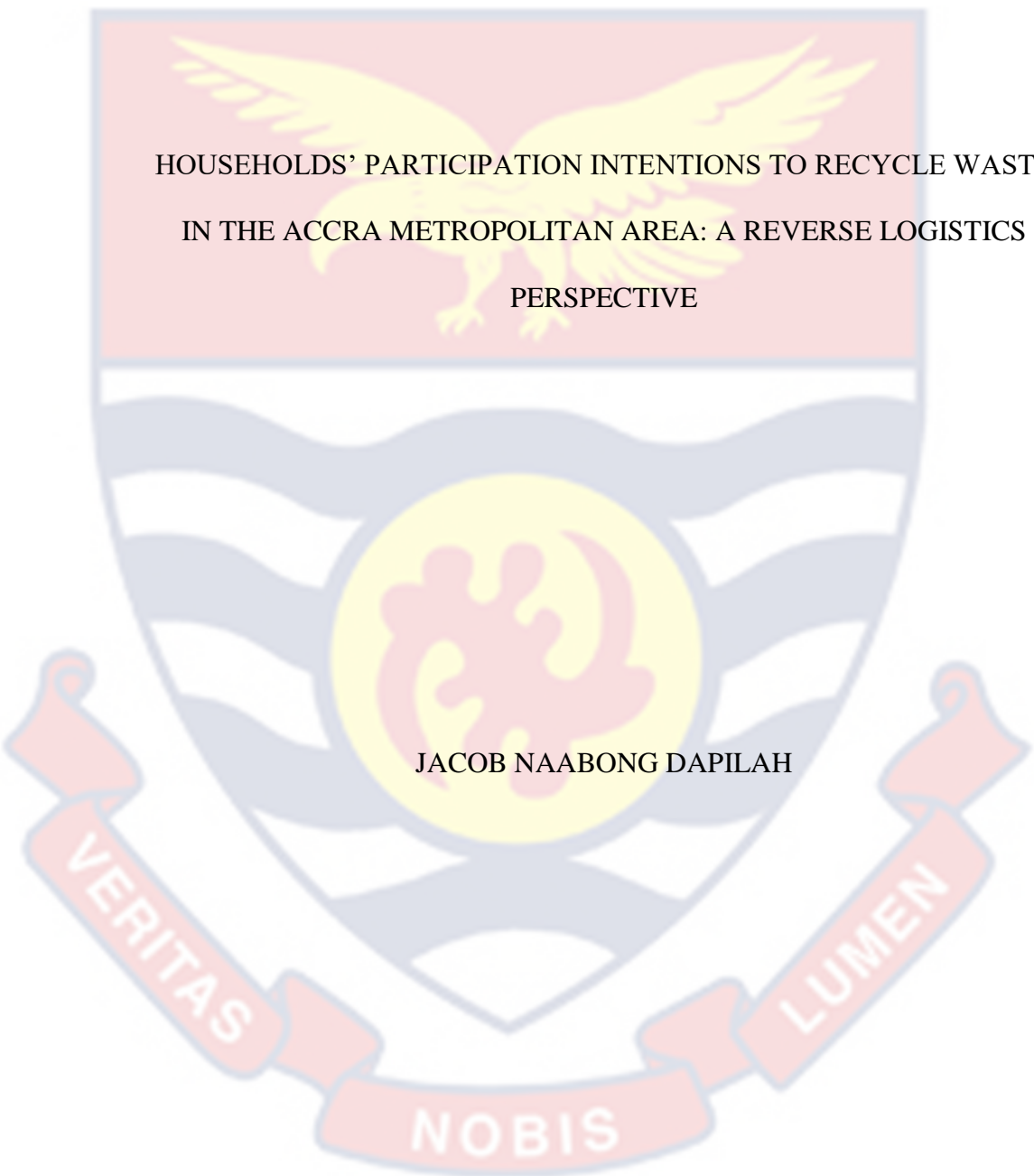


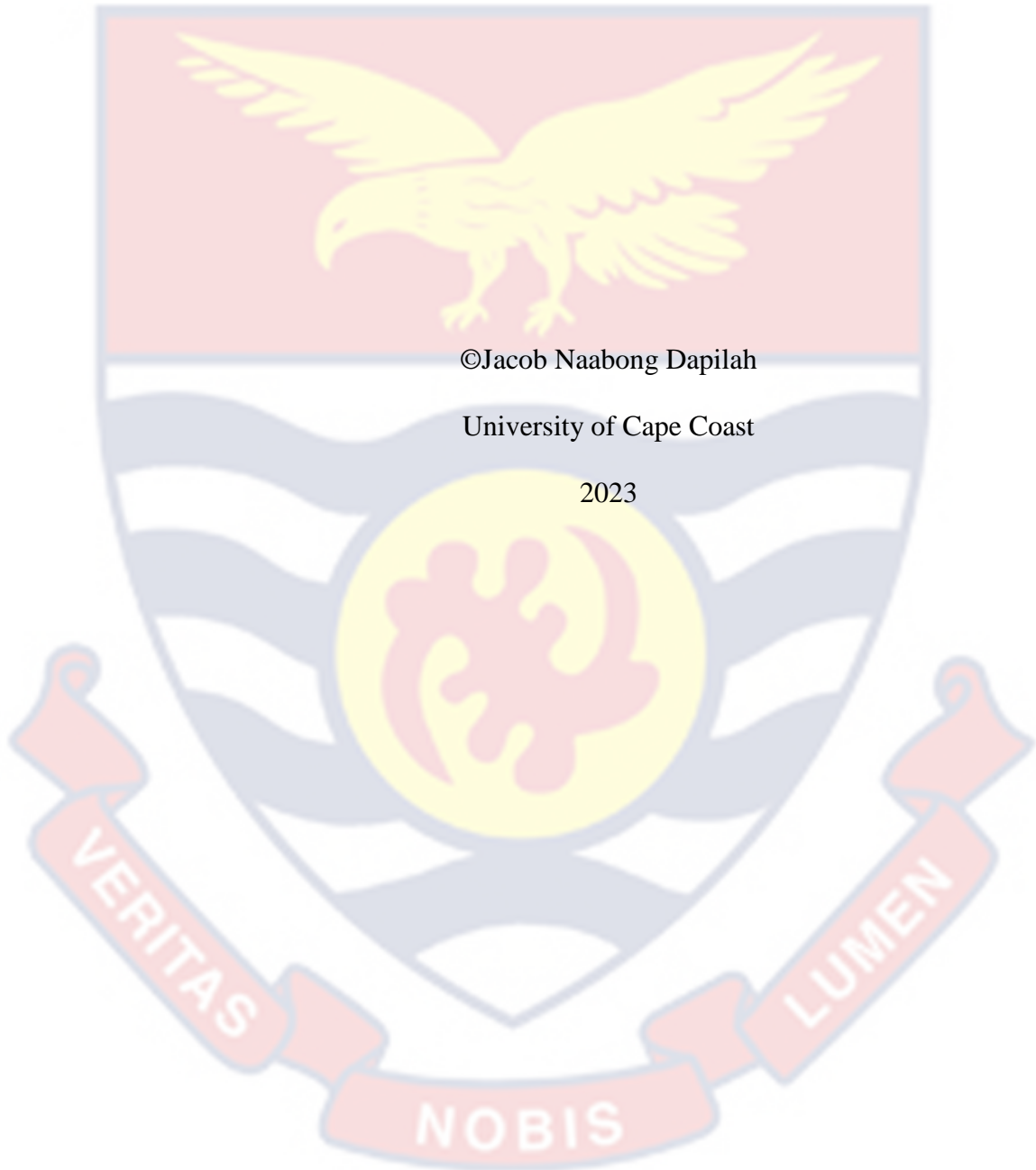
UNIVERSITY OF CAPE COAST



HOUSEHOLDS' PARTICIPATION INTENTIONS TO RECYCLE WASTE
IN THE ACCRA METROPOLITAN AREA: A REVERSE LOGISTICS
PERSPECTIVE

JACOB NAABONG DAPILAH

2023




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IN THE ACCRA METROPOLITAN AREA: A REVERSE LOGISTICS
PERSPECTIVE

BY

JACOB NAABONG DAPILAH

Thesis submitted to the Department of Marketing and Supply Chain
Management of the School of Business, College of Humanities and Legal
Studies, University of Cape Coast, in partial fulfillment of the requirements
for the award of Doctor of Philosophy degree in Business Administration

MAY 2023

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate Signature Date:

Name: Jacob Naabong Dapilah

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature Date:

Name: Prof. Daniel Agyapong

Co-Supervisor's Signature Date:

Name: Prof. Anokye Mohammed Adam

ABSTRACT

This thesis addresses a critical research gap in the domain of municipal solid waste management, specifically focusing on household waste recycling in emerging economies. Despite the proven effectiveness of reverse logistics in waste management (Flygansvær, Samuelsen & Støyle, 2021), limited research exists on how adaptations in reverse logistics systems towards households can enhance recycling behaviour in emerging economies like Ghana—a context with significant potential for waste recovery (Oduro-Appiah, Afful & Osei-Tutu, 2022). To fill this gap, the research integrates contextual factors and behavioural tendencies, providing a comprehensive understanding of the factors influencing households' intentions to recycle waste. Through a quantitative approach and a survey involving 385 respondents, data were collected and analyzed using various statistical measures, including frequencies, means, standard deviations, and EQS structural equation modeling. The findings reveal that both contextual and behavioural factors positively influence households' intentions to recycle waste. Moreover, the study highlights the significant roles played by policy inducement as a moderator and individual attitudes as mediators in shaping household waste recycling intentions. This research emphasizes the importance of considering both contextual and behavioural factors in waste recycling and advocates for the implementation of integrated policies that comprehensively address these elements. The contribution of this study is not only practical but also enriches our understanding of the effectiveness of policies that holistically incorporate both contextual and behavioural aspects in the realm of waste management.

KEY WORDS

Behavioural Factors

Contextual Factors

Household Recycling Intentions

Municipal Solid Waste

Recycle waste

Reverse Logistics



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DEDICATION

This work is especially dedicated to my beloved son, Jeff Zunomah Dapilah
and my late parents, Mr. and Mrs. Dapilah



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LIST OF ABBREVIATIONS

ABC	Attitude-Bahaviour-Context Model
ACaRP	Accra Composting and Recycling Plant
AMA	Accra Metropolitan Area
CE	Circular Economy
CLM	Council of Logistics Management
CUMT	Consumer Utility Maximisation Theory
EC	European Commission
EMF	Ellen McArthur Foundation
GAMA	Greater Accra Metropolitan Area
GHG	Greenhouse Gas
GMACP	Ga Mashie Aerobic Composting Plant
GPAP	Global Plastic Action Partnership
IRaCP	Integrated Recycling and Composting Plant
MESTI	Ministry of Environment, Science, Technology and Innovation
MSW	Municipal Solid Waste
NT	Nudge Theory
OECD	Organisation for Economic Co-operation and Development
ROP	Recovery Option Pyramid
SCM	Supply Chain Management
SDGs	Sustainable Development Goals
TPB	Theory of Planned Behaviour

UN DESA United Nations Department of Economic and Social
Affairs

UNEP United Nations Environmental Programme

UN-SDGs United Nations Sustainable Development Goals

WCED World Commission on Environment and Development

WEF World Economic Forum



CHAPTER ONE

INTRODUCTION

The escalating global waste generation continues to pose severe environmental, resource, and health challenges, necessitating improved recycling strategies (Abubakar et al., 2022). End-of-life product logistics has become integral to the circular economy paradigm (Zhang & He, 2022). Despite this, many developing countries still indiscriminately dump substantial amounts of municipal solid waste (MSW) instead of recovering it. However, the global shift towards circularity and the demands of the sustainable development goals (SDGs) is making recycling a common policy response (Manklin et al., 2022). Understanding the factors that influence households' intentions to recycle MSW is vital for improving and optimizing recycling efforts. This understanding can be derived from various theoretical perspectives, which provide valuable insights into the motivations and barriers to recycling.

MSW management primarily involves reverse logistics operations, requiring efficient service provision (Jalil et al., 2016). Surprisingly, this topic receives limited attention in the logistics and supply chain management literature, despite increasing legislative emphasis on supply chain sustainability (Halldórsson et al., 2019). This study employs four theoretical frameworks: the theory of planned behaviour (TPB), attitude behaviour context (ABC) theory consumer utility maximization theory (CUMT), and nudge theory (NT) to investigate contextual and behavioural factors influencing MSW recycling intentions among households in the Accra Metropolitan Area. This thesis contributes to the growing significance of reverse logistics in sustainable MSW management in emerging economies.

Background to the Study

The rapid urbanization and expansion of logistics services have significantly contributed to the generation of household waste, presenting a challenge for sustainable waste management (Jalil et al., 2016). In light of the global population of 7.9 billion, with 55% residing in resource-intensive urban areas, there has been a substantial increase in municipal solid waste (MSW) generation (UNDESA, 2019a). Predictions suggest that urbanization and population growth will lead to approximately 68% of the world's population living in urban areas by 2050. In 2016, the world produced 2.01 billion tonnes of urban solid waste, with projections indicating an increase to 2.24 billion tonnes by 2025 and a concerning 3.40 billion tonnes by 2050 (UNEP, 2019) as detailed in Figure 1. These trends underscore the immediate need for sustainable waste management strategies to address the challenges posed by expanding urbanization.

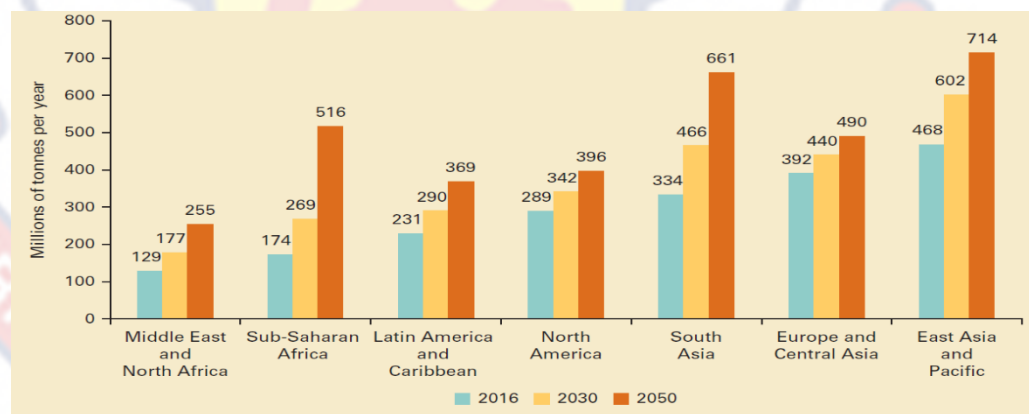


Figure 1: Estimated Waste Generation by Region in Tonnes Per Year.

Source: World Bank (2019).

One alarming example of this surge in waste volume can be seen in Sub-Saharan African (SSA) nations including Ghana. Between 2012 and 2019, there was an astonishing increase of 55 million tons of waste, coinciding with a

population of approximately 1.31 billion in 2019. Projections for 2025 present an alarming outlook, with SSA waste expected to soar to an astounding 244 billion tonnes, matching an anticipated population size of about 1.50 billion (Scarlat & Motola, 2015; United Nations, 2022) as detailed in Figure 2. These trends underscore the immediate imperative for comprehensive interventions aimed at addressing waste management challenges within the SSA region. It is crucial that these interventions strongly prioritize the promotion of sustainable practices and the mitigation of environmental impacts.

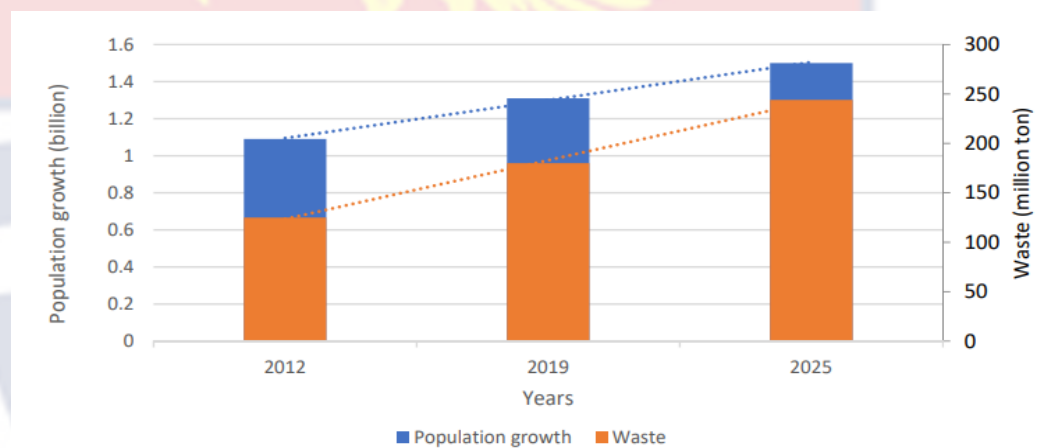


Figure 2: Population and Waste Generation Trend in SSA from 2012 to 2025

Source: United Nations (2022)

Globally, waste management methods exhibit a distribution with 37% directed to landfills, 33% openly dumped, 19% undergoing materials recovery (recycling and composting), and 11% treated through modern incineration (Kaza et al., 2018). These statistics offer valuable insights into the global waste management landscape, highlighting the necessity for sustainable practices. The emphasis on reducing environmental and health impacts, enhancing recycling and composting efforts, and ensuring responsible landfill and incineration management aligns with the goal of promoting a circular economy. This approach seeks to minimize the linear "take, make, dispose" model, as

underscored by Alamerew (2020), by encouraging the reuse, recycling, or repurposing of waste materials.

The continuous reliance on landfilling as a primary waste disposal method is increasingly recognized as an unsustainable and inadequate approach to managing waste (Abdissa, Ayalew, Dunay & Illés, 2022). The practice of landfilling not only poses environmental and health risks but also signifies that emerging economies, such as Ghana, have lagged significantly behind advanced economies in terms of resource recovery and recycling efforts (Oteng-Ababio, 2014). This stark contrast highlights the need for emerging economies to transition toward more sustainable and environmentally responsible waste management practices.

In line with global trends, Ghana's rapid urbanization, coupled with a population of 30.8 million, has strained local authorities in effectively managing urban development and waste. Each day, Ghana generates 14,232 tonnes of MSW, with approximately 90% of it being potentially recoverable (Miezah et al., 2015). However, the recycling rate is only 8.6%, with a 6.2% contribution from the informal sector (Oduro-Appiah et al., 2019). To address this issue, there is a critical need to implement and improve waste segregation at the source of generation to prevent contamination and preserve the value of recyclable materials (Alhassan et al., 2018).

Households have been identified as the most significant contributors to the generation of MSW in Ghana, accounting for a substantial proportion ranging from 55% to 80% (Miezah et al., 2015). Given the ongoing population growth and the prevalence of slum urbanization in the country, there is a pressing need for a significant revamp of the waste management system (Oteng-

Ababio et al., 2017). The lack of efficient waste management infrastructure and the absence of widespread waste source separation practices have led to the haphazard disposal of waste in landfills, open dumps, and drainage systems, resulting in extensive pollution of land, air, and water bodies (Alhassan et al., 2018).

These unregulated disposal practices have given rise to an environment that encourages the proliferation of pests and scavenging animals. Additionally, they have unintentionally created breeding grounds for disease-carrying vectors, including mosquitoes, leading to an increased incidence of sanitation-related diseases such as typhoid fever, poliovirus infections, and cholera (Bowen, 2018). The public health risks are further exacerbated by the blockage of drainage systems, resulting in stagnant water, as depicted in Figure 3. In this context, a transition to sustainable waste management practices not only addresses immediate health and environmental challenges but also contributes to the overall well-being of communities, economic stability, and environmental preservation (Oteng-Ababio, 2014).



Figure 3: A choked Drain in Accra after a Rainfall

Source: Photos: Dapilah (2022)

Inadequate MSW management has detrimental effects on both the environment and human well-being. Poor waste disposal methods, like open dumping and insufficient landfill maintenance, release harmful pollutants and greenhouse gases, which can worsen respiratory issues, exacerbate health problems, and contribute to climate change (Kaza et al., 2018). MSW can also generate toxic leachate when rainwater percolates through it, contaminating ground and surface water, impacting drinking water quality and aquatic life (Abila, 2021). Additionally, hazardous materials in MSW, like heavy metals and chemicals, can leach into the soil, making it unsuitable for agriculture and other purposes (Nyiramigisha, 2021). Additionally, MSW management, which encompasses collection, transportation, and disposal, demands substantial financial resources, with estimates indicating that it can consume up to 65% of available funds, as observed by Debrah et al. (2022).

The significance of effective solid waste management is highlighted by its alignment with global objectives established in 12 out of the 17 UN-SDGs as noted by Debrah et al. (2021) and Rodic & Wilson (2017). Specifically, SDG 11.6 places an emphasis on reducing the adverse environmental impact per capita in urban areas, with a particular focus on air quality and municipal waste management by 2030. In addition, SDG 12.5 targets a substantial reduction in waste generation through the methods of prevention, reduction, recycling, and reuse by 2030. Together, these goals underscore the global commitment to responsible consumption and production patterns, waste reduction, and sustainable urban development, with a particular focus on effective waste management practices and their role in achieving a more sustainable and environmentally friendly future (UN, 2015).

Despite its critical importance, the MSW subsector in developing countries often receives inadequate attention and funding (Kaza et al., 2018). Global estimates highlight the livelihoods dependent on waste collection and recycling, with the World Bank reporting that \$205 billion was spent on MSW management in 2010, projected to rise to nearly \$375 billion by 2025 (Thamagasorn & Pharino, 2019). Growing environmental concerns and the need to conserve finite resources have given rise to the concept of reverse logistics. Reverse logistics is dedicated to the collection and management of end-of-use and end-of-life products, including MSW, for value reclamation and proper disposal (Hazen, Confente & Pellathy, 2022). This approach addresses sustainability challenges in waste management, making it a crucial solution to ensure long-term well-being and environmental preservation (Govindan & Bouzon, 2018).

The conventional logistics concept, which centres on the movement of products from source to consumption, typically positions consumers as the final endpoint in the supply chain (Anderson & Hage-Brodin, 2005). However, in the context of a circular recycling system, consumers assume a distinct role as "end-consumers-turned-suppliers," playing a dual function as recipients of goods and services from forward logistics (inbound flows) and sources of material resources in the reverse flow system (outbound flows) (Jalil et al., 2016). This unique role is underscored by Obule-Abila (2020), who emphasizes that municipal solid waste functions both as a crucial end-node activity in the production and distribution value chain and as the source point in the reverse system, forming a closed-loop supply chain as detailed in Figure 4. This perspective highlights the evolving dynamics of logistics and waste management in circular economy models.

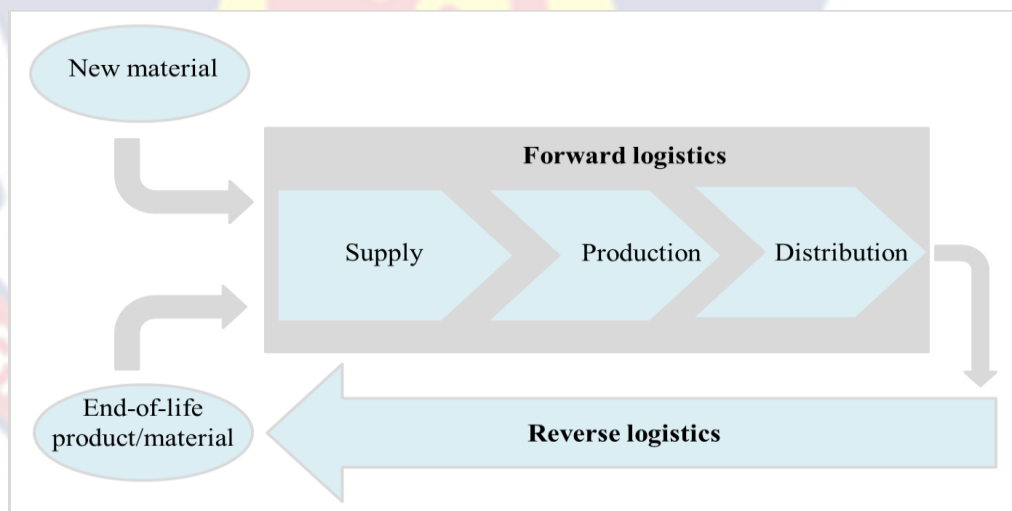


Figure 4: Forward and Reverse Logistics in a Closed System

Source: Alamerew (2020)

This marks a significant departure from the conventional understanding of supply chains and logistics. In the traditional linear supply chain model, consumers are perceived as the ultimate endpoint where products are consumed

(Flygansvær et al., 2021). However, within circular recycling systems, consumers assume a more dynamic role. They not only consume products but actively engage in the reverse logistics process by contributing materials back into the production system through recycling or returning used items (Flygansvær et al., 2021). This transformation marks the transition from a linear supply chain paradigm to a closed-loop supply chain model, illustrating the evolving dynamics of consumer participation and resource sustainability in modern supply chain management with regards to post-consumer products (Govindan & Bouzon, 2016).

Reverse logistics, when integrated into the circular economy, offers a range of significant benefits, including the potential to reduce carbon emissions by up to 70% and create green jobs, as emphasized by Wijkman and Skanberg (2015). Over the past three decades, it has played a pivotal role in reshaping supply chain management, particularly in the development of closed-loop supply chains. Researchers such as Flygansvær et al. (2021), Heydari, Govindan and Jafari (2017), Kazemi et al. (2019), Sari, Masruroh, and Asih (2021), Sarkis et al. (2010), Tjahjono and Ripanti (2019) and Wang et al. (2018) have significantly contributed to our understanding of reverse logistics. These studies highlight its potential to drive sustainability, stimulate economic growth, and foster innovation within supply chain management, particularly in the context of waste recycling.

Over the past three decades, there has been a noteworthy expansion in the availability of organized recycling services for households in developed nations, as observed by Barr et al. (2013). These services often encompass the convenient curbside collection of recyclable materials, alongside waste destined

for landfills. Despite these infrastructure improvements, local authorities still grapple with significant challenges regarding the reduction of overall MSW volumes and content, including food and inorganic waste (Debrah et al., 2022). In line with global policies that prioritize waste reduction, reuse, and recycling, there is a growing need to explore how municipal authorities can effectively engage and encourage individual to reconsider their approach to managing household waste materials as resources.

This involves going beyond the conventional practice of merely discarding items and instead fostering a fresh perspective on what is traditionally considered "waste." This transformation encompasses the adoption of innovative practices that center on creating value from MSW, influenced by both individual habits and external factors (Chen & Lee, 2020). Essentially, the challenge lies in reshaping how people perceive and manage household waste materials, shifting from a linear "discard and forget" mindset to one that embraces circular principles (Jalil et al., 2016). In this perspective, MSW are seen as valuable resources to be conserved, repurposed, and reimaged (Coffee, 2023). Achieving this transformation not only requires changes in individual behaviours but also underscores the pivotal role of municipal authorities in facilitating and promoting these sustainable practices (Martin et al., 2006).

Household recycling is crucial for managing MSW challenges and advancing sustainable waste management, offering economic opportunities. The OECD's (2021) focus on recycling highlights its pivotal role in a circular economy. However, household recycling is a complex subject, extensively explored in various studies as observed by Knickmeyer (2020) and MacGregor (2019). These researches cover diverse perspectives, including psychology,

economics, and social sciences, exemplified in Phulwani et al.'s (2020) work. Much of this research has been confined to specific disciplines, primarily centered on behavioural aspects, as noted by Concari et al. (2020) and Macklin et al. (2023). Bridging these disciplinary boundaries is crucial for a comprehensive understanding of household recycling behaviour.

Pellmar and Eisenberg (2000) emphasize the importance of delving into sustainability issues within specific disciplines, acknowledging that such investigations can shed light on particular aspects of a problem, thus enriching the collective knowledge. Nevertheless, it becomes evident that solely concentrating on narrowly focused research may lead to diminishing returns, yielding only partial insights (Krishnan, 2009). Therefore, the complex nature of household waste recycling as a sustainability challenge underscores the necessity of adopting interdisciplinary research approaches. This approach promotes the integration of insights from diverse fields and viewpoints, fostering a more holistic and unified comprehension of the issue in question (Feitsma & Whitehead, 2022).

