality of the environment was not improved especially in low income areas (Oteng-Ababio, 2010) City authorities have engaged in some projects to divert the organic content of solid waste of about 67% (Oteng-Ababio, 2011) for composting to reduce the amount of waste going to landfills. These projects include the Teshie-Nungua compost plant and the Accra composting and recycling Plant established in 1974 and 2010 respectively. The national source waste segregation programme which was launched in November

2013 by the Ministry of Environment, Science, Technology and Innovation in collaboration with Environmental Protection Agency, Zoomlion and Jekora ventures, (Ghana News Agency, 2013), but low participation led to its failure(EPA/BED, 2015).

There is limited research in the area of waste segregation in Africa including Ghana. Research on source separation in Ghana have focused on the technical aspects (Asase, 2011; Adjei, 2013; Oteng-Ababio, 2013), the degree and category of source separation (Oduro-Appiah & Aggrey, 2013) and households' wiliness to accept economic incentives to participate in source separation (Owusu et al., 2013). With these, it is clear that though some studies have been done on solid waste source separation in Ghana, there is no enough detailed research on households' source separation behavior using the theory of planned behavior in Ghana. Alhassan et al. (2018) found that certain demographic variables such as "educational attainment of head of household, total income of household, occupation type of household head, information, past experience with source separation, inconvenience in terms of time, space and availability of formal source separation scheme, attitude, subjective norm and the location of the respondents significantly predicted households' solid waste separation intentions.

Oduro-Appiah et al. (2013) examined the determinants of source of separation of municipal solid waste in developing countries using a 5000 households sampled through a stratified multistage probability sample. The findings revealed that generally citizens are willing to participate and have reasonably proved they have the ability to source separate waste in the country. An initial two-stream source separation process followed by a three-stream process where biodegradables and plastics would be separated from all other municipal solid waste components has been established as the most preferred option. The successful attainment of future source separation system would

require the provision of free or subsidised bins to householders. Oduro-Appiah and Aggrey (2013) cautioned that practical success on source separation that could possibly be adopted nationwide, stakeholders should aim at providing the required resources and motivation to help pilot and sustain the practice. This will enable implementers to ascertain the progress and real challenges of the process since in many survey processes, what people claim they will do, and what they actually do when reality dawns are not the same.

Boadi and Kuitunen (2014) conducted study on municipal waste management in the Accra, Ghana with findings that revealed that solid waste management in the city of Accra, is unsatisfactory and thereby needs immediate address. Access to solid waste facilities remains limited in low income areas, and private sector involvement in service delivery is also constrained by many obstacles. Oduro-Kwarteng et al. (2016) studied municipal solid waste, source separation and recycling potential of municipal solid waste in Ghana. The study showed that the high willingness to source separate waste and separation efficiency are indication for potential source separation. This shows that the establishment of an effective source separation programme with continuous education on source separation methodologies can significantly enhance the recycling potential of recyclables in the waste stream. Amoah and Kosoe (2014) conducted solid waste management Urban, Wa, Ghana. The findings revealed that 810 tonnes of solid waste is generated daily, out of which; 216 tonnes are collected leaving backlog of 594 tonnes uncollected posing serious environmental and public health hazards. Owusu-Sekyere et al. (2018) concluded that in order to pursue a more sustainable municipal SWM, local government policies may have to be rebalanced towards assigning appropriate priorities and support to waste prevention activities.

2.3 Theoretical Framework

According to Miner (2015, p 116), a “theory is a generalization which is applicable within the stated boundaries, that specifies the relationship between factors. Thus, it is an attempt to make sense out of observations that in and of themselves do not contain any obvious logic”. From the theoretical perspective, waste management through segregation has been recognized as one of the modern forms of waste management in the history of environmental sanitation (Pakpour et al., 2014). Due to an increased interest in waste segregation in recent times, scholars have sought to establish the various forms of waste segregation or separation at the household levels, the causes and reasons for segregating waste. Most researchers invariably have explained waste segregation behavior on the background of the theory of planned behavior (Pakpour et al., 2014). In this research, the Theory of Planned Behavior (TPB) is employed to find out the factors that influence source separation of waste at the household level.

2.3.1 Theory of Planned Behavior

The theory of planned behavior was proposed by Icek Ajzen (1985) through his article “From intentions to actions: A theory of planned behavior”. The idea of theory of planned behaviour was initially proposed by Martin Fishbein together with Icek Ajzen in 1980. The theory of planned behavior was therefore grounded in various theories of attitude such as theory of reason action, learning theories, expectancy-value theories, consistency theories (such as Heider's balance theory, Osgood and Tannenbaum's congruity theory, and Festinger's dissonance theory) and attribution theory. According to the theory of planned behavior, if people evaluate the suggested behavior as positive (attitude), and if they think their significant others want them to perform the behavior (subjective norm), this results in a higher intention (motivations) and they are more likely to do so (behavior) (Stoeva & Alrikson, 2017; Nguyen & Watanabe, 2019). A high correlation of attitudes

and subjective norms to behavioral intention, and subsequently to behavior, has been confirmed in many studies (Conke, 2018). TPB maintains that attitude, subjective norms, and perceived behavioral control, can shape an individual's behavioral intentions leading to the change of behavior together, and the perceived behavioral control can also directly predict the behavior (Stoeva & Alrikson, 2017).

Researchers who view environmental behavior as self-interested behavior often rely on rational choice models, like the TPB (Ajzen, 1991). The basic hypothesis of the TPB which was generated in the field of social psychology is that intention is the only direct psychological determinant of behavior (Nguyen & Watanabe, 2019). On the other hand, intention is influenced by peoples' perceived control and whether they have the power to effect change, their attitude towards displaying a particular behavior, and their subjective norms. According to Pakpour et al. (2014) attitude towards the behavior refers to a person's overall evaluation of behavior, while subjective norms refer to the perceived social pressure to perform or not to perform the behavior. Theory Planned Behavior is the most commonly used intention-based model, which has largely been tested in the domain of recycling behavior. TPB has been applied to studies of the relations among beliefs, attitudes, behavioral intentions and behavior (Arı & Yılmaz, 2016; Babaei et al., 2015; Pakpour et al., 2014).

The theory of planned behavior demonstrates that household waste segregation (behavior) is motivated by household members' attitude, subjective norm, perceived behavior control and intention to segregate waste at the house level. The theory establishes that attitude, subjective norm and perceived behavior control to segregate waste directly influences segregation behavior while intention to segregate waste plays a mediation role on the relationship between attitude, subjective

norm, perceived behavior control and segregation behavior. Even though, attitude, subjective norm, perceived behavior control and intention act as independent variables, intention to segregate as the same time act as a dependent variable.

2.4 Conceptual Clarifications

2.4.1 Attitude in Waste Segregation

The Theory of Planned Behavior, developed by Ajzen et al. (2011), suggests that attitudes towards a specific behavior, such as waste segregation, are determined by the individual's evaluation of the positive or negative aspects associated with engaging in that behavior. These attitudes are shaped by the individual's beliefs regarding the expected costs and benefits of the behavior, which are further weighted based on the perceived importance of these costs and benefits. For instance, let's consider a person who believes that waste segregation is crucial for effective recycling and assigns a high level of importance to this belief. This individual recognizes the positive impact of waste segregation on the environment and the potential benefits of recycling, such as conserving resources and reducing pollution. Consequently, they develop a positive attitude towards waste segregation, as they view it as a valuable and beneficial behavior.

However, this person also acknowledges that there are some costs associated with waste segregation (Wang et al., 2018). They may perceive the expenses related to obtaining separate dustbins or paying for waste collection services as relatively high. Nevertheless, when weighing these costs against the importance they place on waste segregation and its potential benefits, they consider them to be of lesser significance. Consequently, the positive evaluation of the behavior outweighs the perceived costs, reinforcing their positive attitude towards waste segregation. The theory suggests that attitudes towards waste segregation are formed by evaluating the positive and

negative aspects of engaging in the behavior. The beliefs about the costs and benefits are weighed in relation to their importance, ultimately shaping the individual's attitude towards waste segregation. In the example given, the person's recognition of the importance of waste segregation for recycling, despite perceiving certain costs, leads to a positive attitude towards the behavior.

2.4.2 Subjective Norm in Waste Segregation

According to the Theory of Planned Behavior, subjective norm is another key component in understanding attitudes and behavior, and it refers to the extent to which an individual believes that significant others, such as friends, family, or colleagues, will approve or disapprove of a specific behavior (Ma et al., 2018). It reflects the social influence and the perceived social costs and benefits associated with engaging in a particular behavior. Subjective norms are shaped by an individual's beliefs about the expectations of relevant reference groups regarding the behavior, and these beliefs are further weighted by the person's motivation to comply with those expectations (Zhang, Huang, Yin & Gong, 2015). For instance, if a person's classmates and friends express a strong expectation for waste segregation and consider it as an important practice, the individual may feel a strong motivation to comply with their expectations. They may believe that their social relationships and acceptance among their peers are dependent on adhering to these expectations, thus reinforcing their subjective norm in favor of waste segregation.

On the other hand, if a person values the opinion of their neighbor less and their neighbor approves of not segregating waste, the individual may disregard that opinion and attach less weight to it when forming their subjective norm (Ma et al., 2018). In this case, their motivation to comply with the neighbor's expectations is low, and their subjective norm will lean towards waste segregation rather than not segregating their waste. Therefore, subjective norm plays a significant role in

shaping an individual's attitudes and behavior towards waste segregation. It involves considering the expectations and opinions of relevant reference groups and attaching different weights to them based on the individual's motivation to comply with those expectations. In the example provided, the strong expectation of classmates and friends in favor of waste segregation creates a subjective norm that promotes the behavior, while the less-valued opinion of the neighbor in favor of not segregating waste is disregarded, reinforcing the subjective norm in favor of waste segregation.

2.4.3 Perceived Behavioral Control in Waste Segregation

Perceived behavioral control is considered as the perceived possibility to perform the behavior, which depends on the beliefs about the presence of factors that may facilitate or hinder the relevant behavior (Stoeva & Alriksson, 2017). For example, you may believe you cannot afford bins or do not have time for waste source separation, this will result in a low perceived behavioral control to segregate waste, or believing that you have what it takes for example bins, time and convenient pick up schedule resulting in high perceived behavioral control to separate ones waste. Perceived behavioral control can influence behavior via intention, but also influence behavior directly.

The TPB assumes that all other factors such as socio-demographics, general beliefs and values, influence behavior via attitudes, subjective norms and perceived behavioral control (Ghani et al., 2013). For example strong biospheric values may result in positive attitude towards cycling and negative attitude towards driving, based on their different environmental impacts. The TPB has been successful in explaining various types of environmental behavior such as waste segregation (Ghani et al., 2013; Stoeva & Alriksson, 2017). The predictive power of the TPB increases when other motivational predictors are included in the model. For instance, personal norm that is feelings of moral obligation to engage in particular pro-environmental actions. Personal and subjective

norm is a key factor in two other prominent theories in environmental psychology, the norm activation model and the value-belief-norm theory of environmentalism (Pakpour et al., 2014). These models assume that morality plays a key role in pro-environmental behavior because pro-environmental actions often involve higher costs and efforts for individuals. In many cases people will only act pro-environmentally because they feel it is the right thing to do.

2.4.4 Intention to Segregate Waste

According to the Theory of Planned Behavior, intention is a crucial determinant of behavior. It reflects both an individual's motivation to engage in a particular behavior and the level of effort they are willing to exert to carry out that behavior (Ajzen, 1991). Intention is considered a close determinant of behavior. It reflects both the individual's motivation to behave in a certain manner and how hard they are prepared to try to carry out that behavior (Ajzen 1991). Behavior is thought to be closely determined by intention. Intention is influenced by a person's attitude towards the object behavior, the subjective norms and the perceived behavioral control. Attitude refers to the individual's overall evaluation or assessment of the behavior, whether it is seen as positive or negative. It is shaped by outcome expectancy beliefs, which are the person's beliefs about the likely consequences or outcomes of performing the behavior. For instance, if a person holds a positive attitude towards waste segregation, they may believe that it will lead to environmental benefits, resource conservation, and a sense of personal responsibility. These positive outcome expectancies contribute to a strong intention to engage in the behavior.

According to Stoeva and Alriksson (2017) subjective norms play a role in shaping intention by capturing the social pressure an individual perceives regarding the behavior. Subjective norms are composed of normative beliefs and motivation to comply. Normative beliefs refer to the

individual's beliefs about the expectations of important others or reference groups regarding the behavior. For example, if someone believes that their family, friends, or community members value waste segregation and expect them to practice it, it can strongly influence their intention to comply with those expectations. The motivation to comply reflects the person's willingness to conform to these social norms. Further, Perceived behavioral control is another factor influencing intention. It refers to an individual's perception of their ability to perform the behavior successfully and their confidence in their capability to do so. If someone believes that waste segregation is within their control and they possess the necessary skills, resources, and opportunities to carry out the behavior effectively, their perceived behavioral control will be high, increasing their intention to engage in waste segregation. Intention represents a person's motivation, conscious plan, or decision to make an effort to perform a specific behavior. It is influenced by attitudes, which are shaped by outcome expectancy beliefs, subjective norms, which encompass normative beliefs and motivation to comply, and perceived behavioral control, which relates to the individual's confidence and perceived ability to carry out the behavior (Pakpour et al., 2014). In the context of waste segregation, a strong intention to engage in the behavior can be driven by a positive attitude towards the benefits of waste segregation, the perception of social expectations, and the confidence in one's ability to practice waste segregation effectively.

2.4.5 Waste Segregation Behavior

Behavior results from the intention to engage in a specific behavior. The stronger your intention, the more effort you will make to conduct a particular behavior, and the more likely it is that you engage in the behavior (Pakpour et al., 2014). The intention depends on attitude towards the behavior, the subjective norms related to the behavior and perceived behavioral control. Behavior refers to the acts that we engage in which are the external reactions to our environment. Behavior

varies among individuals as they are influenced by ethics, health, attitudes, prejudice, emotions, culture, values, past experience (Bernstad, 2014). Waste segregation behavior refers to the actions and practices individuals undertake to separate different types of waste materials for proper disposal and recycling (Leeabai et al., 2022). It is a key aspect of waste management that aims to maximize resource recovery, minimize environmental impacts, and improve the efficiency of waste treatment processes. Effective waste segregation behavior requires individuals to have knowledge and awareness of the different types of waste and the appropriate methods for segregation. This includes understanding the categories of waste such as organic, recyclable, hazardous, etc., and knowing how to properly separate them. Individuals need to actively engage in waste segregation practices at the source, typically in their homes or workplaces (Leeabai, et al., 2022). This involves sorting waste into different containers or bins designated for specific types of waste, such as separate bins for organic waste, recyclables, and non-recyclable waste.

Proper segregation ensures that different types of waste can be treated and disposed of using appropriate methods (Bardus & Massoud, 2022). Waste management authorities and organizations play a crucial role in providing clear guidelines and infrastructure to support waste segregation behavior. This includes providing information on how to segregate waste correctly and ensuring the availability of separate collection bins or systems for different waste categories. Infrastructure may also include waste collection vehicles with separate compartments for different types of waste. Further, several behavioral factors influence waste segregation behavior. These include attitudes, subjective norms, and perceived behavioral control. Positive attitudes towards waste management, social norms that encourage segregation, and individuals' belief in their ability to segregate waste effectively can all contribute to improved waste segregation behavior.

Moreover, effective waste management systems require ongoing education and communication campaigns to promote proper waste segregation behavior (Bernstad, 2014). These campaigns can focus on raising awareness about the importance of waste segregation, providing information on the benefits of recycling and resource recovery, and offering practical tips and guidance on how to segregate waste correctly. In addition, monitoring waste segregation behavior and providing feedback can help individuals stay motivated and improve their segregation practices. Regular monitoring of waste collection and providing feedback on the quality of segregation can help identify areas for improvement and reinforce positive behavior (Stoeva & Alriksson, 2017). By encouraging and promoting waste segregation behavior, waste management systems can enhance the efficiency of waste treatment, increase recycling rates, reduce the burden on landfills, and minimize environmental pollution. It requires a combination of individual efforts, supportive infrastructure, education, and continuous communication to foster a culture of responsible waste segregation and management.

2.4.6 Application of TPB to Waste Management and Segregation

TPB helps in understanding individuals' attitudes towards waste management and waste segregation. By assessing their positive or negative evaluations of these behaviors, it is possible to identify barriers and facilitators of participation. This understanding allows for targeted interventions to address misconceptions, promote awareness, and emphasize the benefits of proper waste management practices (Bardus & Massoud, 2022). TPB recognizes the importance of subjective norms, which reflect the influence of social pressures and expectations. By understanding the perceived norms related to waste management within a community or social group, interventions can be designed to foster a sense of collective responsibility and encourage behavior that aligns with positive social norms. This can be achieved through community

engagement, educational campaigns, and the involvement of influential individuals or organizations (Reijonen et al., 2021).

Perceived behavioral control is a key component of TPB and relates to an individual's perception of their ability to perform a behavior. In the context of waste management, factors such as access to recycling facilities, knowledge of segregation techniques, and personal skills play a crucial role (Reijonen et al., 2021). By addressing these factors and providing resources, training, and infrastructure support, individuals' perceived control over waste management practices can be enhanced, leading to increased participation and adherence to proper waste segregation (Bardus & Massoud, 2022). By applying the Theory of Planned Behavior, waste management practitioners, policymakers, and community leaders can gain a deeper understanding of the factors that influence individuals' waste management behaviors. This understanding allows for the development of targeted interventions, educational campaigns, infrastructure improvements, and policy changes to promote sustainable waste management practices and achieve desired waste segregation outcomes (Reijonen et al., 2021).

2.5 Empirical Literature

2.5.1 Attitude, Intention and Behavior

The relationship between attitude and intention as well as actual behaviors is showcased in the literature in diverse ways. Stoeva and Alrikson (2017) showed that there is a significant relationship between attitude to recycling programmes and waste separation intention and behaviors. Stoeva and Alrikson (2017) also showed that a lack of proper conditions for waste separation can prevent individuals from participating in the process, regardless of their positive attitudes. Nguyen and Watanabe (2019) examined waste separation behavior, waste management

of livestock activities with 298 respondents from rural and semirural households. The results revealed that the livestock group exhibits more positive attitudes toward waste separation than does the non-livestock group. Conke (2018) examined household recycling source-separation, selective waste collection and waste management using a mixed method 800 householders and 33 guided interviews. The findings revealed that poor attitude towards knowledge about practical and operational aspects of programs, an unequal sharing of the costs and benefits of recycling, a deficient infrastructure and a shortfall of professional management are the factors that affect household recycling source-separation.

Ma et al. (2018) analysed influencing factors on municipal solid waste source-separated collection behavior in Guilin and China. The findings revealed that individuals' attitude and situational factors are major predictors of their behavioral intention. Pakpour et al. (2014) examined household waste behaviors among a community sample in Iran and found that attitude of community members significantly predicted household waste behaviors in Iran. Stoeva and Alriksson (2017) conducted a study on the influencing of recycling programmes on waste separation behavior in Bulgaria, Sweden. The results showed that a lack of proper conditions for waste separation can prevent individuals from participating in this process, regardless of their positive attitudes. Apinhapath (2014) examined community mapping and theory of planned behavior as study tools for solid waste management using a mixed method approach. The findings indicated that community people's intentions, attitudes, in regard to separate disposal of recyclable materials were high.

Alhassan et al. (2018) found that educational attainment of head of household, total income of household, occupation type of household head, information, past experience with source

separation, inconvenience in terms of time, space and availability of formal source separation scheme, attitude and the location of the respondents significantly predicted households' solid waste separation intentions. Shen et al. (2019) examined factors influencing young people's intention to municipal solid waste sorting using 524 young respondents from Hebei Province in China. The findings revealed that contrary to our expectations, attitude and environmental concern do not significantly contribute to young people's intention toward MSWS.

H1: There is a significant relationship between attitude towards waste segregation and intention to segregation waste.

H2: There is a significant relationship between attitude towards waste segregation and actual waste segregation behavior.

2.5.2 Subjective Norm, Intention and Behavior

Stoeva and Alrikson (2017) found that subjective norm influences waste segregation behaviors of household members. Nguyen and Watanabe (2019) examined waste separation behavior, waste management of livestock activities with 298 respondents from rural and semirural households. The results revealed that the livestock group exhibits greater concern for subjective norm toward waste separation than does the non-livestock group. Lo and Liu (2018) examined sustainable consumption using socio-economic analysis of household waste recycling outcomes in Hong kong and revealed that recycling outcomes vary with a limited set of socio-economic factors including housing estates managed by a private property management company and populated by better off households collected more recyclables from their residents.

Previous studies have showed that several other factors enhances waste segregation or separation (Xu, Ling & Wu, 2018; Wadehra & Mishra, 2018). For instance, Xu et al. (2018) studied economic

incentive and social influence to overcome household waste separation dilemma with the findings revealed that 188 residents in three communities of Hangzhou, Zhejiang Province were encouraged to participate in waste separation activities through either the economic rewards given on their performance, or door-stepping campaigns aimed at constructing a supportive social environment. Six-month intervention effects were analyzed and showed that economic inducement was more effective than social mobilization in promoting waste separation. Further mediation tests indicated that self-efficacy partially mediated the effects of both strategies, while personal norms were positively associated with two treatments instead of behavior demonstration (Xu et al., 2018). Wadehra and Mishra (2018) sought to encourage urban households to segregate the waste generated among 1880 households across 15 localities in Delhi, India with the findings that information campaigns, detailing the benefits of segregation for the environment and rag pickers, had an impact on changing the waste disposal behavior of the households. According to Wadehra and Mishra (2018, p 241) “field observations also highlighted that feedback to the residents, in terms of the amount of waste diverted from landfill composted or recycled, would also influence their actions. Responses highlight that garbage collector could nullify the actions of the household, so it is important to educate the garbage collector of the Rules”.

In another context, Agovino Cerciello and Musella (2019) analysed the impact of European Regional Development Fund (ERDF) regulations over two programming periods (2000–2006 and 2007–2013) in terms of separate waste collection rates of Italian regions. The estimates suggest that ERDF regulations in both programming periods had no relevant impact on the achievement of cohesion policy goals for separate collection at the regional level. Subsequently, the study analysed data for 103 NUTS-3 Italian provinces over 2000–2013. The results made a case for the relevance of ‘cultural’ policy measures fostering environmentally responsible attitudes as a

possible pre-condition for effective implementation of ERDF-funded separate collection projects in low-performing regions. Pakpour et al. (2014) examined household waste behaviors among a community sample in Iran and found that subjective norms and past behavior of community members significantly predicted household waste behaviors in Iran. Fornara et al. (2016) distinguished the sources of normative influence on pro-environmental behaviors in household waste management. In particular, descriptive norms (both subjective and local) emerged as powerful predictors of the target pro-environmental behavior.

Apinhapath (2014) examined community mapping and theory of planned behavior as study tools for solid waste management using a mixed method approach. The findings indicated that community people's intentions and subjective norms in regard to separate disposal of recyclable materials were high. Alhassan et al. (2018, p 714) found that "educational attainment of head of household, total income of household, occupation type of household head, information, past experience with source separation, inconvenience in terms of time, space and availability of formal source separation scheme, subjective norm and the location of the respondents significantly predicted households' solid waste separation intentions". Moreover, Shen et al. (2019) examined factors influencing young people's intention to municipal solid waste sorting using 524 young respondents from Hebei Province in China. The findings revealed that personal moral obligation and subjective norms are the most critical factors influencing young people's intention toward municipal solid waste sorting.

Bernstad et al. (2011) examined how environmental impact is assessed and discussed within the framework of life cycle assessments (LCA) where the LCA is used as a systematic method for evaluation of the waste management system in a specific geographic area. The findings revealed

that optimising source-separation behavior could divert up to 80% of waste to recycling. Avoidance of nutrient enrichment, acidification and photochemical ozone formation could more than double and avoidance of global warming potential increase more than six times compared to the current situation. Zhang and Wen (2014) conducted a study on residents' household solid waste, source separation, residents' behavior and community types. The main determinants of residents' HSW source separation behavior are residents' age, HSW source separation facilities and government preferential policies. Xu et al. (2017) examined household waste separation behavior with emphasis on testing the role of moral, past experience and perceived policy effectiveness within the theory of planned behavior. The finding revealed that subjective norms significantly predict household waste separation behavior with past behavior being the most significant construct to predict individuals' intention and behavior.

H3: There is a significant relationship between subjective norm towards waste segregation and intention to segregation waste.

H4: There is a significant relationship between subjective norm towards waste segregation and actual waste segregation behavior.

2.5.3 Perceived Behavioral Control, Intention and Behavior

Perceived behavior control has been identified in the literature to have positive relationship with waste segregation behavior. Stoeva and Alrikson (2017) study examined the influence of recycling programmes on waste separation (segregation) behaviors and found that the lack of proper conditions for waste separation can prevent individuals from participating in the process, regardless of their positive attitudes. These conditions which include but not limited to fees, legal obligations, prompts or information campaigns could also play key roles in predicting waste

segregation behavior. Conke's (2018) findings proved that the lack of knowledge about practical and operational aspects of programmes, an unequal sharing of the costs and benefits of recycling, a deficient infrastructure and a shortfall of professional management significantly impact waste segregation behavior.

Furthermore, Meng, Guo and Guo (2019) investigated decision-making mechanism of residents' household solid waste classification and recycling behaviors using a survey of 709 residents. The findings showed that residents' behavioral waste selection has been significantly related to four intrinsic subjective factors such as publicity and education, accessibility to recycling facilities, accessibility to classification facilities, willingness to participation of classification and residents' environmental awareness. Ma et al. (2018) analysed influencing factors on municipal solid waste source-separated collection behavior in Guilin and China. The findings revealed that individuals' perceived behavioral control and intention play an important role in predicting source separated collection behavior.

Wang et al. (2016) examined the antecedents of urban residents' separate collection intentions for household solid waste separation and their willingness to pay with 618 respondents. The findings showed that residents' separate collection intentions are positively influenced by the behaviors of others, facility conditions and moral obligations in China. Pakpour et al. (2014) examined household waste behaviors among a community sample in Iran and found that perceived behavior control, moral obligation and self-identity of community members significantly predicted household waste behaviors in Iran. Jiang, Van-Fan and Klemes (2019) conducted a comparison study of motivation-intention-behavior on household solid waste sorting in China and Singapore. The study found that general and specific environmental motivations substantially influenced

behavioral intention to sort out solid waste. Moreover, the direct influence and moderating effect of contextual factors on waste sorting behavior are significant. Habitual factors also have a significant effect on behavior.

Fornara et al. (2011) distinguished the sources of normative influence on pro-environmental behaviors in household waste management. The findings revealed that target pro-environmental behavior regarding waste management are influenced, both directly and indirectly through perceived behavioral control. Apinhapath (2014) examined community mapping and theory of planned behavior as study tools for solid waste management using a mixed method approach. The findings indicated that community people's intentions and perceived behavioral control in regard to separate disposal of recyclable materials were high. Shen et al. (2019) examined factors influencing young people's intention to municipal solid waste sorting using 524 young respondents from Hebei Province in China. The findings revealed that personal moral obligation and perceived behavioral controls are the most critical factors influencing young people's intention toward MSWS.

Chen and Lo (2016) examined source of separation of municipal solid waste and its effects on different separation methods and citizens' inclination with findings indicating that outcome (waste separation) reflects the inconsistency between people's environmental awareness and behavior. Such inconsistency and conflict may be attributed to the lack of environmental knowledge. Environmental education is assumed to be a fundamental solution to improve the effect of source separation of MSW in Changsha. Xu et al. (2017) examined household waste separation behavior with emphasis on testing the role of moral, past experience and perceived policy effectiveness within the theory of planned behavior. The finding revealed that perceived behavioral control and

past behavior significantly predict household waste separation behavior with past behavior being the most significant construct to predict individuals' intention and behavior. Mbiba (2014) studied urban solid waste characteristics and household appetite for separation at source in Eastern and Southern Africa. The paper confirmed that the quantity and composition of wastes in East and Southern Africa are dominated by organic wastes that are amenable for composting and anaerobic digestion. Inorganic recyclables are dominated by plastics especially in Bulawayo. These recyclables are already the basis for a vibrant informal recycling industry in all the cities (Mbiba, 2014).

H5: There is a significant relationship between perceived behavioral control towards waste segregation and intention to segregation waste.

H6: There is a significant relationship between perceived behavioral control towards waste segregation and actual waste segregation behavior.

2.5.4 Intention and Waste Segregation Behavior

The TPB predicts that intention enhances actual behavior, thus waste segregation. For instance, Nguyen and Watanabe (2019) examined waste separation behavior, waste management of livestock activities with 298 respondents from rural and semirural households. The results revealed that the livestock group exhibits a more well-developed perception of the encouragement of waste separation and higher waste separation performance than does the non-livestock group. Wang, Gaustad and Babbitt (2016) examined the antecedents of urban residents' separate collection intentions for household solid waste separation and their willingness to pay with 618 respondents. The findings showed that residents' willingness to pay for separate collection by other organizations is negatively influenced by the separate collection behaviors of others and age but

positively influenced by perceptions of results, facility conditions, moral obligations and government policies in China.

Zhang et al. (2017) examined college students' municipal solid waste source separation behavior and its influential factors with the findings that female students separated more waste at source than male students and will be the primary practitioner of household waste separation in China in the future. Again, students' awareness of current environmental pollution caused by municipal solid waste and their actual efforts for environmental protection has significant positive with their behavior (Zhang et al., 2017). Nainggolan et al. (2019) looked at the circular economy analysis of household waste sorting behavior and found that household preferences for home waste sorting and handling are not homogeneous. Households express different appreciations towards different aspects of home waste sorting systems (Nainggolan, et al., 2019). Pakpour et al. (2014) examined household waste behaviors among a community sample in Iran and found that intention and action planning of community members significantly predicted household waste behaviors in Iran.

Apinpath, (2014) examined community mapping and theory of planned behavior as study tools for solid waste management using a mixed method approach. The findings indicated that attitudes, subjective norms, and perceived behavioral control were associated with the intention to dispose of recyclable materials in separate waste bins. Shen et al. (2019) examined factors influencing young people's intention to municipal solid waste sorting using 524 young respondents from Hebei Province in China. The findings revealed that compared with male and rural groups, female and urban groups' intentions are not significantly affected by subjective norm. Ghani et al. (2013) survey demonstrates that the public has positive intention in participating provided the

opportunities, facilities and knowledge on waste separation at source are adequately prepared by the respective local authorities. Furthermore, good moral values and situational factors such as storage convenience and collection times are also encouraged public's involvement and consequently, the participations rate. Xu et al., (2017) examined household waste separation behavior with emphasis on testing the role of moral, past experience and perceived policy effectiveness within the theory of planned behavior. The finding revealed that intention to separate significantly predict household waste separation behavior with past behavior being the most significant construct to predict individuals' intention and behavior.

H7: There is a significant relationship between intention towards waste segregation and actual waste segregation behavior.

2.5.5 Mediating Role of Intention to Segregate Waste

The mediating role of intention to segregate waste is underscored in the relationship between attitude and waste segregation behavior, subjective norm and waste segregation behavior, and perceived behavioral control and waste segregation behavior. First, the TPB emphasizes the mediating role of intention in the relationship between attitude and waste segregation behavior (Leeabai et al., 2022; Zhang et al., 2019). The TPB suggests that attitude influences an individual's intention to segregate waste. When individuals hold a positive attitude towards waste segregation, they are more likely to form a strong intention to engage in the behavior. This positive attitude contributes to the belief that waste segregation is worthwhile and aligns with their personal values and goals. As a result, they are motivated to take action and practice waste segregation in their daily lives.

The mediating role of intention comes into play as it serves as a bridge between attitude and behavior (Zhang et al., 2019). Intention represents an individual's readiness and willingness to engage in a specific behavior. It is shaped by attitude, subjective norms, and perceived behavioral control. In the case of waste segregation, intention reflects the conscious decision to segregate waste based on a positive attitude towards the behavior. Therefore, when individuals hold a positive attitude towards waste segregation, it increases their intention to engage in the behavior. This intention acts as a mediator, translating the favorable attitude into actual waste segregation behavior. Individuals who have a strong intention to segregate waste are more likely to follow through and practice waste segregation consistently (Leeabai et al., 2022). Understanding the mediating role of intention can guide interventions and strategies aimed at promoting waste segregation behavior. By targeting and influencing individuals' attitudes towards waste segregation, it becomes possible to foster a positive intention to engage in the behavior, ultimately leading to increased waste segregation practices and contributing to more sustainable waste management practices overall.

Second, the TPB suggests that subjective norms influence an individual's intention to segregate waste, and subsequently, their actual behavior. When individuals perceive strong social pressure or expectations to engage in waste segregation, it can shape their subjective norm regarding the behavior (Bardus & Massoud, 2022). For instance, if a person believes that their family, friends, or influential members of the community highly endorse and expect waste segregation, they are more likely to perceive a social obligation to engage in the behavior themselves. This perception of strong subjective norms then influences the individual's intention to segregate waste. The more individuals believe that important others in their social environment expect them to practice waste

segregation, the stronger their intention becomes to conform to these expectations and engage in waste segregation behavior.

The mediating role of intention becomes evident as it acts as a link between subjective norms and behavior. Intention represents an individual's readiness and willingness to perform a behavior and is influenced by multiple factors, including subjective norms. In the context of waste segregation, the subjective norm shapes the individual's intention to engage in the behavior, as they feel compelled to conform to the social expectations associated with waste segregation (Reijonen et al., 2021). Thus, the stronger the perceived subjective norm endorsing waste segregation, the stronger the intention to segregate waste. This intention, in turn, predicts the likelihood of individuals actually practicing waste segregation behavior (Bardus & Massoud, 2022). When individuals have a strong intention to engage in waste segregation, they are more motivated to align their behavior with the perceived social expectations, leading to increased adoption of waste segregation practices. Understanding the mediating role of intention in the relationship between subjective norms and waste segregation behavior is crucial for designing effective interventions and strategies. By influencing subjective norms through awareness campaigns, social influence, and education, it becomes possible to shape individuals' perceptions of social expectations regarding waste segregation. This, in turn, can enhance their intention to segregate waste and promote actual behavior change towards more sustainable waste management practices.

Third, the TPB suggests that perceived behavioral control influences an individual's intention to segregate waste, and subsequently, their actual behavior (Mir et al., 2021). When individuals perceive a high level of control over waste segregation, they are more likely to believe that they have the capability and resources to successfully engage in the behavior. This perception of control positively impacts their intention to segregate waste. The mediating role of intention becomes

evident as it serves as a link between perceived behavioral control and behavior. Intention represents an individual's readiness and willingness to perform a behavior and is influenced by various factors, including perceived behavioral control (Bardus & Massoud, 2022). In the context of waste segregation, individuals who perceive a high level of control over waste segregation are more likely to develop a strong intention to engage in the behavior.

Therefore, the stronger the perceived control individuals have over waste segregation, the stronger their intention becomes to practice waste segregation. This intention, in turn, predicts the likelihood of individuals actually engaging in waste segregation behavior. When individuals have a strong intention to segregate waste, they are more motivated to utilize their perceived control, resources, and capabilities to carry out the behavior consistently. Understanding the mediating role of intention in the relationship between perceived behavioral control and waste segregation behavior is crucial for promoting sustainable waste management practices (Bardus & Massoud, 2022). By addressing and enhancing individuals' perceived control over waste segregation, interventions can help individuals develop a stronger intention to engage in the behavior. Providing accessible waste disposal facilities, offering education and training on proper waste segregation methods, and creating a supportive environment can all contribute to strengthening perceived behavioral control and, consequently, fostering the intention and behavior of waste segregation.

Therefore the following mediating hypotheses (MH) were proposed for testing.

MH1: *Intention to segregate mediates the relationship between attitude in waste segregation and behavior regarding waste segregation.*

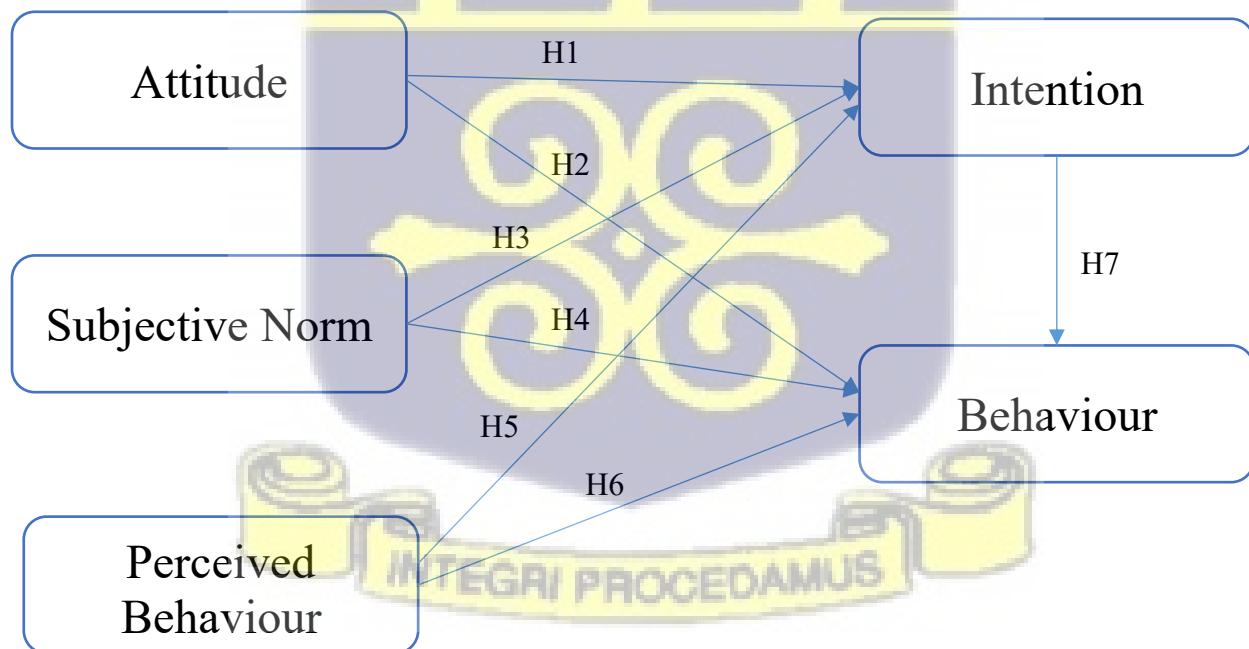
MH2: *Intention to segregate mediates the relationship between subjective norm and behavior towards household waste segregation.*

***MH3:** Intention to segregate mediates the relationship between perceived behavior control and actual behavior in house waste segregation.*

2.6 Conceptual Framework

The Figure 2.1 below indicates the relationships that exist among the various variables in the study. The independent variables are attitude, subjective norm, and perceived behavior control. The mediating variable is intention and the dependent variable is behavior. As indicated below, there are direct relationships between the three independent variables and dependent variable thus behavior. There is also an indirect relationships passing through intention to behavior with intention acting as the mediator. These relationship underscores the Baron and Kenny 1978 approach which is adopted for the analysis.

Figure 2 1: Conceptual Framework



Source: Adopted and modified (Author's own construct, 2020)

CHAPTER THREE

METHODOLOGY

3.0 Chapter Overview

This chapter discusses the description of the methods and the various processes as well as procedures that were engaged in collecting and analyzing the empirical data. The methodology and philosophical paradigm underpinning the study is presented in this Chapter. This section consists of various sub-sections namely; research approach, research design, study area, population, sample and sampling procedure, data collection procedure, instrumentation, method of data analysis, the validity of data, data reliability, ethical consideration in data collection, limitations of the study and conclusion of the Chapter.

3.1 Philosophical Paradigm

There are different philosophical paradigms researchers lean on in undertaking research. Among some are positivism, interpretivism, realism, pragmatism, among others. Positivism holds the view that there is an objective reality and it can be understood through the application of the laws by which it is governed. Khan (2014) define positivism as an “epistemology which seeks to explain and predicts what happens in the social world by searching for the regularities and causal relationships between its constituent elements”. Positivism contends that the world works according to fixed laws of cause and effect and therefore researchers test theories about those laws in order to either reject or temporarily accept those (Brennan et al., 2011). For the positivists, knowledge is made up of objective facts that can be measured and tested with statistical methods (Khan, 2014). The Positivists believe in empiricism, which is of the view that, the scientific process is based on observation and measurement (Babbie & Mouton, 2007).