This study's purpose was to investigate the multifaceted factors influencing household participation in waste recycling, encompassing both behavioural and contextual dimensions. In this comprehensive framework, behavioural factors comprise attitude, perceived norms, perceived behavioural control, and an additional dimension, environmental awareness. Prior extensive research has firmly established these constructs as pivotal determinants shaping household waste recycling intentions and behaviours (Koshta et al., 2022; Kumar, 2019; Sabbir et al., 2023). To provide a solid theoretical underpinning

for comprehending the influence of these behavioural factors on recycling intentions, this study relies on the TPB, initially proposed by Ajzen (1991).

In the TPB, attitude reflects how individuals perceive recycling behaviour, with positive attitudes linked to a greater intention to recycle. Chengqin et al.'s (2022) study underlines the significant impact of attitude on household recycling intentions, indicating that those who view recycling as environmentally beneficial and personally rewarding are more inclined to recycle. Environmental awareness, representing one's understanding of environmental issues and their consequences, plays a pivotal role in shaping recycling intentions. Greater environmental awareness usually results in a stronger intention to recycle, as supported by Wang, Guo, and Wang's (2016). These findings underscore the complex relationship between attitude, environmental awareness, and recycling intentions in the TPB framework.

It is important to emphasize that the role of attitude as a mediator between environmental awareness and intentions is strongly supported by various psychological and behavioural theories, including the TPB as noted by Guo et al. (2016). In the context of environmentally responsible behaviour, individuals who possess a heightened awareness of environmental issues tend to develop positive attitudes towards eco-friendly actions. These positive attitudes, in turn, play a pivotal role in connecting environmental awareness with the intention to engage in pro-environmental behaviours. For example, a study conducted in Indonesia by Indriani, Rahayu and Hadiwidjojo (2019) revealed that attitude served as a complete mediator in the relationship between environmental awareness and the intention to make green purchases.

The influence of perceived norms, another key construct of the TPB which relates to an individual's perception of socially acceptable recycling behaviour, carries substantial weight in shaping recycling intentions (Wang et al., 2014). Multiple studies consistently show that individuals are more inclined to express an intention to recycle when they perceive recycling as widely supported and expected within their social networks. A recent research endeavor conducted by Vijayan et al. (2023), focusing on the impact of perceived norms on household recycling intentions in India, validates this concept. The study underscores that a strong perception of recycling as a socially endorsed and normative behaviour is positively linked to the intention to engage in recycling activities.

In a similar vein, perceived behavioural control, which reflects an individual's confidence in their ability to carry out a desired behaviour, holds a central position within the TPB. It exerts a substantial influence on both intentions and actual behaviours. Individuals who have faith in their capacity to access necessary resources and possess the required skills for recycling are more likely to express an intention to recycle. For instance, in a recent investigation conducted by Xu, Liu and Rustam (2023), delving into the influence of perceived behavioural control on household waste recycling intentions, it was established that this construct has a positive and significant impact on the intention to engage in waste recycling activities.

Despite the evident predictive power of the TPB, it primarily concentrates on the determinants of intentions and behaviours at the individual level. In contrast, Guagnano et al.' (1985) attitude-behaviour-context (ABC) theory places a strong emphasis on external factors, such as recycling facility

availability and awareness creation (Wang et al., 2021). Neglecting these contextual elements can impede individuals in translating intentions into actions. Access to recycling facilities, coupled with heightened awareness creation and proper waste separation practices, significantly boosts recycling participation. A study by Chen and Lee (2020) in Nanning, China, revealed a positive correlation between awareness of recycling collection points and accessibility, leading to increased participation rates. This perspective complements the TPB, offering a more comprehensive understanding of the factors influencing recycling intentions and behaviours.

Furthermore, creating awareness about the importance of recycling and spreading knowledge about effective recycling methods can positively influence people's willingness to recycle (Alhassan et al., 2018). When individuals understand the environmental benefits of recycling and the consequences of not recycling, they are more likely to participate in recycling efforts. A study by Altunbey and Çelikler (2023) demonstrated that exposure to educational programs and information about recycling significantly increased recycling behaviours. Conversely, a separate study conducted by Elmosaad et al. (2023) found that insufficient awareness campaigns led to low levels of recycling participation in Saudi Arabia, highlighting the significant impact of awareness campaigns on individuals' motivation to recycle.

The ABC framework has made important contributions to recycling studies by combining attitude and contextual variables. However, it fails to consider the voluntary nature of household waste recycling, and the inherent lack of immediate economic benefits which may discourage participation (Alhassan et al., 2020). Additionally, while household waste recycling is crucial

for society, it faces free-riding issues due to non-exclusivity (Blok et al., 2020). In addressing this concern, the consumer utility maximization theory (CUMT) by Ben-Akiva and Lerman (1991), offers valuable insights into how individuals weigh the costs and benefits of contributing to public goods like recycling. CUMT suggests that policy inducements like mandatory recycling programs and financial incentives are essential to boost waste recycling. A recent study by Ma et al. (2023) underscores the significant impact of these policies in enhancing recycling rates, confirming their effectiveness.

In addition, this study extended its examination to assess how policy inducements influence the relationship between social norms and household waste recycling intentions within the TPB. Wang et al. (2014) found that policy inducements significantly moderate the link between perceived norms and recycling intentions. When policy inducements, like government regulations or behaviour-related incentives, are present, they moderate the impact of subjective norms on intentions, strengthening their influence. However, a study by Liao et al. (2017) in Sichuan, China, discovered a negative moderating effect of policy inducements on the connection between perceived norms and recycling intentions within the TPB. In both theory and practice, the presence of policy support can shape and enhance the influence of social norms on recycling intentions, but its effect can vary in different contexts.

However, policy inducements pose increasing challenges for governments, particularly in current choice-oriented, consumer-focused service economies (Barr et al., 2013). In the context of household recycling, convenience is paramount. The nudge theory, as advanced by Thaler and Sunstein (2008) and rooted in psychology and behavioural economics (Stoknes,

2015), underlines the importance of simplifying recycling to engage individuals. It involves adjusting how recycling options are presented to positively influence people's choices while maintaining their freedom. This includes the creation of user-friendly recycling systems, like enhancing bin accessibility and visibility. Both Cudjoe et al.'s (2022) study in Hong Kong and Flygansvær et al.'s (2021) research in Oslo affirm the significant impact of curbside recycling in boosting household participation in MSW management.

This research highlighted the crucial role of household waste recycling in sustainable waste management in Accra, emphasizing the need for interdisciplinary understanding of the multifaceted factors influencing their intentions. The integration of behavioural factors within the TPB, alongside contextual elements necessitated the inclusion of the ABC framework for a more holistic perspective. To address challenges like free-rider issues, CUMT was incorporated, stressing the importance of mandatory recycling schemes and policy inducements. Given policy complexities in current consumer-focused service economies, user-friendly recycling systems based on the NT became essential. Finally, the thesis underscored the importance of the dual role of households in reverse logistics, both as recipients of services and sources of recyclable materials for a circular economy aligned with the UN-SDGs.

Problem Statement

The global community faces an unprecedented challenge in managing waste, driven by population growth, urbanization, and increased consumption. MSW generation has reached alarming levels, posing significant environmental and economic threats (Kaza et al., 2018). As concerns over resource depletion and environmental degradation intensify, the circular economy paradigm has

emerged as a transformative approach to tackle these issues (Yang et al., 2023). At its core, the circular economy aims to reduce waste, maximize resource utilization, and minimize environmental impact (Wilson, 2021).

Urbanization in Ghana has had a significant impact on the efficiency of waste management in the country (Volsuuri et al., 2023). As more people migrate from rural areas to cities and towns in search of better economic opportunities and improved living standards, several key factors come into play that affect waste management. Urbanization often leads to a rapid increase in the population of urban areas. The more people there are in a city, the more waste is generated. This puts immense pressure on waste management systems, making it challenging to keep up with the increasing volume of waste and can lead to changes in waste composition (Oteng-Ababio et al., 2017). In urban areas, there is often more packaging, electronic waste, and industrial waste, which require specialized handling and disposal methods.

The Accra Metropolitan Area (AMA) holds a central role in Ghana's economic and political landscape as the nation's capital. It is a bustling city, officially covering 139.7km² (Asabere, Acheampong & Ashiagbor, 2020), and it comprises three Sub Metros: Ashiedu Keteke, Ablekuma South, and Okaikoi South. According to the United Nations World Urbanization Prospects, AMA's population is estimated at about 2.5 million, and it is projected to grow to 2.7 million and 3.6 million by 2025 and 2035, respectively (Figure 5). This rapid urban growth has significant implications for waste management. The increasing population and urbanization mean more waste is generated. Consequently, there is a growing need for infrastructure and services to handle

this waste as the environmental impact of waste mismanagement becomes more pronounced in densely populated areas.

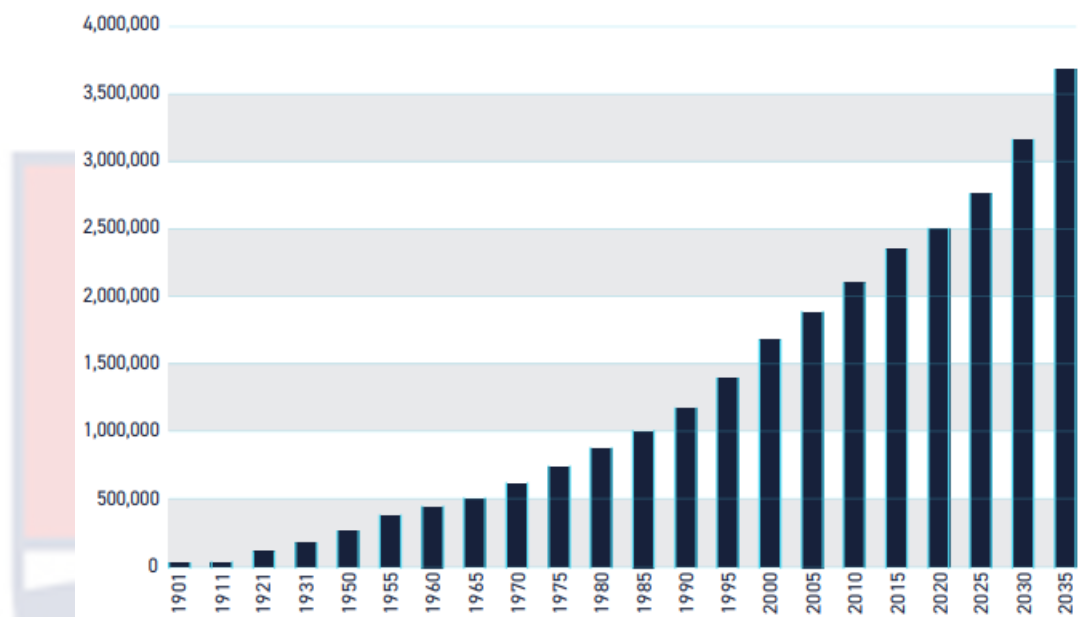


Figure 5: Accra population trends from 1901 to 2035

Source: UN World Urbanization Prospects (2018)

The selection of the Accra Metropolitan Area (AMA) for this study is underpinned by several unique characteristics, one of which is its distinctive population distribution within the city-region. Over the course of three decades, from 1985 to 2017, the urbanized area within the metropolis witnessed substantial growth, expanding from 42.1 square kilometers to a notable 89 square kilometers (Asabere et al., 2020). This remarkable urban expansion has resulted in the urbanized zone now covering approximately 63% of the total land area of the AMA. Furthermore, this expanded urbanized region is home to a significant 44% of the total population, as depicted in Figure 6. The implications of this substantial population concentration within the urbanized area are profound, emphasizing the necessity for effective waste management solutions that can accommodate the needs of a densely populated urban center.

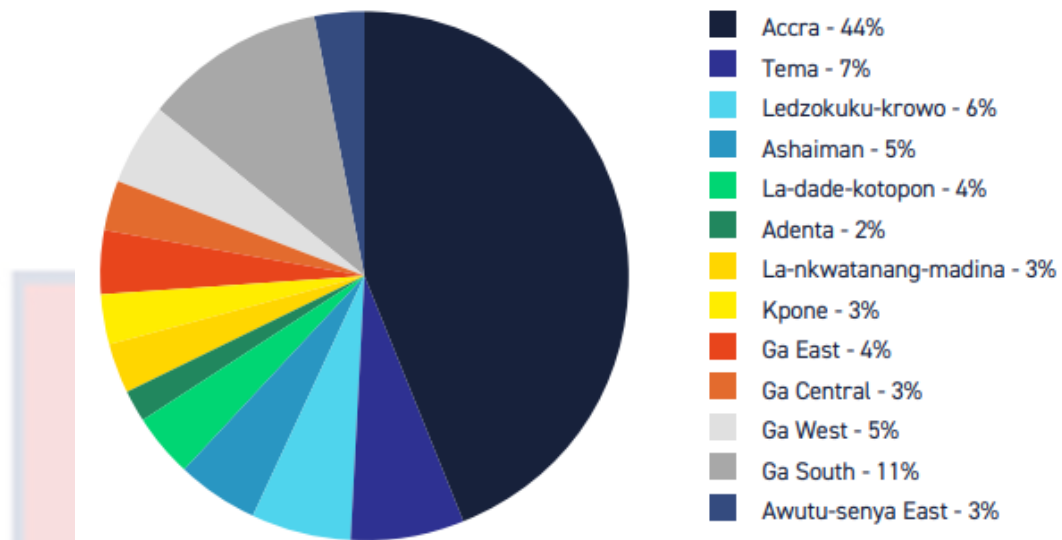


Figure 6: Accra city-region population distribution

Source: UN World Urbanization Prospects (2018)

To address these challenges, there is a need for attitudinal change among households including norms, perceived control and environmental awareness (Alhassan et al., 2018). People must understand the importance of proper waste management, recycling, and waste reduction. Concurrently, investment in waste management infrastructure and services is crucial. This includes waste collection, recycling facilities, and proper disposal sites. Creating an environment that encourages active participation in waste management is also vital. This goes beyond just the physical infrastructure; it includes policies and incentives that motivate individuals and communities to engage in waste separation and recycling. Waste management practices should not only address current waste generation but also anticipate future growth and changes in waste composition (Chen & Lee, 2020).

In addition to well-defined policies and regulations, robust enforcement mechanisms are essential to ensure compliance and hold individuals and businesses accountable for their waste management practices. Public awareness

campaigns and education play a crucial role in informing the community about the benefits of responsible waste management and recycling (Martin et al., 2006). Furthermore, investment in infrastructure and services, such as recycling centers and waste collection systems, is vital to create a conducive environment that encourages active participation in waste reduction and recycling initiatives. By addressing the waste management challenges effectively, AMA can not only preserve its environment but also support its economic and social growth in the years to come.

Forecasts from the United Nations Department of Economic and Social Affairs (2018) indicate a substantial increase in waste generation in Accra, Ghana, spanning the years from 2000 to 2030. During this period, the amount of waste generated in the city is projected to rise significantly, from 2,127 tonnes in 2000 to 4,419 tonnes by 2030. This represents a noteworthy surge in the volume of waste produced by Accra over the course of three decades. Unfortunately, as waste generation has grown, the city's capacity to provide efficient solid waste disposal services has deteriorated over the past two decades (Oduro-Appiah et al., 2019). This deterioration is primarily attributed to a lack of sufficient funding sources. The increased volume of waste generated has strained the existing infrastructure and services, and the available funding has not kept pace with the rising demand.

Table 1: Accra's Projected Population and Waste Generation (2000-2030)

Year	Population	Percentage (%)	Waste generation (tonnes/day)	Waste collection (tonnes/day)	Backlog (tonnes/day)
2000	1,658,939	3.03	2,127	1,702	425
2005	1,960,797	2.15	3,369	2,695	531
2010	2,317,583	2.13	3,454	2,123	674
2020	3,237,730	1.58	3,590	2,712	678
2030	4,523,203	2.74	4,419	3,535	884

Source: UNDESA (2018)

The choice of AMA as the study area is further justified by the prevailing situation where open dumping remains the predominant and, inevitably, the preferred method for MSW disposal. Unfortunately, most disposal sites in the region have surpassed their designated capacities, creating a precarious waste management scenario for both the city of Accra and its surrounding suburbs (Oduro-Appiah et al., 2019). Years of urbanization, inadequate governance, and a lack of inclusive user participation in MSW management facility planning have hindered the establishment of a planned engineered landfill in the capital city, as originally intended by the Urban Environmental Sanitation Project (Oteng-Ababio, 2014). This situation has compelled city authorities to resort to waste disposal in neighboring municipalities.

Currently, AMA grapples with a substantial daily waste generation rate is over 3,000 tonnes (Oduro-Appiah et al., 2022). However, due to equipment limitations, AMA can only collect around 2,500 tonnes per day. This

discrepancy is notably reflected in the city's deteriorating environmental conditions, characterized by choked drainage systems, overflowing garbage heaps, and littered pavements. Consequently, the AMA dedicates more than 65% of its revenue to waste collection, transportation and disposal at unregulated landfills and dumpsites (Oteng-Ababio), posing a significant risk to the overall ecosystems and surrounding communities. (Figure 5).



Figure 7: Uncontrolled Dumpsites in Accra.

Photos: Dapilah (2022)

In 2015, Ghana earned the unenviable distinction of being ranked as the seventh dirtiest country in the world due to its significant challenges in waste management and environmental cleanliness (Sarfo-Mensah et al., 2019; UNEP, 2018). What makes this issue even more critical is its far-reaching impact on the achievement of the UN-SDGs as emphasized by Fujimori et al. (2016), Srigboh et al. (2016) and Akortia, Olukunle, Daso, and Okonkwo (2017). For example, the situation has dire consequences for multiple SDGs, including SDG3, which pertains to good health and wellbeing, SDG6, addressing clean water and sanitation, SDG11, which focuses on creating sustainable cities and

communities, and SDG12, aiming for sustainable consumption and production patterns. Additionally, these challenges affect SDG13, which seeks to mitigate climate change, as well as SDG14, which concerns life below water, and SDG15, aiming to protect life on land.

The prevailing waste situation in Accra, and for that matter Ghana, carries grave consequences for public health, manifesting in seasonal cholera outbreaks and an alarming statistic where over 70% of diseases reported at outpatient health facilities are attributed to inadequate waste and sanitation conditions (Boadi & Kuitunen, 2005; Oteng-Ababio, 2011). Regrettably, Ghana Health Service data reveals that diarrhoea claims the lives of 5,100 children under the age of five and 13,900 adults each year, with more than 90% of these fatalities linked to subpar sanitation and hygiene (Abalo et al., 2018; Alhassan et al., 2018). Furthermore, improper waste disposal exacts a significant toll on Ghana, with the Waste and Sanitation Programme (WSP, 2012) estimating annual losses amounting to \$290 million, equivalent to 1.6% of the country's GDP. Consequently, in 2015, Ghana was ranked as the seventh most polluted country on a global scale (Sarfo-Mensah et al., 2019; UNEP, 2018).

In an effort to tackle these challenges, the Ghanaian government is committed to addressing waste management issues through active engagement with stakeholders, spearheaded by the Ministry of Environment, Science, Technology, and Innovation as highlighted in UNEP's (2019) report. Ghana has assumed a trailblazing role by becoming a member of the Global Plastic Action Partnership (GPAP) and initiating the National Plastic Action Partnership (NPAP) in 2019. With a specific focus on eradicating plastic pollution in water bodies by the year 2040, these initiatives not only set a commendable example

for other nations but also hold the potential for substantial reductions in waste-related concerns, as emphasized in the UNDP's (2019) publication.

Emphasizing the application of reverse logistics principles alongside behavioural models in MSW management is crucial and deserves national attention. Reverse logistics, as a supply chain concept, allows waste service providers to establish long-lasting partnerships with households by facilitating the efficient exchange of waste materials and data (Takar, 2010). This system creates streamlined channels for the targeted recovery of specific waste fractions, aligning with the NPAP's objectives. Moreover, by involving households as primary waste resource providers, the reverse system encourages collaborative efforts between local authorities and citizens (Gaur & Mani, 2018).

In this context, examining the behavioural logistics of households in the reverse supply chain is essential to understand how consumers' intentions and actions impact waste collection, segregation, and recycling, facilitating the development of effective waste management strategies (Flygansvær et al., 2021; Sabbir et al., 2022). Additionally, the transition to a circular economy requires a cultural shift towards sustainability, not only on an individual level but also within society and institutions (Calisto Friant et al., 2023). Households, as a microcosm of society, provide a tangible example of sustainability in action through their waste management practices (Ellen MacArthur Foundation, 2015).

Encouraging sustainable waste management practices within households transcends mere waste volume reduction; it entails nurturing a culture of sustainability that serves as a beacon for succeeding generations

(Blomsma & Brennan, 2017). Although the theoretical underpinnings of the circular economy and reverse logistics are well-established, the application of these principles to household waste recycling remains in its embryonic stages (Flygansvær et al., 2021). Considerable gaps and challenges persist, encompassing the intention-behaviour disjunction, adherence to recycling regulations, and the intricate economic ramifications associated with efficient waste management practices (Sabbir et al., 2022). These facets demand comprehensive exploration within the scholarly realm.

This study employed a comprehensive, interdisciplinary approach to uncover the intricate interplay of factors affecting household waste recycling intentions. It explores various theories and their practical strategies to improve the reverse supply chain. The primary focus of this research was to examine behavioural aspects, such as attitudes, perceived social norms, perceived behavioural control and environmental awareness. In addition, it integrated contextual elements like the access to recycling facilities, convenience in recycling, awareness creation, and policy inducements. These combined efforts aimed to enhance the sustainability and efficiency of household waste recycling, thereby contributing to the larger shift towards a circular economy.

The study ventured into additional dimensions related to households' waste recycling intentions including the moderating role of policy inducements and mediating effect of attitude. Thus, the research delved into how contextual factors, such as government policies and incentives, can impact the connection between perceived social norms and households' intentions to recycle waste. This involved examining whether policy measures strengthen or weaken the relationship between social norms and an individual's waste recycling

intentions. It aimed to understand the extent to which policy influences these intentions.

Moreover, the study explored how attitude serves as an intermediary in the relationship between environmental awareness and the intention to recycle waste. In essence, attitude in the TPB framework plays a mediating role, bridging the gap between increased environmental awareness and more positive attitudes toward recycling (Fishbein & Ajzen, 2010). These positive attitudes, in turn, significantly affect an individual's recycling intentions. The study's expanded focus moves beyond the core factors influencing recycling intentions and investigates how external factors (context) and internal processes (behavioural) shape the recycling intentions of households.

However, in the pursuit of effective MSW management aligned with sustainability principles (Bernardo et al., 2023), a critical gap in research exists regarding households' role as suppliers in reverse logistics. The field of behavioural logistics within household recycling, which is vital for sustainable supply chains (Tokar, 2010), remains largely unexplored. Despite the increasing emphasis on promoting recycling by treating waste as a valuable resource, there is a significant gap between the intentions expressed by end consumers and their actual recycling behaviours as observed by Flygansvær et al. (2021). These gaps revolve around issues, context and theory.

Behavioural studies often emphasize internal motivations and favour strategies like education and persuasion (Guagnano et al., 1995). In contrast, studies focusing on contextual factors use interventions like regulations, taxes, or incentives to drive behaviour change. Bridging these two perspectives is essential to create a unified theory of behaviour that accounts for both internal

and contextual factors (Bagozzi, 1992). In the realm of reverse logistics and supply chain literature, limited attention has been paid to understanding the determinants of households' reverse exchange intentions (Jalil et al., 2016). The few existing studies on this topic suggest that both contextual and behavioural factors require further investigation (Sabbir et al., 2022). Integrating these elements is crucial to addressing the complexity of managing reverse logistics networks and recycling behaviour effectively.

The efficacy of reverse logistics programs is predominantly reliant on the engagement of end consumers, who act as primary contributors to this process (Gaur and Mani, 2018). Nevertheless, the dearth of consumer awareness and subsequent low participation rates serve as deterrents for companies to engage in these initiatives spontaneously (Abdulrahman et al., 2014). Hence, it is imperative to explore the factors influencing consumer behaviour within the realm of reverse logistics in the context of MSW recycling schemes (Budijati et al., 2016), an area that has garnered insufficient attention in existing literature as highlighted by Khan et al. (2019), Kumar (2019) and Yuan et al. (2016). A few limited existing studies by Jena and Sarmah (2015) and Kianpour et al. (2017) have concentrated on consumers' e-waste recycling intentions, whereas the majority has focused on recycling performance from the suppliers' perspective (Khan et al., 2019; Kochan et al., 2016; Yuan et al., 2016).

Consequently, a review of prior reverse logistics studies conducted by scholars such as Arain et al. (2020), Delcea et al. (2020) Dixit and Badgaiyan (2016), Kianpour et al. (2017), Kumar (2019) Mahmud et al. (2020), Nguyen et al. (2018) and Sabbir et al. (2022) has brought to light the following key research gaps. First, within the broader domain of reverse logistics (Khan et al., 2019;

Kumar, 2019) and reverse supply chain management (Kianpour et al., 2017; Wang et al., 2019b), limited importance has been attributed to the predictors of consumers' reverse exchange intention, particularly in the context of MSW (Yuan et al., 2016). Second, in the realm of examining reverse exchange behaviours, Kianpour et al. (2017) and Parajuly et al. (2020) have argued that the exploration of contextual factors, such as government initiatives, and non-cognitive factors is still inadequate and necessitates further investigation.

Third, it has been observed that consumers' attitudes do not invariably lead to intention, giving rise to the "attitude-intention gap," which continues to be a concern in the sustainability literature as argued by Sabbir et al. (2022) and Halldórsson et al. (2019) and ElHaffar et al. (2020). Moreover, numerous consumer behaviour studies, including those on organic food consumption (Tandon et al., 2020a), brand switching intention (Aw & Chong, 2019) and recycling intention (Wan et al., 2014), and have addressed this gap by incorporating context-specific moderators. However, the examination of such intervening mechanisms remains a rare exploration in the literature on reverse logistics. More importantly, Guarnieri et al., (2020), Koshta et al. (2022) and Kumar (2019) have advised against validating existing findings on reverse logistics within diverse contexts, particularly in developing countries, where social and cultural nuances significantly affect consumer behaviour.

Recycling behaviour is influenced by internal and external factors, as studied by various scholars (Ahrari et al., 2021; Alzubaidi, Slade, & Dwivedi, 2021; Chen & Lee, 2020; Isock, Roberts-Lombard & Mpinganjira, 2020; Knussen, Yule, MacKenzie & Wells, 2004; Steg & Vlek, 2009; Tonglet, Phillips & Read, 2004; Wan et al., 2017; Whitmarsh et al., 2018). The Theory

of Planned Behaviour (TPB) model has been widely applied to understand pro-environmental intentions and actions (Kautish, Paul, & Sharma, 2019; Morren & Grinstein, 2016; Sabbir et al., 2022; Strydom, 2018). Despite recognizing the complexity of behaviour, previous research on recycling tends to be discipline-specific, primarily focusing on psychological aspects, which highlights fragmentation within the field.

The bulk of these studies have been carried out in developed nations, including the United States, Western European countries, and advanced Asian nations such as China, Japan, and Malaysia (Abila & Kantola, 2019; Chen & Lee, 2020; Flygansv er et al., 2021; Jalil et al., 2016). These countries have reached the pinnacle of recycling due to well-established infrastructure, enforceable legislation, and a high level of public environmental awareness and education as advanced by Barr et al. (2013). However, various demographic and socio-economic factors, such as income, age, gender, education, occupation, awareness, and recycling habits, continue to exert diverse influences on household recycling behaviour (Alhassan et al., 2020). Even when conducted within the same country, the inconsistent findings suggest that attitudes and intentions in this regard are not confined to specific nations (Oduro-Appiah et al., 2022). This underscores the variability in recycling intentions and behaviours both across and within countries.

Hence, it is crucial to evaluate the TPB's applicability across diverse cultural contexts, notably in emerging economies like Ghana. Prior TPB research has primarily emphasized psychological factors, often overlooking contextual aspects (Manklin et al., 2022). Scholars have proposed that the persistent intention-behaviour gap may stem from this one-dimensional

approach, neglecting the interplay of contextual and behavioural factors influencing pro-recycling intentions and actions (Jalil et al., 2016; Sabbir et al., 2022; Wang et al., 2021). Consequently, this research project seeks to depart from previous ones by investigating households in their role as sources as well as suppliers of waste resources and examining how the design of reverse logistics systems, tailored to these transformed end-consumer-suppliers, can bolster recycling intentions.