Even though there are different philosophical paradigms, this study leans on the positivist paradigm in order to achieve the study's objectives. According to Cole (2006, p 158), the positivist paradigm believes that reality is considered as a single and independent fact that can be empirically measured using structured quantitative methods. The positivists generally lean on the objectivism assuming that knowledge is out there independent of the researcher and can be measured objectively (Tronvoll et al., 2011). Khan (2014) observes that using positivist paradigm to investigate a subject matter affords the law of generalization which seeks to uphold that a single reality or subject will yield the same or similar results if the similar methods are used. The positivists also interested in investigating the relationship between variables by examining the cause and effect outcomes of those variables. This is a secondary study which aims to explore pre-existing quantitative data, a positivist position will be best suited to drawing out the implications of the data in the analysis.

As stipulated by Sobh and Perry (2006, p. 126), "there is no objective ground for choosing a paradigm". The researcher needs to adopt a paradigm that is suitable and consistent with the assumptions made concerning the study. Consequently and judging from the various paradigms and their underlying assumptions, this study embraced the positivism paradigm since it is the most consistent research paradigm with this study. The adoption of the Positivist paradigm allowed the researcher to formulate research questions and hypotheses, and used the survey method to collect large data to test the hypotheses that were formulated in the early stage of the study. Also, the study did not seek to find deeper understanding of a phenomenon or to generalise propositions as it pertains to the other alternative research paradigms.

The positivist approach, is a research paradigm that emphasizes objectivity, empirical observation, and the scientific method. It is based on the belief that knowledge can be obtained through the systematic observation and measurement of phenomena, leading to the formulation of general laws or theories. In the context of this study, the researcher chose to embrace the positivist paradigm as it aligned well with the nature and goals of the research. One of the key characteristics of the positivist paradigm is its focus on formulating research questions and hypotheses. Research questions guide the investigation by identifying specific areas of inquiry, while hypotheses provide testable predictions or assertions about the relationships between variables (Brennan et al., 2015). By adopting the positivist paradigm, the researcher was able to frame research questions and hypotheses that aimed to explore and understand the phenomenon under investigation. Another aspect of the positivist paradigm is the use of the survey method for data collection. Surveys involve gathering data from a sample of individuals through the use of structured questionnaires or interviews. This method allows for the collection of large amounts of data, which can be analyzed statistically to test the formulated hypotheses. The adoption of the survey method in this study enabled the researcher to collect data from a sizeable sample and utilize statistical techniques to analyze and interpret the findings.

The positivist paradigm also values objectivity and aims to minimize the influence of researcher biases on the research process and outcomes. It promotes the use of standardized measurement tools and methods to ensure consistency and replicability. By following the positivist paradigm, the researcher strived to maintain objectivity by employing established measurement instruments and adhering to rigorous research procedures. The choice to embrace the positivist paradigm in this study allowed the researcher to approach the research in a systematic and scientific manner (Khan, 2014). It facilitated the formulation of research questions and hypotheses, the collection of

large-scale data through surveys, and the application of statistical analysis to test the formulated hypotheses. By adhering to the principles of the positivist paradigm, the study aimed to provide reliable and generalizable findings that contribute to the body of knowledge in the research field.

3.2 Research Approach

In general, the research approach is based on three core strands. These include the qualitative research method, quantitative method, and the mixed method research approach. The qualitative research approach allows the researcher to make knowledge claims predominantly on interpretivist or constructivist perspectives. A quantitative research approach has been used in this study to analyse data and statistically, support or reject the stated hypotheses. According to Babbie and Mouton (2007), this study qualifies to use quantitative research method because the emphasis of this study is on the quantification of variables by assigning numbers to these perceived qualities of constructs. The study's focus was to estimate the associations between various constructs which were: attitude towards segregation, subjective norm, perceived behavioral control, intention to segregation and the actual behavior (segregation). In line with this, the researcher adopted the quantitative research method. The use of this research approach enabled the researcher to use a questionnaire to collect data from a large number of respondents for analysis. Additionally, Choy (2014) upholds that quantitative research has two major advantages. Firstly, it can be carried out and evaluated quickly as responses can be tabulated within a short period of time compared to qualitative research. Secondly, if the data is rigorously and legitimately collected, it becomes more dependable to use for quantitative analysis.

3.3 Research Design

There are several research designs such as longitudinal, experimental and cross-sectional research designs. This study basically employed cross-sectional survey design (Panneerselvam, 2010;

Neuman, 2011). The cross-sectional survey design ensured that the researcher collected data from the respondents at a single time period. Babbie (2008) suggested that cross-sectional designs are suitable for making generalizations from a sample to a population as well as facilitating inferences to be made from the sample. It is also generally quick, easy, and cheap to conduct cross sectional survey design (Sedgwich, 2014). Thus, this design was deemed to be the most appropriate in undertaking the study, which examined how the theory of planned behavior is used to enhance household segregation behavior the Wa Municipal in Ghana. Although a longitudinal design could be more appropriate in establishing causal relationships (Johnson, 2010), insufficient availability of secondary data on some of the variables such as household segregation behavior as well as intention to segregate and perceived behavioral control, attitude towards segregation and coupled with the limitations of time made it inappropriate to adopt cross-sectional research design.

3.4 Study Area/Setting

This research area covered the Wa Municipal of the Upper West Region of Ghana. The Wa Municipality is the capital town and one of the 11 administrative and political districts in the Upper West Region of Ghana. The district was upgraded to a municipal status in 2004 and this has changed the structure of the area significantly. The municipality lies between latitude 1°40'N and 2°45'N and longitude 9°32 to 10°20W, thus covering an area of approximately 23,474 square kilometers which is about 32% and 2.56% of the total land area of the region and the country respectively. The Municipal has over six communities under the classifications of Ghana Health Service. Thus, Zongo area, kpagori residential area, Wa technical area and social security and national insurance trust (SSNIT) residential area were included in the study. These areas were selected because most households within the Wa Municipal are assumed to produce large sum of

waste materials in the Upper West region. In addition, these areas are also predisposed to waste segregation behavior due to its economic and social benefits.

3.5 Population

The population of a study consists of all the members, participants or subjects about which the research wants to make inferences (Creswell, 2014). According to Creswell (2014) it is not always practical to investigate an entire large population under consideration by the researcher. It is therefore necessary to target sub-set of population and estimate a sample large enough to represent the population characteristics. The Target Population of the study was all households within the Wa Township. The population structure of the Wa Municipality revealed a preponderance of youth over the aged and females over males.

3.6 Sample Size

Sample size is very paramount in any research and most especially in Structural Equation Modelling (SEM) studies because it gives greater stability of the parameter estimates. Various researchers have suggested different sample size for SEM and no consensus have been reached in literature (Kline, 2011; Hair, Black, Babin, Anderson & Tatham, 2006) so far. The criteria suggested by Kline (2011) is that a sample size below 100 is small, between 100 and 200 is medium and fairly acceptable, and a sample size over 200 is often considered large and good to use. Considering the suggestion of Kline (2011), Hair et al. (2006) maintains that a sample size of 200 and above is more appropriate for SEM analysis.

This study, therefore, distributed a total of three hundred and fifty (350) questionnaires to the selected households from four main locations or residential area in the Wa Municipality as indicated earlier. Out of this number of questionnaires distributed to the households at their various

homes, a total of 307 valid and usable questionnaires were retrieved and used for the analysis. This represented a response rate of 87.71%. The residential areas distributions in respect of the response rate were as follows; 38% (117) of respondents were from the Zongo area, 31% (96) from the kpagori residential area, 18% (54) from the Wa technical area and 13% (40) from the SSNIT residential area were selected for inclusion in the study.

This study specifically sampled key informants of households from the regional capital of the upper west region for some obvious reasons. One of the reasons was that, the information sought was that parents of households were responsible for developing ensuring proper disposal of waste emanating from the house. Similarly, caretakers are also responsible for introducing, supervising and having oversight responsibilities for ensuring that these household waste are implemented to the latter. The grown children in the house are those in-charge of delivery of products and services to customers and reflects the true nature of these segregation practices to achieve competitive edge. As a result, these levels of managers were in better positions to provide information about their companies' practices, systems and policies.

The demographic characteristics of the respondents were analyzed. The sample respondents were represented by 158 males and 149 females, majority of the respondents were within the ages of 18 to 40 representing 247 respondents with a minority (60 respondents). The study revealed 102 respondents having diploma and/or HND, others were: senior high school certificate (54) first degree (52), masters (32), junior high school certificate (16) and 2 respondents were PhD holders. Moreover, 230 respondents were married as against 76 respondents being single. Majority of the respondents (254) had family size between 2 and 10.

3.7 Sampling Techniques/Selection

The researcher adopted three (3) different sampling techniques to select participants for inclusion in the study. The first is the stratified sampling technique which involves grouping the population into homogeneous strata before sampling (Babbie, 2008). This enabled the research to divide the households into strata on the basis of their location or residence as denoted in the Township. Four different strata (that is, Wa technical, zongo, kpagori residential area, etc) were chosen. Stratified sampling ensures that respondents within the same stratum have similar attributes, but respondents between strata have dissimilar attributes (Penneerselvam, 2010). This, therefore, was the proper and appropriate representation of the stratification of respondents in each stratum.

The second technique was the purposive sampling technique which is “a type of non-probability sampling in which the units to be observed are selected on the basis of the researcher’s judgment about which ones will be the most useful or representative” (Babbie, 2008, P. 96). This technique therefore aided the researcher in using his judgement in selecting particular household from the various strata used in the process of data collection. This is because some households sometimes take a while to understand the real essence of segregation especially if they do not immediately understand the economic benefit of waste segregation.

Finally, the researcher adopted another non-probability sampling technique called convenience sampling technique which states that the researcher decides on sampling units based on their convenience (Penneerselvam, 2010). This technique was employed due to the fact that: firstly, household members are generally difficult to access because of their busy schedules. Secondly, some respondents possibly might refuse or not cooperate to fill the questionnaires. Therefore, the researcher adopted convenience sampling technique to sample respondents from the selected

households. Though probability sampling, gives superior accuracy in terms of the confidence level of inferences of the study, the obvious and practical difficulties in completely executing probability sampling due to the above stated limitations, made the researcher to resort to purposive and convenience sampling in order to overcome such difficulties. According to Uprichard (2013) it is appropriate to combine probability and non-probability sampling techniques especially when that gives the researcher the best and quality data and also leads to the achievement of the research objectives.

3.8 Materials, Tools and Data for Analysis

3.8.1 Data Sources

There are two key types of research data sources. They are primary and secondary research data sources. Primary sources of data are data that are collected directly from the respondents and used for the specific purpose for which they were collected. Primary data sources include interviews, observation and questionnaire (Creswell, 2014). Secondary source of data on the other hand, includes sources of data that are available due to the fact that the data has been collected, processed and probably used by another researcher for different purposes (Babbie, 2008; Babbie & Mouton, 2007). This study, conducted primary source of data analysis. The primary source of research analysis, aided the researcher to investigate the effect of aspects of the theory of planned behavior on the segregation behavior of householders. Additionally, the use of primary source of data analysis, guaranteed that the study did not use a secondary data that could have a questionable quality (Babbie, 2008). For instance, there are possibilities that secondary data cannot give accuracy of information as it regards to members of the house could be manipulated by other waste collectors so as to meet their specific needs. Therefore, primary research analysis was considered more appropriate instead of secondary analysis for this study.

3.8.2 Description of Measurement Scales/Variables

The main instrument used for the data collection was a structured questionnaire which has been suggested as an easier approach to collect data (Hox & Boeijs, 2005) for effective factual information (Burkard, Knox & Hill, 2012). The use of a questionnaire also allows for unbiased information since data given by respondents is with limited interference on the part of the researcher.

The questionnaire was divided into two distinct sections. The first part of the questionnaire sought to ask respondents about their demographic data such as age, sex, educational level, the number of years spent in the company, the position occupied and sector of the company. The second part elicited responses about, household waste segregation which was narrowed to the aspects of waste segregation for the purpose of this study. These categories included attitude, subjective norm, perceived behavioral control, intention to segregation and behavior (actual segregation).

Respondents were informed to indicate by ticking the extent to which each respondent agrees or disagrees with statements in the questionnaire. The questionnaire aimed at measuring the key independent variables as planned behavior (attitude, subjective norm, perceived behavioral control, intention to segregation), actual behavior in segregating household waste as the dependent variable. Thus, the questionnaire was structured using the Likert format with a five-point response scale. Thus, the set of items was structured using the responses to select items that were elicited on a five-point Likert scale ranging from 5 = “*Strongly Agree*”; 4= *Agree*; 3= *Neutral*; 2= *Disagree* and 1 = “*Strongly Disagree*”. The following briefly describes the various sections of the questionnaire.

Part one (section 1) of the questionnaire characterized the demographic profile of the respondents and The Part two of the questionnaire measured household waste segregation with a 6-item representing attitude scale, with Cronbach Alpha value 0.732. The second construct registered 5-item representing subjective norm, with Cronbach alpha of 0.76, was adapted with modifications to suit the purpose of the study. The third construct, perceived behavioral control was measured with 5-item scale, with Cronbach Alpha of 0.88, was adapted with minor modifications. The fourth part (Part IV) of the questionnaire measured intention to segregate with 3-item scale, with Cronbach alpha value of 0.90, was adopted with little modifications to meet the purpose this study. The last aspect of the measurement catered for behavior with 4-item scale which has internal consistency of .88 (see: Appendix A, for detailed research questionnaire). The questions were developed based on the guidelines of the TPB (Ajzen et al., 2011) and modified from work of Ghani et al. (2013). A self-administered questionnaire was designed by the author to assess household waste segregation behaviors. The questionnaire was prepared with majority of the questions being close-ended.

3.8.3 Validity of the Study Variables

According to Hair et al. (2006), validity is the extent to which a scale measures accurately represent the concept of interest. Normally, validity assessments include, but not limited to, face validity, content validity, construct validity. Face validity suggests the quality of an indicator that makes it seem a realistic measure of some variables. Similarly, content Validity denotes the degree to which a measure covers the range of meanings included within a construct (Babbie, 2008). One common way of considering content validity is through expert opinion. In this study, face and content validity were assured with the aid of expert opinions. The instrument was scrutinized by this thesis'

supervisor and other scholars in the field, to use their expert knowledge to assess the suitability of the questions as well as their extent of coverage of the constructs under study.

Construct validity or convergent validity refers to the degree to which a measure relates to other variables as expected within a system of theoretical relationships (Babbie, 2008). Construct validity of a measurement scale is often assessed using factor analysis. Consistent with scale development and cleansing procedures (Malhotra et al., 2012), the construct validity of the measurement items were guaranteed through Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The EFA was used to retain items that shared significant variance with their main variables, whereas CFA was used to confirm them (see Chapter Four). Also, an Average Value Extracted (AVE) value of at least 0.5 indicates sufficient convergent validity, meaning that a latent variable is able to explain above half of the variance of its indicators on average (Go'tz, Liehr-Gobbers & Krafft, 2009) (see Chapter Four).

3.8.4 Reliability of the Scales

The reliability of scale is very important as it shows the extent to which scales are consistent with the results if the measurements were made repeatedly (Absar, Azim, Balasundaram & Akhter, 2010). It is usually measured using coefficient alpha or cronbach's alpha (Hair et al., 2006; Malholtra et al., 2007) Cronbach's alpha is a measure of the inter-correlations between the various items used to capture the construct (Ghauri et al., 2020). In literature, there is no consensus on what constitutes an acceptable value of Cronbach's alpha. For instance, Hair et al. (2010) suggested that a threshold value of above 0.60 is acceptable. Nunnally (1970) also stipulate that Cronbach's alpha of less than 0.50 are deemed unacceptable, those between 0.50 and 0.69 are regarded as adequate, and those above 0.70 are acceptable. This study, therefore, assesses the

reliability of the scales using Cronbach's alpha value of 0.70 as the threshold based on Nunnally's (1970) recommendation. Other measures of reliability such as composite reliability generated using confirmatory factor analysis can be employed as additional measures of reliability (Hair et al., 2006). This study, therefore, employed composite reliability in addition to the Cronbach's alpha as predictors of internal consistency of the measurement scales.

3.9 Method of Data Analysis

In the present study, each questionnaire was given a code number to facilitate easy identification and fed into the computer using Statistical Package for Service Solution (SPSS) Version 22 and later exported into Amos version 20 of Structural Equation Modelling (SEM) software. The results were presented using simple descriptive statistics to describe the data, including means, standard deviations, frequencies, and percentages to make inferences concerning the research questions. Other analyses including factor analysis (FA) and correlation were used to perform preliminary analyses such as normality, construct validity, reliability among others. The hypothesised relationships (both direct and mediation) were, however, tested for confirmation or otherwise using Structural Equation Modelling, Amos version 20, Baron and Kenny's (1986) mediation procedure and bootstrapping technique using estimates from the SEM analysis. Below are the brief explanations of the statistical analyses tools.

3.9.1 Structural Equation Modelling (SEM)

This study adopted Structural Equation Modelling (SEM) to test the hypothesised relationships for the reason that; SEM is robust in multivariate analysis techniques which specifies the relationships among independent and dependent variables simultaneously through the use of two main sets of equations as measurement equation and structural equations (Schreiber et al., 2006). Overall, SEM centers on these two sets of models: firstly, the measurement model allows for the use of latent

variables and cluster of variables of observed variables underlying each construct in the analysis as well as using confirmatory factor analysis (CFA) for validation and reduction of measurement errors. Secondly, the structural equation model allows for measuring the significance of the relationships between latent variables, achieved through the path analysis to minimize measurement errors by testing multiple indicators per latent variables while offering a good fit and graphical modeling interface (Byrne, 2010).

There are four reasons for using SEM in this study. First, basic statistical methods such as bivariate correlation or regression are unable to postulate a complex model structure which could represent the complexities of the multivariate world. The use of a small number of variables to understand complex phenomena is limiting”. However, multifaceted studies are statistically modeled and tested by using SEM (Schumacker & Lomax, 2004). Secondly, SEM techniques explicitly take measurement error into consideration when statistically analyzing data (Schumacker & Lomax, 2004). Thirdly, SEM allows for the use of moderating and mediating variables where a dependent variable can act as independent simultaneously. Finally, using SEM has the capacity to simultaneously estimate the multiple hypothesized relationships, which ensures better precision of the estimated coefficients, than measuring individual variables.

3.9.2 Mediation Analysis

The analysis of the mediation variable was accomplished using the Cause-Effect Model approach as suggested by Baron and Kenny (1986). According to Baron and Kenny (1986, p) some conditions must be met when testing a mediating effect through a three-separate regression estimate: firstly, the independent variable must affect the mediator in the first equation (model A); secondly, the mediating variable must be shown to affect the dependent variable in the second

equation (model B); and thirdly, when Model A and Model B, are controlled, a previously significant relation between the independent and the dependent variables in the third equation (model C) is no longer significant. The other conditions clearly show that, the independent variable must significantly predict the mediator in Model A; the independent variable must significantly predict the dependent variable in Model B; the mediator must significantly predict the dependent variable in Model C, and the independent variable must predict the outcome variable less strongly in Model C than in Model A (partial mediation). But full mediation occurs when the independent variable is insignificant in the third model (Model C). In testing for mediation, it is preferred to use SEM techniques to using regression techniques in testing the mediated effect. This is because SEM provides the best techniques in controlling measurement error. SEM also provides interesting alternatives for exploring the mediation effect (Baron & Kenny, 1986). For this reason, the conditions considered by Baron and Kenny (1986) were employed in SEM to test the hypothesized mediated relationships.

3.9.3 Bootstrapping Technique

The Baron and Kenny's (1986) approach fail to determine whether the mediation (partial or full) is significant or not (McKinnon, Fairchild & Fritz, 2007; Preacher & Hayes, 2008). According to Preacher and Hayes (2008), the statistical significance of the difference between the total effect and the direct effect is not formally stated by Baron and Kenny as a requirement for mediation. These researchers have also argued that the conditions given by Baron and Kenny (1986) are not so relevant precondition before one can test mediation. Aside, the approach has simply become old and therefore needs to be revised. They therefore proposed that one can still test for mediation without necessarily meeting Baron and Kenny's (1986) mediation conditions. In order to strengthen and confirm Baron and Kenny mediation analysis, bootstrapping method has been

recommended to be relevant in supporting the mediating analysis, thereby, overcoming the shortfalls of Baron and Kenny (1986) and raising the confidence of researchers.

3.10.1 Pilot Study

A pilot study was conducted to ascertain the research instrument based on the constructs of the study. The idea was also to ensure face, content and context validity of the research instruments. The pilot study was conducted in Accra, Nima with 28 informants from 20 households. The respondents comprised of 18 males 10 females with 22 of the sample being landlords or landladies of their households. The average age was 38 years and majority of them were not highly educated with most of them being self-employed. In order to measure internal consistency reliability of the scale items, Cronbach's Alpha (α) was computed. The results of the reliability of the scale used in this study were displaced on Table 3.1. The values ranged from 0.67 to 0.92. Hence, the constructs or scales used in the current study are reliable, since all the Cronbach's Alpha values met the threshold of 0.70 based on Nunnally's (1970) except for one construct which is acceptable according to Hales' (1986) threshold. The results revealed that attitude had a Cronbach alpha of 0.80, subjective norm with 0.67, perceived behavior control with 0.72, intention with 0.90 and behavior with 0.81

Table 3. 1: Summary of result showing Pilot Study

Variable	Cronbach Alpha	Remark
Attitude	0.80	Excellent
Subjective norm	0.67	Acceptable
Perceived behavior control	0.72	Excellent
Intention	0.90	Excellent
Behavior	0.81	Excellent

Source: Pilot Data (2019)

3.10.2 Data Collection Procedure

The researcher submitted introductory letters together with copies of the research questionnaire from the school of environmental science of the University of Ghana, Legon to the various households visited. The reason was to introduce the researcher to the selected households and to allow them peruse the questionnaire and respond or otherwise. The researcher then proceeded to submit the required number of questionnaires to households at a given locality that had given approval for participation in the study. The questionnaires were delivered by hand to most of the households. In some cases, the researcher was aided by a representative from the house in distributing questionnaires to respondents. After submission, several follow-ups were made by personal visits and phone calls in order to retrieve these questionnaires. The actual data collection period lasted for about four (4) months. A total of 350 copies of questionnaires were distributed and some left with respondents for between two to four weeks to respond at their convenience. This was done in different locations as provided by the strata. The actual distribution of the introductory letter and administration of the research questionnaires started in January, 2020 and ended in July, 2020.

3.11 Ethical Consideration

The researcher provided a letter to participants explaining the study to overcome their reservations about providing sensitive and confidential information. Participants were assured of the privacy of their information, and that their identities would not be revealed. It was made clear that their contribution was voluntary and they had full authority to refuse or to withdraw if they changed their mind about responding. They were also educated that the purpose of the study was purely for academic and no information provided would be used against them. Moreover, they were assured that the information collected from all other companies taking part in the study would

be combined for analysis. Therefore, information on individual companies would not be revealed in any form.

3.12 Conclusion

This chapter discussed the methodology of the study, which involved the mode of data collection and the analytic procedure undertaken. The targeted population of the study was mainly households in Wa Municipal in Ghana and the stratified, purposive and convenience sampling techniques were used to sample the population. It also highlighted how the data was analyzed, using descriptive, correlation and SEM analysis to find the relation among the independent variables, mediating variable and the dependent variables. The next chapter would discuss the results of the data analysis in detail.



CHAPTER FOUR

DATA ANALYSIS

4.0 Chapter Overview

This Chapter discusses the results of the analyzed data collected from the field. The discussion makes use of tables, figures and charts. The order of presentation in this Chapter includes a demographic profile of the respondents, test of normality and outliers, Factor Analysis (FA), Structural Equation Modeling (SEM) (measurement and structural models) and the mediation results. The results of the study are subsequently discussed.

4.1 Background to Data Analysis

The purpose of the study is to investigate whether the household waste segregation is influenced by aspects of the theory of planned behavior in Wa municipality, Ghana. Hundred and fifty (150) households participated in the study with three hundred and fifty (350) respondents sampled. The data collection process were able to retrieve three hundred and seventeen (317) responses. After sorting to ensure completed questionnaires, ten of the questionnaires were removed due to incomplete answers. This translated to three hundred and seven (307) usable responses, giving a response rate of 87.71%. The 307 respondents used for the study were made up of three strata adopted from the Wa municipal: Kambale, Wa-sub and Bamaahoo. Prior to the analysis, the data was entered using the IBM SPSS version 22 software. After data screening, demographic characteristics of the respondents were analyzed as well as the relationships among the main variables were tested by using SEM and Amos version 21 software.

4.2 Data Screening and Examination

Data cleaning/screening is often discussed in terms of missing values, outliers and data normality.

4.2.1 Missing Value Analysis

Missing values have the potential of impacting the statistical analyses of the overall data in terms of statistical power and regression bias, if not dealt accurately. The researcher has the “options of deleting responses which have missing values, replacing the missing data values, or using robust statistical procedures that accommodate for the presence of missing data” (Schumacker & Lomax, 2004 p. 157). Several methods are used to handle missing data like listwise, pairwise, mean imputation, multiple imputation and expectation maximisation method among others. It is noted (Gold & Bentler, 2000) that expectation maximisation (EM) method proposed by Dempster, Laird and Rubin (1977), holds more promise for dealing with difficulties caused by missing data than other methods irrespective of the sample size, proportion of data missing, and distributional characteristics of the data. This is because the imputed data imposed for maximum likelihood estimation, provides good estimators of the data. In this light, the researcher employs the EM method in the estimation of missing values in the data. The EM was used to estimate the missing values in the data set before further analysis. All missing data were estimated appropriately after going through the procedure for EM in SPSS.

4.2.2 Test of Data Normality

A normal distribution of data assumes that, the mean distribution across samples should be normal (Garson, 2012). Non-normally distributed data should be transformed by various statistical means as this helps to set up a confidence interval for some target values and to make the data fit for further analysis, hence the test for normality. There are two forms of normality test. These are the univariate and multivariate normality. Univariate normality is when one variable is normally distributed. On the other hand, multivariate normality of a data occurs when the variables are normally distributed with respect to each other (Tabachnick et al., 2007; Garson, 2012). According

to Garson (2012) multivariate normality is a necessary condition for using structural equation modeling which this study adopts. Precondition assessing of multivariate normality is checking for univariate normality. It is noted that though univariate normality is a necessary condition, it is not a guarantee for multivariate normality (Osborne, 2013).

Univariate normality is checked by using the absolute skewness and kurtosis values. A common rule of thumb is that skewness and kurtosis should be in the range of -2 to +2 for a data to be normally distributed (Garson, 2012). This does not, however, guarantee that the data will also have multivariate normality, as it can still be multivariate non-normal (Curran, West & Finch, 1996). According to Yuan, Bentler and Zhang (2005), in practice, the critical ratio (C.R) which is equivalent to z-statistics that is associated with the Mardia's coefficient of multivariate kurtosis, if greater than five (> 5.00) suggest that the data is not normally distributed. Therefore, the C.R (z-statistic) of 5.37 in this study as shown in Table 4.1 implied that the data also satisfied the multivariate normality assumption.

Table 4. 1: Results Showing Univariate and Multivariate Test of Normality

Variable	Min	Max	Skewness	C.R	kurtosis	C.R
Attitude	1.83	5.00	-0.087	0.139	2.635	0.277
Subjective Norm	1.76	4.80	-0.411	0.139	-.297	0.277
Perceived Beh. Control	1.40	4.80	-0.618	0.139	-.698	0.277
Intention to Seg.	1.33	5.00	-0.832	0.139	.897	0.277
Seg. Behavior	1.25	5.00	0.826	0.139	-0.928	0.277
Multivariate					6.45	5.37

Source: Fieldwork (2020), Note: Seg. = segregation

The results of both the univariate and multivariate test of normality shows that all variables met the threshold and therefore the data was considered normal for further analysis.

4.3. Demographic Profile of Respondents

The demographic data was presented with the aid of descriptive statistics in the form of Tables, frequencies and percentages. The main analysis was presented based on the multiple regression analysis. The demographic profile of respondents included gender, age, academic qualification, marital status, length of service and position at work.

4.3.1 Gender of Respondents

On gender, 52% of the study respondents are males and 49% of them consist of females (Figure 4.1). This shows that, majority of the respondents in the study were dominated by males.

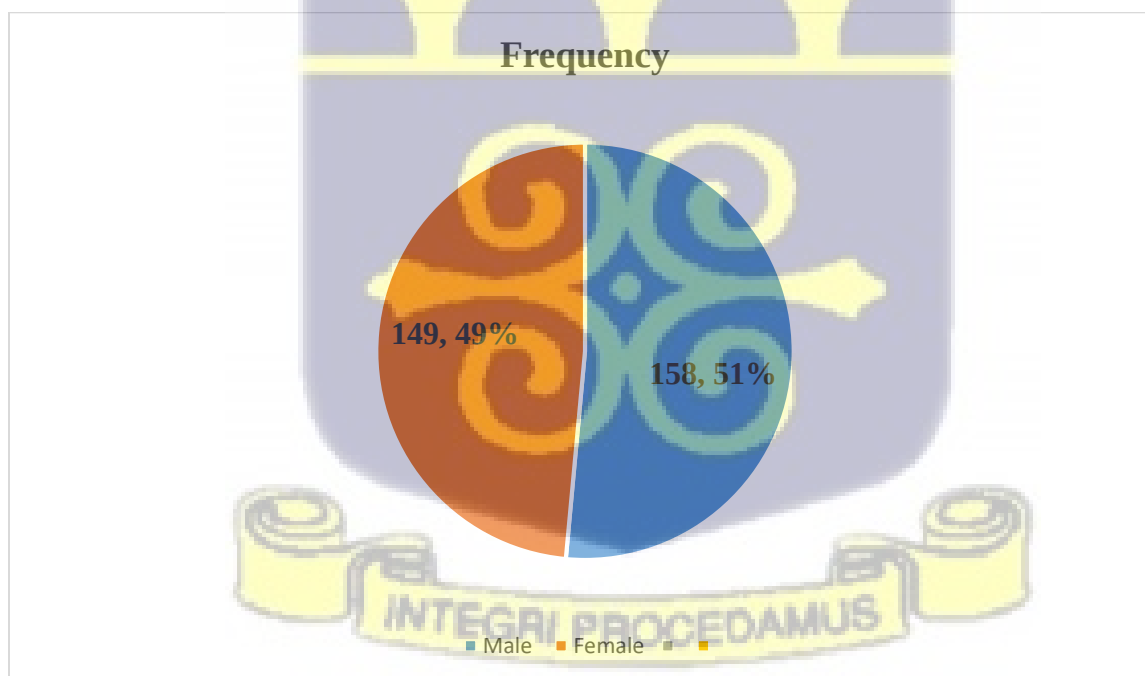


Figure 4. 1: Summary of Results showing Gender of Respondents

Source: Field Data (2020)

4.3.2 Age of Respondents

The analysis revealed that 47% of the respondents were between 31 to 40 years while 33% of them were between 18 to 30 years. About 18% of the respondents were between 41 to 50 years respectively. This finding showed that minority of the respondents was in their youth age, specifically 31-40 years or below. This implies that employees within the ages of 31-40 years dominant in the disposal of waste and therefore the engage in household waste segregation.

Table 4. 2: Summary of Results showing Age of Respondents

Age of Respondents	Frequency	Percentages
18 – 30 years	102	33.2
31 – 40 years	145	47.2
41 – 50 years	54	17.6
51 years +	6	2
Total	307	100

Source: Field Data (2020)

4.3.3 Education of Respondents

Among the respondents, the highest level of education was PhD with less than 1%, master's level education with 10%, first degree level of education with 17% and diploma/HND level of education with 33%.



Table 4. 3: Summary of results showing Educational Qualification of Respondents

Educational qualification	Frequency	Percentage
Junior High School	16	5.2
Senior High School	54	17.6
Diploma/HND	102	33.2
Degree	52	16.9
Masters	32	10.4
PhD/MD	2	.7
Others	49	16
Total	307	100

Source: Field Data (2020)

The analysis also noted that 18% of the respondents were senior high school leavers and 5% of the same were junior high school leavers. About 16% of the respondents were holders of other educational qualification other than those mentioned here including those who have not had formal education.

4.3.4 Marital Status of Respondents

The analysis showed that majority of the respondents (75%) were married while 25% of the respondents were single. Therefore the study reveal that majority of the respondents were married. This is consistent with the expectations of the study since the concentration is on households. One of the basic unit of the household is the married couple (parents). The single group was described in this study to include those who are not married, divorced, single parents (due to separation), and others.

Table 4. 4: Summary of results showing Marital Status of Respondents

Marital Status	Frequency	Percentage
Married	230	74.9
Single	76	24.8
Others	1	.3
Total	307	100

Source: Field Data (2020)

4.3.5 Family Size

The study considered the size of the family of respondents as an important factor that could be of interest for the outcome of the study. Family size could possibly be a factor that determines how waste is management and the tendency to segregate waste. The results in Figure 4.2 show that majority (69%) of the respondents had family size of 5 to 10 members. While 14% and 13% of the respondents had family size of 11 to 15 and less than 5 respectively. Large family sizes constituted 2% of the respondents with 16 to 20 family members and with less 1% of the respondents having family size of more than 20 members.

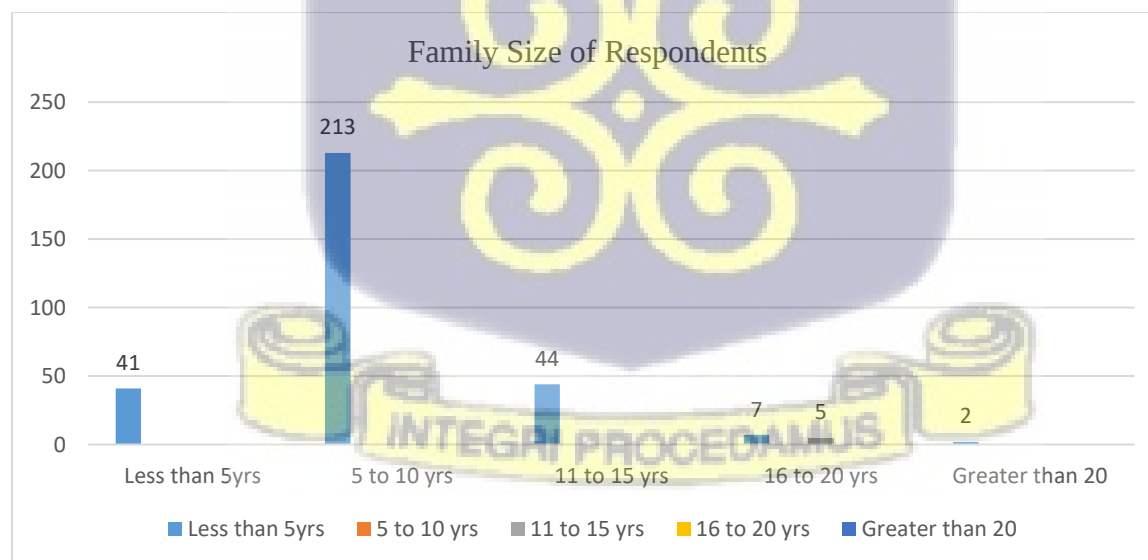


Figure 4. 2: Summary of results showing Family Size; Source: field Data (2020)

4.3.7 Position of Respondents in Family

The study in Table 4.5 identified that 38% of the respondents were fathers and 37% were mothers while the others such as children, grandchildren, in-laws, extended family members constituting 26% of the respondents.

Table 4. 5: Summary of results showing Position

Family Position	Frequency	Percentage
Father	116	37.8
Mother	112	36.5
Others	79	25.7
Total	307	100

Source: Field Data (2020)

4.4 Correlation Analysis

Pearson correlation test was conducted to ascertain relationships among the variables in the study. According to Tonidandel and LeBreton (2011) a linearity test using correlation analysis is important to establish the relationships between the variables by recognizing those that have significant relationships or otherwise. A linearity test also satisfies the basic assumptions of regression that there must first of all be association between the independent variables and the dependent variables before a causal relationship can be established. For the purpose of this study, the independent variables three dimensions of the planned behavior theory (attitude, subjective norm, and perceived behavior control), the mediating variable was intention while the dependent variable was behavior. It should be noted that the mediator variable was at one hand used as dependent variable and on the other hand used as independent variable. Table 4.6 presents the results of the correlation analysis.

Table 4. 6: Correlation Analysis

Variable	1	2	3	4	5	6	7	8	9	10	11
Gender	1										
Age	.047	1									
Education	.024	.536**	1								
Marriage	-.145	-.543**	-.453**	1							
Family Size	.082	.225**	.252**	-.063	1						
Position	.339**	-.570**	-.417**	.713**	-.032	1					
Attitude	-.067	-.180**	-.132*	.089	-.036	.016	1				
Subj-Norm	-.024	-.148**	-.203**	.007	-.171**	-.003	.512**	1			
PBC	-.157**	-.221**	-.201**	.075	-.244**	-.007	.361**	.686**	1		
Intention	-.012	-.096	.236**	-.014	-.193**	-.020	.295**	.438**	.419**	1	
Behavior	-.076	-.223**	-.278**	.081	-.193**	.057	.372**	.606**	.695**	.354**	1

Source: Summarized from Field Data (2020), Note: *significant at 0.05 level, **significant at 0.01 level

The findings, Table 4.6 indicate that significant relationship exists between the independent variables and dependent variable as well as the mediator (intention to segregate). Thus, there is a significant positive relationship between attitude and intention ($r=.295$, $p<0.01$), attitude and behavior ($r=.372$, $p<0.01$). There were also significant relationships between subjective norm and intention ($r=.438$, $p<0.01$), between subjective norm and behavior ($r=.606$, $p<0.01$). The analysis also revealed that a significant relationship exists between perceived behavior control and intention ($r=.419$, $p<0.01$), and between perceived behavior control and behavior ($r=.695$, $p<0.01$). The correlation analysis also indicates a positive relationship between intention and behavior ($r=.354$, $p<0.01$). The results therefore proved that the correlation analysis shows linearity between the independent variables and the dependent variables; thereby meeting the assumption for regression analysis as proposed by Tonidandel and LeBreton (2011). The independent variables (attitude, subjective norm, perceived behavior control, and intention (also a mediator)) as well as some

demographic variables employed in the study were tested for correlation to find out if they had any significant relationship with the dependent variable (behavior).

At this stage of the analysis, it is established that there is a positive relationship between the independent variables and the dependent variables. Even though this correlation analysis serves as an important preliminary condition for conducting regression analysis, the results also showed that, the dependent variable is significantly associated with some independent variables (example: attitude, subjective norm and perceived behavior control) with the control variables such as age, education, marital status, position in the family and family size. Therefore, there was the need to include these variables in this study in the proceeding analysis to serve as control variables.

4.4.1 Analysis of Structural Equation Modelling (SEM)

The two-step Structural Equation Modeling (SEM) approach was adopted for this study: a measurement model and a structural model as suggested by researchers (Cheng, 2019; Schreiber et al., 2006). These multiple-indicator models were estimated by the maximum likelihood method using Amos version 21 software package. The variables employed in this study include attitude towards segregation, perceived behavior control in segregation, subjective norm in segregation as independent variables. While intention to segregate waste acted as mediating variable, behavior (actual segregation of waste) as dependent variable.

4.5 Exploratory Factor Analysis

Factor Analysis (exploratory & confirmatory) is used to examine the entire set of interdependent associations by not distinguishing variables (dependent & independent) in the study. Exploratory Factor Analysis (EFA), largely known as Principal Component Analysis, was performed on the

data to extract the underlying factors and also to retain items that have high correlations with the variables for SEM analysis.

Table 4. 7: Summary of Results Showing Factor Analysis of the Study Variables

Variables	CVE (%)	KMO	Bartlett's test (P-Value)
Attitude to Segregation	55.986	0.821	0.000
Subjective Norm	61.711	0.805	0.000
Perceived behavior Control	58.122	0.780	0.000
Intention to Segregation	69.043	0.525	0.000
Segregation Behavior	55.358	0.781	0.000

Source: Fieldwork, 2020, Note: Acceptable thresholds: CVE = Cumulative Variance Explained, > 50%; KMO = Kaiser-Meyer-Olkin, minimum value > 0.6; Bartlett's test of Sphericity (p-value < 0.05).

In order to gather information about the relationship between constructs to reduce redundancy, the Kaiser-Meyer-Olkin (KMO) Sampling Adequacy test, Cumulative Variance Explained (CVE) and Bartlett's test of Sphericity (p-value) were used. The conventional thresholds for KMO value should be greater than five (> 0.5), CVE should also be greater than fifty percent ($> 50\%$) and Bartlett's test value should be significant at 5% confidence level. The table 4.7 shows the results KMO, CVE and the p values of Bartlett's test, that the data or the sample is sufficient or adequate for factor analysis.