As previously noted, prior research on pro-recycling has explored household recycling intentions, emphasizing either behavioural factors or effective reverse logistics system designs (Sari et al., 2021; Sabbir et al., 2022). In practice, however, it is widely acknowledged that household behaviour and the design of reverse logistics systems operate in tandem, exerting a synergistic influence on sustainable waste management practices (Jalil et al., 2016). In an attempt to address these issues, this study empirically tests a model to unravel the dynamic interplay between contextual and behavioural factors shaping recycling intentions. The behavioural aspects include environmental awareness, attitudes, perceived social norms, and perceived behavioural control, while contextual factors encompass recycling facility accessibility, convenience, awareness initiatives, and policy incentives.

This research addresses significant gaps in the current body of knowledge on waste recycling. It focuses on two underexplored areas: firstly, examining how policy support moderates the relationship between social norms and household waste recycling intentions. While some prior studies have touched upon this aspect, there remains a substantial gap in the literature, as highlighted by Wang et al. (2014). Secondly, the study investigates the

mediating role of attitudes in the link between environmental awareness and waste recycling intentions, drawing on the TPB. This theoretical framework positions attitudes as a crucial influencer of behavioural intentions, contributing to a nuanced understanding of recycling behaviour (Alhassan et al., 2018).

The Purpose of the Study

The purpose of the study sought to investigate households' participation intentions to recycle MSW from a reverse logistics perspective in AMA.

Research Objectives

1. To analyse the effect of contextual factors (access to recycling facilities, convenience, awareness creation and policy inducement) on households' intentions to recycle MSW in AMA
2. To examine the effect of behavioural factors (environmental awareness, attitude, perceived norms and perceived behavioural control) on households' intentions to recycle MSW in AMA
3. To analyse the moderation effect of policy inducement on the relationship between perceived norms and households' intentions to recycle MSW in AMA
4. To assess the mediating role of attitude on the relationship between environmental awareness and household intentions to recycle MSW in AMA.

Research Hypotheses

In view of the stated objectives, the hypotheses for the study were set in relation to objectives 1, 2, 3 and 4

H1a: Access to recycling facilities has significant relationship with households' intentions to recycle waste.

H1b: Convenience in recycling significantly influences households' intentions to recycle waste

H1c: Awareness creation significantly relates to households' intentions to recycle waste

H1d: Policy inducement significantly influences households' intentions to recycle waste

H2a: Environmental awareness considerable impact on household waste recycling intentions.

H2b: Attitude significantly predicts households' intentions to recycle waste

H2c: Perceived norms has a significant relationship with households' intentions to recycle waste

H2d: Perceived behavioural control significantly predicts households' intentions to recycle waste

H3: Policy inducement significantly moderates the relationship between perceived norms and households' intentions to recycle waste

H4: Attitude significantly mediates the relationship between environmental awareness and households' intentions to recycle waste

Significance of the Study

This study holds significance for theory, policy, and practice in understanding household waste recycling. It integrates well-established behavioural and rational-based theories, including the TPB (Ajzen, 1991), the ABC model (Guagnano et al., 1995), the CUMT (Ben-Akiva & Lerman, 1991) and NT (Thaler & Sunstein, 2008), forming a robust theoretical framework. The research delves into individual factors such as attitudes, perceived norms, behavioural control, and environmental awareness, as well as contextual factors

like access to recycling facilities, awareness campaigns, policy incentives, and convenience. This comprehensive approach deepens the understanding of waste recycling intentions. By considering this broad spectrum of determinants, the research offers profound insights into the complex nature of waste recycling intentions.

In terms of policy, the study's significance lies in its capacity to inform evidence-based policy formulation. The insights drawn from the fusion of behavioural theories provide policymakers with a nuanced understanding of the factors that drive or impede recycling behaviours (Jalil et al., 2016). This knowledge serves as a solid foundation for designing effective interventions and incentives that encourage sustainable recycling practices within households (Chen & Lee, 2020). The research also facilitates the tailoring of policies and interventions according to specific determinants identified through the comprehensive framework. For instance, policies can be designed to target attitude change, enhance perceived behavioural control, improve recycling accessibility, or foster environmental awareness, based on the specific needs of a given community or demographic.

From a practical perspective, the study contributes to the development of behavioural interventions aimed at promoting household waste recycling. The integrated theoretical framework provides a roadmap for crafting persuasive, effective nudges, campaigns, and educational initiatives that resonate with individuals' motivations and situational contexts as advanced by Alhassan et al. (2018). Additionally, the research offers valuable insights for practical community engagement strategies (Jalil, 2015). By identifying the key factors influencing recycling intentions and behaviour, community organizers

can tailor their outreach efforts to maximize impact and foster sustainable recycling practices among residents.

Delimitation

The research project focuses on reverse logistics in household waste recycling, aiming to challenge the prevalent "take-make-dispose" paradigm responsible for substantial waste generation in supply networks. Despite ongoing efforts to promote environmental responsibility downstream, a significant portion of products eventually becomes household waste, posing harm to the environment. The pivotal role households play in this waste supply chain is acknowledged. Departing from the traditional role as end-consumers, the study explores how households can transform into active suppliers of recyclable materials. This shift in perspective enables an examination of the dynamics and implications of this role reversal in the context of waste recycling.

The primary objective of this study was to investigate the intentions of households to engage in waste separation at the household level for recycling purposes, with a specific focus on the Accra Metropolitan Area. The selection of the Accra Metropolis for the geographical scope was deliberate, driven by the area's substantial population size and the persistent generation and unregulated disposal of waste, which has been exacerbated by rapid urbanization. This uncontrolled waste disposal has posed significant threats to the environment, public health, and the overall aesthetic appeal of Accra, which is Ghana's Capital City.

Considering the significance of both behavioural and logistical aspects in determining the efficiency of household recycling, a comprehensive exploration of variables from both domains within a single study has been

notably lacking. Consequently, the aim of this research endeavor was to bridge this gap and serve as the central focus of the thesis. To achieve the study's objectives, a cross-sectional survey employing a quantitative approach was conducted. Structured questionnaires were administered within the study area to collect data, enabling a comprehensive statistical analysis of the critical aspects of household recycling behaviour and logistics efficiency in waste management.

Definition of Terms

1. Reverse logistics: the flow of end of life products from the consumer, upstream the distribution channel, to regain the value of the returned material or provide the means for proper disposal
2. Municipal solid waste: encompasses the waste generated by households, businesses, institutions, and some industrial processes within a municipality or urban area
3. Circular economy: an economic and industrial model that aims to minimize waste, promote sustainability, and maximize the efficient use of resources.
4. Sustainable waste management: It involves the efficient and responsible handling, disposal, and reduction of waste materials to minimize their impact on the environment, human health, and natural resources while promoting long-term sustainability.
5. Access to recycling facilities: refers to the availability and proximity of locations or facilities where individuals and communities can conveniently drop off or dispose of recyclable materials

6. Recycling convenience: refers to the degree to which recycling processes and systems are easy, accessible, and user-friendly for individuals and communities.
7. Awareness creation: to increase knowledge and understanding about a particular topic, with the hope of influencing attitudes, behaviours, or actions related to that topic.
8. Policy inducement: refers to the use of government policies, regulations, incentives, or measures to encourage or stimulate certain behaviours, actions, or outcomes in society.
9. Recycling intention: refers to an individual's expressed willingness or plan to engage in recycling behaviour in the future.
10. Attitude: attitude is a person's overall outlook or feelings toward something, which can be positive, negative, or neutral.
11. Perceived norms: refer to an individual's perception of what they believe others think they should do in a particular situation.
12. Perceived behavioural control: refers to an individual's subjective perception or belief regarding their ability to perform a particular behaviour
13. Environmental awareness: It involves recognizing the importance of environmental conservation and adopting behaviours and practices that promote sustainability and the well-being of the Earth.
14. Household waste recycling: Household waste recycling refers to the process of collecting, sorting, and processing materials that are typically discarded as waste in households, with the goal of diverting them from landfills and incineration facilities.

Organisation of the Study

The organizational structure of this study comprises six distinct chapters. The initial Chapter provides a comprehensive exploration of the background and contextual framework within which this thesis operates. Chapter Two is dedicated to an extensive review of pertinent literature, encompassing relevant theories and concepts that underpin the study. In Chapter Three, a focused examination is conducted, primarily centered on empirically evaluating key studies germane to the subject matter. These studies serve as the foundational basis for constructing the conceptual framework of the research.

The ensuing Chapter, Chapter Four, delves into the research methods employed, elucidating the methodologies, procedures, and strategies employed for both data collection and subsequent data analysis. Chapter Five encompasses the presentation of empirical data, as well as an in-depth discussion of the findings derived from the analysis. These findings are meticulously examined in light of the study's defined objectives, hypotheses, and the conceptual framework. The final chapter, Chapter Six, serves as the culmination of this study. It encapsulates a concise summary of the findings, provides overarching conclusions, offers practical recommendations, acknowledges the study's limitations, and outlines potential avenues for future research.

CHAPTER TWO

THEORETICAL AND CONCEPTUAL REVIEW

Introduction

In the first chapter of this research, the purpose was outlined: to investigate household recycling intentions within the context of a reverse flow system. It emphasized the role of sustainability in shaping supply chains, particularly in recycling municipal solid waste. The chapter stressed that public participation in waste recycling is influenced by a blend of contextual and behavioural factors. It underscored the dual role of households as both source and suppliers of the recycling process. Employing a comprehensive approach, the study integrated four key theoretical frameworks: TPB, ABC, CUMT, and NT, to enhance the understanding of waste recycling intentions. This integration aimed to unravel the complex dynamics governing household engagement in waste recycling, contributing to a more nuanced comprehension of this critical aspect of waste management.

Theoretical Review

The Theory of Planned Behaviour

Ajzen's TPB (1991) remains a highly influential academic concept, reaffirmed by his 2013 insights. It suggests that behaviour is influenced by beliefs and perceptions, originating from factors like personality traits (Bogg & Roberts, 2004), personal experiences (Schwarzer, 2008), education (Ajzen, 2015), media exposure (Vakratsas & Ambler, 1999), online information (Joinson, 2001), and social interactions (Ajzen, 2013). These beliefs significantly affect behaviour, supported by empirical evidence (Armitage & Conner, 2001). The TPB Model categorizes beliefs and highlights the crucial

role of an individual's intention in shaping subsequent actions (Ajzen, 1991; Sheeran, 2002).

Ajzen's TPB model (1991) posits that individuals initiate their decision-making process by evaluating potential outcomes, termed behavioural beliefs. They also consider social influences from significant individuals, known as normative beliefs, while balancing available resources and obstacles through control beliefs. As articulated by Ajzen (2013), behavioural beliefs shape one's attitude toward the behaviour, normative beliefs influence perceived social pressure or norms, and control beliefs contribute to a sense of behavioural control. This comprehensive framework illuminates the interplay of these beliefs in the decision-making process.

In accordance with Fishbein and Ajzen (2010), the TPB posits that an individual's attitude toward a behaviour, subjective norms, and their perceived behavioural control collectively influence the formation of behavioural intentions. This theory contends that these factors, namely attitudes, subjective norms, and perceived control, are reliable indicators of an individual's preparedness to engage in a particular behaviour. Consequently, a substantial portion of the variability in actual behaviour can be explained by these intentions and perceptions of behavioural control, as highlighted by Ajzen (2011a). Figure 7 illustrates that as attitudes and subjective norms become more favourable, and perceived control increases, the likelihood of an individual engaging in the target behaviour also rises, as emphasized by Ajzen (2015).

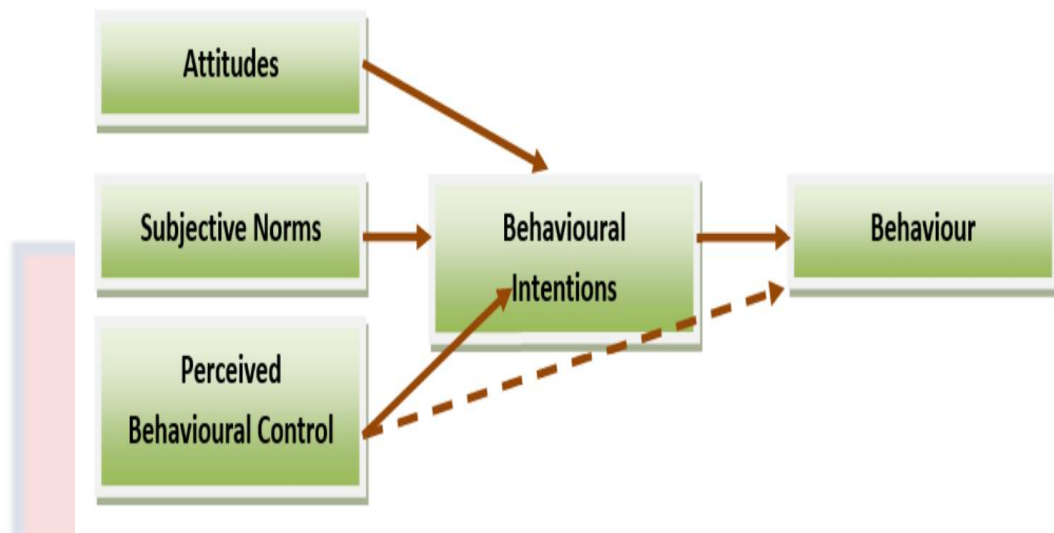


Figure 8: The TPB (Ajzen, 1991)

According to Ajzen (2013), individuals are likely to act on their intentions if individuals have genuine control over their behaviour, positioning intention as a direct precursor to behaviour. Recognizing that practical constraints can impede volitional control in various behaviours, perceived behavioural control is deemed essential, alongside intention, as direct determinants of behaviour (La Barbera & Ajzen, 2021). However, it's crucial to acknowledge that not all determinants of intention carry equal predictive weight. As indicated by Hagger, Cheung, Ajzen, and Hamilton (2022), the inclination to engage in a specific behaviour is contingent on a unique blend of attitudinal, normative, and control factors. This multifaceted interplay underscores the complexity of translating intention into actual behaviour.

The theory's foundational assumptions are pivotal to its framework. Firstly, it asserts that individuals' cognitive processing of available information serves as a mediating mechanism, enabling the amalgamation of biological and environmental influences into their behavioural choices. This perspective resonates with the critical role of cognitive self-regulation in comprehending

human behaviour, as underscored by Ajzen (1991), Ryan and Deci (2000) and Ajzen (2011b). It aligns with the concept of extrinsic motivation, emphasizing both external control and intrinsic self-regulation within specific behavioural contexts, as detailed by Largo-Wight, Bian and Lange (2012). Also, the theory posits that diverse behaviours and contextual factors encompass distinct configurations of primary antecedents that shape behavioural intentions.

This recognition highlights the theory's flexibility and applicability across a spectrum of human actions and situational settings. Lastly, it underscores the significance of control beliefs as the bedrock for shaping individuals' perceptions of their own behavioural control, while normative beliefs constitute the fundamental components shaping subjective standards. Ajzen's (2011b) and Côté et al.'s (2013) empirical support solidify the role of these beliefs within the theory, enhancing its capacity to elucidate the intricate nature of human behaviour and intention. These assumptions collectively furnish a comprehensive framework that significantly contributes to our understanding of decision-making processes and behaviour.

The theory recommends a thorough assessment of belief-based variables, advocating the utilization of two items per variable to enhance precision (Armitage & Conner, 2001). Ajzen (2002) underscores the importance of evaluating both the perceived outcomes and the significance of these beliefs, which are instrumental in comprehending the attitudes guiding individuals' decisions to engage in or abstain from specific behaviours. When examining behavioural beliefs, it is imperative to consider belief strength and result evaluation. Control beliefs should be evaluated for their strength and impact, while normative beliefs should be assessed based on their strength and

propensity for conformity (Ajzen & Klobas, 2013; Pearson & Hamilton, 2014). This meticulous evaluation approach for belief-based variables enriches our understanding of the factors that shape behavioural decisions within the framework of the theory.

Furthermore, the theory underscores the significance of measuring each construct or element with a minimum of five to six items defined by target, action, context, and time (TACT) (Oluka, Nie & Sun, 2014)). This adherence to the compatibility principle stipulates that the three theory constructs should align in terms of these elements, irrespective of how the TACT aspects of behaviour are delineated. Moreover, the theory promotes the measurement of variables using the Discrete Indicators (DI) scale due to its user-friendly nature and the scale's capacity to facilitate parametric analysis (Zemore & Ajzen, 2014). This meticulous approach to construct measurement enhances the theory's robustness and ensures consistency in evaluating the factors influencing behavioural intentions and decisions within its framework.

While the TPB has been successful in explaining various aspects of human social behaviour, it has not been immune to criticism. Orbell and Sheeran (1998) argue that the theory unfairly categorizes beliefs and their associated constructs. Ajzen (2011b) counters by emphasizing the necessity of this division for both theoretical and practical purposes, such as tailored policy formulation. An alternative perspective suggests that these distinctions are valuable in predicting intentions and behaviour. Ajzen (2011b) further underscores that such differentiation allows for the inclusion of additional predictors, provided they meet the theory's inclusion criteria (Cheung & Vogel, 2013; Sheeran, Gollwitzer & Bargh, 2013). These ongoing debates in the

academic discourse surrounding TPB highlight the theory's evolution and refinement to address criticisms while preserving its efficacy in comprehending and predicting human behaviour.

Fishbein and Ajzen (2010) outline key inclusion criteria for introducing additional constructs into the theory. Firstly, the suggested construct must be behaviour-specific and conform to the compatibility principle, which entails defining and measuring the variable in terms of the TACT elements explaining the behaviour. Secondly, the proposed variable should be perceived as a causal factor influencing both intention and action. Thirdly, the suggested construct should be conceptually distinct from the existing predictors within the theory. Fourthly, the variable in question should have the potential for broad applicability across a diverse range of behaviours studied by social scientists. Lastly, if the suggested variable is to be incorporated into the theory, it should consistently enhance the prediction of either intentions or actual behaviour, thus meeting the stringent criteria for its inclusion.

Critics have faulted the theory for not differentiating between affective and evaluative reactions to behaviour (Ajzen, 1991). However, research by Ajzen and Driver (1992) found that employing two distinct measures of attitude did not enhance intention prediction. Another concern has revolved around the exclusion of personal feelings of moral obligation or responsibility in deciding whether to perform or abstain from a particular behaviour, as proposed by Conner and Armitage (1998). In response, Ajzen (2011a) notes that tests involving the incorporation of felt moral duty demonstrated a significant contribution to intention prediction. Nevertheless, trials without it also showed adequacy within the theory's framework. Hence, considering its adaptability,

perceived moral duty could be added to the predictors of intention, as suggested by Ajzen (2011a) and Côté et al. (2013).

The TPB remains a pivotal model for predicting human social behaviour due to its extensive applicability across diverse fields and its exceptional predictive capacity (Ajzen, 2014; Kautonen et al., 2015). As noted by Ajzen (2011b), the TPB has found utility in a wide array of disciplines, including education and health studies. Notably, the theory's adaptability, as it accommodates new predictors, has led to its recognition under synonyms like the "deconstructed" or "extended" TPB (Xu et al., 2017; Liao et al., 2018). Despite its perceived complexity, the TPB offers a robust framework for the analysis of intricate facets of human social behaviour, as exemplified in studies such as household waste separation intentions. Its enduring relevance and versatility continue to make it an invaluable tool in understanding and predicting human actions across diverse contexts.

Nevertheless, the application of the theory has produced mixed and inconclusive results (Kianpour, Jusoh, Mardani, & Streimikiene, 2017; Kumar, 2019; Wang et al., 2016). As a response, various studies have introduced additional variables, such as environmental awareness, norms, values, and contextual factors, to predict pro-environmental intentions (Kumar, 2019; Wang et al., 2016). These developments align with Ajzen's (2011) assertion that the predictive power of pro-environmental intentions is contingent on factors beyond individual control. Furthermore, the intensity of the intention-behaviour relationship is constrained by actual behavioural control, indicating the need for alternative theories to address the TPB's limitations. These diverse research

approaches reflect ongoing efforts to explore more comprehensive frameworks for improved understanding and prediction of pro-environmental behaviour.

Considering the objectives of the current study's focus on both behavioural and contextual factors, relying solely on the TPB is inadequate.

While TPB is valuable for understanding individual attitudes and control over behaviour, it predominantly addresses internal cognitive processes. The study's emphasis on contextual factors necessitates the incorporation of additional theoretical frameworks. These could encompass theories related to external influences, policy interventions, or societal determinants that impact behaviour. Integrating multiple theoretical perspectives will offer a more comprehensive understanding of the complex interplay between behavioural and contextual elements, and the ABC theory is appropriate in this context.

The Attitude Behaviour Context (ABC) Theory

In contrast to the TPB, the ABC theory offers an alternative perspective by asserting that attitude (A) and contextual (C) factors interact synergistically to shape behaviour (B). Researchers in the social sciences have embraced the ABC model as a valuable complementary framework for unraveling the intricate connections among attitude, behaviour, and context (Guagnano et al., 1995). According to this theory, contextual circumstances exert a significant influence over the dynamic relationship between attitude and behaviour, emphasizing the role of the environment in shaping human actions (Peattie, 2010). This perspective aligns with the growing recognition that comprehending human social behaviour requires a holistic approach that considers both internal cognitive processes and the external contextual factors that impact decision-making (Knickmeyer, 2020).

In essence, while individuals' internal cognitive processes undoubtedly play a role in influencing their behaviour, the ABC theory underscores the substantial influence of the surrounding environmental context (Stern, 2000). What sets the ABC theory apart is its adept integration of variables from both cognitive and contextual approaches into a unified model of behavioural change, effectively bridging the gap between traditionally distinct theoretical paradigms (Chen & Lee, 2020). This synthesis underscores the holistic nature of understanding and explaining human behaviour, emphasizing the intricate interplay between attitudes, contexts, and actions in shaping the choices individuals make (Steg & Vlek, 2009).

As per the ABC theory, when capabilities and constraints exert a strong predisposition either in favour of or against a particular action, the influence of attitudes and other individual-driven variables becomes less significant, at least temporarily (Guagnano et al., 1995; Stern, 2000). This theory posits that human behaviour is co-determined by the interplay of attitudes and contextual conditions (Olander & Thøgersen, 2005). To a certain extent, it suggests that the contextual factors have the potential to override the impact of attitudes on behaviour (Steg & Vlek, 2009). Additionally, the theory implies that the context also modulates the strength of the association between attitude and behaviour (Zepeda & Deal, 2009). Consequently, this model underscores the pivotal role of contextual variables in predicting customers' attitudes toward engaging in various behaviours.

The theory, as postulated by Guagnano et al. (1995), posits that participation rates in a given activity are intricately tied to the presence of facilitating conditions. This means that even when individuals hold positive

attitudes and exhibit heightened environmental awareness, their participation may remain limited if the necessary favourable conditions are lacking. This underscores the significance of environmental context in shaping behaviour and highlights the potential limitations of attitudes alone in driving action. Studies by Hage et al. (2008) and Olander & Thøgersen (2005) provide empirical support for this premise, further emphasising the theory's validity.

In a complementary vein, Goh and Balaji (2016) emphasize that attitudes, although pivotal, are insufficient in providing a comprehensive understanding of consumers' behaviours, particularly in the realm of household recycling. Instead, the extent to which recycling occurs within households is intricately tied to the community's waste management plan. This plan encompasses various aspects, including the specific household waste fractions targeted for recycling and access to recycling facilities, collection services awareness creation. Therefore, the theory underscores the dynamic interplay between individuals' attitudes and the enabling contextual conditions as the driving forces behind behaviour. This highlights the pivotal role played by a supportive environment in translating positive attitudes into tangible action, shedding light on the nuanced complexities of human behaviour within a broader social and environmental context.

Household waste recycling is significantly influenced by contextual factors, such as access to recycling facilities (Millute-Plepiene et al., 2016). Favourable external conditions promote widespread recycling, making individual attitudes less decisive (Ogunbode et al., 2020). Conversely, challenging external conditions deter participation, regardless of positive attitudes (Millute-Plepiene et al., 2016). Public policy plays a vital role in

reshaping environmental behaviours, particularly by optimizing external conditions through policy interventions (Gibbs et al., 2015; Tlili et al., 2021). These interventions enhance the convenience and accessibility of eco-friendly actions, encouraging increased household waste recycling (Gibbs et al., 2015; Tlili et al., 2021). In essence, contextual conditions acts as a catalyst for promoting environmentally responsible behaviours among individuals.

Recent empirical studies have increasingly applied the ABC theory to diverse areas, including garbage separation and recycling (Carrington, Neville & Whitwell, 2010), consumer purchase behaviour (Dong & Hua, 2018; Knickmeyer, 2019), energy consumption (Chiu, Yeh & Spangler, 2016; Wang et al., 2021), and consumers' reverse exchange intention (Sabbir, 2022). In alignment with this trend, the current study extends the TPB framework by incorporating contextual variables rooted in the ABC theory. Notably, the presence of robust general waste infrastructure services and policy incentives exerts considerable external pressure on individuals to engage in recycling behaviours. Moreover, these factors may also have a notable influence on the formation of societal norms and collective recycling practices.

The attitude-behaviour-context (ABC) theory, while insightful in understanding human decision-making, presents notable limitations. For example, the ABC theory acknowledges the role of context but may not fully account for the dynamic and ever-changing nature of contexts (Trafimow & Sheeran, 1998). Thus, the same attitude may lead to different behaviours in different situations. (Trafimow & Sheeran, 1998). It often overlooks influential individual differences like personality traits and values (Eagly & Chaiken, 1993). Additionally, external factors, such as unexpected events or new

information, can alter the relationship between attitudes and behaviour (Fishbein & Ajzen, 2010).

To address these constraints, integrating the CUMT is crucial. Grounded in rational decision-making and utility maximization (Guagnano et al., 1995), CUMT enriches our understanding of consumer behaviour by considering economics, individual uniqueness, and rational choice intricacies. This integration offers a more comprehensive view of consumer behaviour, filling gaps left by the ABC theory and providing a robust foundation for empirical research and practical applications in consumer behaviour analysis. Together, these theories provide a more holistic perspective on the complexities of consumer decision-making in evolving pro-environmental issues.

The Consumer Utility Maximisation Theory (CUMT)

In the realm of microeconomics, a foundational theory that provides insights into human behaviour is the CUMT, which is rooted in the concept of rational choice (Alhassan et al., 2017). Ahmad and Daud (2010) characterize rationality as a process through which individuals seek to maximize utility (satisfaction) while adhering to a set of constraints. The concept of rationality is closely tied to all facets of human behaviour (Khamis, & Kamarudin, 2023), including that of recycling. Individuals, in their roles as members of households, would make waste recycling decision with the aim of maximizing their satisfaction or utility (Wetzstein, 2005). The application of CUMT to household waste recycling offers a comprehensive framework for understanding the intricate decisions individuals make within households while pursuing utility in the context of waste management (Alhassan et al., 2020).

The application of CUMT to waste recycling offers a comprehensive framework for understanding the intricate decisions individuals make while pursuing utility in a multifaceted waste management landscape. It takes into account economic considerations ranging from cost-benefit analyses, economic incentives and rational decision-making. However, it is crucial to recognize that the real-world application of CUMT in recycling entails complexities beyond purely economic considerations. This study underscores the need for a holistic understanding of waste recycling behaviour that integrates both economic and non-economic motivations (Krstić, 2020).

While advocating for public goods such as waste recycling often highlights the long-term benefits, like improved environmental conditions and resource efficiency, these gains may not sufficiently offset the immediate costs and efforts borne by individuals (Olson, 1965; Hage, 2008). This challenge arises because recycling's advantages are non-excludable, a point emphasized by Xu et al. (2018). In a voluntary recycling context, rational individuals might choose not to participate, recognizing that they can still reap the non-excludable collective benefits without actively engaging. This situation means that everyone benefits from recycling efforts, whether they contribute or not. Unfortunately, this can discourage active recyclers and foster free-rider behaviour, potentially leading to lower rates of material recovery.

Within the rational egoism framework, the collective-action dilemma, often termed the "tragedy of the commons" by Hardin (1968), seems nearly inevitable. Public goods demand collective provision but remain accessible to all, as explained by Yau (2010). Individuals, driven by self-interest, may choose to free ride on others' efforts, abstaining from waste separation, as seen in Xu et

al's. (2018) study. Recognizing that actions carry more weight in one's life than inactions, incentivizing participation and penalizing nonparticipation in public goods provision can effectively motivate individual contributions and serve group interests, as suggested by Alhassan et al. (2020). The assumption is that households will decide on waste separation by calculating individual utility, carefully weighing the costs and benefits of their involvement in waste sorting, as indicated by Ma et al. (2020).

Economic incentives, alongside other external motivators, are believed to influence certain psychological processes. As such, both individual and group incentives can be employed to provide feedback on work done, as discussed by Tonglet et al. (2004) and Thøgersen (2005). This approach can effectively boost an individual's sense of self-efficacy, potentially increasing their willingness to participate. From an environmental collectivism perspective, Knickmeyer (2019) suggests that offering incentive packages and leveraging social pressure represent a dual solution to a group problem, particularly in encouraging waste separation. The implementation of incentive programs serves as a persuasive tool to encourage individuals to reconsider their behaviours and align with intervention efforts, as emphasized by Lee and Chen (2020).

Behavioural insights reveal that people do not always act as purely rational beings in the real world, marked by ambiguity and uncertainty. Thaler and Sunstein (2008) argue that individuals are not inherently rational and may not consistently align their behaviour with their knowledge and intentions, challenging the classical CUMT. Parajuly et al. (2020) emphasize that biases can significantly shape decision-making, leading individuals to engage in pro-social behaviours influenced by social imitation or self-imposed expectations,

irrespective of mandates (Yin & Ma, 2022). Therefore, it is crucial for behavioural economics to integrate findings from psychology and other social disciplines to enhance the traditional economic model by highlighting deviations from the assumptions of homo economicus.

The Nudge Theory

Efficient waste management policy formulation necessitates a deep understanding of the factors influencing individuals' decisions regarding recycling and waste separation. Addressing pressing societal challenges requires the implementation of effective behavioural interventions. Nudge theory, centered on modifying the environment to encourage favourable behaviour without restricting choices or altering financial incentives, has gained significant prominence in recent decades, as articulated by Thaler and Sunstein (2008). Van Dessel, Boddez, and Hughes (2022) underscore the importance of urgent interventions that promote behaviour aligning with societal goals and adaptable to changing circumstances. This underscores the pivotal role of nudge theory in addressing the complexities of waste management policy design within the context of advanced academic discourse.

The NT posits that modifying the choice environment can increase the likelihood of individuals selecting default options while preserving their freedom of choice (Thaler & Sunstein, 2009). NT relies on well-defined principles rooted in rigorous behavioural research for effective implementation. It underscores how the decision-making environment significantly impacts individuals' choices (Beshears & Kosowsky, 2020). By subtly adjusting elements like default options, individuals can make more informed and advantageous decisions (Loan & Balanay, 2022). This proposition highlights

the significance of nudge theory as an empirically supported approach within the realm of waste management discourse (Beshears & Kosowsky, 2020).

In contemporary discourse, the concept of nudging has permeated the realm of environmental policy, offering a strategic approach to influencing individuals' behaviour through alterations in choice architecture, with the primary aim of mitigating adverse externalities (Marteau et al., 2011). It addresses traditional economic challenges by gaining insights into real-life decision-making and response patterns (Goepel, Svanhall, & Rahme, 2015). Nudging relies on social psychology and behavioural economics to explain deviations from classical economic rationality (Linder, Lindahl & Borgström, 2018). This interdisciplinary approach highlights the complexity of human decision-making and underscores the growing relevance of nudging in environmental policy and contemporary scholarship.

Nudging, as an emerging field of study, posits that individual cognitive biases can lead to decisions that go against their best interests due to inherent flaws in the decision-making process (Wright & Ginsburg, 2012). Stoknes (2015) emphasizes that for an intervention to qualify as a nudge, it must be both convenient and cost-effective to avoid. Nudges should respect individuals' free will and not restrict or eliminate alternative options. Importantly, nudges should refrain from introducing significant financial incentives. For instance, arranging fruits and vegetables at eye level in a store is considered a nudge in favour of healthy eating, in contrast to outright bans on junk food (Thaler & Sunstein, 2015; Sunstein & Reisch, 2019).

Nudging comprises tailored strategies for specific contexts, including modifying default options (e.g., double-sided printing) to encourage desired

behaviours (Thaler & Sunstein, 2009). Leveraging social influence, rooted in individuals' tendency to emulate others, is another effective approach (Sunstein, 2014), with peer pressure reinforcing this dynamic. Thoughtfully designed interventions informed by these strategies can notably enhance well-being by fostering user-friendly environments (Halpern, 2015). Moreover, Stoknes (2015) outlines various recycling presentation methods, such as bundling services, specialized bins, easy access to facilities, and information dissemination. These multifaceted tactics amplify the efficacy of nudging interventions for promoting environmentally responsible behaviour.

Bhargava and Loewenstein (2015) argue that the future holds promising opportunities for the enhanced application of nudges within government regulations. Research conducted by Ly et al. (2013) and Cosic et al. (2018), with a particular focus on waste sorting and disposal behaviour, underscores the considerable impact of nudges in the realm of waste recycling. For instance, the strategic placement of waste bins, such as drawing attention to trash cans through visually appealing green footprints, can positively influence how individuals manage their waste. Notably, Cosic et al. (2018) have demonstrated that the size of waste bins plays a significant role in shaping the effectiveness of waste sorting behaviours. These findings collectively emphasize the potential for nudging to contribute meaningfully to policy and behaviour change initiatives in the context of waste management and beyond.

The broad embrace of nudging by policymakers, governments, and global institutions can be ascribed to its foundational philosophical and political principles. Thaler and Sunstein's (2003) concept of libertarian paternalism epitomizes this approach, preserving individuals' freedom of choice while

permitting private and public entities to guide decisions for the betterment of well-being. Consequently, for an intervention to qualify as a nudge, it must serve a dual purpose: influencing behaviour toward desired outcomes for individuals or society, reflecting paternalistic aims without infringing upon people's freedom of choice, embodying libertarian ideals (Hansen, 2016). This philosophical and political alignment has propelled the widespread acceptance and adoption of nudging as a powerful tool for shaping policies and influencing behaviours across diverse domains.

However, both the concept of nudging and the idea of libertarian paternalism have faced scrutiny, primarily in relation to the paternalistic aspect inherent in nudging. Detractors argue that nudging can be perceived as manipulative, effectively steering individuals toward specific decisions and behaviours (Marteau, 2011; Goodwin, 2012). They contend that nudging inherently entails elements of compulsion and control, potentially encroaching upon individual liberties. In contrast, proponents of nudging often assert that all policy instruments, to some extent, exhibit paternalistic traits, and that nudging represents a "soft" policy tool that can be deployed as an alternative to outright prohibition or regulation (Thaler & Sunstein, 2015). This ongoing debate highlights the nuanced ethical considerations surrounding nudging and its role in shaping public policy.

Chapter Summary

In shaping the theoretical framework for this research on sustainable recycling practices, the inclusion of four foundational theories is strategic. TPB forms the core, examining individual recycling intentions. To enrich this foundation, ABC theory is incorporated for its ability to offer a holistic

perspective by considering the interplay between attitudes and contextual factors. The CUMT introduces an economic dimension, exploring the rational behaviour of individuals in the context of recycling, particularly concerning policy inducements. The NT enhances the ethical and practical aspects, emphasizing non-coercive methods and user-friendly environmental interventions. Together, these theories provide a nuanced, multidimensional understanding of recycling intentions and behaviours, aligning with both theoretical depth and practical relevance in the realm of waste management policymaking.

Conceptual Literature

This study's purpose was to look into households' intentions to participate in waste recycling from a reverse logistics perspective. Thus, the first part of this section considered the concept of reverse logistics. The next section comprised a review of two groups of factors including contextual and behavioural factors. Here, the contextual group of factors preceded the behavioural factors. The study is of the opinion that, while behavioural research in recycling may give a greater knowledge on households' intentions and behaviour, it fails to grasp the pre-condition parts of the contextual variables necessary for intentions to be properly activated as advanced by Chen and Lee (2020) and Jalil et al. (2016). To a large extent, policy actions can steer or regulate behaviour. Public authorities can affect people's behaviour through policy interventions including providing access to recycling facilities, convenience, awareness creation and policy inducement.

Reverse Logistics

In contemporary supply chains, products extend their utility beyond initial customer use (Fleischmann et al., 2004), serving multiple purposes and generating repeated revenue from end-of-life materials. Realizing this value entails adopting a comprehensive supply chain perspective and exploring innovative approaches like reverse logistics (Rogers & Tibben-Lembke, 2002). The focus on recycling MSW signifies a significant shift in waste management, triggering a reverse flow of recyclables from households (Jalil et al., 2016). This recognition acknowledges the detrimental impact of traditional waste disposal on the environment and finite resources. Recycling, integral to sustainable waste management, necessitates strategically designed reverse logistics systems for systematic collection, processing, and reintegration of recyclables into existing supply chains, aligning with circularity (Abdissa et al., 2022).

However, research on sustainable supply chain design has traditionally focused on the downstream supply chain leading to the market, leaving a significant research gap regarding reverse flows, especially in the context of recycling and reuse, as it pertains to MSW (Jalil et al., 2016), particularly in emerging countries like Ghana. It is important to note that logistics, in its broadest sense, manages product flows in both forward and reverse directions within the supply chain (Carter & Ellram, 1998; Stock, 1997), as illustrated in Figure 9. According to the Council of Logistics Management (CLM, 1999), forward logistics encompasses planning, implementing, and controlling the efficient flow of goods, services, and information from the point of origin to consumption to meet consumer demands, underscoring its inherent connection to supplying products or services to the market.

Reverse logistics refers to the process of moving goods from their final destination (usually the consumer end) back to the manufacturer or other designated points for the purpose of return, recycling, or proper disposal (Rogers & Tibben-Lembke, 1999). This process involves collecting, transporting, and managing products that have reached the end of their useful life or need to be returned for various reasons, such as defects, recalls, or recycling (Mollenkopf et al., 2007). Reverse logistics plays a crucial role in MSW by addressing waste reduction, recycling, and the responsible disposal of products and materials. Different types of products in the reversal movement in reverse logistics systems can be directly reused, repaired, refurbished, remanufactured, recycled, incinerated, or landfilled, which are collectively termed reverse logistics activities (Abdissa, Ayalew, Dunay & Illés, 2022).

Figure 9 illustrates how logistics flows are actually a dynamic two-way, closed-loop system rather than a linear process (Dyckhoff et al., 2013; Lee, Wang, & Chen 2017). Reverse logistics' primary objective is to recover damaged products, production scraps, returnable end-of-life and end-of-use packaging materials, and other waste and deliver them to a location where they can be properly recycled, remanufactured, or disposed of (Carter & Ellram, 1998; Dyckhoff et al. 2013). Due to this, other renowned academics such as Tibben-Lembke (1999) and Fleischmann et al. (1997) define reverse logistics as the application of logistics for the following: product returns, decreased material procurement, reuse, material substitution, recycling, waste disposal, repair, and remanufacturing.

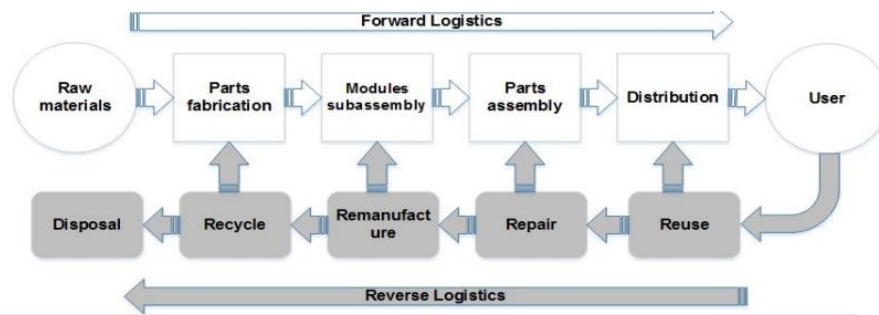


Figure 9: Integration of forward and reverse logistics

Source: Ali, Zalavadia, Barakat and Eid (2018)

Carter and Ellram (1998), Stock (1998), and Sarkis, Helms and Hervani (2010) have discussed the concepts of reverse and forward logistics, where "waste recaptured" encompasses waste generated in both forward and reverse logistics, including pre-consumer waste materials, production waste, returned items, packaging waste, and end-of-use and end-of-life materials. Islam and Huda (2018) provide a comprehensive perspective on the significance of closed-loop supply chains and reverse logistics, advocating the integration of waste management processes within them. This thesis places its primary emphasis on waste generated by households, traditionally perceived as end-consumers, in the context of these evolving responsibilities.

As the generators and suppliers of end of use and end of life products, reverse logistics processes can influence an individual's attitude toward recycling (Jalil et al., 2016). For example, if a person perceives that participating in a reverse logistics system is convenient and environmentally beneficial, their attitude toward recycling waste through this process will be more positive as emphasised by the TPB. Reverse logistics systems can influence this perception. If a reverse logistics system is well-organized and accessible, individuals may perceive greater control over participating in recycling, leading to increased recycling intentions (Ajzen, 2015). As these systems become more efficient and

environmentally friendly, they contribute to positive attitudes and increased perceived control among consumers, ultimately fostering greater participation in recycling and sustainable waste management practices.

Aligned with the ABC theory, companies possess the capability to structure their reverse logistics strategies and policies to create an environment that fosters sustainable return behaviours, as suggested by Sabbir et al. (2022). This approach empowers businesses to influence consumers positively and encourage responsible product returns. With CUMT, consumers assess various factors when deciding whether to return a product. These considerations include the convenience of returns, the potential for refunds, and their personal environmental values (Kumar & Vaidyanathan 2016). Additionally, by subtly promoting eco-friendly return behaviours, the NT complements the broader efforts in reverse logistics to encourage environmentally responsible practices at the household level in the return process (Flygansv ar et al., 2021). These underscore the importance of networks and social influences in shaping consumer behaviour in the context of product returns and sustainability.

Homrich et al. (2018) stress the pivotal role of reverse logistics in minimizing materials within the downstream supply chain. This entails moving fewer materials back, promoting product reuse and facilitating recycling, creating a more circular and sustainable system. Wu and Zhao (2022) highlight the broader positive impact of effective reverse logistics on sustainable development through household waste recycling. They argue that it improves resource consumption by extracting more value from existing products and materials, reducing the demand for new resources. Additionally, recycling in reverse logistics aids in responsible disposal and material recovery, crucial for

environmental preservation and reducing the overall environmental footprint (Govindan & a Bouzon, 2018; Wilson, 2020). In essence, reverse logistics aligns with sustainable development principles by enhancing efficiency and responsible resource management.

The definitions discussed primarily focus on both pre-consumer and post-consumer waste and the consumer's role in the reverse logistics process. Waste retrieval commences at the household or other points within the forward logistics chain, as indicated by Dyckhoff et al., (2013). Household participation in recycling and waste separation contributes to the creation of exchange value for other supply chains, blurring the traditional consumer-producer distinction. In the context of reverse logistics, municipal waste recycling is positioned at the point of household consumption, diverting waste from landfills and enabling energy recovery (Jalil, 2015). Reverse logistics, being the reverse of forward logistics, is often viewed as a green logistics concept in scholarly discussions.

The business community is facing increased scrutiny due to the growing emphasis on sustainability and circularity (Srivastava, 2013). The United Nations' Agenda 2030 and its Sustainable Development Goals (SDGs) are posing new challenges for firms, compelling them to adapt their operations and strategies (UN, 2015). Sustainable waste management, much like reverse logistics, aims to reduce residues generated by economic activities, employing two key approaches. The first involves waste reduction and the conversion of existing waste into valuable resources. The second approach focuses on product design with the goal of facilitating end-of-life recycling (Broman & Robert, 2017). These strategies align with the broader objectives of sustainability, circularity, and responsible resource management, reflecting the evolving

landscape of business practices in response to global sustainability imperatives (Melan et al., 2020).

Reverse logistics has been conceptualised in the literature in a way that suggests that the terms green logistics and reverse logistics may have been used synonymously in the past before supply chain management had a similar interest in sustainability (Hazen et al., 2011; Guide Jr et al., 2003). Sustainable development is also emphasised by the supply chain management concepts of green and reverse logistics. Sustainability is the capacity to meet existing demands without compromising the capacity of future generations to meet their own needs (Brundtland Report; UNESCO, 2015). Teixeira et al. (2018) claim that the advent of green supply chain management has introduced the notion of eco-efficiency into the supply chain, integrating more effectively with environmental issues throughout the production cycle.

As the topic of sustainability has become a major concept for the success of the 21st century organisation, many companies are under great pressure from numerous stakeholders to manage their economic activities in accordance with sustainable principles (Abbasi & Nilsson, 2012; Grant et al., 2013; Lozano, 2015). Consequently, some of these companies have chosen to use strategic supply chain management and reverse logistics practices as corporate enablers for pursuing the sustainability agenda (Carter & Easton, 2011; Grant et al., 2013). At its core, sustainable development strives to strike a long-term balance between ecological, economic, and social impacts at the societal level (Wu & Zhao, 2018). The requirement for sustainable logistics is to ensure that business activities in general are carried out in a way that considers environmental implications, social well-being and cost minimization (Kazemi et al., 2018).

Economic and environmental challenges are closely intertwined, as disposal costs rise, encouraging waste reduction and appealing to eco-conscious customers (Fleischmann et al., 1997). Sustainable reverse logistics, primarily linked to waste management, obliges businesses to meet long-term objectives and legal requirements (Sakál, 2009). The central aim of sustainable logistics is to fulfill customer needs while minimizing environmental and societal impacts (Srivastava, 2013). Therefore, sustainable reverse logistics plays a pivotal role in industrial firm logistics processes (Fidlerová, 2013), encompassing ecological and economic benefits in line with the concept of a sustainable economy (Fidlerová & Mkva, 2016).

In contemporary discourse, the role of reverse logistics within the value chain has gained prominence due to the proliferation of global environmental regulations (Large et al., 2013). The initial set of regulations concerning waste disposal, particularly those pertaining to WEEE and certain types of packaging waste, primarily placed responsibility on producers and manufacturers (Bailey, 2003; Mayers et al., 2013). Subsequently, the scope of enforcement was broadened to encompass households, with an emphasis on proper disposal at authorized drop-off locations and the separation of WEEE from regular waste streams (Mayers et al., 2013). It is noteworthy that these regulations extended beyond households to encompass businesses and municipalities, which assumed pivotal roles in ensuring compliance with these restrictions (Jalil, 2015).

Waste management legislation aims to mitigate the impacts of waste generation and improve waste handling for the well-being of both citizens and the environment. Similarly, domestic waste recycling systems are designed to reduce waste generation and expand recycling efforts in alignment with the

waste hierarchy (Wright et al., 2011). In such waste recycling systems, environmental policy guidelines prioritize diverting all recyclables away from landfills to meet recycling targets (Christopher, 2011; Peitz & Shin, 2013). In supply chain management, sustainability revolves around the three core dimensions of the economy, environment, and social outcomes (Rodric & Wilson, 2017). According to Mintz et al. (2019), these critical aspects can be realized through the 4Rs guiding reverse logistics within the supply chain.

Backward flow management, as applied to the hierarchy of product disposition alternatives, shares traits with a reverse logistics system (Fleischmann et al., 1997). By focusing on the closed-loop perspective to remove waste from landfills, reverse logistics has empirically contributed greatly to the social and economic sustainable impact (McKinnon et al., 2012). Reverse logistics has been viewed as a green logistics strategy in supply chain management that focuses on preserving energy and raw materials in both forward and backward movement, lowering the use of landfill capacity, and effectively recovering resources (Flygansvaer et al., 2021; Jalil et al., 2016). Specifically, recycling has been crucial in the disposal of many different sorts of products, such as end-of-life electronic materials and unwanted, out-of-date, and irreparable items in domestic waste systems.

In much of the logistics literature, the terms "green logistics" and "reverse logistics" are synonymous (Jalil, 2015). This is due to the fact that recycling is one way to achieve sustainability through reverse logistics, which is a component of both green and sustainable logistics (Sarkis et al., 2010). However, green logistics does not, on its own, reflect the backward movement in recycling systems, as can be seen in the definition of supply chain

management provided by Thiell et al. (2011). Accordingly, green logistics connotes "all activities related to the eco-efficient management of the forward and reverse flows of products and information between the point of origin and the point of consumption".

The primary goal of green logistics, according to Hasen et al. (2011), is to limit the environmental harm and energy use caused by waste management, material and product processing, packaging and transportation. Thus, according to Thiell et al. (2011), green logistics can be defined as municipalities' understanding of the ecological impact of backward flow within the framework of recycling of domestic waste. Recovering the value of returned and recyclable products is the core of reverse logistics, which is comparable to green logistics strategies for supply chain management (Hazen et al., 2011; McKinnon et al., 2012). Furthermore, by designing an effective recycling system within waste management, reverse logistics is regarded as a sustainable solution (Jalil, 2015).

In light of the aforementioned, it is crucial to have a firm understanding of the reverse logistics role within the larger supply chain management in order to successfully execute an efficient recycling system for municipal waste management. Similar to waste management, reverse logistics places an emphasis on source reduction and substitution, like recycling and reuse (Cherrett, Maynard, McLeod, & Hickford, 2010). In this context, municipalities and reverse logistics service providers are therefore, required to divert waste from landfills and return it to usable forms while applying appropriate methods for managing the backward flows (Mishra et al., 2022).

McKinnon et al. (2012) state that research interest in reverse logistics began early in the 1990s, when governments and businesses recognised the need

to improve municipal solid waste management. Particular focus was placed on efforts to limit the quantity of waste transferred to landfills and boosting resource recovery (Stock, 1992). The concern of this realisation was particularly heightened during and after the United Nations Conference on Environment and Development (UNCED, 1992) which largely bordered on the production of household waste. In particular, Agenda 21 emphasised environmentally appropriate solid waste management and sewage-related concerns as its central priority.

This completely changed the concept of waste logistics management and sparked interest in the study of the upstream reverse flow of materials. Stock (1992), in a white paper written for the CLM, set the direction for upcoming scholarly investigation on the subject matter. By reviewing the present state of knowledge and identifying a number of study topics needing additional investigation, the author used the statistical data from the US that was available to underline the significance of the issue at hand (McKinnon et al., 2012). Since then, various notable researchers dived into the specific dimensions of reverse logistics and recycling functions, channel layout, forward and reverse operations, costs and other general linked fields etc.

Since the early 1990s, reverse logistics research has primarily focused on business challenges at both macro and micro levels. Macro-level concerns include the development of take-back policies and frameworks for returnable goods (Carter & Ellram, 1998; Rogers et al., 1999). Micro-level efforts have aimed to enhance operational efficiency with returnable item systems and IT applications for end-of-life item tracking (Jingbo, 2011; Rubio et al., 2008). However, this strong emphasis on empirical studies, particularly in operational

and technological domains, has limited interdisciplinary integration (Chicksand et al., 2012; Stock, 1997; Mentzer & Kahn, 1995). There is an opportunity for reverse logistics to adopt a more holistic perspective by incorporating various disciplines, including consumer behaviour, marketing, and waste management (Carter, 2011; Genchev et al., 2011; Jalil et al., 2016; Rubio et al., 2008).

According to Carter and Ellram (1998), in order to properly comprehend reverse logistics effectiveness, investigations should use interdisciplinary techniques that would benefit the overall understanding of the reverse logistics framework. Thus, the period when reverse logistics research had generally focused on end-of-life items, production planning, inventory management and supply chain management concerns that were essentially operational and technological should allow for expansion. Therefore, the logistics process needs to take into account the behavioural aspect, which deals with interactions and behaviours (Tokar, 2010). In the backward flow, where the point of origin in the chain of activities increasingly shifts from the producer to end-users, human behaviour and interaction are key, according to Samuelsen & Style (2016).

While the behavioural dimension remains largely overlooked in empirical investigations (Patel, 2017), behavioural logistics has emerged as a promising area of study within supply chain management. Despite the wealth of research on reverse logistics, Carter & Ellram (1998) lament the lack of robust theoretical support and empirical exploration in this field. In their comprehensive review, they critically assess the key drivers and constraints in reverse logistics and advocate for future "theoretically-grounded" research efforts (p. 99). According to their analysis, four primary driving factors within the broader macro-environment that significantly impact an organization's

reverse logistics operations include suppliers in the input sector, customers in the output sector, government regulations in the regulatory sector, and inter-organizational competition.

Beside these forces, one key lesson derived from Carter Ellram's framework is the positioning of reverse logistics as an interdisciplinary area of research. Moreover, their conceptual model is largely being recognised as the first theoretically grounded reverse logistics framework (Hazen, Hall & Hanna 2012). Since the publication of their model, several scholars have commented on the factors that influence reverse logistics. As a result, the reverse logistics literature saw an increase in both theoretical and analytical contributions over the years (Jayaraman et al., 1999; Beamon, 1999; Dowlatshahi, 2000; Fleischmann, 2000; Knemeyer et al., 2002; Dekker et al., 2004; Srivastava, 2008; Stock & Mulki, 2009; Dowlatshahi, 2010), which reflect a greater focus on the theorization and optimization of return flows of waste and other products.

Today, managing waste and product return flows remain crucial to the supply performance of companies as well as society at large, especially as the volume of return flows has significantly expanded (Srivastava, 2013). Due to this, there has been a significant rise in business and governmental initiatives, as well as academic publications on reverse logistics (Abbey & Guide 2017; Banihashemi et al., 2019; Bing et al., 2014; de Campos et al., 2020; Lee et al., 2017; Govindan et al., 2015; Govindan et al., 2019; Govindan & Soleimani 2017; Holldersson et al., 2019; Homrich et al., 2018; Julianelli et al., 2020; Kazemi et al., 2019; Mahadevan, 2018; Pathak & Srivastava 2017; Prajapati et al., 2018; Rubio et al., 2019; Sari et al., 2021; Wang et al. 2017; Zarbakhshnia et al., 2019).

Recent waste generation trends and the call for household participation in waste management necessitate some research focus on behavioural logistics (Tokar, 2010). Previous research has defined reverse logistics as backward movement, and mentioned sustainable approaches such as the 4Rs, closed loop supply chain, cradle-to-cradle, resource recovery (Kumar & Putnam, 2015), and renewable energy (Chiarini, 2013; Sahamie et al., 2016) which have projected the subject's importance. However, the significant role of end users is often disregarded (Sharma et al., 2017). Consequently, household participation and engagement should be encouraged in order to ensure and maintain the success of consumer involvement in reverse logistics.

Reverse Logistics and the 4Rs

Reverse logistics, with its focus on resource recovery and recycling, aligns with the UN-SDG 12.5, which aims to substantially reduce waste generation through prevention, reduction, recycling, and reuse (UN, 2015). Therefore, the integration of reverse logistics practices into waste management processes is a tangible step toward realizing the sustainable consumption and production patterns set forth by the UN SDGs. In essence, reverse logistics serves as a critical link in the chain of global efforts aimed at reducing waste, conserving resources, and promoting a more sustainable and environmentally responsible approach to handling products and materials (Govindan & Bouzon, 2018).

It is believed that only around 10% of the resources extracted from the planet generate useable goods across all businesses. The remaining 90% represents waste generated during production (McIntyre 2007). Therefore, a new trend is centred on waste reduction driven by government legislation,

environmental concerns, consumer pressure and economic value derived from the recovery of product returns (Srivastava, 2013). Businesses are being compelled to incorporate reverse logistics into their supply chain strategy. While the aforementioned elements enhance reverse logistics application, it can also be limited by business challenges such as management support, technology etc, in specific industries.

Beside the 4Rs, academics and professionals have proposed additional "R" frameworks, such as the 6Rs including reuse, repair, refurbishment, repurpose, recycle and recover (Sihvonen & Ritola, 2015) or the 9Rs of refuse, rethink, reduce, reuse, repair, refurbishment, remanufacture, recycle and recover (Potting et al., 2017; Van Buren et al., 2016). As stated by Larsen et al. (2018b), the order of these Rs depends on the nature of the targeted products, whether they are complex, perishable, hazardous, etc. Nevertheless, Abila and Kantola (2019) in their assessment, state that promoting waste reduction, reuse, recycling and recovery in line with UN-SDG 12.5 has been the main goal of sustainable waste management.