4.4.2 Model Validity Analysis

To determine the construct validity of the instrument, an EFA was conducted to ascertain the factors involved in the data. In identifying the factors to be extracted from the model, the cumulative variance explained in percentage and the factor loadings of individual constructs were considered. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett test of

Sphericity are tested to determine the suitability of using factor analysis. All the items are also significant at 1% (0.01) level. The results, therefore, show that the scale has a good convergent validity (See values at table 4.10).

Apart from convergent validity, the study also showed a good discriminant or divergent validity. Discriminant validity, according to Kenny (2016) differentiates one construct from another in their mode. It ensures that the same reason cannot account for the variance among different variables. There is, therefore, poor discriminant validity, if correlations values of 0.85 or more exist between the independent variables. Table 4.10 below shows the correlation coefficients of the independent variables and suggests that no discriminant validity issues, as all values are within the threshold of Kenny's (2016) recommendation. Furthermore, the Average Variance Explained (AVE) was also to test for discriminant validity. The variance captured by a construct compared to the level of variation due to measurement error is measured by AVE. A threshold of greater than 0.70 (> 0.70) is considered very well. However, the AVE level of 0.50 and above is acceptable (Hair et al., 2010). The AVE values of this study ranged from 0.55 to 0.67 (see Table 4.10), showing some acceptable level as indicated by Hair et al. (2010). It is also noted that AVE values are to assess discriminant validity by simply comparing the square root of the AVE with the squared correlation between the construct items. Discriminant validity exists when the square root of AVE is greater than the squared construct correlations (Hair et al., 2010; Fornell & Larcker, 1981).

As shown in the Table 4.8, all the constructs in this study has demonstrated good discriminant validity that had one of its squared construct greater than the square root of its AVE. This indicates a bit of concern but all other forms of discriminant validity tests have proven that employee performance as a construct is discriminately valid.

Table 4. 8: Fornell-Lacker Procedure for Discriminant Validity Analysis

Variables	1	2	3	4	5
Attitude	0.78				
Subjective Norm	0.49	0.72			
Perceived Behavior Control	0.60	0.39	0.70		
Intention	0.61	0.65	0.51	0.79	
Behavior	0.74	0.33	0.44	0.49	0.71

Source: Fieldwork (2020); NB: bolded elements are the squared root of AVE and other elements represent the squared correlation estimation between construct items.

4.4.3 Model Reliability Analysis

In order to measure internal consistency reliability of the scale items, Cronbach's Alpha (α) and composite reliability (CR) were computed. The results of the reliability of the scale used in this study are displayed on Table 4.9. The values ranged from 0.71 to 0.92. Hence, the values or scales used in the current study are reliable, since all the Cronbach's Alpha values are above 0.70 based on Nunnally's (1970) threshold except for one construct which is acceptable according to Hales' (1986) threshold. Likewise, the constructs had composite reliability values ranging from 0.66 to 0.79. This result shows that all the constructs have also demonstrated sufficient reliability based on the composite reliability (CR) results. The Average Variance Explain (AVE) which measures the level of variance captured by one construct versus the level explained due to measurement error, was also used to ascertain that data (Ahmad, Zulkurnain & Khairushalimi, 2016). The constructs have AVE values ranging from 0.55 to 0.67. Values, greater than the threshold of 0.50 indicate that, large portion of the variance is explained by each respective constructs. The result shows that all constructs met the criteria (Hales, 1986), have demonstrated enough reliability. The loading of each item is also displayed indicating that the loadings were significant.

Table 4. 9: Validity and Reliability Analyses for PCA

S/N	Variables	Loadings	t-value
Attitude towards Waste Separation, $\alpha = .82$, C.R= 70, AVE=.55			
A3	For me, waste separation at home is useful	.682***	11.917
A5	I am interested to separate my household waste at home	.794	
Subjective Norm to Waste Separation, $\alpha = .78$, C.R= .79, AVE=.67			
SBN1	Most of my friends think that waste separation is a good thing to do	.626	
SBN2	My family thinks that I separate my household waste	.746***	10.832
SBN3	My colleagues would think that I should be involved in waste separation at home	.682***	11.240
SBN4	I am satisfied to participate in waste separation	.764***	11.265
Perceived behavioral Control, $\alpha = .71$, C.R=.66 , AVE= 57			
PBC1	Waste separation at home is easy	.737***	9.646
PBC2	I know how to separate my waste home	.618***	8.692
PBC4	I have time separate my household waste	.897***	10.210
PBC5	There many opportunities for me separate household waste	.584	
Intention to Separate Waste, $\alpha = .92$, C.R=.75 , AVE=.61			
INT1	I estimate that I will separate my household waste as much as possible in the near future	.785***	14.455
INT3	I truly intend to separate my household waste at home as much as possible in the future	.858	
Behavior toward waste Separation, $\alpha = .88$, C.R=.72 , AVE=.56			
B3	I have rarely separate my household waste at home.	.459	
B4	I set a possible environmental example (separation)	.745***	7.841

Source: Field Data (2020)

4.5 Structural Model Analysis

4.5.1 Validation Test of the Baseline Structural Models

The overall fitness of the structural model is validated using various fit indices (see Table 4.10).

Table 4.10 shows the various fit indices, their conventional criteria and the results of both the direct and mediation models. The CMIN/df or (χ^2/df), RMSEA and the Incremental fit measures of both models are shown in the table. From the table, all the fit indices have shown sufficient fit based on each of the fit indices and their related benchmarks recommended by Hu and Bentler (1999), Hair et al., (2010) and Etezadi-Amoli and Farhoomand (1996). For example, CMIN/df (χ^2/df) of the study's models, 2.210 and 1.635 for the direct and mediation baseline structural model respectively, which are less than the threshold of 3 recommended by Hu and Bentler (1999) for a good fit.

Table 4. 10: Goodness-of-Fit Indices for Structural Model

Measurement	Direct Model	Mediated Model	Threshold	Interpretation
CMIN		96.356	---	---
DF	45*	50	---	---
CMIN/DF	1.635*	1.927	Between 1 and 3	Excellent
C.F.I	.962	0.951	> 0.95	Acceptable
G.F.I	.974	0.966	> 0.95	Acceptable
RMSEA	.045	0.012	< 0.06	Acceptable
PClose	.004	0.002	>0.05	Excellent
SRMR	.07	0.047	<0.08	Excellent
TLI	.927	0.919	>0.95	Acceptable
IFI	.945	0.952	>0.95	Excellent

Threshold sources: Hu and Bentler (1999), and Gaskin and Lim (2016)

Also, the study models have RMSEA of 0.063 and 0.046 for the direct and mediation baseline which are within the acceptable threshold. The CFI of the structural models of 0.982 (direct) and 0.990 (mediation) are excellent as recommended by Hu and Bentler (1999) and Hair et al. (2010).

Likewise, the GFI of 0.989 for the direct baseline model and 0.999 for the meditation baseline model are excellent and consistent with Hair et al. (2010) and Etezadi-Amoli and Farhoomand's (1996) recommendation of $GFI \geq 0.90$.

4.6 Direct Model Analysis

The following presents the estimated structural models as developed based on theory and empirical evidence. The Figure 4.3 shows the direct path analysis with the role of the mediator constrained to zero and Figure 4.4 shows the mediation model. Visual examination of the baseline structural models (direct path and mediation path) shows positive relationships between the independent variables and the dependent variables. The assessments of the acceptability of the study model using a number of model fit indices are presented next.

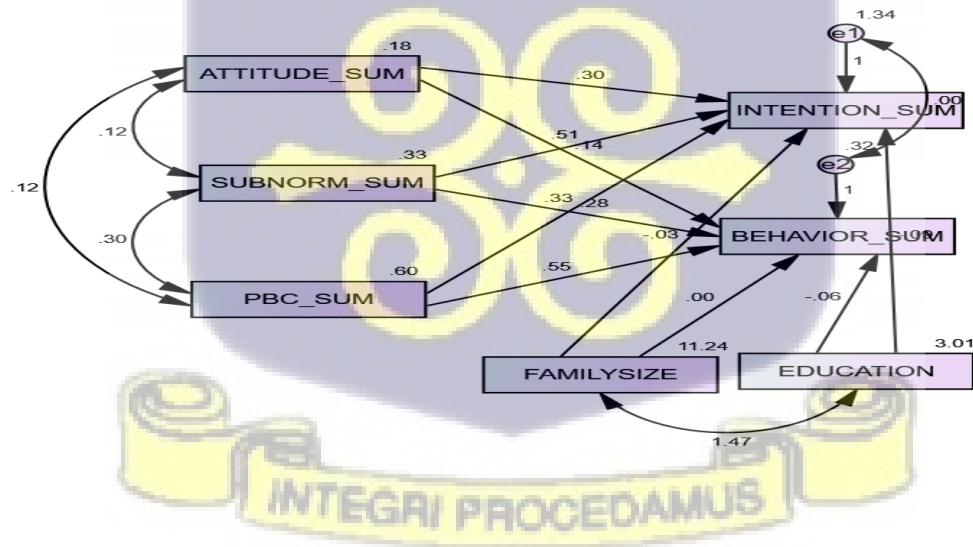


Figure 4. 3: Direct Model; Source: Output from Amos graphic (Field Data, 2020)

The diagram above shows a pictorial representation of the relationships that exist in the study as stated in the objectives. Attitude, subjective norm and perceived behavior control were independent variables while behavior was the dependent variable. Intention was the mediating variable while family size and education of respondents were used as control variables.

The direct model represents the relationship between the independent variables and the mediator as well as the dependent variables. Family size and education of respondents were used as control variables. The finding briefly revealed that subjective norm, perceived behavioral control and educational level of respondents significantly predicted both behavior and intention to segregate waste. However, attitude and family size of the respondents did not significantly predict behavior. Details of the findings are discussed below.

Table 4. 11: Direct Model

Hypothesis	Direct Path Relationship	Estimates	Decision
H1	Attitude --→ Intention	.097	Not supported
H2	Attitude --→ Behavior	.073	Not supported
H3	Subjective Norm --→ Intention	.224**	Supported
H4	Subjective Norm --→ Behavior	.195**	Supported
H5	Perceived behavior Control --→ Intention	.195**	Supported
H6	Perceived behavior Control --→ Behavior	.522**	Supported
	Education --→ Intention	-.124*	
	Education --→ Behavior	-.130*	
	Family Size --→ Intention	-.076	
	Family Size --→ Behavior	-.001	

Source: Field Data (2020)

4.6.1 Objective One: Attitude, Intention and Behavior

The first objective sought to examine whether attitude influences behavioral intention and behavior of households waste segregation in Wa Municipal. Two hypotheses were set achieve this objective. Hypothesis 1: *there would be a significant influence of attitude on waste segregation intention.* Hypothesis 2: *attitude would significantly predicts waste segregation behavior.* From Table 4.11, the analysis indicated that the overall effect of attitude towards segregation on intention to segregate is not significant ($\beta = 0.097, P > 0.05$) and the effect of attitude towards segregation on behavior (actual segregation) ($\beta = 0.073, P > 0.05$) is not also significant. Therefore the both hypotheses were not supported by the data. This means that even though attitude towards segregation is positive, it is not significant enough to cause any change in intention and behavior regarding household waste segregation.

4.6.2 Objective Two: Subjective Norm, Intention and Behavior

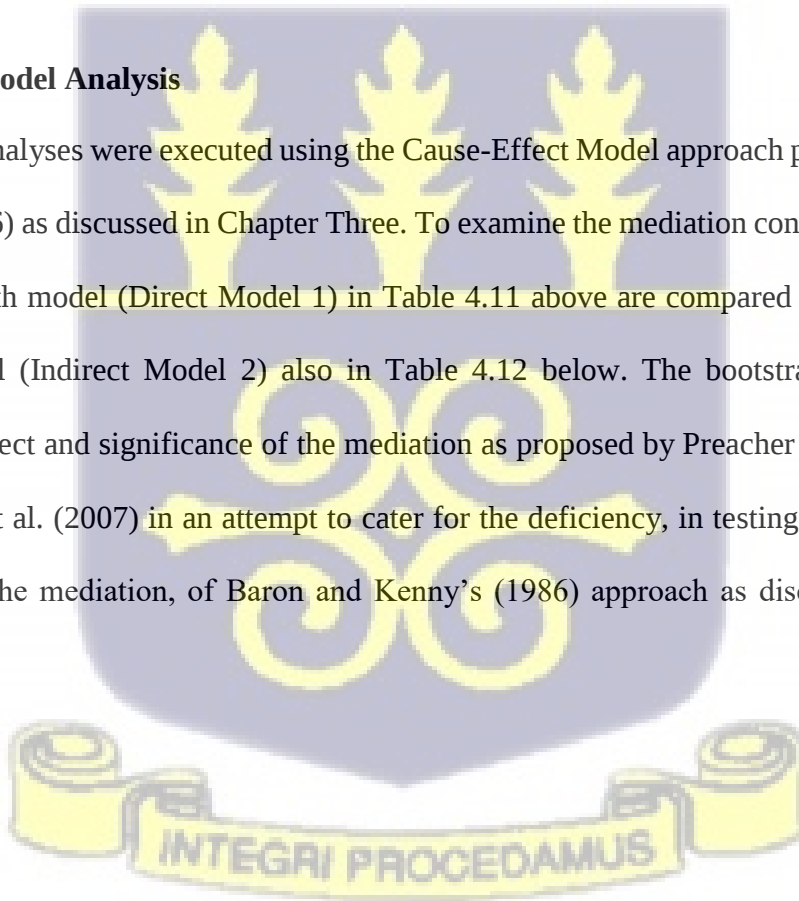
The second objective sought to find out the influence of subjective norm in waste segregation on behavioral intention and actual behavior of household waste segregation. Two hypotheses were set to measure this objective. Hypothesis 1: *there would be significant influence of subjective norm on waste segregation intention.* Hypothesis 2: *subjective norm would significantly predict waste segregation behavior.* From Table 4. 11, the finding revealed that subjective norm in waste segregation significantly predicts behavioral intention ($\beta = 0.22, P < 0.01$). Also, subjective norm significantly predicted behavior towards household waste segregation ($\beta = 0.20, P < 0.01$). Therefore, the both hypotheses were supported by the data. This means that subjective norm in household waste segregation is a good predictor of intention to segregate waste and the actual behavior of waste segregation.

4.6.3 Objective Three: Perceived Behavior Control, Intention and Behavior

The third objective also sought to examine the effect of perceived behavioral control on intention to segregate and waste segregation behavior. This objective was measured by developing two hypothesis: Hypothesis 1: *there would be significant influence of perceived behavioral control on intention*. Hypothesis 2: *perceived behavioral control significantly predicts waste segregation behavior*. The findings (Table 4.11) showed that perceived behavioral control has a significant positive effect on intention to segregate ($\beta = 0.20, P < 0.01$) and actual behavior segregation behavior ($\beta = 0.52, P < 0.01$). Therefore perceived behavioral control significantly predicts both intention and behavior regarding household waste segregation.

4.7 Mediated Model Analysis

The mediation analyses were executed using the Cause-Effect Model approach proposed by Baron and Kenny (1986) as discussed in Chapter Three. To examine the mediation conditions, the results for the direct path model (Direct Model 1) in Table 4.11 above are compared with those for the mediation model (Indirect Model 2) also in Table 4.12 below. The bootstrapping method of analysing the effect and significance of the mediation as proposed by Preacher and Hayes (2008) and Mckinnon et al. (2007) in an attempt to cater for the deficiency, in testing for the effect and significance of the mediation, of Baron and Kenny's (1986) approach as discussed in Chapter Three this study.



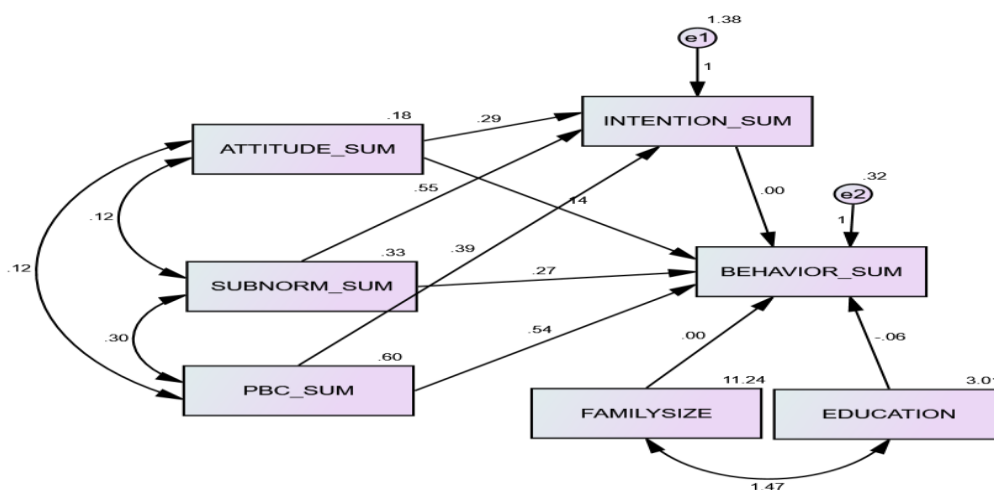


Figure 4. 4: Mediated Model

Source: Output from Amos Graphics (Field Data, 2020)

The figure above demonstrates the mediation role of intention in the relationship the independent variables (attitude, subjective norm, perceived behavior control) and the dependent variable (behavior).

Table 4. 12: Mediated Model

Hypothesis	Mediated	Intention (Mediator)	Behavior (Dependent)
MH1	Attitude	.094	.073
MH2	Subjective Norm	.236**	.194**
MH3	Perceived behavior Control	.223**	.521**
MH4	Intention		.006

Source: Adopted and modified from Field Data (2020)

The mediated model above explains the mediated relationships between the variables. After the introduction of the mediator (intention), subjective norm and perceived behavior control were still significant while attitude was not significant.

4.7.1 Objective Four Mediation Analysis

The fourth objective sought to examine mediational role of intention to segregate waste on the relationships between attitude, subjective norm and perceived behavioral control, and behavior regarding household waste segregation. To measure this objective, three hypotheses were developed. The results are presented based on the hypotheses:

MH1: *Intention to segregate mediates the relationship between attitude in waste segregation and behavior regarding waste segregation.*

The Tables 4.11 and 4.12 show the SEM results of the mediation role of intention on the effect of attitude towards household waste segregation on waste segregation behavior. Consistent with Baron and Kenney's (1986) three-step procedure for mediation analysis, attitude is regressed on intention, intention was regressed on behavior, and attitude was regressed on behavior. The results show that attitude insignificantly predicts behavior ($\beta=0.10, P>0.05$). Intention also insignificantly predicts behavior ($\beta=0.01, P > 0.05$). Both attitude and intention also insignificantly predict behavior ($\beta = 0.161, P > 0.05$). The results therefore show that, intention does not mediate the relationship between attitude and behavior regarding segregation based on Baron and Kenney (1986)'s conditions for mediation analysis. The results, of the bootstrapping also indicate that, the effect of the mediating role of intention in the relationship between attitude and behavior was positive but not significant.

MH2: *Intention to segregate mediates the relationship between subjective norm and behavior towards household waste segregation.*

The tables 4.11 and 4.12 show the results of the mediation role of intention on the effect of subjective norm on behavior regarding household waste segregation. Consistent with Baron and Kenney (1986)'s three-step procedure for mediation analysis, behavior is regressed on subjective norm and intention is regressed on subjective norm, and waste segregation behavior is regressed on both subjective norm and intention. The results show that subjective norm significantly predicts waste segregation behavior ($\beta=0.20$, $P<0.01$). Subjective norm also significantly predicts intention ($\beta=0.22$, $P<0.05$). Both subjective norm and intention also significantly predict waste segregation behavior. The results therefore show that, intention fully mediates the relationship between subjective norm and waste segregation behavior based on Baron and Kenney's (1986) conditions for mediation analysis. Again, bootstrapping was performed on this line of relationship to check whether the effect of the full mediation found, using Baron and Kenny's (1986), was significant or not. The results from table 4.9, show that, the full mediation of intention in the relationship between subjective norm and waste segregation behavior ($\beta= 0.114$, $P < 0.05$) was positive and significant.