Accordingly, applying reverse logistics concepts in municipal waste management is essential for promoting the recovery options pyramid (ROP) (Carter & Ellram, 1998; Kopicki et al., 1993). The equivalent of the ROP in logistics is the waste hierarchy which views waste as heterogeneous mass of materials that must be handled and treated differently. The ROP serves as the foundation for the reverse logistics approach to waste management, which aims to control waste at the operational level and create frameworks for waste policy (De Brito & Dekker, 2004; Skapa, 2004). Reduce, reuse, recycle and recovery

are the order of priority for waste management according to the ROP as indicated in Figure 8.

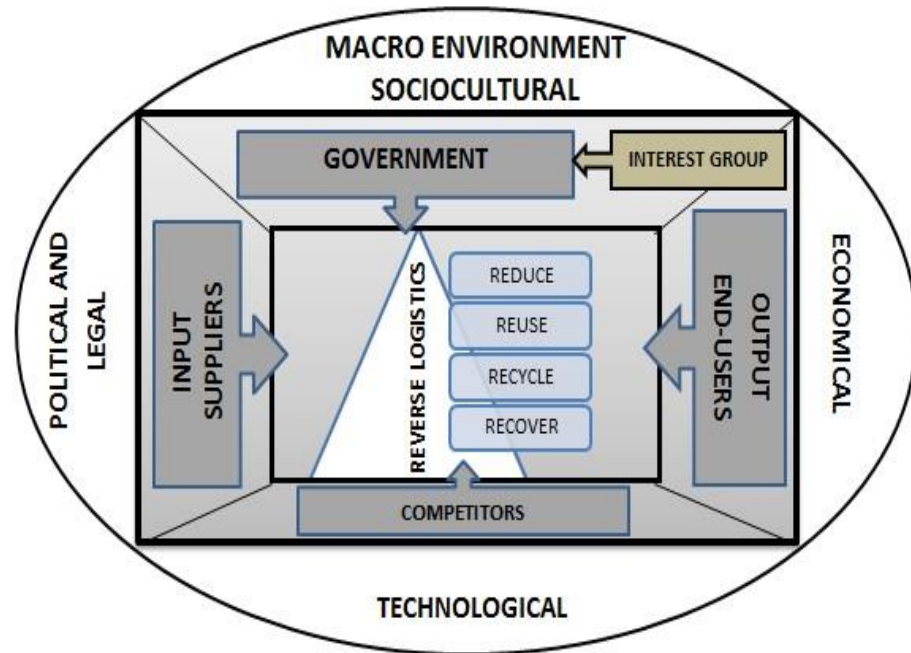


Figure 10: Reverse Logistics Recovery Options Pyramid for Waste Recycling.
Source: Adopted from Jalil (2015)

From Figure 10, Carter and Ellram's (1998) illustration of ROP is integrated within a broader perspective that includes the forces driving reverse logistics. The model illustrates how reverse logistics is conceptualized in the 4Rs within a multifaceted macro and micro environments. The goal is to gain a better understanding of the challenges of reverse logistics in household waste recycling in a multidisciplinary setting that includes logistics as well as other sectors like waste management and consumer behaviour (Carter & Ellram, 1998). The ROP exemplifies sustainable logistics in that it focuses on reducing resources in the forward flow in ways that allow less materials to flow back, and those upstream bound goods should have been designed in ways that they can easily be reused and/or recycled beyond their useful life.

Efforts directed at preparing for materials for reuse to minimize waste in both forward and reverse distribution processes is referred to as resource reduction or waste prevention. There are three means by which waste can be prevented: reduce quantity, reduce adverse impact and reduce harmful content (Musharavati, 2012). Thus, reduction, is the most preferred among the options because its application avoids impacts across the entire product life cycle, including disposal (Ramirez-Zamora et al., 2019). The means of achieving source reduction include process modifications, chief among which is the principle of design for waste management, feedstock substitutions, enhancement in feedstock purity, improvements in housekeeping management practices and recycling along the process (Zhang, Hu, Di Maio, Sprecher, Yang & Tukker, 2022).

In terms of waste management, the word "reduce" refers to the effort to minimise overall household waste where consumers are urged to cut back on their daily consumption of undesirable items through sustainable consumption (Jalil, 2015). Sustainable consumption requires that household members are conscious of the effects of the purchases they make on the environment. Individuals would be guided by this awareness to purchase what is actually needed and avoid what is not. Furthermore, sustainable consumption encourages the continuous use of products (Wilson et al., 2021). By producing less waste, the concept of source reduction minimises the level of material that must be handled by non-disposal or waste disposal procedures.

However, the primary objective of supply chain management is reducing the usage of virgin resources in the manufacturing or production processes. Sustainably, reduction makes it possible to use less resources to achieve more,

which radically improves resource use efficiency (Carter & Ellram, 1998; Gertsakis & Lewis, 2003; Price & Jeseeph, 2000). Thus, source reduction in its truest form, refers to any actions taken to make products more durable, reusable and repairable. In essence, this option remains active until materials reach their end of life cycle and cascades to the next level of the hierarchy to maximize reuse, followed by recycling (Pires & Martinho, 2019).

Reuse in the context of supply chain management refers to material loop closure, particularly when it comes to green supply chain initiatives. A closed-loop supply chain, similar to the circular economy, emphasises the efficient recovery of value from end-of-life and end-of-use materials, as well as returnable products, the exchange of products, functional components, and packaging that are reused throughout the supply chain (Gurtu et al., 2015). Waste reuse, according to the Waste Framework Directive (WFD), is any procedure through which non-waste end-of-life products or components are repurposed for the original purpose (Jalil, 2015). Thus, in the context of managing household waste, the term "reuse" refers to actions taken by households to repurpose items like used drink bottles and paint cans in an effort to prolong their useful lives.

Because reuse does not necessitate reprocessing, it has low energy requirements (Alsulaili, AlSager, Albanwan, Almeer & AlEssa, 2014). In sustainable waste management practice, however, when these items exhaust their usefulness and are no longer needed but still contain some intrinsic value that can be recaptured, they channeled through the reverse logistics system for recycling. Reuse in green supply chain strategy refers to the practise of closing supply loops for value reclamation in order to feed back the supply chain and

minimise costs while maximising profit (Gurtu et al., 2015). Thus, the concept of reuse, accordingly can significantly cut logistics costs related to purchase, shipping and disposal.

Recycling is a strategy for environmental sustainability that seeks to replace raw material inputs into the economy while rerouting waste outputs out of it (Villalba et al., 2002). Scholars have thoroughly examined recycling and concluded that it is a reverse logistics concept (Carter & Ellram, 1998; De Brito, 2004; Skapa, 2004; Autry et al., 2008; Dowlatshahi, 2010), which has inspired the development of numerous theoretical frameworks. As a facilitator of the circular economy, reverse logistics offers new and innovative techniques for businesses, academia and governments to explore the social, economic and environmental implications of recycling and waste disposal. However, Wright et al. (2011) lament the little consideration given to the understanding of how waste materials flow from the end user.

Recycling is the sustainable alternative to traditional waste disposal to help conserve resources and reduce greenhouse gas emissions (Mintz et al., 2019). By minimising waste, fostering resource efficiency, and advancing the circular economy perspective, recycling also helps to protect our stock of material resources. Thus, rather than strictly focusing on the forward flow of products towards the market, there is the need to create new and innovative ways by which end of life goods can be accounted for and reused (Zheng et al., 2017). Operations in reverse logistics are essential for the smooth flow of recyclable resources. It is said that reverse logistics should be incorporated into the conventional supply chain in order to effectively extract value from resources and decrease waste through reuse and recycling (Zhang et al., 2022).

To this, the concept is to group all logistics-related activities into an industrial ecological system that includes both forward and reverse material movements (Fleischmann et al., 1997). If successful, the reverse logistics component will begin where the standard supply chain terminates. This integrated ecologically focused supply chain ecosystem is also variously known as reverse logistics, green supply chain, or closed-loop supply chain (Sarkis et al., 2011). For these reasons, there is the urgent need to infuse recycling and reverse logistics into municipal waste to guarantee long-term quality environments while ensuring a derivation of other socio-economic benefits (Kazemi et al., 2018). However, a material's recyclability is typically contingent on its ability to re-acquire the qualities it previously possessed in its original state, otherwise, it moves to the ROP's last option of recovery (Huang & Lo, 2020).

Conventional landfilling is rarely considered a sustainable method due to its incompatibility with the idea of a completely closed material cycle (Bosmans, Vanderreydt, Geysen & Helsen, 2012). Instead, landfills are often viewed as interim storage facilities, holding materials until further processing or as potential repositories for materials that can be incinerated to produce energy in a more sustainable materials management framework. This process of converting waste into useful forms of energy, like heat, light, and electricity, is referred to as waste-to-energy conversion (Brems, Baeyens & Dewil, 2012). It's an approach that can make use of waste fractions that cannot be recycled. Incineration, as a form of waste-to-energy conversion, can offer environmental benefits by conserving natural resources and is sometimes integrated into recycling efforts to minimize waste and harness energy (Figuring 9).

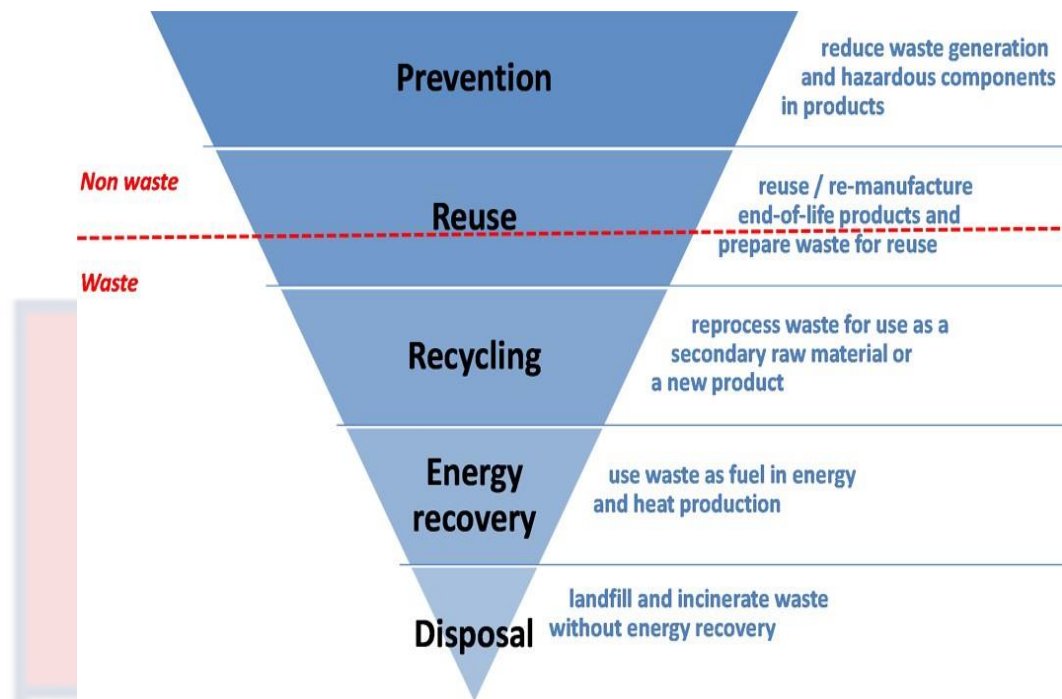


Figure 11: The Waste Hierarchy.

Source: OECD (2020)

The waste hierarchy, though a recognized policy tool, may not always align with economic interests (Rasmussen & Vigs, 2005). It should be seen as a flexible guideline for waste policies, adaptable to varying situations. Encouraging recycling, a key element of the hierarchy, presents the challenge of engaging the public to think beyond waste disposal, requiring innovative approaches. This approach involves reevaluating waste as a resource and finding new ways to recapture its value through community and external efforts. However, implementing the hierarchy can yield benefits such as income generation, job creation, reduced illegal waste disposal, and preserved landfill space.

Reverse logistics and the principles of the 4Rs as emphasised by the UN-SDG 12.5 are intricately connected to key psychological and theoretical frameworks. This is because the TPB suggests that people's intentions to engage in recycling, reusing, and other waste management practices are influenced by

their attitudes, subjective norms, and perceived control (Wang et al., 2021). In the context of reverse logistics and the 4Rs, one's attitude towards these sustainable activities significantly affects their intention to participate. The ABC model emphasizes attitudes, behavioural control, and context (steg & Vlek, 2009). When applied to reverse logistics and the 4Rs, it highlights the importance of attitudes toward sustainable practices and the influence of factors like the ease of participation, which reflects behavioural control as well as access to recycling facilities, play a crucial role (Martin et al., 2006).

CUMT focuses on how consumers weigh costs and benefits when making choices. In the context of reverse logistics and the 4Rs, individuals assess the environmental benefits against the convenience and costs of participating (Alhassan et al., 2020). This theory helps us understand why people choose to recycle or reduce waste. NT, based on behavioural economics, subtly promotes eco-friendly behaviours through environmentally-user friendliness, social networks, information sharing, and social norms (Flygansv er et al., 2021). In the context of the 4Rs, it underscores the role of social networks in encouraging activities like remanufacturing and redesign. In essence, these theories provide a structured understanding of how personal intentions to partake in reverse logistics and the 4Rs are shaped by individual attitudes, social influences, control over behaviour, and economic considerations.

Contextual Determinants of Households' Recycling Intentions

Access to Recycling Facilities

Accessibility of recycling facilities play a pivotal role in influencing recycling intentions. Research consistently demonstrates that shorter distances

between households and recycling facilities, such as bins or drop-off centers, are associated with increased recycling (Siu & Xiao, 2016). Recycling becomes more accessible when facilities are strategically placed in easily reachable locations like residential neighborhoods, public areas, or shopping centers (Li, Wang, Han, Wang & Fu, 2023). Accessibility also relates to the availability of recycling facilities; having an ample number of these facilities in an area positively impacts recycling intentions (Sari et al., 2021).

Access is not just about location but also design, visibility, and features as advanced by the NT. Clearly marked and user-friendly recycling bins with simple instructions encourage recycling (Flygansvær et al., 2021). Recycling facilities with 24/7 access accommodate varying schedules and preferences, making recycling more convenient (Martin et al., 2006). Additionally, accessibility must consider inclusivity, ensuring that recycling facilities are accessible to all residents, including those with disabilities or mobility challenges (Venter, Savill, Rickert, Bogopane, Venkatesh, Camba & Maunder, 2002). The importance of access to recycling facilities in the context of logistics is crucial for the smooth operation of the reverse logistics system. Access provides the infrastructure for households to fulfill their recycling responsibilities (Halldórsson et al., 2019). Efficient procedures and actions governing the reverse logistics system are essential (Chen & Lee, 2020).

Accessibility in waste collection, which is the initial step of reverse logistics, involves locating recycling facilities in convenient places (Zhang, Zhang, Yu & Ren, 2016). These underscore the necessity of making recycling containers and facilities widely available and easily accessible to the public. Prioritizing accessible recycling bin placement is crucial for encouraging

sustainable waste management practices and enhancing recycling rates (Srun and Kurisu, 2019; Zhang et al., 2019; Dai et al., 2015). As a result, curbside pickup, the location of recycling facilities, and the suitability of waste containers play significant roles in shaping individuals' recycling behaviour and intentions (Reschovsky & Stone, 2017; Sheau-Ting et al., 2016; Martin et al., 2006). These factors collectively act as external controls that enhance or inhibit household participation in waste separation, reflecting the critical role of accessibility in recycling intentions (Baldé, Forti, Gray, Kuehr & Stegmann, 2017; Soomro et al., 2022).

Recycling Convenience

Xu et al. (2017) emphasize the significant role of convenience in the TPB concerning waste recycling intentions, especially in terms of behavioural control. Skills needed for domestic waste recycling, as highlighted by Passafaro & Livi (2017) and Shan et al. (2020), depend on an individual's perceived control over the process. Varotto and Spagnolli (2017) underline that recycling facilities that are visible and readily available enhance perceived control, influencing convenience. Visible recycling bins align with the TPB's behavioural control concept. On the other hand, Sujata et al. (2019) note that irregular waste collection act as significant barriers, reducing perceived control and negatively impacting recycling intentions, consistent with TPB's emphasis on behavioural control.

Waste recycling can be challenging for residents due to changing waste material requirements and variations in municipal systems across different areas, limiting participation (Knickmeyer, 2020). Research suggests that contextual factors, including physical convenience, significantly influence

recycling intentions (Lee et al., 2017; Fan et al., 2019). Enhancing convenience contributes to stronger social norms and control perceptions, thereby bolstering recycling intentions. Moreover, Shan et al. (2020) point out that perceived effort, a component of the TPB, is influenced by convenience. Perceived convenience encompasses personal perceptions about available resources and the ease or difficulty of taking action (Negash, Sarmiento, Tseng, Lim & Ali, 2021). These findings underscore the pivotal role of convenience in shaping household recycling behaviour and intentions.

The mix of factors like cost, time and drop-off locations or curbside pickup that support home recycling intentions are what Kumar (2019) refers to as convenience. One of the most critical variables necessary to enhance household waste recycling participation is convenience (Sari et al., 2021). Convenience is the ease with which one can participate in domestic recycling. According to Kianpour et al. (2017) and Sari et al. (2021), ease and convenience appear to be incorporated in perceived behaviour control, notably in the context of recycling. Yet, there is a conceptual discrepancy since convenience is essentially external to the individual, but perceived behaviour control is intrinsically internal to the individual (Jalil et al., 2016). Hence, convenience refers to how straightforward it is to engage in household recycling (Roy, Berry & Dempster, 2022).

Convenience has a significant effect on households' intentions and behaviour when it comes to recycling. Whether residents will take the initiative to engage in recycling through official channels depends on the level of convenience (DiGiacomo et al., 2018; Lakhan, 2016; Miliute-Plepiene et al., 2016; Wang et al., 2019). It is worth noting that the original TPB does not

address major external issues such as recycling convenience. As a result, the majority of the existing literature employing the TPB extended the model from an internal perspectives (López-Mosquera et al., 2014; Savari & Gharechae, 2020; Yadav & Pathak, 2016). However, because recycling intention is highly influenced by external circumstances, Lou, Zhang, and Zhangit (2022) propose that the variable be included as a key influencing factor in the TPB model.

Furthermore, research has indicated that if households perceive reverse logistics systems to be more convenient, they are more likely to boost their recycling intentions (Bernstad, 2014). Accordingly, a closer distance to the collection site or better service in the collecting function reflect such a characteristic (Rousta et al., 2015). Changing the location of collection points to suit the needs of residents is thus a type of nudging towards the household. Distance and availability nudges affect product flows (Flygansvær et al., 2021). According to the behavioural research, a closer point requires less effort, which enhances recycling behaviour (Halldórsson et al., 2019). To participate, consumers need convenience in recycling provisions.

In the realm of reverse logistics, akin to a curbside system, it outperforms conventional approaches, as per Monnot et al. (2014). To create an effective reverse logistics system, ensuring residents have easy access to recycling services and placing collection points in close proximity is paramount (Bernstad, 2014). Studies show that co-locating collection stations for home-separated waste fractions yields positive results. The various waste disposal methods adopted by consumers, impact product flow efficiency (Monnot et al., 2014). Consequently, streamlining recycling efforts becomes easier when

households are equipped with waste-specific tools at collection points (Stoknes, 2015).

Awareness Creation

Enhancing public awareness is key for effective waste management, as per Hasan (2004). The primary aim is to promote waste reduction, reuse, and recycling within the community's waste collection area. Nudge theory suggests that subtle actions, like strategically placed recycling bins with clear signage, can encourage eco-conscious choices without stringent regulations. Attitudes play a crucial role in shaping waste management behaviours, and fostering understanding of sustainable practices can foster positive attitudes, potentially influencing social norms to make responsible waste management, including the 4Rs (Reduce, Reuse, Recycle, Recover), more socially acceptable. Public awareness, as underscored by Abe and Didham (2007), forms the basis for public engagement in sustainable practices, ultimately leading to eco-friendly behaviours.

Improving behavioural changes towards more sustainable acts is critical for spreading the circular economy concept, and awareness creation plays a critical role in accomplishing this goal. Kotler and Zaltman's (1971) introduction of the idea of social marketing gave evidence of how effective awareness campaigns contribute to social change by increasing citizen participation in public good productivity (Levit & Cismaru, 2020; Lee & Kotler, 2019). The strategic social marketing focus advocates for a more all-encompassing strategy that mobilises the individual, community, political and sociocultural elements (Akbar et al., 2021; Fries et al., 2020). Community-based social marketing posits that behaviour change is the cornerstone of

sustainability in line with environmental performance and climate change (Romero-Luis et al., 2022).

Community based social marketing to a large extent, shares common features with the nudge theory and these are theoretical and applied frameworks that focus on identifying and selecting behaviours that would be beneficial to society, piloting and broad scale implementation strategy (Zhang and Wang, 2020). A crucial component of this process is persuasive communication, which must be founded on a thorough comprehension of the attitudes and behaviours of the audience (Tseng et al., 2020). Added to this is to create messages that are specific, direct, and individualised that drive action and problem-solving (Romero-Luis et al., 2022). Social change initiatives are successful when they can persuade audiences to adopt, modify, or reject particular beliefs, attitudes, practices and behaviours.

Various disciplines, including psychology, economics, industrial ecology, and marketing, have examined household behaviour in the context of circularity (Mesjasz-Lech & Michelberger, 2019). The concept of the "green consumer" offers opportunities for reverse logistics and marketing, with businesses promoting recycling and energy conservation for decades (Kazemi et al., 2019). Recent studies highlight sustainable consumer behaviour as an avenue for young people to combat climate change and for educational institutions to promote circularity awareness (Garcia et al., 2021; Raducu et al., 2020; One Planet network, 2020). Ling and Xu (2020) emphasize that influencing people's views, attitudes, and actions depends on delivering the right mix of incentives.

Disseminating knowledge to enlighten people about recycling is referred to as awareness creation. Consequently, for waste management to operate effectively, there is the need for both the public and waste management agencies to embrace effective communication (Ho, 2002). To ensure that they are used effectively, the public should be made aware of the services that are offered to them, as well as their schedule and needs (Festus & Ogoegbunam, 2012). If citizens are made aware of what happens to garbage sent for recycling and the resulting environmental advantages, they would likely be more inclined to engage in waste sorting and recycling activities.

According to Olander and Thogersen (1995), inadequate task knowledge in recycling systems might result in the placement of foreign materials in recyclable containers or recyclable materials in rubbish containers. In order to encourage environmentally friendly behaviour among communities, local efforts aimed at raising knowledge of environmental preservation are a crucial tool (Lam et al., 2019; Sloot et al., 2018). The effectiveness of raising awareness in promoting environmentally friendly behaviours is supported by a wealth of empirical data, including studies on the use of sustainable energy (Hoffman & High-Pippert, 2010; Sloot et al., 2018), the sorting and recycling of household waste (Dai et al., 2015), and many others.

Ensuring public approval and involvement is critical to the proper operation of a municipal recycling system (Lakhan, 2016). The effectiveness of the recycling system will be decided primarily by a household's capacity to detect recyclable material, what to do with recyclables segregated from the trash stream, and the overall relevance of recycling activities (Geissdoerfer et al., 2017; Potting et al., 2017). Promotion and educational programmes are a

common strategic tool used by local governments to create and increase household awareness and engagement in recycling projects (Abbas et al., 2020; De Freitas Netto et al., 2020; Morseletto, 2020).

Public education on the benefits of recycling and recycling practises is seen as a crucial tactic with favourable effects on recycling performance (Jalil, 2015). Marketing is an important tool for creating awareness and inspiring people to adopt sustainable behaviours such as recycling, conservation and general pro-environmental practises. Because engagement elements stimulate households' attitudes toward recycling, they have an incremental impact on recycling performance (Lakhan, 2016). Through social marketing, households can easily become aware of their environmental responsibilities and embrace more responsible sustainable behaviour, such as recycling and other green behaviours.

According to Mesjasz-Lech (2018), recycling municipal waste commercially is the best way to reduce its negative effects on the environment, and enlightening the public about this is crucial. Context-specific awareness creation tools are therefore, important that can highlight the risks of not, and benefits of recycling as a means of shifting public view on the perspective of waste management from being a disposal problem to a more integrated one from the circular economy approach (Abila et al., 2019). Being aware of the environmental repercussions of irresponsible disposal of waste and the benefits of putting waste to productive use is the first step towards reconsidering alternative waste treatment and disposal options (Cudjoe et al., 2020). Thus, the awareness of waste as materials of economic value which can be extracted to fulfil additional societal needs is crucial.

Generally, peoples' awareness of the beneficial use of waste is known to influence their intention to engage in source separation for recycling (Liberty & Wu Hongjuan, 2010). Environmental education is said to be a critical tool in creating awareness in waste segregation in developing countries (Ramayah et al., 2012). Environmental education can increase people's knowledge of the environment and the problems it faces, as noted by UNESCO (2018) and Leicht et al. (2018). Handling municipal solid waste is a process that evolves through time and so requires behavioural changes alongside (Elshof, 2021).

Effective promotional campaigns must be behaviour-specific, focusing on the target behaviour, elucidating the underlying factors, and offering intervention measures and benefits (Steg & Vlek, 2009). Customization and targeting are essential for achieving the desired impact, particularly in addressing the diverse barriers encountered by different social classes within the population (Jesson et al., 2014). The persuasive effectiveness of leadership communication hinges on trust and the quality of relationships between individuals, their communities, and local authorities (Jarreau et al., 2017). Multiple studies have demonstrated a positive correlation between public awareness campaigns and residents' attitudes toward recycling behaviour (Grazhdani, 2016; Wang et al., 2018; Xiao et al., 2017).

Policy Inducement

Inducement policies, as per French & Russell-Bennett (2015) and Wan et al. (2014), align with consumer utility maximization theory. To incentivize waste separation in households, as proposed by Khalil et al. (2017), motivation-based incentives are crucial. Success in these incentives largely depends on a conducive policy environment, as stressed by Liao et al. (2018). In line with the

CUMT, individuals aim to maximize their utility. For households to engage in waste separation effectively, local governments must ensure accessible facilities and incentives, as per Wang et al. (2021). This alignment between policy and individual utility maximization enhances the effectiveness of inducement strategies in promoting desired behaviours.

According to Olson (1965), it is difficult for rational beings to contribute to the creation of public goods when they know they will still enjoy non-excludable communal advantages at the expense of others' labour, under the condition of voluntary provision. In order to enforce adherence to this self-serving logic, rewarding participation and penalising nonparticipation in the delivery of public services could effectively encourage individual effort and act in the public interest considering that actions would be more likely to result in personal gains than inactions (Xu, Ling & Wu, 2018). Incentives are viewed as an enabling condition since they have an impact on households' recycling patterns (Tang et al., 2022). In the literature, a range of incentive-based techniques have been used to promote household waste separation, including price schemes, rewards and gifting.

According to research, incentives are essential in encouraging residents to recycle. Inducement policies here as referring to the various incentives both formal and informal to households in exchange for their participation in, and/or compliance to waste recycling practices. These policies are set to encourage and stimulate a specific behaviours (Wan et al., 2014; Liao et al., 2018). In particular, the literature emphasise that incentives become more effective during the introductory stages of a recycling scheme when rates are low (Liao et al., 2018). Inducement policies can take various forms and may include waste

charging, enforcement of local laws, economic rewards and public praise. According to Wang et al. (2021), reward programmes have a substantial positive association with the per-household weight of recyclables collected, suggesting that economic incentives actually promote waste recycling in.

Government, just like the general public, are required to develop public policy interventions to reduce ecological damage and implement systematic and systematic reforms (Wang et al., 2018). Hence, they establish policies that regulate personal behaviour and require active participation (United Nations, 2021). Since citizens' participation is crucial to achieving the desired outcomes, it is critical to identify and understand the factors that affect their acceptance of policies. While policy incentives are significant, earlier research on households' intentions to recycle waste has focused on the analysis of the pros and cons of recycling primarily at the individual level, using models based on the theory of planned behaviour (Siegrist, 2021).

The relevance of policy interventions is also recognised in the established social marketing literature (Issock et al., 2020; Khalil et al., 2017). Motivational incentives are especially important in persuading households to engage in waste sorting for recycling (Wang et al., 2021). Although persuasive incentives can have a significant impact on people's pro-environmental behaviour, little research has specifically addressed this issue (Bruno, Bianchi, & Sanchez, 2022). There are many different kinds of incentives, but they all involve a desired outcome after the behaviour. A substantial body of research has demonstrated that incentives can have a tremendous influence on pro-environmental behaviour, and different incentives drive both intrinsic and

extrinsic motives, resulting in diverse persuasive effects (Rode et al., 2015; Sarabia-Sanchez et al., 2021).

Harder and Woodard (2007) argue that the concept of free riding in public goods provision supports individual-focused incentives over group-oriented ones. Thus, incentivizing participation or penalizing nonparticipation in public goods provision may be justifiable (Xu et al., 2018). Such inducement policies effectively align individual interests with group goals, offering more personal benefits for active involvement (Zhang et al., 2021). Recent studies emphasize government policies' role in motivating pro-environmental behaviour through economic incentives, rooted in the rational decision-making principle of utility maximization (Bruno et al., 2022)

Behavioural Determinants of Households' Waste Recycling Intentions

Environmental Awareness

Baumgart-Getz et al. (2012) and Ali (2015) highlight the challenge of defining environmental awareness due to its complex interplay of attributes spanning rational-experiential and emotional-psychological domains (Ham et al., 2016). The rational-experiential domain encompasses objective and subjective environmental knowledge, while the emotional-psychological domain includes values and attitudes towards the environment (Cynk, 2017). These dimensions are vital in the TPB, particularly regarding attitudes. In TPB, attitude significantly shapes one's intentions for pro-environmental actions. Environmental awareness is multifaceted, blending factual knowledge, emotional connections, and values, shaping environmental attitudes and motivating eco-friendly behaviours (Al-Balushi, 2020).

The degree to which people are aware of local, regional and global environmental issues as well as potential solutions is referred to as their level of environmental knowledge (Bamberg & Moser, 2007). Objective knowledge relates to how much an individual truly understands about the environment, whereas subjective knowledge refers to how much people believe they understand about the environment (Vicente-Molina et al., 2018). On the other hand, personal values are part of the psychological and emotional components. The majority of the time, values are mental constructs that express idealistic, abstract aspirations. These constructions serve as broad guiding principles for people's unconscious decision-making processes while also impacting their behaviour (Despotovic, Rodic, & Caracciolo, 2021).

Environmental awareness is therefore, a reflection of people's care for the environment, knowledge of how their actions affect the environment, and their willingness to help find solutions (Fu et al., 2019). Although the literature has shown a link between people's environmental knowledge and intention to act responsibly towards the environment, there is relatively little data on this topic in the majority of developing nations (Cheng et al., 2020). When it comes to environmental degradation, households and their disposal practises are crucial. The research field currently lacks much literature on environmental awareness in Africa. Consequently, the knowledge base of the subject is still evolving and ambiguous (Debrah et al., 2021).

Research shows that public environmental awareness is critical when designing programmes that seek to promote environmental sustainability goals. Sengupta (2010) argues that environmental awareness includes a person's mindset, beliefs, and skill set for addressing environmental issues. In this

context, many contend that environmental awareness is the first step to carry out responsive behaviour. Environmental knowledge is therefore the amount of information people possess about environmental concerns as well as their ability to comprehend and assess its influence on society and the environment. Environmental knowledge is therefore, related to environmental awareness (Debrah et al., 2021). In this study, both terms will be used interchangeably in this research project.

Consumer environmental awareness is cited by Gadenne et al. (2009), Sekhokoane et al. (2017), Ari and Ylmaz (2017) and Fu et al. (2018) as the fundamental prerequisite for behaviour change. Accordingly, people who are knowledgeable of environmental issues and the effects of environmental change are more inclined to take action to protect the environment (Chen & Lee, 2020). According to Cudjoe et al. (2020), household recycling propensity can be considerably influenced by their level of understanding of the benefits of recycling. Research suggests that persons with a high level of environmental awareness are more likely to take environmentally responsible actions (Gan et al., 2021).

Attitude

In the context of household waste recycling, attitude, as defined by Eagly and Chaiken (1993), represents an individual's psychological inclination towards the assessment of recycling practices with a degree of favourability. Within the TPB, one's attitude toward recycling aligns with their judgment of recycling behaviour and its consequences, shaping their recycling actions. In this framework, attitude primarily involves providing evaluative feedback on recycling efforts (Gawronski, 2007), which plays a crucial role in influencing

recycling behaviour in various household situations. It is important to note that attitudes towards recycling are not fixed; they can evolve over time (Albarracin & Shavitt, 2018), emphasizing the dynamic nature of recycling attitudes and their impact on intentions and actual recycling behaviours within the household context.

Thus, "attitude towards recycling" refers to a person's positive or negative attitude towards recycling endeavours (Ajzen, 1991). Numerous research have discovered that attitude is the most accurate predictor of recycling intentions and behaviour (Alhassan et al., 2018; Ghani et al., 2013; Tonglet et al., 2004). Wan et al. (2017) distinguish two types of attitudes: experiential attitude and instrumental attitude. Accordingly, experiential attitude refers to the affective feelings people exhibit towards behaviour, including the feeling that waste sorting is a responsible disposal behaviour (Li & Wu, 2019). On the other hand, an attitude is termed instrumental when individuals evaluate the outcomes of their behaviour before action is taken, for example, the idea that waste separation for recycling is a potential means of reducing landfill costs (Wang, Qin & Zhou, 2020).

It is essential to understand the interplay of cognitive and affective attitudes on behaviour. The emotional school of thought, represented by scholars like Kobbeltved, Brun, Johnsen, and Eid (2005), suggests that affective attitudes precede cognitive attitudes in shaping intentions. They argue for the use of the affect heuristic, emphasizing the efficiency of this approach over exhaustive cognitive evaluation. In contrast, the cognitive school of thought, supported by proponents like Keller et al. (2012), contends that cognitive assessments occur before the elicitation of affective responses. According to

this perspective, affect is a result of cognitive evaluations (van der Linden, 2014; Lai, Hagoort, & Casasanto, 2012).

According to Ajzen (2005), a person's beliefs about the potential outcomes of engaging in a behaviour are what form their behavioural beliefs, which are the basis for the development of an attitude. When households are of the firm belief that engaging in waste separation at home would yield favourable outcomes, this belief would then reflect in their attitudes to recycle. On the contrary, if they believe that recycling would produce negative consequences, this would reflect in their attitude not to recycle. In light of this, it is presumable that behaviour is goal-directed and that the key to changing people's behaviour is through their evaluations of suggested actions or behaviour's outcomes (Verplanken & Orbell, 2021). Thus, using attitudinal approaches to modify behaviour is one of the well-established practices that serve as the foundation for social policy.

Perceived Norms

Perceived norms play a crucial role in the TPB, which explores factors influencing human behaviour in various settings (Bicchieri & Muldoon, 2011). Social norms, as described by Smith et al. (2012), serve as a blueprint for human behaviour. In the TPB framework, perceived norms pertain to individuals' perceptions of their social group's expectations regarding how they should behave (Issock, 2020). These perceived norms are essentially informal guidelines for appropriate conduct within a specific culture (Cheng, 2020). They represent the social pressures exerted by significant others, like family, friends, spouses, and neighbors, influencing one's intentions and decisions. Therefore,

the TPB acknowledges the vital role of perceived norms in shaping individual behaviour within social and cultural contexts.

In modern day society, it is not possible that one can separate he/herself from the community in which he/she lives and become an isolated person. Thus, one of the primary mechanisms that can be used to influence personal pro-environmental behaviour is word of mouth as we live in communally (Sweeney, Webb, Mazzarol, Soutar, 2014). Many previous previous researchers have empirically explored the effect of subjective norms on recycling intentions using TPB. While other studies confirm that attitudes are the strongest predictor of intentions, Ahmad et al. (2009) Goh et al. (2017) and Macovei (2015) indicate that perceived norms form the strongest predictor followed by attitude.

Cialdini and Reno (1991) and Cialdini et al. (1990) categorize perceived norms into injunctive and descriptive norms. According to them, injunctive norms relate to what others approve or disapprove of as appropriate behaviour and is enforced by social rewards and punishments. Descriptive norms on the other hand, relates to the normative behaviour itself being performed by their significant others. According to Smith et al. (2012) and Schuster et al. (2016), injunctive and descriptive norms are discrete sources of motivation that ought to have an impact on a particular behaviour. Issock et al. (2020) assert that both injunctive and descriptive norms need to be taken into account in order to fully comprehend how social norms affect attitudes regarding intention and behaviour in various settings.

According to Schultz (1999), recycling behaviour is influenced by both injunctive and descriptive norms. In the case of recycling, Geiger et al. (2019) note that people are more likely to follow suit if they believe that other people

in their neighbourhood sort their waste or that these people expect them to do so. While both injunctive and descriptive norms contain the common aspect of conformity requirements, the distinction between them is in the roles that social punishments are thought to play in the normative influence process (Trudell, 2019; Roustae et al., 2020). Hence, to the extent that injunctive norms are dependent on people's views of social acceptability, an underlying assumption in the influence of injunctive norms is that behaviour is directed, in part, by a desire to do the right thing (Issock et al., 2020).

People may not always be reasonable in the actual world of uncertainty and ambiguity, thus, they may act pro-socially just to follow others or to live up to their own expectations in the absence of external inducements. Perceived norms, which are beliefs about conduct that are regarded compulsory, permissible or prohibited shared by members of a group (Ostrom, 2000), can drive voluntary behaviours by establishing social pressure and/or modifying self-cognition. According to Abrahamse & Steg (2013), Abrahamse et al. (2005) and Suh (2002), people often seek social approval while avoiding criticism or punishment from others. According to the findings of Mintz et al. (2019), social norms are important predictors of household waste separation among Japanese, Germans and Israelis. Following this, Borg et al. (2020) advocate using social norm approaches to induce the avoidance of single-use plastics in their work.

Perceived Behavioural Control

The TPB emphasizes the importance of an individual's perception of their ability to carry out a specific action, considering their available resources and opportunities (Ajzen, 2013). Trafimow et al. (2002) break down perceived behavioural control into two essential components: perceived control, which

relates to personal agency, and perceived difficulty, indicating the complexity of the behaviour (Ajzen, 2013). Control beliefs, which involve judgments about external circumstances that can either facilitate or hinder behaviour, play a significant role in influencing perceived behavioural control within the TPB (Ajzen, 2013). This concept is crucial for understanding human behaviour in the context of attitude-behaviour theory because one's perception of their capability to take action significantly shapes their intentions and subsequent behaviour (Chen & Lee, 2020).

Thøgersen (1994) indicates that while participants may possess the intention and ability to engage in the recycling process, the opportunities for doing so may not be available due to circumstances beyond the person's power to control. Thus, in the context of the current study, perceived behavioural control connotes a set of control beliefs related to self-efficacy (Wan et al., 2012). One unique feature of perceived behavioural control among the TPB constructs is the dual role it plays. In addition to its direct influence on intention, perceived behavioural control also directly predicts actual behaviour (Ajzen, 1991, 2013). From the analysis, the greater the capability to execute the courses of action required, the greater the probability that the action will be performed (Xu et al., 2017).

Additionally, perceived control is thought to represent both past experience and anticipated challenges. According to Knussen et al. (2004) and Tonglet et al. (2004), intentions for waste separation behaviour are influenced by a person's perceived control, especially in places with limited recycling facilities. Because of this, it's possible that the relative significance of perceived behavioural control in forecasting intention will vary depending on the

circumstance (Lee & Kotler, 2016). Nevertheless, many other other studies (Oztekin et al., 2017; Stoeva and Alriksson 2017) have shown the significance of perceived control as a predictor of recycling intentions.

Intentions

In household waste recycling, intention plays a vital role in the TPB, akin to the Theory of Reasoned Action. Ajzen (1991) defines intention as a measure of an individual's willingness to put effort into recycling, reflecting the motivating factors behind recycling behaviour. Within TPB, intentions are shaped by attitudes toward recycling's environmental impact and personal evaluations of its benefits and drawbacks. Since recycling intention is deeply rooted in an individual's cognitive framework, signaling their readiness to recycle, it serves as a potent predictor of actual recycling behaviour (Ajzen, 2015). This emphasizes intention's central role in household waste recycling, encompassing both motivational and cognitive aspects guiding recycling choices and actions.

The TPB framework conceives that an intention is the moment where all the motivating elements that affect a particular behaviour converge (Ajzen, 1991). In simple terms, intentions represent a commitment to act or the willingness to respond in a certain way to a specific situation. However, as intention is a direct predictor of behaviour, it entirely mediates the influence of attitudes, subjective norms and perceived behavioural control (Ajzen, 1991, 2002; Han et al., 2010; Wu & Chen, 2014). Previous studies show that intentions are the most reliable indicator of a particular behaviour (Ajzen, 2015). Abadi et al. (2021) assert that an individual intention arises from their mental framework and describes their subjective preparedness to engage in a behaviour.

But it should be clear that a behavioural intention can only manifest through behaviour if such behaviour is voluntarily chosen. To put it another way, only free will allows a person to choose whether or not to act on their goals. Even if certain behaviours might adequately satisfy this requirement, most behaviours are at least somewhat influenced by non-motivating variables including the accessibility of other critical opportunities and resources (Ajzen, 2015). Therefore, to the extent that a person has behavioural control, performance should be influenced by intentions, leading to improvement in behavioural control to the extent that a person is motivated to act.

Chapter Summary

This chapter offered a comprehensive exploration of recycling intentions by first examining theoretical frameworks such as the TPB, ABC, CUMT, and NT. It also delves into reverse logistics and the 4Rs principles crucial for sustainable waste management. Conceptually, the chapter highlights the TPB's behavioural factors, encompassing attitudes, subjective norms, environmental awareness and perceived behavioural control, in shaping recycling intentions and actions. Furthermore, it emphasizes the role of contextual factors, including access to recycling facilities, recycling convenience, awareness campaigns, and policy incentives, in promoting recycling practices. This comprehensive overview underscores the interplay of individual psychological elements and external contextual factors in fostering recycling and supporting environmentally responsible waste management.

CHAPTER THREE

EMPIRICAL REVIEW AND CONCEPTUAL FRAMEWORK

Introduction

In the previous chapter, we established a theoretical framework for exploring logistics in sustainable household waste management. A literature review highlighted that household recycling intentions are influenced by contextual and behavioural factors. In this section, we provide an empirical review of these factors, aiming to synthesize previous research, identify trends, nuances, and research gaps. Our focus is on aligning article reviews with our study's objectives: understanding factors impacting household recycling intentions as they apply to the underlisted research objectives are:

1. To analyse the effect of contextual factors (access to recycling facilities, convenience, awareness creation and policy inducement) on households' intentions to recycle MSW
2. To examine the influence of behavioural factors (environmental awareness, attitude, perceived behavioural control and perceived norms) on households' intentions to recycle MSW
3. To determine the moderating effect of policy inducement on the relationship between perceived norms and households' intentions to recycle MSW
4. To examine the mediating role of attitude on the relationship between environmental awareness and household intentions to recycle MSW.

Empirical Review on Contextual Factors and Households' Participation Intentions in Waste Recycling

In emerging countries like Ghana, despite the extensive efforts put into waste separation and recycling campaigns, there is a significant research gap in understanding the factors influencing household waste recycling intentions through reverse logistics principles (Sabbir et al., 2022). This study addresses this gap by utilizing established theoretical frameworks, including TPB, ABC, CUMT and NT. Through empirical research, it comprehensively explored contextual and behavioural elements shaping household waste recycling intentions. In this chapter, the review is divided into two sections, focusing on contextual and behavioural factors. The first section of the study highlights the critical role of contextual factors in shaping and enhancing waste recycling intentions among households.

The breadth of this review incorporates a wide range of studies that have delved into the intricacies of waste management and recycling behaviours. Notable contributions include works by Zhang et al. (2016), Sheau-Ting et al. (2016), Khalil et al. (2017), Latif et al. (2018), Chen and Lee (2020), Sari et al. (2021), Sabbir et al. (2022), Liu et al. (2022), Zhang et al. (2019), Méndez-Lazarte et al. (2023), Barr and Gilg (2007), Stoeva and Alriksson (2017), Conke (2018), Khana, Ahmeda, and Najmi (2019), Schoeman and Rampedi (2022), Juliana et al. (2022), Mohamad, Thoo, and Huam (2022), Oke and Kruijzen (2016), Liu et al. (2019), T et al. (2022), Zaikova et al. (2022), Xu, Liu, and Rustam (2023), Xu et al. (2017), Xu et al. (2018), Abila and Kantola (2019), and Liu (2022).

Access to Recycling Facilities and Intentions to Recycle Waste

Zhang et al's. (2016) study delves into waste recycling behaviours and their underlying psychological antecedents in a controlled laboratory experiment, exploring variations in waste recycling facility accessibility. The study aimed to validate the hypothesis that the lack of effective recycling facilities serves as a significant barrier preventing Chinese individuals from properly sorting and reusing recyclable waste. The results of this research highlight the potential of enhanced accessibility to recycling facilities in reducing the behavioural costs associated with recycling, thereby encouraging individuals to engage in recycling actions. It is important to note that while this strategy directly influences behaviours, its impact on the underlying behavioural antecedents is relatively limited. Furthermore, the study provides empirical evidence supporting the existence of a gap between behavioural intentions and actual behaviour.

One of the key findings of this study is the substantial role played by the accessibility of recycling facilities in influencing recycling behaviour. The research indicates that when recycling facilities are easily accessible, individuals are more likely to engage in recycling activities. This effect is observed as a significant increase in the percentage of individuals who recycle when compared to scenarios where recycling facilities are less accessible. Specifically, the data demonstrates that in scenarios with easily accessible recycling facilities, the percentage of individuals participating in recycling is over 25% higher compared to scenarios where such facilities are hardly accessible.

These findings have crucial implications for the development of recycling promotion policies and efforts aimed at breaking the cycle of mixed waste disposal and collection. They underscore the importance of improving the accessibility of recycling facilities as a means of directly influencing recycling behaviour. However, the study also reveals that while enhancing accessibility can lead to increased recycling participation, it may have limited impact on the underlying psychological factors that drive recycling behaviours. Zhang et al.'s (2016) controlled laboratory experiment provides valuable insights into the relationship between recycling behaviours and the accessibility of recycling facilities. For example, results of their Chi-square test show that accessibility of recycling facilities significantly influences individual's choice of recycling.

However, this study was carried out in China and has limitations in terms of context. These limitations encompass diverse cultural norms and socioeconomic factors in different countries, variations in recycling infrastructure and government policies, disparities in legislation and regulation, and disparities in environmental awareness. Additionally, the study didn't consider variables like education, socioeconomic status, and other factors that can influence recycling behaviour. Moreover, its controlled laboratory setting may not fully capture the real-world complexities of recycling practices. Finally, the effectiveness of recycling promotion policies can be time-sensitive and context-specific. Therefore, applying the study's findings to another country necessitates careful consideration of the unique factors influencing recycling intentions and behaviours in that specific context.

Sheau-Ting et al.'s (2016) study aimed to delve into the factors that influence waste separation behaviour within communities in Malaysian

universities. To achieve this, they employed a choice-based conjoint analysis methodology. The primary objective of this research was to pinpoint the combination of attributes that are most effective in motivating waste recycling behaviour within the university setting. Unlike traditional surveys that inquire about individual attributes separately, this approach allowed the researchers to simultaneously assess multiple attributes by asking respondents to choose a set of attributes they found most appealing. This innovative approach added depth to their understanding of the factors that drive waste recycling behaviour.

To construct their questionnaire, the researchers used a method with balanced overlap facilitated by Sawtooth Software, a tool commonly employed in choice-based conjoint analysis. Originally, the questionnaire comprised 13 questions, each presenting respondents with four profiles representing various attribute combinations aimed at promoting consistent waste separation behaviour on campus, with the option to choose "none." However, based on feedback received during the pre-test phase, the number of questions was reduced to 11. This adjustment was made to ensure that respondents were not overwhelmed and that their preferences were accurately captured without being forced to select attribute combinations they did not favour.

The study identified four key attributes that significantly influence waste recycling behaviour within the university community: accessibility to recycling bins, incentives, reminders, and information. The findings revealed that having easy access to recycling bins within a distance of 100–500 meters was the most critical attribute for encouraging waste recycling on campus. Limited access to recycling bins was identified as a hindrance to effective waste recycling behaviour. Additionally, the study underscored the importance of providing

incentives to motivate individuals to engage in waste recycling efforts, implementing reminders to prompt the community to practice waste recycling consistently, and providing up-to-date information on the process. These attributes were seen as integral components of a comprehensive program aimed at fostering voluntary waste recycling behaviour within the campus community.

Despite the valuable insights gained from this study, it is important to acknowledge its limitations. Firstly, the research was not grounded in any specific theoretical framework, which could potentially enhance the robustness of the findings. Secondly, the attributes identified for waste recycling behaviour may not be directly transferable to other types of pro-environmental behaviours, emphasizing the need for caution when extrapolating these findings to different contexts. Lastly, the study's results are specific to the Malaysian context, and generalizing them to other geographical contexts may require further investigation and adaptation to local conditions. Therefore, while the study provides valuable insights into waste recycling behaviour within Malaysian universities, broader applications and cross-cultural relevance should be explored cautiously.

In Khalil et al.'s (2017) study, the primary objective was to assess the applicability of the TPB and its extended version in predicting household recycling intentions in Nigeria. Additionally, the research aimed to investigate whether the perceived lack of facilitating conditions including accessibility played a role in influencing households' recycling intentions. The study adopts the quantitative approach and employed a systematic sampling procedure to select representative local governments in three income categories: Dala LGA

(middle income), Nassarawa LGA (high income), and Kumbotso LGA (low income) to represent their respective zones within Kano metropolis, Nigeria.

Subsequently, the research utilized proportionate random sampling to select households based on the population of each chosen local government. In light of the local governments' heterogeneity, a multistage stratified random sampling technique was employed to collect data from households. A total of 450 questionnaires were distributed, with 393 households from Kano metropolis being included in the final analysis using Structural Equation Modeling (SEM) through the SEM AMOS statistical software program version 22.

The findings of the study indicated that the TPB Model successfully predicted household recycling intention in Nigeria and accounted for 42% of the variance in recycling intention. Among the components of the TPB model, attitude emerged as the most significant predictor of recycling intention ($\beta = 0.593$, $p = 0.000$). However, when personal norm (PN) was integrated into the model, the explained variance in recycling intention increased to 58%, and personal norm (PN) became the most influential predictor in the extended TPB model ($\beta = 0.496$, $p = 0.000$). Importantly, the research also revealed that the perceived lack of facilitating conditions played a significant role in shaping households' recycling intentions.

Despite these insightful findings, it is essential to acknowledge certain limitations of the study. Firstly, the research was confined to Kano metropolis, which may not represent the entire diversity of recycling behaviours and attitudes across Nigeria. The study's generalizability to other regions or urban areas in the country may be limited. Secondly, the data collection was based on self-reported responses from households, which could introduce response bias

or social desirability bias, potentially affecting the accuracy of the findings. Additionally, the study focused on intention rather than actual recycling behaviour, which may not always translate directly into real-world actions. Finally, as the study was conducted in 2017, the dynamics and factors influencing recycling intentions and behaviours may have evolved since then, necessitating further research to assess any changes or developments in this regard.

In the study conducted by Latif et al. (2018), the focus was on investigating how situational factors, with emphasis of on accessibility affect recycling behaviour and its implications for overall quality of life. Utilizing a quantitative approach and employing cluster sampling, the researchers randomly selected a total of 300 respondents from three urban areas in Malaysia, namely Kuala Lumpur, Penang, and Johor Bahru. These locations were chosen due to the presence of recycling facilities, each serviced by three different providers. The data analysis employed structural equation modeling (SEM), with the statistical package analysis of moment structures (AMOS) used to assess model fit, predictive power, and the significance of paths within the proposed model. A self-administered structured questionnaire was designed to measure the constructs within the theoretical framework, and the analysis consisted of two parts: the measurement model and the structural model.

This empirical study's key findings highlight the significant influence of access to recycling facilities on recycling intentions and behaviour. In essence, when recycling facilities are less accessible and recycling is, participation decreases. Moreover, the study shows that respondents' intention to recycle greatly affects their actual recycling behaviours. The study concludes that

intention to recycle acts as a partial mediator in the relationship between contextual factors and recycling behaviour but becomes a full mediator when contextual factors have no significant impact on recycling behaviour. These findings are crucial for local authorities in developing effective strategies to encourage public participation in waste recycling and mitigating waste management challenges.

Given that consumers' perception of a lack of facilities can impact their intention to recycle, it is crucial for local governments to focus on improving and providing recycling facilities, even when these services are managed by private sectors. Creating more accessible recycling centers and expanding recycling infrastructure should be priorities. However, it is essential to acknowledge the limitations of this study, particularly in terms of context and generalizability. Firstly, the research was conducted specifically in the urban areas of Malaysia, which may limit the applicability of the findings to other regions or countries with different cultural, economic, and environmental contexts.

Additionally, the study relied on a sample of 300 respondents, which may not fully represent the diversity of the population, and its findings may not be generalizable to broader populations or rural areas. Finally, the study's reliance on self-administered questionnaires may introduce response bias, and the research may not capture all potential variables influencing recycling behaviour. These limitations should be considered when interpreting and applying the study's results beyond the specific context in which it was conducted.

In their comprehensive quantitative study, Zhang et al. (2019) undertake a thorough examination of the intricate dynamics surrounding the connection between intention and household waste recycling behaviour among the Chinese population. Employing a meticulously designed structured survey methodology, they systematically gathered data to probe deeply into how access to recycling facilities influence individual intentions, attitudes, perceived norms, and perceived behavioural control in the context of waste recycling practices. This methodological rigour allowed for a precise and comprehensive assessment of the factors influencing waste management decisions within Chinese households.

One of the study's notable strengths lies in its integration of two influential psychological models: the TPB and the Norm Activation Model. The TPB focuses on individual attitudes, subjective norms, and perceived behavioural control as drivers of intention and subsequent behaviour. In contrast, NAM highlights the significance of moral norms and personal obligations in motivating prosocial behaviour. The integration of these two models by the researchers offers a more nuanced perspective on the complex dynamics underpinning waste sorting behaviour.

The study's findings underscore the pivotal role of access to recycling facilities in shaping recycling behaviour within Chinese households. This observation aligns with the TPB's emphasis on perceived behavioural control, in this instance, the influence of accessible facilities on intentions and actions. Additionally, the incorporation of NAM elements, such as moral norms, sheds light on why individuals participate in waste recycling beyond mere convenience, enriching our understanding of the underlying motivations.

Nevertheless, it is crucial to acknowledge a notable limitation within this study. It falls short in exploring the potential impact of self-interest and the effectiveness of government inducements in stimulating waste recycling behaviour. The theory of self-interest posits that individuals may not actively engage in activities that contribute to public goods, like waste recycling, if they can reap collective benefits without participating. This raises pertinent questions about the potential efficacy of government incentives or disincentives in incentivizing participation.

To address this gap, future research endeavours could delve into the effectiveness of government policies, such as offering financial incentives or imposing penalties, to encourage waste recycling. This avenue of inquiry becomes particularly relevant in situations where voluntary participation might prove inadequate in achieving the desired behavioural outcomes. An enhanced comprehension of the interplay between self-interest and government interventions could yield invaluable insights for refining waste management strategies.

Chen and Lee (2020) conduct a thorough investigation into household waste recycling intention in Nanning city, China, emphasizing the crucial role of public policy in shaping attitudes and behaviours. The primary objective of this research was to use the TPB and ABC models to comprehensively explore the influences of both contextual and behavioural factors on waste recycling intentions among targeted households in various regions of China. Their research framework comprised nine variables, including attitude, subjective norm, self-efficacy, access to facilities, moral norm, awareness of consequence, incentives, policy regulation, and intention to recycle waste. Importantly, all

measurement items were adapted and modified from prior studies, adding to the robustness of their approach.

Data collection was conducted in Nanning city, the capital of Guangxi Zhuang Autonomous Region in China, utilizing a quantitative approach and a cross-sectional research design. Out of a total of 579 questionnaires collected, 371 valid responses were selected for in-depth analysis, further bolstering the credibility of their findings. The research model comprised eight constructs interconnected through dependence relationships and causal paths, necessitating a rigorous structural equation modeling (SEM) analysis. The SEM analysis entailed an assessment of constructs to establish convergent and discriminant validity, ensuring the soundness of their measurements.