MH3: *Intention to segregate mediates the relationship between perceived behavior control and actual behavior in house waste segregation.*

The Tables 4.11 and 4.12 show the SEM results of the mediation role of intention on the effect of perceived behavior control on segregation behavior among households of Wa Municipality. Consistent with Baron and Kenney's (1986) three-step procedure for mediation analysis, intention is regressed on perceived behavior control, behavior is regressed on perceived behavior control,

and intention is regressed on perceived behavior control. The results show that perceived behavior control and intention relationship was significant ($\beta = 0.20, P < 0.01$). Perceived behavior control and waste segregation behavior was significant ($\beta = 0.52, P < 0.01$), but intention on behavior ($\beta = 0.01, P < 0.01$) was not significant. Both perceived behavior control and intention are also significant with waste segregation behavior. The results therefore show that intention fully mediates the relationship between perceived behavior control and waste segregation behavior based on Baron and Kenney (1986)'s conditions for mediation analysis. To further check the effect and significance of this mediation analysis, the bootstrapping method was employed as proposed by Preacher and Hayes (2004) which confirmed that the relationship was positive and significant.

4.8 Final Conceptual Framework

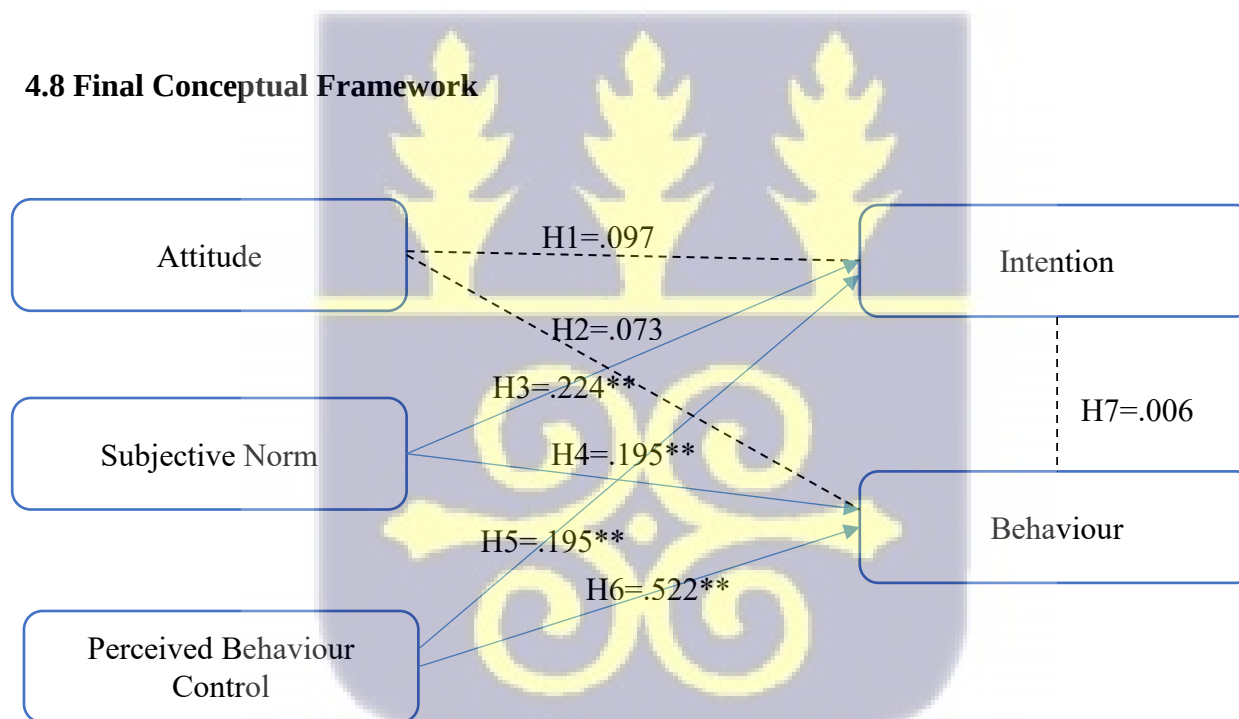


Figure 4. 5: Final *conceptual Framework*; Note: dotted line indicate not significant

The final conceptual framework after data analysis is displayed below (Figure 4.5). After the analysis, it is revealed that attitude to waste segregation did not predict intention to segregate neither did it predict waste segregation behaviour. Therefore making attitude redundant in this

study. Subjective norm and perceived behaviour control predicted both intention to segregate waste as well as actual waste segregation behaviour. It is also not intention alone did not predict waste segregation behaviour.



CHAPTER FIVE

DISCUSSIONS, SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.0 Chapter Overview

This chapter presents the discussion of findings, summary of the research findings, its conclusions, and recommendations as well as implications. It also discusses the study's contributions to theory and management as well as practice. The limitations of the study and recommendations for further research are also discussed. The purpose of this study was to examine aspects of the theory of planned behavior and its relationship with household waste segregation in the Wa Municipality.

5.1 Discussion of Findings

5.1.1 Attitude, Intention and Waste Segregation Behavior

The findings revealed that attitude to household waste segregation did not significantly predict waste segregation behavior as well as intention to segregate household waste. This implies that waste segregation attitude of a particular household does not translate into their intention to segregate waste. Also, attitude to household waste segregation has no direct impact on waste segregation behavior. This seems to suggest that attitude may not affect behavior because waste disposal in most households is compulsory due to its nuisance to their environment (Pakpour et al., 2014). This view is also consistent with the findings of Ajzen et al. (2011) that waste disposal attitude is based on beliefs about the likely costs and benefits of the behavior that have been weighted with the extent to which these costs and benefits are considered important. The finding revealed that good intentions to segregate and a positive behavior towards waste segregation is dependent on other factors such as economic values of waste to households (Wang et al., 2018),

demands from national regulatory bodies like Environmental Protection Agency (EPA) and other international stakeholders on environmental issues (Owusu-Sekyere et al., 2019).

The findings further support the view of Oduro-Appiah and Aggrey (2013) who cautioned that practical success on source separation that could possibly be adopted nationwide, stakeholders should aim at providing the required resources and motivation to help pilot and sustain the practice. Oduro-Appiah and Aggrey (2013, p 51) identified that “implementers to ascertain the progress and real challenges of the process since in many survey processes, what people claim they will do, and what they actually do when reality dawns are not the same”. The current findings also confirm Oduro-Kwarteng et al.’s (2016) study that the high willingness to separate waste and separation efficiency are indication for potential source separation. They cautioned that the establishment of an effective source separation programme with continuous education on source separation methodologies can significantly enhance the recycling potential of recyclables in the waste stream.

The study noted that attitude alone may not enhance waste separation. This understanding do not differ from the ideas of Stoeva and Alrikson (2017) that a lack of proper conditions for waste separation can prevent individuals from participating in the process, regardless of their positive attitudes. Nguyen and Watanabe (2019) reiterate that waste separation behavior in livestock group exhibits more positive attitudes toward waste separation than those of the non-livestock group. This suggests that attitude may be influenced by other factors before it can enhance waste segregation behavior. This claim supports the findings of Conke (2018) that poor attitude towards knowledge about practical and operational aspects of programs, an unequal sharing of the costs and benefits of recycling, a deficient infrastructure and a shortfall of professional management are the factors that affect household recycling source-separation.

Again, the finding concurred with Shen et al.'s (2019) findings revealed that, contrary to popular expectations, attitude and environmental concern do not significantly contribute to young people's intention toward MSWS. Owusu-Sekyere et al. (2019) concluded that in order to pursue a more sustainable MSWM, local government policies may have to be rebalanced towards assigning appropriate priorities and support to waste prevention activities. Furthermore, Stoeva and Alriksson's (2017) study showed that a lack of proper conditions for waste separation can prevent individuals from participating in this process, regardless of their positive attitudes. Ma et al. (2018) revealed that individuals' attitude and situational factors are major predictors of their behavioral intention whereas Pakpour et al. (2014) claimed that attitude of community members significantly predicted household waste behaviors in Iran.

The finding that attitude does not significantly predict household level segregation level was therefore contrary to that of Apinhapath (2014) who found that community people's attitudes regarding separate disposal of recyclable materials was significantly high. This contrary findings could emanate from the demographic characteristics of the respondents such as setting, population, culture, age bracket and region. This claim is buttressed by Alhassan et al. (2018) who found that educational attainment of head of household, total income of household, occupation type of household head, information, past experience with source separation, inconvenience in terms of time, space and availability of formal source separation scheme, attitude and the location of the respondents significantly predicted households' solid waste separation intentions and behavior. Again, other factors such as fees to be paid, legal obligations, prompt or information campaigns could also play roles in predicting waste segregation behavior (Stoeva & Alrikson, 2017). Moreover, Shen et al. (2019) noted that attitude and environmental concern do not significantly contribute to young people's intention toward municipal solid waste segregation.

5.1.2 Subjective Norm, Intention and Waste Segregation Behavior

The findings revealed that subjective norm in household waste segregation significantly improves intention to segregate and actual behavior in household waste segregation. This findings emphasized that subjective norms are based on beliefs about the expectations of relevant reference group concerning the behavior, weighted by one's motivation to comply with these expectations (Zhang et al., 2015). The findings underscore that subjective norm is the person's perception of social pressure regarding the behavior. According to Stoeva and Alrikson (2017), subjective norms are made up of normative beliefs and motivation to comply. Normative beliefs are our beliefs about what the people who are important to us expect from us concerning the object behavior and the motivation to comply refer to our willingness to comply with these norms.

This findings emphasized that social cost and benefits of behavior (Zhang et al., 2015). This study's findings confirm the view that the best place to start making a difference is right in the home waste segregation is managed. The findings imply that there is the need to separate, reduce, reuse, and recycle to decrease household waste, since household waste has a great contribution to municipal solid waste (Oduro-Kwarteng, 2011). According to EPA (2020) report, about 65 to 70 percent of Ghana's municipal solid waste comes from the household level. This study's findings underscores the fact that subjective norm is paramount in enhancing household waste segregation.

The findings identify with Oduro-Appiah and Aggrey (2013) that Ghanaian citizens are willing to participate and have reasonably proved they have the ability to source separate waste in the country. The successful attainment of future source separation system would require the provision of free or subsidized bins to householders. The findings support Oduro-Appiah and Aggrey's (2013) cautioned that practical success on source separation that could possibly be adopted

nationwide, stakeholders should aim at providing the required resources and motivation to help pilot and sustain the practice. This will enable implementers to ascertain the progress and real challenges of the process since in many survey processes, what people claim they will do, and what they actually do when reality dawns are not the same.

The findings of this study support previous studies (Stoeva & Alrikson, 2017; Nguyen & Watanabe, 2019; Xu et al., 2018) which also found a positive relationship subjective norm, intention to segregate and actual segregation behavior. Also, the finding concurred with Nguyen and Watanabe (2019) findings that sustainable consumption using socio-economic analysis of household waste segregation outcomes vary with a limited set of socio-economic factors including housing estates managed by a private property management company and populated by better off households collected more recyclables from their residents. Moreover, the findings are consistent with Xu et al. (2018) view that 188 residents in three communities of Hangzhou, Zhejiang Province were encouraged to participate in waste separation activities through subjective norms such as the economic rewards given on their performance, or door-stepping campaigns aimed at constructing a supportive social environment.

The study confirms the notion of Pakpour et al. (2014) that subjective norms and past behavior of community members significantly predicted household waste behaviors in Iran. Furthermore, Fornara et al. (2011) distinguished the sources of normative influence on pro-environmental behaviors in household waste management. In particular, descriptive norms (both subjective and local) emerged as powerful predictors of the target pro-environmental behavior. Alhassan et al. (2018) found that educational attainment of head of household, total income of household, occupation type of household head, information, past experience with source separation,

inconvenience in terms of time, space and availability of formal source separation scheme, subjective norm and the location of the respondents significantly predicted households' solid waste separation intentions. Moreover, Shen et al. (2019) revealed that personal moral obligation and subjective norms are the most critical factors influencing young people's intention toward municipal solid waste sorting.

Ghanaian culture is often characterized as collectivist, meaning that individuals tend to prioritize the needs and goals of the group over their individual desires. In a collectivist culture, there is a strong emphasis on social norms, interpersonal relationships, and the opinions of others (Oteng-Ababio et al., 2013). This cultural orientation can influence individual behavior and decision-making processes. Subjective norm refers to the perceived social pressure or influence that individuals perceive from important others, such as family, friends, or community members, regarding a particular behavior or belief. The subjective norm construct is commonly used in social psychology to understand the impact of social influence on individual behavior. Given the collectivist nature of Ghanaian culture, it is plausible to expect that subjective norm would be significant in influencing individual behavior. Ghanaians may be more likely to consider the opinions and expectations of others when making decisions, as social cohesion and harmony are valued in collectivist cultures (Oteng-Ababio et al., 2013). Consequently, if individuals perceive that their behavior aligns with the expectations of their social network, they may be more inclined to conform to those norms. It is important to note, however, that individual differences and other factors can also influence the significance of subjective norm. While collectivist cultural values may contribute to the importance of subjective norm in Ghanaian society, it is crucial to consider other contextual factors and individual variations that could also shape this relationship.

On the contrary, the finding that subjective norm significantly improves intention to segregate and actual behavior in household waste segregation is not in line with other scholars in the environmental sanitation literature. For instance, the finding is in contrast with that of Nainggolan et al. (2019) who underscored that household preferences for home waste sorting and handling are not homogeneous. Alluding to the fact that households express different appreciations towards different aspects of home waste sorting systems. Agovino et al. (2019) also noticed that European Regional Development Fund (ERDF) regulations in both programming periods had no relevant impact on the achievement of cohesion policy goals for separate collection at the regional level. This made a case for the relevance of cultural policy measures fostering environmentally responsible subjective norms as a possible pre-condition for effective implementation of ERDF-funded separate collection projects in waste segregation.

5.1.3 Perceived Behavior Control, Intention and Waste Segregation Behavior

The findings revealed that perceived behavioral control in household waste segregation significantly improves intention to segregate and actual behavior in household waste segregation. The findings imply that perceived possibility to perform the behavior, depends on the beliefs about the presence of factors that may facilitate or hinder the relevant behavior (Stoeva & Alriksson, 2017). The findings confirm the view that perceived behavioral control is the person's expectancy that performance of the behavior is within their control and confident that they can perform the behavior (Pakpour et al., 2014). Intention is influenced by a person's attitude towards the object behavior, the subjective norms and the perceived behavioral control (Bernstad, 2014). The study is consistent that economic growth results in environmental degradation as it influences lifestyle

practices and leads to increased consumption of goods thus generating the large volume of municipal solid waste (Boadi & Kuitunen, 2014).

The findings of this study support the idea that educational attainment of head of household, total income of household, occupation type of household head, information, past experience with source separation, inconvenience in terms of time, space and availability of formal source separation scheme, perceived behavior control and the location of the respondents significantly predicted households' solid waste separation intentions. For instance, again, the study support the view of Meng et al. (2019) that that residents' behavioral waste selection has been significantly related to four intrinsic perceived factors such as publicity and education, accessibility to recycling facilities, accessibility to classification facilities, willingness to participation of classification and residents' environmental awareness. Also, this study is consistent with Ma et al.'s (2018) revelation that individuals' perceived behavioral control and intention play an important role in predicting source separated collection behavior.

Consistent with other researchers (Wang et al., 2016; Pakpour et al., 2014; Fan et al., 2019). For instance, Wang et al. (2016) showed that "residents' separate collection intentions are positively influenced by the behaviors of others, facility conditions and moral obligations in China. Pakpour et al. (2014) found that perceived behavior control, moral obligation and self-identity of community members significantly predicted household waste behaviors in Iran. Fan et al. (2019) found that general and specific environmental motivations substantially influenced behavioral intention to sort out solid waste. Moreover, the direct influence and moderating effect of contextual factors on waste sorting behavior are significant. Therefore, habitual factors also have a significant effect on waste separation behavior. Fornara et al. (2011) further revealed that target pro-

environmental behavior regarding waste management are influenced, both directly and indirectly through perceived behavioral control. Apinhapath (2014) indicated that community people's intentions and perceived behavioral control in regard to separate disposal of segregation and recyclable materials were high.

Contrary to this study's finding, Fan et al. (2019) findings indicated that general and specific environmental motivations substantially influenced behavioral intention than perceived behavior control. Moreover, the direct influence and moderating effect of contextual factors play a significant role on waste sorting behavior. More so, habitual factors also have a significant effect on behavior. Furthermore, Wijekoon and Attanayake (2012) noted contrary to this study's finding that good moral values and situational factors such as storage convenience and collection times as well as encouraged public's involvement and consequently, the participations rate are significant factors in enhancing waste segregation behaviors. Boadi and Kuitunen (2014) noted that solid waste management in the city of Accra, is unsatisfactory and thereby needs immediate address. Access to solid waste facilities remains limited in low income areas, and private sector involvement in service delivery is also constrained by many obstacles (Boadi & Kuitunen, 2014).

5.1.4 Mediation Role of Intention to Segregate Waste

Intention to segregate does not mediate the relationship between attitude towards waste segregation and waste segregation behavior. The finding seems to suggest that other factors beyond intention to segregate waste may contribute to the relationship between attitude towards waste segregation and behavior to segregate. This findings confirms the idea that households express different appreciations towards different aspects of home waste sorting systems (Nainggolan, et al., 2019). The findings support Wang et al.'s (2016) notion that residents'

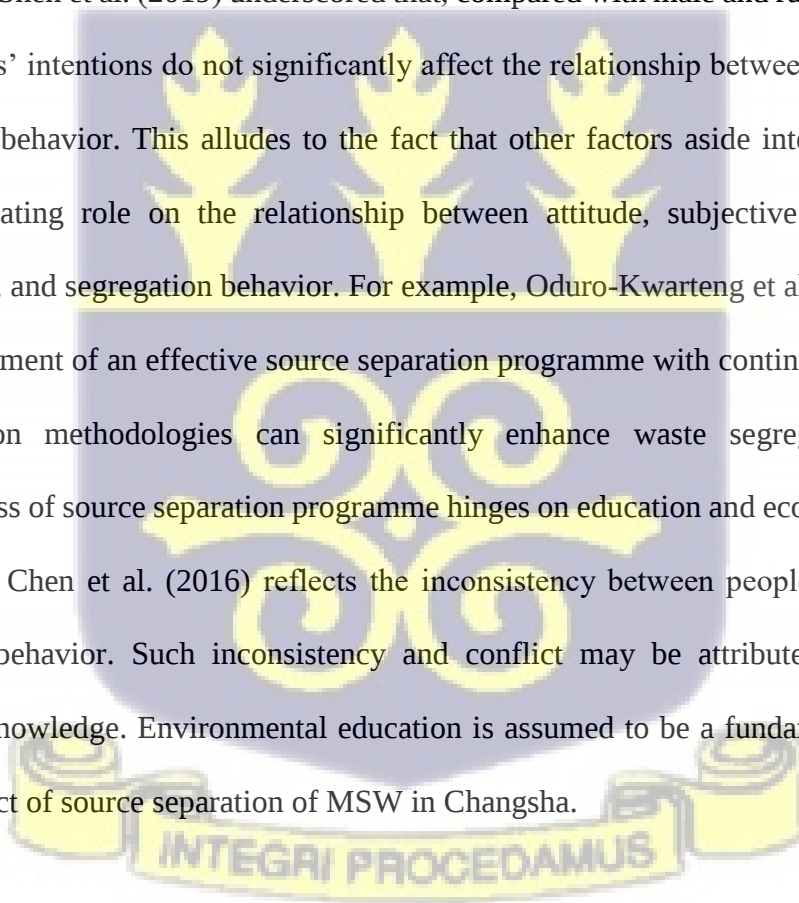
willingness to pay for separate collection by other organizations is negatively influenced by the separate collection behaviors of others and age but positively influenced by perceptions of results, facility conditions, moral obligations and government policies. Furthermore, attitudes such as good moral values and situational factors such as storage convenience and collection times are all necessary in influencing public's involvement and consequently, the participations rate (Ghani et al., 2013). The findings confirms the results of Stoeva and Alriksson (2017) that showed a lack of proper conditions for waste separation which can prevent individuals from participating in this process, regardless of their positive attitudes. However, the findings are contrary to Apinhapath, (2014) that community people's intentions, attitudes, in regard to separate disposal of recyclable materials were high. This difference may be explain by other contextual factors that might make the Ghanaian context differ in terms of findings.