To analyze the data effectively, Chen and Lee opted for Partial Least Squares Structural Equation Modeling (PLSSEM). While the study provides policy-makers with strategies to provide adequate facilities in both quantity and quality, it is imperative to recognize and acknowledge the inherent limitations of the study. One such limitation is its generalizability across various contexts, with a particular emphasis on its relevance in emerging economies. This limitation implies that the applicability of the study's recommendations may vary in diverse geographical and socio-economic settings. Policymakers need to exercise caution and adapt these recommendations as needed when formulating waste management policies, particularly in dynamic and multifaceted environments.

Sari et al. (2021) conduct a thorough examination of Indonesian households' willingness to participate in an e-waste recycling program, employing the TPB and the value belief norm theory (VBNT) within the context

of reverse logistics. Their methodology involved a quantitative survey approach, targeting a specific group of participants, smartphone users in Indonesia and gathering data from 324 valid questionnaires. The chosen quantitative survey method was well-suited for investigating consumer intentions and the factors influencing their participation in e-waste recycling programs. Again, the researchers' adoption of the TPB and VBNT frameworks aligns with existing research in the field of pro-environmental behaviours.

Their findings indicating the significance of government drivers, facility accessibility, and personal attitudes in influencing consumer intentions are consistent with the fundamental constructs of TPB. Furthermore, their observation that environmental concern positively influences consumer intentions through TPB variables and perceived behavioural control via government drivers supports the integration of TPB and VBNT. Nevertheless, the study's conclusion that economic drivers and subjective norms do not exert a significant influence on consumer intentions contradicts some prior literature. It would be beneficial for the authors to delve deeper into these disparities and explore potential reasons for the observed differences. It is plausible that cultural or contextual factors in Indonesia may contribute to shaping consumer intentions differently compared to other regions, warranting further investigation.

One other notable limitation of the study is its primary focus on smartphone users, potentially excluding a substantial portion of the Indonesian population without smartphones. This limitation could raise concerns regarding the generalizability of the findings to the broader Indonesian population. Furthermore, although the study recognizes the importance of convenience and

awareness creation in waste recycling, it falls short in incorporating these crucial factors into the TPB framework. This omission might hinder the study's capacity to provide a comprehensive analysis of consumer recycling intentions, given that convenience and awareness are pivotal determinants of waste recycling behaviour.

Sabbir et al. (2022) conducted an investigation into the determinants of consumers' intentions to engage in reverse exchange practices for e-waste recycling in developing countries. They employed a combination of the TPB and the ABC theories to analyze the factors influencing these recycling intentions. The study used the quantitative approach to gather data by means of questionnaire surveys to gain a comprehensive understanding of consumers' attitudes, perceptions, and intentions regarding e-waste recycling. The integration of the TPB and ABC theories in this study allows for a multifaceted examination of consumers' recycling intentions.

The TPB primarily focuses on the psychological determinants of behaviour, including attitudes, subjective norms, and perceived behavioural control. On the other hand, the ABC theory introduces the concept of activated behavioural control, emphasizing the role of external factors, such as government initiatives and regulations, in influencing behaviour. Their findings suggest that government initiatives significantly impact recycling intentions. This aligns with the ABC theory, which underscores the importance of external factors. The results show the need for integration, because the variables reinforce each other and there is the need to orient personal attitudes in a sustainable direction requires campaign enforcement.

However, it is noteworthy that the study may have overemphasized the role of rules and regulations while not adequately considering the provision of recycling facilities. This oversight raises questions about the comprehensive assessment of all potential determinants, as recycling infrastructure is a crucial component in facilitating e-waste recycling. The study's overemphasis on government regulations as compared to the provision of recycling facilities is a potential limitation. Adequate infrastructure and access to recycling centers play a pivotal role in encouraging recycling behaviour. Ignoring this aspect may lead to an incomplete understanding of the factors influencing consumers in developing countries

Although the TPB and ABC theories offer a valuable framework for understanding recycling intentions, their explanatory power may vary across different contexts and settings. Researchers should consider the relevance of these theories in specific environments and adapt their methodologies accordingly. The study could benefit from a more balanced consideration of both regulatory and infrastructural factors.

In the research conducted by Liu et al. (2022), the primary aim was to gain insights into the waste recycling behaviour of both urban and rural residents in Jiaying, China. This study sought to identify the factors influencing waste recycling behaviour in the context of local government promotion of waste classification, even though it had not been officially legalized. To accomplish this, the researchers employed a theoretical framework that combined the TPB and the VBNT, creating a comprehensive "motivation-intention-behaviour" model to understand the determinants of household waste recycling behaviour.

The research utilized a quantitative approach and employed population ratio quota sampling techniques to collect data through questionnaires. In total, 600 questionnaires were distributed, resulting in 541 valid responses, equating to an effective questionnaire recovery rate of 90.17%. Data analysis was carried out using IBM SPSS, and structural equation modeling with partial least squares was employed for empirical analysis. The analysis was structured into several steps, beginning with the evaluation of the reliability and validity of the various dimensions of the variables under consideration. The subsequent steps involved examining the significance of independent variables (attitudes, subjective norms, perceived behavioural control, and perceived policy effectiveness) through intermediary variables (behavioural intentions) and assessing their impact on the dependent variable (waste recycling behaviour). This process also entailed testing the validity of relevant assumptions.

The study's results unveiled several significant relationships among the variables. Attitudes (ATT), subjective norms (SN), and perceived behavioural control (PBC) were found to have a significant positive effect on the intention of household waste recycling. Additionally, perceived policy effectiveness (PPE) with access to recycling facilities was found to positively and significantly influence attitudes and waste recycling intentions, suggesting that effective policies enhance residents' willingness to recycle waste. Furthermore, waste recycling intention was positively linked to waste recycling behaviour, indicating that residents with the intention to recycle waste were more likely to engage in actual recycling behaviour.

The study's findings illuminated several key insights. Firstly, they underscored the paramount importance of policy regulation as the most

significant determinant of attitude among external stimuli. This highlights the influential role of public policy in shaping the attitudes of individuals towards waste recycling. Secondly, the study revealed that awareness of consequences had the strongest relationship with attitude among internal stimuli, emphasizing the importance of understanding the potential outcomes of waste recycling actions. Additionally, facilitating conditions, subjective norms, and moral norms were all found to be significant predictors of attitude, collectively fostering a positive attitude towards waste recycling. This, in turn, was shown to lead to an enhanced adoption of a waste recycling lifestyle among the studied households.

However, it is important to acknowledge some limitations in terms of context and generalizability of these findings. Firstly, the study focused on a specific region in China, namely Nanning city. While the insights are valuable, they may not be universally applicable to all regions, especially those with different cultural or socio-economic contexts. Secondly, the research was conducted in 2020, and circumstances and policies related to waste management may have evolved since then. Thus, the findings might not fully represent the current state of waste recycling intentions and policy impacts. Lastly, the study mentions providing policy development information for three Asian countries, but it does not delve into the specifics of how these findings could be adapted to varying policy contexts in other countries including Ghana.

Méndez-Lazarte et al. (2023) aimed to challenge the conventional belief that attitude alone serves as a sufficient motivator for household solid waste recycling in Lima. Their primary objective was to identify the additional factors that influence waste recycling behaviours within this particular context. To

accomplish this, the researchers conducted face-to-face surveys targeting individuals aged 18 to 70 residing in three distinct districts of Lima: Comas (50%), Miraflores (25%), and San Borja (25%). The sample size was determined to be 450 cases, assuming maximum dispersion ($p = q = 0.5$), with a 95% confidence level and a margin of error of +4.6%. Notably, Comas represents a district characterized by predominantly low-income households with limited purchasing power, while Miraflores and San Borja are marked by higher-income households. The municipal environmental waste recycling program in these districts did not employ financial incentives or penalties but offered logistical support such as bags, collection frequency, and educational campaigns. Low-income districts like Comas faced more substantial logistical challenges but sought to replicate the successful practices observed in high-income districts like Miraflores and San Borja.

The study employed a questionnaire based on variables derived from the literature review and operationalized in the methodology section. The data underwent exploratory factor and reliability analyses, followed by confirmatory factor analysis or structural equation modeling (SEM). Through this process, the study revealed that several factors significantly influenced solid waste recycling behaviour. These factors included attitude, perception of technical knowledge, and the availability of physical space. Furthermore, the research demonstrated that intention mediated the relationship between a person's attitude toward solid waste recycling and their actual behaviour. In emerging economies, municipal recycling programs often prioritize education and motivation but tend to underestimate the importance of available space within households for effective waste management.

The lack of appropriate urban infrastructure and limited space at home act as substantial barriers to waste separation practices in these economies. While the availability of physical space may not directly affect intention, it does exert a meaningful direct influence on the actual behaviour of waste recycling. These findings underline the need to reconsider the design of local waste recycling programs, which have historically placed strong emphasis on educational aspects related to waste, categorization knowledge, and the generation of environmental awareness. Notably, this study underscores the opportunity for policymakers in Latin America to give priority to the provision of adequate space for waste recycling, thereby encouraging the adoption of these behaviours in large cities across the region.

However, the study does have certain limitations. First, the research primarily focused on three specific districts in Lima, which may limit the generalizability of the findings to other regions or countries with different socioeconomic and cultural contexts. Additionally, the study relied on self-reported data obtained through surveys, which may introduce response bias and potential inaccuracies. Future research in this area could explore the specific characteristics of home spaces in more depth, including their size, equipment, layout, and how these factors influence waste recycling behaviours in Latin America. Furthermore, investigating other logistical factors within households, such as waste transportation, task execution time, use of cooling systems, and reminders for product expiration, could further enhance our understanding of waste recycling practices.

According to Barr and Gilg (2007), individuals have the capacity to decide on their behaviour, but the successful implementation of that behaviour

may hinge upon external factors like the availability of service facilities and incentives. In this research, the specific external factor directly impacting the inclination to separate waste is termed "facility accessibility." For instance, research by Kannangara et al. (2018) has demonstrated that improvements in recycling programs that enhance the visibility, availability, and accessibility of drop-off stations can significantly boost recycling rates. Based on the empirical studies that have examined, this study asserts that having easy access to recycling facilities exerts a positive and substantial influence on people's intentions to recycle waste.

Convenience and Intentions to Recycle Waste

In their study titled "Convenience improves composting and recycling rates in high-density residential buildings," DiGiacomo, Wu, Lenkic, Fraser, Zhao, and Kingstone (2018) investigated how convenience could positively impact recycling behaviour through a series of experiments. The study primarily focused on the household perspective, recognizing that the single most significant factor contributing to the convenience of recycling is the improved provision of recycling services at the curbside. However, it also acknowledged the continued importance of local drop-off recycling centers within the recycling infrastructure.

To provide empirical evidence on the relationship between convenience and recycling rates, the authors conducted two randomized field experiments. In these experiments, residential buildings were randomly assigned to different conditions, and the composting and recycling behaviours of the residents were monitored over time. The first experiment involved manipulating the distance between compost bins and residential suites within a building. They measured

the amount of compost produced under three conditions: highly convenient (bins located on the same floor as the suites), moderately convenient (bins placed at the base of the elevator near the building entrance), and inconvenient (bins located outside of the building).

The authors then replicated and extended the experiment by assessing compost, paper, and container (e.g., glass bottles, jars, and plastic bottles) recycling in student residences. They introduced additional forms of inconvenience, such as having different types of recycling bins in various locations and providing the temptation of using a general-purpose garbage chute instead of having to make a trip to the basement to recycle and compost. This research aimed to shed light on how the level of convenience influences recycling and composting behaviours within high-density residential settings, offering valuable insights into the design and placement of recycling facilities to encourage sustainable practices among residents.

In two randomized field experiments, the study unequivocally demonstrates that convenience plays a pivotal role in significantly boosting recycling and composting rates, particularly in multi-family dwellings and university residences. The findings revealed substantial increases in waste diversion when convenience was optimized in these settings. In the first experiment, involving a multi-family residence, the introduction of compost bins on each floor, as opposed to placing them solely on the ground floor, led to a remarkable 70% increase in composting rates. This shift translated to the diversion of a substantial 27 kilograms of compost per unit annually, thereby preventing it from ending up in landfills.

In the second experiment, conducted in student residences, convenience was enhanced by situating recycling stations within meters of the residential suites, as opposed to the less accessible basement location. The results were striking, with recycling rates increasing by a notable 147% for containers and 137% for paper. Additionally, composting rates increased by 139%. These improvements resulted in the diversion of 23 kilograms of containers, 22 kilograms of paper, and 14 kilograms of compost per person annually from the landfill.

These findings underscore the profound impact of convenience on waste management and environmental sustainability. The study's results highlight the efficacy of a straightforward yet impactful intervention: making recycling and composting more convenient. Such a measure has substantial implications for waste management practices and environmental policy, as it can significantly enhance waste diversion, reduce landfill disposal, and contribute to more sustainable resource management. While the study provides valuable insights, it has limitations, including its focus on specific types of residential buildings and the short-term nature of the experiments. These findings underscore the importance of convenience in waste management and environmental policy, although their generalizability to other contexts should be considered.

In a comprehensive study conducted by Conke (2018), the primary objective was to examine the obstacles that hinder the advancement of waste recycling in two distinct cities within Brazil. The study aimed to identify the barriers impeding the expansion of recycling efforts and emphasize the significant influence of convenience on residents' recycling intentions. Conke's research employed a comparative approach, utilizing two different waste

collection schedules in the chosen cities, examining contrasting cases of a recently implemented recycling program and a well-established one.

Data collection methods encompassed documentary research, on-site observations, 800 structured quantitative interviews with residents, and 33 guided qualitative interviews involving waste pickers, scrap dealers, recycling industry managers, and local administrators. Two cities were carefully selected, one with a consistent waste collection schedule and the other with an irregular one, allowing for a meaningful contrast between the two environments. Data was gathered from residents in both cities through surveys, interviews, and observations. This multifaceted approach ensured a thorough exploration of residents' attitudes and behaviours towards recycling.

This methodological choice facilitated a comprehensive analysis of the impact of convenience on recycling participation. The primary barriers identified in the study were the lack of knowledge regarding the practical and operational aspects of recycling programs, an unequal distribution of the costs and benefits associated with recycling, inadequate infrastructure, and a shortage of professional management. The study's findings revealed a striking disparity between the two cities. In the city with consistent waste collection, an impressive 90% of residents actively participated in recycling, while in the city with irregular waste collection, only 45% of residents engaged in recycling efforts. This pronounced contrast underscores the pivotal role of convenience in shaping recycling behaviour.

It is important to note that Conke's findings are specific to the selected Brazilian cities and may not be directly applicable to other regions with differing socio-economic or cultural contexts. Additionally, recycling

behaviours can evolve over time, and the study's snapshot approach may not capture long-term trends. In conclusion, Conke's research provides valuable insights into the critical connection between convenience and recycling participation. However, future studies should strive for broader generalizability, employ more robust measures of behavioural constructs, and consider temporal factors to provide a more comprehensive perspective on recycling behaviour.

In a study conducted by Khana, Ahmeda, and Najmi (2019), the researchers employed the TPB as the theoretical framework to gain insights into consumer behavioural intentions related to plastic waste management in a developing nation context. Building upon the TPB, the researchers utilized a quantitative research approach to investigate consumer behavioural intentions. Data were collected through a survey questionnaire from 371 participants. The choice of a quantitative research approach, combined with the TPB framework, provided a systematic and theoretically grounded foundation for the study. The authors used the structural equation modeling (SEM) as the primary analytical tool allow for a comprehensive examination of how the TPB constructs interrelated to influence consumer intentions.

The study's findings suggest that convenience plays a pivotal role as a significant predictor of the intention to reuse or recycle plastic waste. Essentially, this implies that when individuals perceive waste separation and recycling as convenient activities, they are more inclined to actively participate in them. These findings align with the TPB, as convenience can influence an individual's perceived behavioural control, subsequently impacting their intentions and actual behaviours. Similarly, a more recent study conducted by Simamora et al. (2021) corroborates this notion. Simamora et al. (2021)

demonstrated that improving the convenience of recycling motivates people to recycle more and, consequently, enhances their willingness to embrace new e-waste regulations. This finding reinforces the idea that convenience is a pivotal driver of pro-environmental behaviours.

While the use of the TPB is a strength in both studies, it is essential to acknowledge that individual behaviour is influenced by a multitude of factors beyond the TPB's three main constructs. Environmental attitudes and behaviours are complex and can be shaped by economic, educational, and social factors, among others. Additionally, both studies could benefit from providing more detailed information about the specific interventions or strategies used to enhance convenience in recycling. This additional information could be valuable for policymakers and practitioners seeking to promote sustainable behaviours. It is also important to note that the generalizability of the findings may be limited due to cultural differences, which can impact how individuals perceive convenience and engage in recycling behaviours (Sabbir et al., 2022)..

Using the TPB, Juliana et al. (2022) investigate factors influencing recycling behaviour among households in Sabah, Malaysia. The extended TPB model, in this particular study, incorporates additional factors such as moral norms, convenience, and the cost of recycling. To gather data for this research, a total of 170 responses were obtained through purposive sampling. Purposive sampling is a method that selectively targets specific individuals or groups to ensure a representative sample for the study. The collected data was subjected to analysis using the partial least square structural equation modeling technique (PLS-SEM). PLS-SEM is a robust statistical method employed to examine complex relationships among variables and is particularly useful for modeling

and analyzing relationships in cases where there may be limited data or small sample sizes.

This study extends the TPB by incorporating additional variables, to gain a more comprehensive understanding of factors influencing recycling behaviour. The analysis is conducted using the robust method of partial least square structural equation modeling (PLS-SEM), highlighting the research's commitment to thoroughly investigate these relationships and their impact on recycling behaviour. The study's findings reveal a positive influence of convenience and recycling costs on recycling behaviour. Despite contributing to our understanding of this subject, it's important to note that the study's scope was limited to Malaysia. Therefore, a valuable suggestion is to replicate this study in a low-income nation like Ghana to confirm whether the findings regarding recycling intentions hold true in a different context. This aligns with academic recommendations to test theories across diverse consumer groups and validate the generalizability of previous and recent research.

In a research endeavour conducted by Mohamad, Thoo, and Huam (2022), the TPB was employed to dissect the intricate factors influencing consumer behaviour concerning the recycling of electronic waste, or e-waste, within the Malaysian context. The study's methodology involved the meticulous collection of 159 questionnaires from a diverse pool of participants, all of whom were 18 years of age or older. To ensure that the study's sample was representative, purposive sampling, a method that selectively targets specific individuals or groups within the population, was employed. The data gleaned from the survey questionnaires were subjected to rigorous scrutiny using

structural equation modeling (SEM). SEM is a robust statistical technique that allows for the exploration of complex relationships among variables.

In this case, SEM was instrumental in comprehensively analyzing the factors influencing e-waste recycling behaviour. The findings of the study were illuminating. They unveiled a strong and statistically significant connection between public participation in e-waste recycling and the perceived convenience associated with the recycling process. The notion of convenience was meticulously measured by taking into account factors such as the physical proximity of recycling bins to the participants' locations and the availability of curbside waste pickup services. These results underscored the significance of convenience in motivating and facilitating e-waste recycling practices among the public.

However, it's crucial to recognize a limitation within the study. The research relied exclusively on the TPB, a well-established and influential framework for understanding human behaviour. Yet, one of the TPB's key strengths lies in its flexibility, allowing for the incorporation of additional variables from other behavioural theories. This flexibility presents an opportunity to delve deeper into the complexities of recycling behaviour. The study could have further enriched its findings by considering the inclusion of supplementary variables from diverse theoretical perspectives, enhancing its comprehensiveness and providing a more holistic view of e-waste recycling behaviour.

Awareness Creation and Intentions to Recycle Waste

In Oke and Kruijsen's (2016) study, they delved into the roles and significance of adopting a holistic approach when designing recycling

information. They achieved this through conducting 15 in-depth interviews with experts. The primary objective was to gain a deeper understanding of the concept of waste, recycling, and how information about recycling should be crafted and presented to make recycling more appealing for more participation. By analyzing the insights from the research participants and drawing on existing literature, the study categorized recycling information into three key components, referred to as the "WWW" of recycling information: what, when, and where. Thematic analysis was employed, with NVivo 11, a qualitative data analysis software package, aiding in the organization and labeling of emerging themes within the interview transcripts.

The study posited that coherent recycling information serves to raise awareness about recycling schemes and offers valuable insights for planners aiming to create effective and enticing recycling initiatives. Furthermore, the research sought to redefine waste recycling responsibilities based on acceptable and legal definitions. According to the study, individuals should not bear the responsibility of recycling per se, but instead focus on preparing materials for collection. Recycling was depicted as a technical activity best suited for specialized waste management or recycling firms with the requisite facilities and expertise. The study also identified key recyclable materials that individuals or households could prepare for recycling.

In line with these arguments, the study divided waste recycling information into three distinct segments: what, where, and when. This categorization aimed to provide scheme designers, policymakers, and participants with the means to address and enhance the preparation of recyclable materials. While previous research has identified various factors influencing

recycling behaviours, this study reinforced the idea that recycling information and communication can be a potent strategy for encouraging participation. However, it acknowledged that the effectiveness of such information can diminish over time and in different contexts. Thus, the study emphasized the need for clearer guidance on the what, when, and where of waste recycling information, advocating that policies and waste management schemes are most effective when they incorporate holistic information into their designs.

However, the study has its limitations. One key limitation is that it did not delve deeply into the "why" and "how" aspects of waste recycling. While it briefly touched on the importance of understanding the reasons and processes behind recycling, it did not provide comprehensive insights into these dimensions. A more robust exploration of the reasons for recycling and the procedures involved could have a significant impact on promoting recycling practices. Additionally, the study primarily focused on the design and communication of recycling information, without delving deeply into the implementation and execution of recycling programs, which is a critical aspect of waste management. Therefore, future research should consider these limitations and aim to provide a more comprehensive understanding of waste recycling from both informational and practical perspectives.

In their study, Liu et al. (2019) delved into the intricacies of how public education influences the willingness of urban residents in Taiyuan City, China, to engage in waste classification and recycling. This investigation was rooted in the framework of the Theory of Planned Behaviour, Persuasion Theory, and the Big Five Personality Theory. The study aimed to construct a comprehensive model explaining how public education impacts residents' inclination to recycle

household waste, with a focus on attitude, subjective norms, perceived behaviour control, and conscientious personality. To ensure the relevance and depth of the questionnaire responses, the researchers strategically surveyed individuals who possessed practical experience in waste disposal and a profound understanding of the questionnaire items. The data collection took place adjacent to waste bins within demonstration communities, employing a one-on-one survey approach to maintain data quality. A total of 421 questionnaires were gathered, with 43 invalid ones subsequently excluded. The model's validation was conducted through a hierarchical regression analysis, involving 378 responses from ordinary residents.

The findings of the study affirmed that attitude, subjective norms, and perceived behaviour control partially mediate the connection between public education and the willingness to recycle household waste. Interestingly, conscientious personality emerged as a moderator, affecting the relationship between public education and perceived behavioural control but not the association between public education and attitude. Furthermore, conscientious personality did not moderate the link between public education and subjective norms. Drawing from the Persuasion Theory framework, the study explored how public education influences urban residents' willingness to recycle household waste. Additionally, leveraging the TPB, the researchers delved deeper into the mediating roles of attitude, subjective norms, perceived behaviour control, and individual differences in this relationship. With insights from the Big Five Personality Theory, they analyzed how conscientious personality moderates the relationships between attitude and public education,

subjective norms and public education, as well as perceived behaviour control and public education.

The study produced several noteworthy findings. Firstly, it highlighted the significant positive impact of public education on urban residents' willingness to participate in household waste recycling. This suggests that there is substantial potential for increasing residents' commitment to recycling through more extensive and effective public education efforts. Secondly, the research identified attitudes, subjective norms, and perceived behaviour control as partial mediators in the intricate relationship between public education and urban residents' willingness to recycle household waste. In simpler terms, public education not only influenced residents' attitudes, subjective norms, and perceived control over their recycling behaviour, but it also had an overall effect on their willingness to engage in waste recycling.

Lastly, the study revealed that individuals' conscientious personality traits played a moderating role in the positive impact of public education on their perceived control over waste recycling. In other words, individuals with higher levels of conscientiousness were more responsive to the effects of public education when it came to their perceived control over waste classification practices. It's important to note, however, that conscientious personality traits did not play a similar moderating role in the relationships between public education and attitudes or subjective norms. These findings provide valuable insights into the potential of public education to influence urban residents' recycling behaviour positively, indicating the need for comprehensive educational programs to encourage responsible waste management practices. Additionally, the study underscores the role of individual personality traits, such

as conscientiousness, in shaping the impact of public education on specific aspects of recycling behaviour.

While Liu et al.'s (2019) study provides valuable insights into the influence of public education on waste classification willingness among urban residents in Taiyuan City, China, it is essential to acknowledge several limitations. The study focused on residents in demonstration communities with waste classification facilities. This may introduce sampling bias, as these residents may already have a heightened awareness and willingness to participate in waste classification compared to the general urban population. The findings might not fully represent the broader urban population. The study's findings are specific to Taiyuan City, China, and may not be generalizable to other regions or cultures with different waste management systems, educational approaches, or social contexts. Cultural and contextual factors could significantly influence residents' willingness to classify household waste.

In a study conducted by Tang et al. (2022), the factors influencing household waste recycling among residents in Shanghai were investigated. The research took a comprehensive approach, proposing hypotheses related to these influencing factors at three different levels: government, society, and individual behaviours. Using Shanghai as a case study, this research delved into the factors impacting residents' household waste recycling through a survey. The study initially formulated research hypotheses covering the factors affecting domestic waste recycling from the perspectives of government policies, societal influences, and individual behaviours. Subsequently, a questionnaire was meticulously designed, encompassing five key perspectives: individual

characteristics, government initiatives, societal factors, residents' practices, and waste classification behaviour.

They designed a questionnaire covering various perspectives, distributed 700 questionnaires both online and offline, resulting in 517 valid electronic and 106 paper responses. Online questionnaires were distributed through www.wjx.cn, a popular platform, while paper questionnaires targeted elderly individuals with limited internet access. Statistical analysis using SPSS included descriptive statistics, reliability and validity assessments, as well as ANOVA, correlation, and regression analyses. The data collected from this questionnaire was subjected to thorough analysis using statistical tools like SPSS.

Descriptive statistics, reliability assessments, and validity checks were carried out, and further analyses including ANOVA, correlation, and regression were employed to scrutinize the sample data. The study's outcomes revealed that the research hypotheses held statistical significance in several aspects. Firstly, it was observed that females and individuals with higher education levels were more inclined to participate in domestic waste recycling. Secondly, reward and punishment measures were found to exert the most substantial influence on residents' waste classification behaviour. Lastly, several factors, including publicity and education, classification standards, recycling facilities, the recycling system, subjective norms, environmental knowledge, and environmental attitudes, all contributed positively to residents' engagement in household waste recycling.

The study identifies that gender and higher education levels contribute to greater participation in waste classification, and reward and punishment

measures have the most significant impact on residents' recycling behaviour. Moreover, factors such as publicity, classification standards, facilities, the recycling system, subjective norms, environmental knowledge, and attitudes positively affect waste classification. In conclusion, the study's empirical results provide a basis for recommendations to enhance domestic waste classification practices in Shanghai. However, the study's generalizability to other regions and contexts may be limited due to the specific nature of its findings, emphasizing the need to consider local dynamics when implementing similar waste management policies.

Zaikova et al. (2022) conducted a study that examined the factors influencing municipal solid waste (MSW) recycling behaviour in two distinct settings: an emerging waste collection system in Saint Petersburg, Russia, and a well-established system in selected urban areas of Finland. The researchers employed online questionnaires to gather data from residents in both regions, ensuring data reliability and validity through separate preliminary tests conducted for the Russian and Finnish datasets. The study introduced a theoretical model that underwent refinement during reliability and validity assessments. The model was subsequently analyzed using structural equation modeling (SEM) through IBM SPSS Amos. SEM, a commonly used statistical approach in behavioural research, combines factor analysis and regression/path analysis.