Intention to segregate waste fully mediates the relationship between subjective norm and waste segregation behavior. The full mediation of intention in the relationship between subjective norm and waste segregation behavior was positive and significant. This finding suggest that intention in the TPB represent a person's motivation or conscious plan or decision to exert effort to perform the behavior (Pakpour et al., 2014). This idea supports Xu et al.'s (2017) view that intention to separate do not only significantly predict household waste separation behavior with past behavior being the most significant construct to predict individuals' intention and behavior, but acts as a catalyst in enhancing the relationship between subjective norm and segregation behavior.

Intention fully mediates the relationship between perceived behavior control and waste segregation behavior. The results show that, the full mediation of intention on perceived behavior control and waste segregation behavior was positive and significant. This finding seems to support the view

that household preferences for home waste sorting and handling are not homogeneous (Nainggolan et al., 2019). Households express different perceived behavior controls towards different aspects of home waste sorting systems (Nainggolan et al., 2019). Moreover, intention significantly enhances the relationship between action planning of community members and household waste behaviors (Pakpour et al., 2014). The also concurs with Leonardo and Conke's (2018) findings that the lack of knowledge about practical and operational aspects of programmes, an unequal sharing of the costs and benefits of recycling, a deficient infrastructure and a shortfall of professional management significantly impact waste segregation behavior.

On the contrary, Shen et al. (2019) underscored that, compared with male and rural groups, female and urban groups' intentions do not significantly affect the relationship between subjective norm and segregation behavior. This alludes to the fact that other factors aside intention also play a significant mediating role on the relationship between attitude, subjective norm, perceived behavior control, and segregation behavior. For example, Oduro-Kwarteng et al. (2015) observed that the establishment of an effective source separation programme with continuous education on source separation methodologies can significantly enhance waste segregation behaviors. Therefore, success of source separation programme hinges on education and economic incentives. The outcome of Chen et al. (2016) reflects the inconsistency between people's environmental awareness and behavior. Such inconsistency and conflict may be attributed to the lack of environmental knowledge. Environmental education is assumed to be a fundamental solution to improve the effect of source separation of MSW in Changsha.



5.2 Summary of findings

The findings revealed that:

- i. Intention to segregate does not mediate the relationship between attitude towards waste segregation and waste segregation behavior.
- ii. Intention to segregate fully mediates the relationship between subjective norm and waste segregation behavior. The full mediation of intention in the relationship between subjective norm and waste segregation behavior was positive and significant.
- iii. Intention fully mediates the relationship between perceived behavior control and waste segregation behavior. The results show that, the full mediation of intention on perceived behavior control and waste segregation behavior was positive and significant.

5.3 Limitations of the Study

This study's findings and recommendations should be considered in the light of the following limitations of the study:

First, the study focused solely on selected communities in the Wa Municipal in the upper west region, Ghana. Therefore, it is important to note that, generalizing the current findings to cities in Ghana, other developing countries and beyond should be done with caution. Moreover, the study's findings may not also reflect the situation among cities in Ghana, since the study did not focus on all major cities in Ghana.

Second, the study uses subjective measures and self-rated scales of waste segregation based on the aspects of the theory of planned behavior such as attitude, subjective norm, perceived behavior control, intention and behavior. This might not reflect the true value of the situations in such other communities, especially since respondents were to self-rate their own waste segregation behavior.

Third, the study area was limited to only three communities within the Wa municipality in as defined by the Ghana health service demarcation. This could limit the generalization of the findings in terms of its application to all communities or cities in Ghana.

Fourth, the choice of a singular research approach, quantitative approach could also limit the study since using a mixed method could have been more appropriate and in-depth bringing out the underlining causal relationships involved in the study.

Fifth, this study was limited to only three independent variables (attitude, subjective norm, perceived behavior control), one mediator (intention) and one outcomes (behavior), among several other variables that could be studied. Therefore, waste management managers should be cautioned in terms of generalizing to other variables.

Sixth, another limitation of the study is the sampling techniques used, that is, the combination of stratified, purposive and convenience sampling techniques in a quantitative research method. Though the sampling method helped the researcher to obtain households and members who had engage about their waste management practices and segregation behavior, the selection of purpose and convenience (non-probability) sampling techniques was inconsistent with a probability sampling method which is an important consideration for the increased generalization power of any research results. However, the practical situation of difficulties in accessing respondents, made the research to use the non-probability sampling techniques.

Seventh, the study had some challenges such as access, financial and time constraints. For instance, gaining access to the selected households was indeed frustrating but not impossible especially the gated houses. These processes were bureaucratic in nature. In some households, the introductory letter was sent to their parent or landlord for approval before they could respond to the questions.

The researcher was challenged financially in making frequent personal visits to the selected households as she had not secured funding. The time frame for the whole research was one year, giving the researcher a lot of pressure in accessing primary data from respondents.

However, these challenges were overcome by using various means possible within the limits of the researcher to access information from the respondents. First, the researcher contacted her friends who stay around those areas with these selected households to assist with access and questionnaire administration. Second, family members of some of the selected households were contacted with persuasions to assist with distribution and retrieval of questionnaires. Referral notes were also helpful to gain access to these companies. This was done by taking personal notes or contacts from friends and family members who knew some of the members of these households to help administer and retrieve questionnaires. The use of these personal connections and professional networks significantly assisted the researcher to overcome the biggest data collection challenge of access.

5.4 Implications for Further Studies

Drawing from the above limitations, further studies are necessary to overcome some of these limitations of the current study. Specifically, further studies, should increase the number of communities and cities involved in the study in order to make more generalizations. Their selection for inclusion should be based on some probability sampling procedures such as simple random or systematic sampling in order to enhance its generalization power. Very importantly, a comparative study between metropolitans, municipals and districts cities could provide a very interesting context for contributions.

A comparative study among large, medium and small cities in terms of their waste management Practices will be a worthwhile study as it can produce very interesting results. Also, as intention to segregate played a mediating role in this study, further studies, may also moderate intention to segregate on the effect of aspects of the planned behavior theory on segregation behavior. This is because; improving intention to segregate may enhance or minimize the impact of factors that influence segregation behaviors. Such studies will help expand our understanding of the various roles that intention to segregate can play in waste management practices.

Also, future study could consider more other variables of waste management practices apart from waste segregation with the application of planned behavior theory. Equally, other waste management practices could be studied aside such as a waste recycling, turning waste into economic gains among others. Other outcomes of waste management practices such as waste recycling and others alike could be of interest for future studies. Future studies could also examine the mediating role of intention on the relationship between waste management practices and national outcomes such as clean cities.

5.5 Contributions of the Study

This study provided empirical results to further clarify waste segregation practices (attitude, subjective norm, perceived behavior control, intention) effect on waste segregation behavior at the household levels. The study also made a significant contribution to literature by adopting and validating attitude, subjective norm, perceived behavior control and intention to segregation questionnaires. These questionnaires can be employed by other researchers in future studies in Ghana and other developing countries.

Another stimulating contribution of this study was its particular focus on the context of households at the community level in Ghana, where empirical findings of waste management practices are generally very limited and sporadic to find. In addition, most other studies largely neglected the contribution of other third variables such as intention to segregate to mediate the relationship between aspects of the theory of planned behavior. This study has shown that households can also use their waste management practices to enhance positive outcomes through their intention to segregate which intend promote segregation behavior, making this a novel contribution.

Finally, the study has sought to empirically test the theory of planned behavior in the context of Ghanaian households so as to promote outcomes and also to test the model in other contexts. The model basically suggests that waste segregation practices should be linked with the intention of households' members. This will ensure that households comply with waste segregation practices as well as develop new disposing waste and suitable incentive packages that can be applied to advance the waste segregation behavior. By so doing, communities will benefit significantly through improved sanitation and sustainable clean environments. Clearly, the findings of this study provided empirical evidence that will contribute to the debate on the impact of waste segregation practices on household waste segregation behavior through intention to segregate by enhancing household members' understandings of the nature of its effect on environment particularly, in the Sub-Saharan region of Africa (Ghana).



5.6 Recommendations

The study recommendations are based on practice, policy and theory.

5.6.1 Recommendations for Practice

The study recommends that waste management companies in Ghana should be more strategic in adopting practices that are highly suitable for their specific and strategic needs or organisational goals. Being strategic to waste management practices will enable waste recycling companies to be in a better position to meet the ever increasing sophisticated business environment demands. These waste management practices will also impact on their business operations, sustainability and competitive advantage. Hence, waste management practices will be serving as an integral part in their daily operations, which will also create value for the business. Companies may engage in regular campaigns by creating in members of households the purpose and reason to segregate household waste. This will help managers to develop appropriate training and development, compensation and reward activities, to help meet these challenging demands waste management.

Second, this study finds that subjective norm improves household waste segregation behavior. For this reason, waste management companies especially those into segregation are encouraged to develop community members' subjective norm by promoting activities vital for waste management business operations. Developing waste management programmes by taking into consideration a balance between households' needs and business strategic goals should be of concern to companies. Various training strategies or activities such as waste recycling, sales of segregated waste, economic and social benefits of waste segregation and many other activities are necessary. Community members' development programmes such as formal education, temporary assignments and voluntary waste segregation projects and in-house development exercises are also important for waste management companies to consider. Community members should also be

given opportunities for both knowledge growth in environmental protection and personal development regarding as all these have as strong relationship with good waste segregation behavior. There is the need to educate opinion leaders, family heads and other significant people in society whose views are important to people.

Third, educating opinion leaders, family heads, and other influential individuals in society is crucial in shaping subjective norms related to waste management. In the theory of planned behavior, subjective norms refer to an individual's perception of social pressure to engage in a behavior. By educating these influential individuals about waste management practices, their endorsement and role modeling can positively influence the perceived expectations and social norms of others. They can serve as advocates, communicate the importance of waste management, and mobilize the community to participate in initiatives. Educating these individuals creates a ripple effect, leading to broader societal adoption of responsible waste management and positive waste segregation behaviors.

Fourth, compensating or rewarding for segregating waste boosts household members for segregation of waste should be provided by government or private waste management companies. Therefore, management of waste companies should strategically introduce adequate compensation and reward measures in the form of prompt payment of incentives, bonuses, fringe benefits and all other benefits to those who deserve or engage in waste segregation. Compensation and reward should be considered by management holistically. It is recommended that waste segregation companies need to emulate best practices in rewarding waste segregation practices and consistently benchmarking their compensation and reward designs and understanding what holds good for them in their organisational context.

Fifth, the study recommends that waste management companies or government organization waste management organisations should ignite the intention to segregate with actual segregation behavior in order to stimulate significant outcomes. The study has revealed that intention to segregate positively predicts actual segregation behavior. Therefore, providing household members an economic and social reason to segregate is very important to enhancing household segregation.

One way by which waste management companies can do this is to review their business operations, visions and core objectives and develop work practices or programmes that are consistent with their waste segregation practices. Another way is to ensure that waste segregation practices or programmes of waste management companies are consistent with the companies' specific strategic objectives and principles. By so doing, the waste management companies' business competencies can easily be positioned to ensure proper implementations of the waste segregation practices. Similarly, this integration may also end up helping the firm develop new competencies which can be applied to advance its core business objectives. In this way, the integration between intention to segregate and actual segregation behavior initiatives will be investment tools rather than cost to households.

Sixth, with no exception, every programme needs some amount of monitoring and evaluation for a successful implementation. It is important for firms to effectively monitor and evaluate the implementation of their waste segregation practices in order to achieve their intended waste segregation outcomes. One way of ensuring effective monitoring to achieve and sustain waste segregation outcomes for desired results is a constant supply of required resources to the household members. A waste company's waste segregation department can be of invaluable contributor when

it implements waste segregation practices. Importantly, the subjective norm must be regarded as one of the functional areas of modern waste segregation practices, be fully communicated to households and managed as such. Waste segregation managers or departments should be equipped and mandated to establish transition structures to shepherd the implementation through its various stages and reassure household members that they will be successful earning directly or indirectly by maintaining a constant segregation behavior in the new integrated system (subjective norm). It should be noted that once the subjective norm is in place, it should be evaluated in terms of its processes, outcomes, sustainability and challenges to fit with the waste segregation objective.

Lastly, it is recommended by this study that all progressive waste companies or organisations within the Municipal of all sizes should emulate best practices and implement perceived behavior control in their operations in addition to their traditional waste management practices. When implemented effectively, perceived behavior control will benefit both households and their communities. Household members become more skilled, engaged, motivated and empowered to make decisions, experience greater economic growth and satisfaction and become more valuable, contributors to their communities. Waste management organisations such as recycling benefit from higher productivity, greater return on asset, high quality products or services, flexibility, and customer satisfaction. These features together can provide waste management companies with a sustainable competitive advantage.

5.6.2 Recommendations for Policy

Even though waste management practices are more about normative approaches to individual households, some documents such as the environmental Act, Sanitation policy, appear to have some relations with waste management practices giving it a contextual difference with respect to

Ghana. That notwithstanding, industry-specific policies need to be developed to supplement these documents. Stakeholders and institutions in waste segregation industries such as segregation companies, sanitation companies, recycling companies need to develop a comprehensive waste management policy or framework to encourage waste management companies to create sustained competitive advantage. These policies should also encourage indigenous and upcoming waste management companies to incorporate best practices in their waste management practices in order to build value chain activities of their companies. Consulting various stakeholders broadly in the waste management industry and also benchmarking best international standards and regulations can provide good inputs for such documents to be in line with best practices while fully taking the Ghanaian context into consideration.

Finally, Ghana is a less developed country with many waste management challenges or needs. The government and its agencies, and other international waste management partners need to provide the frameworks that should guide companies' waste management practices. Such frameworks should detail the various 'rule of thumbs' and priorities and how businesses can complement government's efforts in achieving such best waste management practices.

5.6.3 Recommendations for Theory

The study recommends that the theory of planned behavior is good in promoting waste segregation behaviors among households. The study has empirically tested the theory of planned behavior in the context of Ghanaian households. The study found empirical support for the theory of planned behavior (subjective norm, perceived behavior control and intention) and their influence on waste segregation behavior except for attitude to segregation. The model basically suggests that waste segregation practices should be linked with the intention of household members which can cause

segregation behavior. This study recommends that households should comply with waste segregation directives as new ways of disposing waste. By so doing, communities will benefit significantly through economic gains, improved sanitation and sustainable clean environments. The study also recommends that other empirical studies should be conducted to validate the theory of planned behavior in the context of Ghanaian cities. Clearly, the findings of this study provided empirical evidence that will contribute to the debate on the impact of waste segregation practices on household waste segregation behavior through intention to segregate by enhancing household members' understandings of the nature of its effect on environment particularly, in the Sub-Saharan region of Africa (Ghana).

The study acknowledges the crucial role of psychologists in the application of the TPB to the context of waste segregation and human behavior change. Psychologists play a significant role in understanding the underlying psychological processes that drive human behavior and developing effective interventions to promote behavior change. In waste segregation, psychologists examine individuals' attitudes, social influences, and perceived ability to control their behavior. They conduct research to understand these factors and develop targeted interventions. These interventions can include educational campaigns, practical tools, and fostering a sense of community involvement. Psychologists also evaluate the effectiveness of interventions to improve waste segregation behavior. Overall, psychologists contribute to promoting sustainable waste management and environmental impact through their understanding of human behavior and behavior change strategies. Their expertise in understanding human behavior and designing effective interventions can contribute to promoting sustainable waste management practices and creating a positive impact on the environment.

5.7 Conclusion

It is obvious from the research that household waste segregation cannot be left out in environmental management thus waste management strategies. The findings of the study revealed that, all the aspect of the theory of planned behavior (subjective norm, perceived behavior control & intention to segregate) significantly predicted segregation behavior except attitude towards waste segregation. The study also found that intention to segregate fully mediated the relationship between subjective norm and perceived behavior control, and actual segregation behavior. However, intention to segregate did not mediate the relationship between attitude towards waste segregation and segregation behavior. From the findings, families that have subjective norm, perceived behavior control and intention to segregate turn to segregate more often. Families that have greater intention to segregate either due to social or economic reasons are likely to engage in segregation behavior.

The study therefore concludes that intention to segregate, subjective norm in segregation, perceived behavior control are important factors in the management of waste at the household level. The study concludes that attitude alone is not enough to cause any change in behavior regarding household waste segregation. Moreover, waste segregation has become a useful force in community environmental cleanliness and an economic or social tool to enhance livelihood. In addition to the main stream waste disposal which is traditionally practiced, most companies are now interested in waste separation or segregation. Therefore, household waste segregation is now a profit making venture to members of the household. This has led to the interest of households especially those in the cities to practice waste segregation.

REFERENCES

- Absar, M. M. N., Azim, M. T., Balasundaram, N., & Akhter, S. (2010). Impact of human resources practices on job satisfaction: Evidence from manufacturing firms in Bangladesh. *Economic Sciences Series*, 62(2), 31-42.
- Adjei, M. S. (2013). *Municipal Solid Waste Minimisation through Household Waste Segregation in Bantama, Kumasi* (Doctoral dissertation). Dspace.knust.edu.gh.
- Agovino, M., Cerciello, M., & Musella, G. (2019). The good and the bad: identifying homogeneous groups of municipalities in terms of separate waste collection determinants in Italy. *Ecological Indicators*, 98, 297-309.
- Ahmad, S., Zulkurnain, N. N. A., & Khairushalimi, F. I. (2016). Assessing the validity and reliability of a measurement model in Structural Equation Modeling (SEM). *Journal of Advances in Mathematics and Computer Science*, 15(3), 1-8.
- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In *Action control* (pp. 11-39). Springer, Berlin, Heidelberg.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Ajzen, I., Joyce, N., Sheikh, S., & Cote, N. G. (2011). Knowledge and the prediction of behavior: The role of information accuracy in the theory of planned behavior. *Basic and applied social psychology*, 33(2), 101-117.

- Akulume, M., & Kiwanuka, S. N. (2016). Health care waste segregation behavior among health workers in Uganda: an application of the theory of planned behavior. *Journal of environmental and public health*, 16(20) 1-9.
- Alhassan, H., Asante, F. A., Oteng-Ababio, M., & Bawakyillenuo, S. (2018). Application of theory of planned behavior to households' source separation behavior in Ghana. *Management of Environmental Quality: An International Journal*, 29(4), 704 – 721.
- Amoah, S. T., & Kosoe, E. A. (2014). *Solid waste management in urban areas of Ghana: issues and experiences from Wa*. Udsspace.uds.edu.gh
- Apinhapath, C. (2014). Community Mapping and Theory of Planned Behavior as Study Tools for Solid Waste Management. *Journal of Waste Management*, 3(1), 1 – 7
- Ari, E., & Yilmaz, V. (2016). A proposed structural model for housewives' recycling behavior: A case study from Turkey. *Ecological Economics*, 129, 132-142.
- Asase, M. A. D. (2011). *Solid waste separation at source: A case study of the Kumasi Metropolitan Area* (Doctoral dissertation). Dspace.knust.edu.gh
- Babaei, A. A., Alavi, N., Goudarzi, G., Teymouri, P., Ahmadi, K., & Rafiee, M. (2015). Household recycling knowledge, attitudes and practices towards solid waste management. *Resources, Conservation and Recycling*, 102, 94-100.
- Babbie, E. & Mouton, J., (2007). Qualitative methods of data sampling. *The practice of social research*, 7,187-193.

Babbie, E. (2008). *The basics of social research*. Canada: Thomson Wadsworth.

Bardus, M., & Massoud, M. A. (2022). Predicting the intention to sort waste at home in rural communities in Lebanon: An application of the theory of planned behaviour. *International Journal of Environmental Research and Public Health*, 19(15), 9383.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology*, 51(6), 11-73.

Bartelings, H., & Sterner, T. (1999). Household waste management in a Swedish municipality: determinants of waste disposal, recycling and composting. *Environmental and resource economics*, 13(4), 473-491.

Bernstad, A. (2014). Household food waste separation behavior and the importance of convenience. *Waste management*, 34(7), 1317-1323.

Boadi, K. O., & Kuitunen, M. (2014). Environmental and health impacts of household solid waste handling and disposal practices in third world cities: the case of the Accra Metropolitan Area, Ghana. *Journal of environmental health*, 68(4), 32-36.

Brennan, L., Parker, L., Nguyen, D. & Aleti, T. (2015). Design issues in cross-cultural research: suggestions for researchers. In *The Palgrave handbook of research design in business and management* (pp. 81-101). Palgrave Macmillan, New York.

Brennan, L., Voros, J. & Brady, E., (2011). Paradigms at play and implications for validity in social marketing research. *Journal of Social Marketing*, 1(2), 100 – 119.

- Burkard, A. W., Knox, S., & Hill, C. E. (2012). Data collection. psychnet.apa.org.
- Byrne, B. M. (2010). Structural equation modeling with AMOS: basic concepts, applications, and programming (multivariate applications series). *New York: Taylor & Francis Group*, 396, 7384.
- Chen, J. (2019). Exploring the impact of teacher emotions on their approaches to teaching: A structural equation modelling approach. *British Journal of Educational Psychology*, 89(1), 57-74.
- Chen, Y. C., & Lo, S. L. (2016). Evaluation of greenhouse gas emissions for several municipal solid waste management strategies. *Journal of Cleaner Production*, 113(2), 606-612.
- Choy, L. T. (2014). The strengths and weaknesses of research methodology: Comparison and complimentary between qualitative and quantitative approaches. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 19(4), 99-104.
- Cole, M. (2006). Qualitative research: a challenging paradigm for infection control. *British Journal of Infection Control*, 7(6), 25-29.
- Conke, L. S. (2018). Barriers to waste recycling development: Evidence from Brazil. *Resources, conservation and recycling*, 134, 129-135.
- Creswell, J. W. (2014). *A concise introduction to mixed methods research*. Sage Publications.
- Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological methods*, 1(1), 16.

- Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood estimation from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society, Series B*, 39, 1-38.
- Etezadi-Amoli, J., and Farhoomand, A. (1996). A structural model of end user computing satisfaction and user performance. *Information and Management*, 30(2), 65 – 73.
- Fan, B., Yang, W., & Shen, X. (2019). A comparison study of ‘motivation–intention–behavior’ model on household solid waste sorting in China and Singapore. *Journal of Cleaner Production*, 211, 442-454.
- Fishbein, M., & Ajzen, I. (1980). Predicting and understanding consumer behavior: Attitude-behavior correspondence. *Understanding attitudes and predicting social behavior*, 148-172.
- Fornara, F., Pattitoni, P., Mura, M., & Strazzera, E. (2016). Predicting intention to improve household energy efficiency: The role of value-belief-norm theory, normative and informational influence, and specific attitude. *Journal of Environmental Psychology*, 45(2), 1-10.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Garson, G. D. (2012). *Testing statistical assumptions*. Asheboro, NC: Statistical Associates Publishing.

- Ghani, W. A. W. A. K., Rusli, I. F., Biak, D. R. A., & Idris, A. (2013). An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste. *Waste management*, 33(5), 1276-1281.
- Ghauri, P., Grønhaug, K., & Strange, R. (2020). *Research methods in business studies*. Cambridge University Press.
- Goetz, O., Liehr-Gobbers, K., & Krafft, M. (2009). Evaluation of structural equation models using the partial least squares (PLS) approach. In: V. Esposito Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds), *Handbook of partial least squares: Concepts, methods, and applications*. Berlin: Springer (in print).
- Gold, M. S., & Bentler, P. M. (2000). Treatments of missing data: A Monte Carlo comparison of RBHDI, iterative stochastic regression imputation, and expectation-maximization. *Structural equation modeling*, 7(3), 319-355.
- Grimberg, E., & Blauth, P. (1998). *Coleta seletiva: reciclando materiais, reciclando valores* (No. 31). Instituto Pólis.
- Gu, B., Wang, H., Chen, Z., Jiang, S., Zhu, W., Liu, M., ... & Yang, J. (2015). Characterization, quantification and management of household solid waste: A case study in China. *Resources, Conservation and Recycling*, 98, 67-75.
- Gu, F., Zhang, W., Guo, J., & Hall, P. (2019). Exploring “Internet+ Recycling”: Mass balance and life cycle assessment of a waste management system associated with a mobile application. *Science of the Total Environment*, 649(1) 172-185.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis*. New Jersey: Prentice Hall.

Hair, J. F., Black, W. C., Balin, B. J., & Anderson, R. E. (2010). *Multivariate and data analysis*. New York: Maxwell Macmillan. International Editions.

Hales, L.D. (1986) Training: A Product of Business Planning. *Training & Development Journal*, 40, 65-66.

Hox, J. J., & Boeije, H. R. (2005). *Data collection, primary versus secondary*. Dspace.library.uu.nl

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, 6(1), 1-55.

Jiang, P., Van Fan, Y., & Klemeš, J. J. (2020). Data analytics of social media publicity to enhance household waste management. *Resources, Conservation and Recycling*, 164, 105146.

Johnson, S. L. (2010). A question of time: Cross-sectional versus longitudinal study designs. *Pediatrics*, 31, 250-251.

Kenney, A. D. (2016). *Multiple latent variable models: Confirmatory factor analysis*. Retrieved from <http://davidakenny.net/cm/mfactor.htm>

Khan, S. N. (2014). Qualitative research method: Grounded theory. *International Journal of Business and Management*, 9(11), 224-233.

- Kline, R. B. (2011). *Principles and practice of structural equation modelling* (3rd ed.). New York: Guilford Press.
- Leeabai, N., Areeprasert, C., Siripai boon, C., Khaobang, C., Congsomjit, D., & Takahashi, F. (2022). The effects of compost bin design on design preference, waste collection performance, and waste segregation behaviors for public participation. *Waste Management*, 143, 35-45.
- Lo, A. Y., & Liu, S. (2018). Towards sustainable consumption: A socio-economic analysis of household waste recycling outcomes in Hong Kong. *Journal of environmental management*, 214, 416-425.
- Ma, J., Hipel, K. W., Hanson, M. L., Cai, X., & Liu, Y. (2018). An analysis of influencing factors on municipal solid waste source-separated collection behavior in Guilin, China by Using the Theory of Planned Behavior. *Sustainable cities and society*, 37(5), 336-343.
- MacKinnon, D. P., Cox, S., & Baraldi, A. N. (2012). Guidelines for the investigation of mediating variables in business research. *Journal of Business and Psychology*, 27(1), 1-14.
- MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annu. Rev. Psychol.*, 58(4), 593-614.
- Magazzino, C., & Falcone, P. M. (2022). Assessing the relationship among waste generation, wealth, and GHG emissions in Switzerland: Some policy proposals for the optimization of the municipal solid waste in a circular economy perspective. *Journal of Cleaner Production*, 351, 131555.

- Malhotra, R., Chan, A., Malhotra, C., & Østbye, T. (2012). Validity and reliability of the Caregiver Reaction Assessment scale among primary informal caregivers for older persons in Singapore. *Aging & mental health*, 16(8), 1004-1015.
- Mbiba, B. (2014). Urban solid waste characteristics and household appetite for separation at source in Eastern and Southern Africa. *Habitat International*, 43(1), 152-162.
- Meng, L., Guo, L., & Guo, Z. (2019). Separation of metals from metal-rich particles of crushed waste printed circuit boards by low-pressure filtration. *Waste Management*, 84, 227-234.
- Miner, J. B. (2015). Expectancy theories: Victor Vroom, and Lyman Porter and Edward Lawler. In *Organizational Behavior 1* (pp. 110-129). Routledge.
- Mir, I. S., Cheema, P. P. S., & Singh, S. P. (2021). Implementation analysis of solid waste management in Ludhiana city of Punjab. *Environmental Challenges*, 2, 100023.
- Mumtaz, T., Yahaya, N. A., Abd-Aziz, S., Yee, P. L., Shirai, Y., & Hassan, M. A. (2010). Turning waste to wealth-biodegradable plastics polyhydroxyalkanoates from palm oil mill effluent—a Malaysian perspective. *Journal of Cleaner Production*, 18(14), 1393-1402.
- Nainggolan, D., Pedersen, A. B., Smed, S., Zemo, K. H., Hasler, B., & Termansen, M. (2019). Consumers in a circular economy: economic analysis of household waste sorting behavior. *Ecological Economics*, 166, 106402.
- Neuman, W.L. (2011) *Basics of Social Research: Qualitative and Quantitative Approaches*, 2/E, Pearson Education.

- Ng, K. S., Yang, A., & Yakovleva, N. (2019). Sustainable waste management through synergistic utilisation of commercial and domestic organic waste for efficient resource recovery and valorisation in the UK. *Journal of Cleaner Production*, 227, 248-262.
- Nguyen, T. T., & Watanabe, T. (2019). Win-win outcomes in waste separation behavior in the rural area: A case study in vietnam. *Journal of Cleaner Production*, 230, 488-498.
- Nunnally, J.C. (1970). *Introduction to psychological measurement*. New York: McGraw-Hill.
- Obuobi, B., Adu-Gyamfi, G., Adjei, M., & Nketiah, E. (2022). Technologies potential and economic viability analysis of deriving electricity from Municipal Solid Waste in Kumasi, Ghana. *Energy for Sustainable Development*, 68, 318-331.
- Oduro-Appiah, K., & Aggrey, B. E. (2013). Determinants of source separation of municipal solid waste in developing countries: The case of Ghana. *Journal of Sustainable Development in Africa*, 15(3), 47-60.
- Oduro-Appiah, K., Scheinberg, A., Afful, A., & de Vries, N. (2021). The contribution of participatory engagement strategies to reliable data gathering and inclusive policies in developing countries: Municipal solid waste management data in the Greater Accra Metropolitan Area of Ghana. *African Journal of Science, Technology, Innovation and Development*, 13(6), 735-746.
- Oduro-Appiah, K., Scheinberg, A., Mensah, A., Afful, A., Boadu, H. K., & de Vries, N. (2017). Assessment of the municipal solid waste management system in Accra, Ghana: A

‘Wasteaware’ benchmark indicator approach. *Waste Management & Research*, 35(11), 1149-1158.

Oduro-Kwarteng, S. (2011). *Private Sector Involvement in Urban Solid Waste Collection: UNESCO-IHE PhD Thesis*. CRC Press. books.google.com

Oduro-Kwarteng, S., Anarfi, K. P., & Essandoh, H. M. K. (2016). Source separation and recycling potential of municipal solid waste in Ghana. *Management of Environmental Quality: An International Journal*, 27(2), 210-226.

Osborne, J. W. (2013). *Best practices in data cleaning: A complete guide to everything you need to do before and after collecting your data*. Sage Publications.

Oteng-Ababio, M. (2010). Private sector involvement in solid waste management in the Greater Accra Metropolitan Area in Ghana. *Waste Management & Research*, 28(4), 322-329.

Oteng-Ababio, M. (2011). Missing links in solid waste management in the Greater Accra Metropolitan Area in Ghana. *GeoJournal*, 76(5), 551-560.

Oteng-Ababio, M., Arguello, J. E. M., & Gabbay, O. (2013). Solid waste management in African cities: Sorting the facts from the fads in Accra, Ghana. *Habitat International*, 39, 96-104.

Owusu, V., Adjei-Addo, E., & Sundberg, C. (2013). Do economic incentives affect attitudes to solid waste source separation? Evidence from Ghana. *Resources, Conservation and Recycling*, 78(6), 115-123.

- Owusu-Sekyere, E. (2019). Creative individuals, “Kaya Bola” exceptionalism and sustainable development in twenty-first century Ghana. *Journal of Global Entrepreneurship Research*, 9(1), 54.
- Owusu-Sekyere, E., Peprah, K., & Demuyakor, R. M. (2018). Exploring the Dynamics of E-waste Disposal Strategies in Tamale, Ghana. *Ghana Journal of Development Studies*, 15(2), 168-192.
- Pakpour, A. H., Zeidi, I. M., Emamjomeh, M. M., Asefzadeh, S., & Pearson, H. (2014). Household waste behaviors among a community sample in Iran: An application of the theory of planned behavior. *Waste management*, 34(6), 980-986.
- Penneerselvam R. (2010). *Research Methodology*. PHI Learning Private Limited, New Delhi.
- Post, J., & Baud, I. (2003). Between markets and partnerships: urban solid waste management and contributions to sustainable development? *GBER* 3(1) 46 – 65.
- Preacher, K. J., & Hayes, A. F. (2008). *Assessing mediation in communication research* (pp. 13-54). London: The Sage sourcebook of advanced data analysis methods for communication research. Books.google.com.
- Pujara, Y., Pathak, P., Sharma, A., & Govani, J. (2019). Review on Indian Municipal Solid Waste Management practices for reduction of environmental impacts to achieve sustainable development goals. *Journal of environmental management*, 248(4), 109238.
- Reijonen, H., Bellman, S., Murphy, J., & Kokkonen, H. (2021). Factors related to recycling plastic packaging in Finland’s new waste management scheme. *Waste Management*, 131, 88-97.

- Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of educational research*, 99(6), 323-338.
- Schumacker, R. E. and Lomax, R. G., (2004). *A beginner's guide to structural equation modeling*. Psychology press.
- Sedgwick, P. (2014). Unit of observation versus unit of analysis. *British Medical Journal*, 348, 3840.
- Serge Kubanza, N., & Simatele, M. D. (2020). Sustainable solid waste management in developing countries: a study of institutional strengthening for solid waste management in Johannesburg, South Africa. *Journal of Environmental Planning and Management*, 63(2), 175-188.
- Shen, L., Si, H., Yu, L., & Si, H. (2019). Factors influencing young people's intention toward municipal solid waste sorting. *International journal of environmental research and public health*, 16(10), 1708.
- Sobh, R. & Perry, C., (2006). Research design and data analysis in realism research. *European Journal of marketing*, 3(2), 101-119.
- Stoeva, K., & Alriksson, S. (2017). Influence of recycling programmes on waste separation behavior. *Waste Management*, 68(2), 732-741.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston, MA: Allyn & Bacon.

- Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5, pp. 481-498). Boston, MA: Pearson.
- Tonidandel, S. & LeBreton, J.M., (2011). Relative importance analysis: A useful supplement to regression analysis. *Journal of Business and Psychology*, 26(1), 1-9.
- Tronvoll, B., Brown, S.W., Gremier, D. D. & Edvardsson, B. (2011). Paradigms in service research. *Journal of Service Management*, 22(5), 560-585.
- Uprichard, E. (2013). Sampling: Bridging probability and non-probability designs. *International Journal of Social Research Methodology*, 16(1), 1-11.
- Viljoen, J. M., Schenck, C. J., Volschenk, L., Blaauw, P. F., & Grobler, L. (2021). Household waste management practices and challenges in a rural remote town in the Hantam Municipality in the Northern Cape, South Africa. *Sustainability*, 13(11), 5903.
- Wadehra, S., & Mishra, A. (2018). Encouraging urban households to segregate the waste they generate: Insights from a field experiment in Delhi, India. *Resources, Conservation and Recycling*, 134, 239-247.
- Wang, C., Zhang, J., Yu, P., & Hu, H. (2018). The theory of planned behavior as a model for understanding tourists' responsible environmental behaviors: The moderating role of environmental interpretations. *Journal of Cleaner Production*, 194(8), 425-434.
- Wang, X., Gaustad, G., & Babbitt, C. W. (2016). Targeting high value metals in lithium-ion battery recycling via shredding and size-based separation. *Waste management*, 51(4), 204-213.

Wijekoon, S. B., & Attanayake, A. M. C. T. K. (2012). *Study on the cost overruns in road construction projects in Sri Lanka*. dl.lib.uom.lk.

Xu, L., Ling, M., & Wu, Y. (2018). Economic incentive and social influence to overcome household waste separation dilemma: A field intervention study. *Waste management*, 77(2), 522-531.

Xu, L., Ling, M., Lu, Y., & Shen, M. (2017). Understanding household waste separation behavior: Testing the roles of moral, past experience, and perceived policy effectiveness within the theory of planned behavior. *Sustainability*, 9(4), 625.

Yuan, K. H., Bentler, P. M., & Zhang, W. (2005). The effect of skewness and kurtosis on mean and covariance structure analysis: The univariate case and its multivariate implication. *Sociological Methods & Research*, 34(2), 240-258.

Zhang, D., Huang, G., Yin, X., & Gong, Q. (2015). Residents' waste separation behaviors at the source: Using SEM with the theory of planned behavior in Guangzhou, China. *International journal of environmental research and public health*, 12(8), 9475-9491.

Zhang, F., Cao, C., Li, C., Liu, Y., & Huisingh, D. (2019). A systematic review of recent developments in disaster waste management. *Journal of Cleaner Production*, 235, 822-840.

Zhang, H., & Wen, Z. G. (2014). The consumption and recycling collection system of PET bottles: A case study of Beijing, China. *Waste Management*, 34(6), 987-998.

Zhang, W., Liu, N., Cao, Y., Lin, X., Liu, Y., & Feng, L. (2017). Super wetting porous materials for wastewater treatment: from immiscible oil/water mixture to emulsion separation. *Advanced Materials Interfaces*, 4(10), 160 - 290.

Zhu, H., & Huang, G. H. (2011). SLFP: a stochastic linear fractional programming approach for sustainable waste management. *Waste Management*, 31(12), 2612-2619.



APPENDICES

Appendix A: Questionnaire

UNIVERSITY OF GHANA

INSTITUTE FOR ENVIRONMENTAL AND SANITATION STUDIES

QUESTIONNAIRE

Dear Respondent,

I am an Mphil student of the Institute for Environment and Sanitation Studies, researching on the assessment of household waste segregation behavior. I would be grateful for assistance in completing the questionnaire. The following questions are meant to elicit your opinion regarding the household waste segregation behavior. Kindly respond to the best of your knowledge your opinion on the subject matter. Kindly note that there are no right or wrong answers and your confidentiality is assured hence no form of identity would be needed.

Section A: Demographic Profile

Gender: Male ☐ Female ☐

2. Age: 18–30yrs ☐ 31–40yrs ☐ 41–50yrs ☐ 51–60yrs + ☐

3. Academic Qualification: PhD/MD ☐ Masters ☐ Bachelors ☐ Diploma/HND ☐ Others ☐

4. Marital Status: Married ☐ Single ☐ Others ☐

5. Number of Persons in the Household:

6. Occupation:.....

7. Position in the Family: Father ☐ Mother ☐ Others ☐

8. Location of Residence:.....

SECTION B: Main Questions

The following statements represent possible understanding of waste segregation behavior. With respect to your own feelings regarding your waste management behavior, please indicate the extent to which your agreement or disagreement corresponds with each statement/question by checking (✓) **one** of the five alternatives using the scale below:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
(SA)	(A)	(N)	(D)	(SD)
5	4	3	2	1

No.	Attitude towards Waste Separation	SA	A	N	D	SD
A1	I worry about survival and life issues, not waste segregation issues	5	4	3	2	1
A2	I am willing to participate in waste segregation because it saves resources.	5	4	3	2	1
A3	For me, waste separation at home is useful	5	4	3	2	1
A4	Separation of household waste is a waste of time	5	4	3	2	1
A5	I am interested to separate my household waste at home	5	4	3	2	1
A6	Waste separation is important because it protects the environment	5	4	3	2	1
	Subjective Norm to Waste Separation					
SN1	Most of my friends think that waste separation is a good thing to do	5	4	3	2	1
SN2	My family thinks that I separate my household waste	5	4	3	2	1

SN3	My colleagues would think that I should be involved in waste separation at home	5	4	3	2	1
SN4	I am satisfied to participate in waste separation.	5	4	3	2	1
SN5	Waste separation is the responsibility of government and enterprises and has nothing to do with residents.	5	4	3	2	1
	Perceived behavioral Control to Waste Separation					
PBC1	Waste separation at home is easy	5	4	3	2	1
PBC2	I know how to separate my waste home	5	4	3	2	1
PBC3	I know what items of household waste can be recycled.	5	4	3	2	1
PBC4	I have time separate my household waste	5	4	3	2	1
PBC5	There many opportunities for me separate household waste	5	4	3	2	1
	Intention to Separate Waste					
I1	I estimate that I will separate my household waste as much as possible in the near future.	5	4	3	2	1
I2	I want to separate my house waste as much as possible in the near future	5	4	3	2	1
I3	I truly intend to separate my household waste at home as much as possible in the future.	5	4	3	2	1
	Behavior toward waste Separation					
B1	I usually separate all my household waste	5	4	3	2	1
B2	I regularly separate certain parts of my house waste by putting them into different bins	5	4	3	2	1
B3	I have rarely separate my household waste at home.	5	4	3	2	1

B4	I set a possible environmental example (separation)	5	4	3	2	1
----	---	---	---	---	---	---

Thank you.