To measure the various factors considered in the study, 2 to 5 survey items were utilized, with detailed item descriptions available in supplementary materials. Respondents rated their responses on a five-point Likert scale, facilitating the measurement of underlying constructs. Ensuring the study's

applicability to both Russian and Finnish participants, the survey was translated into both languages with input from waste management experts. Pilot tests involving small groups of respondents were conducted to refine item wording for clarity and readability. Measures were taken to ensure the anonymity and confidentiality of responses, mitigating social desirability bias. The dataset consisted of 593 responses from Russia and 474 from Finland. Consequently, the final analysis encompassed 490 observations from Russia and 410 from Finland.

The study's findings highlighted significant differences in the factors influencing waste source-separation behaviour in the two contexts. In Finland's more mature waste system, the primary motivation for recycling was residents' intention, contingent on access to sufficient information. In contrast, Russian households displayed high intentions to recycle waste but faced barriers due to a lack of information and adequate collection facilities. Russian individuals' intentions for waste recycling were notably influenced by their attitudes toward waste separation and had a lesser impact from subjective norms. Regardless of the waste system's maturity, economic incentives and distrust in the waste collection system did not emerge as significant predictors of waste recycling behaviour. Furthermore, comprehensive educational campaigns targeting a broad audience were proposed to effectively engage more residents in waste source-separation.

However, the study has limitations that should be acknowledged. It relied on self-reported behaviour, potentially introducing bias toward more favourable responses. Online data collection excluded certain sociodemographic groups, particularly those without internet access.

Respondents were predominantly middle-aged, female, and well-educated, which may have biased the results. The voluntary nature of online questionnaire responses could have attracted more environmentally-conscious individuals, especially in Russia where waste management is a recognized and evolving issue. These limitations should be considered when interpreting the study's conclusions. Additionally, the study primarily focused on factors within the MSW management system and did not explore potential cultural differences between respondents in the two countries. Future research should aim to address these limitations and provide a more comprehensive understanding of waste source-separation behaviour.

In the study conducted by Xu, Liu and Rustam (2023), an extended theory of planned behaviour was employed to investigate the factors influencing household pharmaceutical waste (HPW) recycling. The primary objective was to propose a targeted take-back system aimed at addressing the challenge of recycling HPW effectively. The research focused on the regions of Anhui and Jiangsu Province, which represent both economically developed and general provinces in East China. The sampling methods employed were convenience and judgmental sampling, chosen due to the impracticality of randomization during the pandemic period. A total of 459 valid household responses were collected through an online questionnaire survey. Data analysis involved exploratory factor analysis for core construct extraction, descriptive analysis using SPSS, confirmatory factor analysis to assess reliability and validity, and structural equation modeling (SEM) with the PLS-SEM technique to test the research hypotheses and validate reliability.

The findings revealed that subjective norm and recycling attitude had a direct impact on HPW recycling intention, though perceived behavioural control did not. Additionally, newly introduced variables such as economic incentives, information publicity, and trust in manufacturers were found to significantly influence HPW recycling intention. In contrast, trust in government and retailers did not emerge as significant predictors of HPW recycling intention. It is worth noting that information publicity exerted an indirect influence on recycling intention through its effects on subjective norms and recycling attitudes. The study provided valuable insights for enhancing household participation in recycling activities, which can inform the design and modification of HPW reverse logistics systems. The results suggested that households are more likely to engage in HPW recycling when they hold positive recycling attitudes and subjective norms, are offered various forms of moderate economic incentives based on their preferences, exhibit high institutional trust in manufacturers, and receive adequate information publicity, which also impacts their recycling attitudes and subjective norms.

However, this research has several limitations and gaps that need to be addressed. Firstly, the study did not account for the potential variations in the key factors affecting HPW recycling intention at different stages of reverse logistics development. Future research could employ experimental methods to delve deeper into the considerations of HPW recycling intention at various developmental stages and validate their findings. Secondly, the research focused solely on HPW recycling intention from the perspective of households and did not consider the current state of HPW recycling in institutions. Future studies may explore recycling from an institutional perspective. Lastly, there is

room for assessing how to design a simplified and practical HPW reverse logistics system tailored to different regions in China, and emerging economies like Ghana taking into account regional variations and specific needs.

Policy Inducement and Intentions to Recycle Waste

Xu et al. (2017) conduct a study to investigate the influence of four external factors on the waste separation behaviour of residents in Hangzhou, China. These factors included market incentives, informal recycling markets, government incentives, and government facilitators. Initially, a preparatory questionnaire was distributed to 220 individuals related to the study, including researchers, experts in solid waste management, government staff, and social workers in JB Street. Following feedback from 87 respondents, the questionnaire was revised, and a pilot study involving 24 households in JB Street was conducted. Subsequent adjustments were made to finalize the questionnaire. The survey encompassed 7 communities within JB Street, home to approximately 27,000 residents and 16,000 households. Systematic sampling was employed to distribute questionnaires, with research assistants available on-site to address any queries from residents.

A high response rate of 96.2% was achieved, resulting in the collection of 1515 questionnaires out of the 1575 disseminated in JB Street. After eliminating invalid questionnaires with blank responses, missing data, and consistent selecting of the same answer, the final sample size was reduced to 631. To assess their proposed conceptual framework, the researchers considered two statistical methods: Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS software and Covariance-based SEM (CB-SEM) using AMOS software. PLS-SEM was favoured for several reasons: its ability

to identify the most effective predictive factors for recycling behaviour, suitability for non-normally distributed data, and applicability to constructs with fewer than three measurements. Consequently, PLS-SEM was chosen as the most appropriate method for this research.

The study's results revealed significant correlations between government facilitators and recycling intention for both high and low-income residents, with varying effect sizes. Specifically, government facilitators had a 16.8% stronger impact on intention in the high-income group, while intention had a 17.9% stronger influence on behaviour in the low-income group, indicating a preference for recycling among lower-income individuals. Differences in age groups showed minor variations, ranging from 3.4% to 8.6%, with no strong conclusions regarding age group moderating effects on recycling intention. Interestingly, both young and older residents' recycling behaviour was influenced more by government policies than market incentives, contrary to previous findings suggesting that young adults had lower recycling rates and were less influenced by government policies.

The study further demonstrated that market incentives, government incentives, and government facilitators significantly affected recycling intention, while market incentives had an insignificant effect. Additionally, recycling intention had a significant impact on recycling behaviour. Multigroup effects analysis was conducted to assess structural models across different demographic backgrounds. Notably, gender differences emerged, particularly regarding the influence of government policy on recycling behaviour, with higher effects in males. Lower-income groups were more likely to recycle when monetary rewards were offered, while higher-income groups were more

influenced by government facilitators. Among Asian young adults, government factors had a greater impact compared to the older group. Moreover, government facilitators only significantly affected the recycling intentions of highly educated residents and those with a high social influence.

The study's findings provided valuable insights for government policy planning to promote recycling in Hangzhou. For instance, government and market incentives could effectively enhance the recycling intentions of lower-income residents who are more responsive to monetary rewards. The government should consider employing additional strategies beyond incentives to boost recycling intentions. Based on demographic moderating factors, targeting highly educated residents near universities with government facilitators and providing more recycling bins in university areas could be beneficial.

Firstly, the geographical limitation of the study is a significant factor to consider. The findings are primarily applicable to Hangzhou residents and cities with similar socio-economic and cultural characteristics. Cultural, belief, and habit differences can play a substantial role in influencing waste separation behaviour. What works effectively in one region might not be as effective in another due to variations in cultural norms, attitudes towards environmental issues, and the level of public awareness. Therefore, researchers and policymakers should exercise caution when attempting to apply the study's results to communities with distinct cultural and socio-economic backgrounds. To enhance the relevance and applicability of the research in the context of global waste management efforts, future studies should endeavour to collect data from a more diverse range of countries and regions. This would allow for

a more comprehensive understanding of waste separation behaviours on a global scale and provide a basis for tailoring waste management policies to the unique needs and preferences of different communities.

Secondly, while the study examined external factors such as market incentives, government policies, and facilitators, it did not delve deeply into the internal factors that may influence waste separation behaviour. Internal factors could include individual motivations, psychological factors, and personal values. A more comprehensive model that considers both internal and external factors would provide a more holistic understanding of why individuals engage in waste separation and how interventions can be designed to effectively promote sustainable behaviours. Future research should explore the interplay between these internal and external factors to develop a more robust framework for waste management strategies. These considerations will contribute to the development of more effective and context-specific waste management strategies globally.

Xu et al. (2018) conduct a study to investigate the impacts of economic incentives and social influence as potential solutions to the domestic waste separation dilemma. Grounded in rational choice theory, the study hypothesized that individuals are unlikely to contribute to public goods unless they face a small group size, coercion, or external inducements like economic rewards. The research involved 188 residents from three communities in Hangzhou, Zhejiang Province, who were randomly assigned to a control group or one of two experimental scenarios. These scenarios encouraged waste separation through economic incentives or social campaigns. The study's analysis of a six-month intervention revealed that economic incentives were more effective than social

mobilization in promoting waste separation. Additionally, mediation tests suggested that self-efficacy partially mediated the effects of both strategies, while personal norms were positively associated with both treatments but not with behaviour demonstration. The study also explored the moderating effects of various sociodemographic factors on psychological mechanisms.

To conduct this research, a framed field experiment was carried out between April and November 2017 in three neighboring communities within Hangzhou's Yuhang District, China. This collaborative effort involved the university, local governments, and a recycling company, aimed at assessing waste separation initiatives before their wider implementation in the target area. The selection of these communities was based on specific criteria. The study randomly selected 100 addresses from each community, resulting in 300 households. Adult residents from these households were recruited as participants by their respective community neighborhood committees, ensuring diversity among the study participants by not including multiple participants from the same family. Out of the 300 registered residents, 225 were selected to participate and received rewards in the form of items like hand sanitizers and tissues. They also completed pre-assessment questionnaires that gathered information on their demographics, baseline waste separation behaviours (T1), general environmental concerns, and attitudes toward waste separation.

Although these psychological factors were not the primary focus, they were assessed to detect initial differences between the experimental conditions. Following the initial assessments, participants were grouped by their respective communities and randomly assigned to one of three scenarios: social influence, economic incentive, or a control group. This random assignment aimed to

ensure the fair distribution of interventions and minimize interference between different treatment groups, thereby ensuring the study's validity. The framed field experiment was designed to evaluate waste separation initiatives in three similar communities with minimal prior exposure to such programs. The study aimed to assess how various interventions (social influence, economic incentives, and control) affected waste separation behaviours, and it was conducted in collaboration with local authorities and a recycling company to inform future waste management strategies.

As one of the few intervention-based studies from an environmental collectivism perspective, this research tested economic incentives and social influence as strategies to promote household waste source-separation practices and examined the underlying factors explaining how these external initiatives influenced individual separation performance. Notably, the study found that the direct economic incentive path, referred to as the "price effect," was a significant driver of waste separation behaviour, aligning with economic logic, which posits that increasing individual marginal benefits can effectively encourage contributions to public goods. Both economic and sociological/social psychological logics appeared applicable in addressing the free-rider problem and encouraging individual efforts in waste separation.

However, the study had several limitations. Firstly, it relied on self-reported measures of individual waste separation, potentially introducing measurement errors due to socially desirable responding compared to actual behaviour. Future research could benefit from replicating the study using observational data. Secondly, the study only examined the short-term effects of economic and social approaches, lacking insights into their long-term

sustainability. Therefore, longitudinal experiments or tracking surveys are recommended to uncover the dynamic evolution of these intervention effects. Thirdly, the study focused on self-efficacy and personal norms as potential mediators to explore the mechanisms of external influences. This approach can help establish a stronger link between intervention-based and determinant-based research within the domain of household waste separation and recycling.

In their 2019 study, Abila and Kantola examined the perceptions of consumers regarding the role of financial incentives in promoting the recycling of municipal solid waste materials in Finland. The research also delved into the various factors influencing individuals' recycling behaviour, including environmental risk, behavioural economics, resource value, economic benefits, convenience, knowledge, legislation, and personal beliefs. Additionally, the study sought to uncover any disparities in the perception of financial incentives for recycling between income-earning and non-income-earning consumers. This investigation was conducted in Vaasa, a municipality located on the west coast of Finland, and it gathered data from five higher education institutions: the University of Vaasa, Vaasa University of Applied Science, Novia University of Applied Science, Abo Akaedemi University, and Hanken School of Economics. A cluster sampling technique was employed to ensure that the collected data represented the population accurately, and a structured questionnaire was used to collect information on how financial incentives were perceived in their role in encouraging waste recycling.

Face-to-face interviews were conducted with 123 respondents, all of whom were either students or staff members at the aforementioned institutions. The empirical findings of the study underscored the crucial importance of

monetary rewards in motivating the recycling of municipal solid waste materials. Consequently, the researchers argued that financial incentives are a fundamental prerequisite for achieving the recycling targets set by the European Union for municipal solid waste in Finland. The primary driver for recycling these materials was found to be the belief in the benefits of recycling itself, while the secondary driver was linked to the presence of financial incentives. In light of this, it was suggested that strict adherence to Finnish waste policies should align with EU waste policies, particularly in ensuring that recycled waste intended for material recovery and reuse is not diverted for energy generation.

Furthermore, the study revealed that although mechanisms were in place for the recycling of certain waste materials, such as newspapers, magazines, mixed papers, cardboard, PET plastic bottles, metals, glass, and tetra packs, the level of participation in recycling these materials remained only slightly above the average proportion of the population. Consequently, the researchers emphasized the need for interventions aimed at increasing the participation of a larger segment of society in the recycling of municipal waste materials, particularly tetra packs and glass, which were produced in substantial quantities on a daily basis in Finland. These materials, widely used in food packaging and with high daily consumption rates among households, presented a significant recycling opportunity. The proposed interventions for promoting increased recycling should be closely aligned with the key drivers for recycling. In essence, interventions, drivers, and incentives should work in tandem to motivate individuals effectively.

While the study provides valuable insights into the role of financial incentives and drivers for recycling in Finland, readers should consider these

limitations when interpreting and applying the results to broader contexts or more recent developments in waste management and recycling behaviour. The study relied on data collected exclusively from higher education institutions in Vaasa. This may limit the generalizability of the findings to the broader population of Finland, as the views and behaviours of students and staff members may not represent those of the entire population. While the study identified key drivers for recycling, it may not have explored all possible factors influencing recycling behaviour. Other socio-cultural or psychological factors could also play a role but were not considered. The study's sample size of 123 respondents, while representative through cluster sampling, may still be relatively small, potentially limiting the statistical power of the findings.

In their study, Jiaying, China, Liu (2022) utilize an integrated model incorporating the Theory of Planned Behaviour (TPB) and the Value-Belief-Norm Theory (VBN). The objective of this research was to investigate the behavioural intention of household waste sorting and identify the underlying factors influencing this waste sorting behaviour mechanism among urban and rural residents. Jiaying City, located in Zhejiang Province, is a pivotal city within the Yangtze River Delta city cluster, the Greater Bay Area of Zhejiang, and the Hangzhou Metropolitan Circle. The study's purpose was to gain insights into residents' waste sorting behaviour and to identify the factors shaping this behaviour in the context of China. It should be noted that, although the local government in Jiaying had initiated waste classification efforts, it had not yet formalized waste sorting as a legal requirement.

The study's subjects consisted of both urban and rural residents in Jiaying, China, with a total permanent population of 4.65 million in 2019. Based

on sample size calculations, the survey aimed to collect 384 samples. Questionnaires were distributed from June 1 to June 30, 2021, resulting in the collection of 600 questionnaires. After excluding 59 questionnaires with identical answer options, 541 questionnaires remained, yielding an effective questionnaire recovery rate of 90.17%. Data analysis in this study involved the use of IBM SPSS and Structural Equation Modeling (SEM), with software versions SPSS 17.0 and SmartPLS 3.2.9 being employed. The analysis process comprised three main components.

First, a measurement model analysis was conducted to assess the reliability and validity of each variable dimension. Second, a structural model analysis aimed to determine the significance of independent variables (attitudes, subjective norms, perceived behavioural control, and perceived policy effectiveness) in relation to intermediary variables (behaviour intentions) and dependent variables (waste sorting behaviour). This analysis also served to validate relevant assumptions. Third, individual characteristics such as gender, age, income, level of education, and living area were incorporated as moderating variables to develop a multigroup structural equation model analysis. These variables were examined to assess their impact on the household waste sorting behaviour of domestic households.

Empirical analysis using structural equation modeling with partial least squares revealed several significant findings. Attitudes (ATT), subjective norms (SN), and perceived behavioural control (PBC) were found to exert a significant positive influence on the intention of household waste sorting (WSI). Moreover, perceived policy effectiveness (PPE) demonstrated a positive and significant effect on attitudes and waste sorting intention. Ultimately, waste sorting

intention was found to positively and significantly impact waste sorting behaviour (WSB). Furthermore, individual characteristics, including gender, higher income, and middle to old age, were identified as factors that significantly influenced waste sorting behaviour, with female respondents and those with higher income and older age groups displaying greater willingness to engage in waste sorting behaviours.

While this study contributes to the existing literature by enhancing our understanding of the determinants of household solid waste sorting behaviour, it is essential to acknowledge its limitations. For instance, the research was conducted in a specific geographic region (Jiaxing, China), which may limit the generalizability of the findings to other locations. Additionally, the study relied on self-reported data, which can be subject to biases. Future research could address these limitations and further explore waste management policies and practices in diverse contexts.

Furthermore, the study's temporal scope was limited to the data collected during a specific timeframe in 2021, potentially overlooking potential variations over time. Additionally, the reliance on self-reported data may introduce social desirability bias, where participants provide responses they perceive as socially acceptable rather than reflecting their actual behaviour and attitudes accurately. It is important to acknowledge that waste sorting behaviour may be influenced by cultural, economic, and infrastructural factors unique to Jiaxing, which may not be fully representative of other regions or countries. To build upon this research, future investigations could adopt a longitudinal approach to capture changes in waste sorting behaviour patterns over time.

Empirical Review on Behavioural Determinants and Households'

Participation Intentions to Recycle Waste

Behavioural factors or attitudinal constructs represent the intrinsic motivations and inner drives that play a pivotal role in shaping individuals' decisions and actions. Among these behavioural factors, those influencing recycling behaviour are particularly intricate and multifaceted. In the context of this study, we expand upon the list of behavioural determinants by introducing environmental awareness as an additional construct, alongside attitudes, perceived norms, and perceived behavioural control. These constructs are derived from the theory of planned behaviour (Ajzen, 1991), which posits that individuals tend to make choices based on moral considerations and are typically cognizant of the consequences of their actions. This theoretical framework underscores the significance of these constructs in understanding and explaining human behaviour within the context of recycling practices.

Environmental Awareness and Intentions to Recycle Waste

An essential determinant influencing resource recycling is the extent of environmental awareness among end-users, as indicated by Kaur (2002). It is imperative to recognize that addressing environmental concerns cannot rest solely on governmental initiatives, nor can we depend solely on scientific and technological advancements to produce more environmentally sustainable packaging materials. Another pivotal stakeholder in the recycling process is the end consumer, who plays a crucial role at the final stage of product delivery, as emphasized by Gadennen et al. (2011). Numerous scholarly investigations have delved into the influence of consumer behaviour on resource recycling. Notably,

studies by Yu et al. (2016) and Zhao et al. (2014) underscore the substantial impact of eco-conscious consumer practices on the recycling of waste materials.

In their study, Wu et al. (2022) set out to investigate the factors influencing individual waste management behaviour, emphasizing the interplay between rational-based and altruistic-oriented beliefs and attitudes. Drawing upon Ajzen's theory of planned behaviour, they introduced the concept of personal norms and provided empirical evidence for its relevance in predicting waste management behaviour. However, they noted a gap in the literature concerning the intricate interactions among the variables within the established model, particularly with regards to the cognitive dimension, which has been somewhat overlooked in the prevailing socio-psychological framework of waste management behaviour. The present study aims to address this gap by integrating environmental awareness into the existing model, thereby exploring the psychological pathways connecting these variables to waste management behaviour within an expanded framework based on the theory of planned behaviour. This endeavour seeks to offer a more comprehensive and nuanced understanding of the determinants that influence waste management practices, with a particular emphasis on cognitive aspects that are often underrepresented in existing research paradigms.

The current study focused on full-time undergraduate students in Jiangsu province, located in Eastern China, which is one of the most developed provinces in the country, with a resident population of 80.7 million as of the end of 2019. The sample was drawn from an online survey company, Wenjuanxin, utilizing its survey system. The survey was conducted over a week, with the goal of obtaining at least 400 usable questionnaires. Ultimately, 434 usable

questionnaires were collected for data analysis. The final sample consisted of 145 male (33.4%) and 289 female (66.6%) participants, aged between 18 and 25 years ($M = 20.50$, $SD = 1.28$). Among the participants, 53.9% pursued majors in science or engineering academic fields, while 46.1% were enrolled in social science or humanities academic fields.

For data analysis, the researchers employed STATA 16.0 for basic descriptive analysis. They utilized SmartPLS version 3.3.2 to test their hypotheses, opting for Partial Least Squares Structural Equation Modeling (PLS-SEM) due to its flexibility in handling data distributions and suitability for testing complex models with smaller sample sizes compared to covariance-based structural equation methods (CB-SEM). The analysis involved a two-stage procedure: in the first stage, the researchers assessed the reliability and validity of the measurement model, while in the second stage, they examined the paths in the structural model. To evaluate moderating effects, a two-stage approach with mean-centered data was employed. The significance of path coefficients in the models was tested using a bootstrap procedure with 5,000 subsamples.

The study's findings indicated that subjective norms, perceived behavioural control, personal norms, and environmental knowledge were significant predictors of waste management behaviour among university students in China. However, attitudes did not exhibit a significant effect on waste management behaviour. Environmental concern influenced waste management behaviour through its impact on personal norms, and the relationship between subjective norms and waste management behaviour was partially mediated by personal norms. Furthermore, environmental knowledge

indirectly influenced waste management behaviour through its effects on environmental awareness, personal norms, and perceived behavioural control. Importantly, perceived behavioural control was found to moderate the relationship between personal norms and waste management behaviour. These results suggest that waste management behaviour among university students in China is context-dependent and driven by moral considerations.

While the study provides new evidence supporting the importance of personal norms and environmental knowledge in shaping waste management behaviour, its limitations should be acknowledged. Firstly, the sample primarily consisted of undergraduate students from a single province in China, limiting the generalizability of the findings to other populations. Secondly, the data were collected through self-report surveys, which may introduce response bias. Thirdly, the study focused on a specific age group, and waste management behaviour may vary across different age cohorts. Lastly, the study employed cross-sectional data, which restricts the ability to establish causality. Future research could address these limitations by including more diverse samples, employing longitudinal designs, and exploring cultural differences in waste management behaviour.

In a study conducted by Wang et al. (2020), the authors sought to explore public awareness of Household Solid Waste (HSW) recycling in typical Chinese cities. They investigated various aspects, including public behaviour, recycling knowledge, and willingness to participate. To identify the key factors influencing public awareness of HSW recycling in urban areas of China, the researchers conducted a questionnaire survey in ten cities: Beijing, Shanghai, Chengdu, Guangzhou, Harbin, Jinan, Lanzhou, Qingdao, Heze, and Weihai.

These cities were chosen due to their rapid urbanization and significant environmental challenges. Notably, Beijing, Shanghai, Guangzhou, and Chengdu ranked among the top ten cities with the highest HSW generation. The questionnaire used in this study was divided into four sections.

The first section collected demographic information, including gender, age, education, occupation, monthly income, and residence. The second section focused on public HSW treatment behaviour, while the third section explored public recycling knowledge, encompassing awareness of pollution hazards and HSW recycling information. The fourth section examined public willingness to participate in HSW recycling. Prior to the full survey, a pilot survey was conducted using an online data-sharing and collection tool called Jinshuju, distributed via the social application Weixin. Out of the distributed surveys, 268 were returned, and feedback from the pilot survey was used to revise and adjust the questionnaire. The main survey was carried out using a simple random sampling method in each city, involving face-to-face interviews. A total of 2,200 questionnaires were collected from the ten cities, with 220 questionnaires gathered from each city. All questionnaires were considered complete and valid due to the on-site face-to-face interview approach. The demographic composition of the sample is presented in Table 2. Notably, the sample had a bias towards individuals aged 18–40 (74.3%), those with college-level education and above (58.2%), and white-collar workers (64.0%), likely because these groups exhibited a higher interest in HSW recycling topics during the survey.

The study's findings revealed that there was inadequate public awareness regarding HSW treatment behaviour and recycling knowledge. Age

emerged as the most significant sociodemographic factor influencing public awareness of HSW recycling. Specifically, white-collar workers, individuals with higher educational attainment, and those aged 20–50 displayed less environmentally responsible behaviour in terms of HSW treatment. Conversely, manual workers, individuals with lower educational attainment, higher monthly income, and older individuals tended to possess poorer HSW recycling knowledge. Additionally, white-collar workers, individuals with higher educational attainment, and those with lower monthly income exhibited less willingness to participate in HSW recycling. Consequently, the study recommended implementing tailored strategies and interventions targeting specific demographic categories to enhance public awareness of HSW recycling, drawing from the insights gained. The scientific information presented in this study could prove valuable in improving HSW recycling practices, particularly from the perspective of public awareness.

One of the primary limitations of this study is its exclusive focus on ten specific cities in China. These cities were chosen based on their rapid urbanization and environmental challenges. However, China is a vast country with considerable regional diversity in terms of culture, economic development, and environmental concerns. Therefore, the findings of this study may not be directly applicable to rural areas or other urban regions within China, let alone other countries with different sociocultural contexts and waste management systems. The lack of a broader geographic sample restricts the generalizability of the study's conclusions.

A study conducted by Afroz et al. (2020), examined Malaysian households' intentions to deposit cell phones in designated collecting boxes and

how it extended the theory of planned behaviour by including environmental awareness, disposal cost, and the ease of accessible disposal infrastructure using Structural Equation Modeling (SEM) and AMOS version 16 with a sample size of 525 respondents through structured questionnaires. The study aimed to shed light on the complex factors influencing individuals' decisions regarding the recycling of cell phones, a critical aspect of electronic waste management. Here are some key points to elaborate on the findings related to the influence of environmental awareness on household attitudes toward recycling intentions. Afroz et al.'s (2020) study highlights the significance of environmental awareness in influencing household attitudes and intentions regarding the recycling of cell phones. By expanding the TPB framework and incorporating this critical variable, the research contributes to our understanding of the factors shaping recycling behaviour and provides valuable insights for policymakers and environmental advocates seeking to promote sustainable e-waste management practices.

Although the literature establishes a link between environmental awareness and intention to act responsibly towards the environment, evidence on the same topic in most developing nations is quite limited (Debrah et al., 2021). Nevertheless, several research have yielded inconclusive results (Yang et al., 2020). According to Fu et al. (2020), environmental awareness does not necessarily convert into pro-environmental behaviour. As indicated, existing literature on the influence of environmental awareness is scarce in the research field in general, and Africa in particular of which Ghana is no exception. Therefore, the understanding of the topic is still evolving and remains unclear to the body of knowledge (Cheng et al., 2020).

Attitude and Intentions to Recycle Waste

People's attitudes towards specific actions are among the most important factors in choosing which behaviours they want to engage in. Alhassan et al. (2018) investigate the application of theory of planned behaviour to Ghanaian households' waste source separation behaviour. The ordered probit regression model was used to study the factors that influence households' willingness to separate their waste. The results showed that attitude, alongside all the other constructs of TPB framework highly predicted households' intentions to separate their solid waste. While the study contributes to the body of knowledge on recycling in Ghana, it neglected to look at the crucial contextual aspects and potential effects of policy inducement on household waste separation behaviour in Ghana.

Concerning the connection between attitude and recycling intention, Kianpour et al. (2017) and Echegaray and Hansstein (2017) find similar results. Kumar (2019) reveals that individual attitudes towards recycling are a strong positive predictor of e-waste recycling intent in developing economies. Mahmud et al. (2020) demonstrate that the attitudes of electronic store managers influence their recycling intentions. In the context of reverse logistics, researchers have also observed the positive effect of recycling attitude on individual intentions to return e-waste for recycling (Sari et al., 2021). Accordingly, the best predictor of recycling and trash separation intention and activity, in general, has been shown to be attitude.

When behavioural interventions address important precursors of the relevant behaviour while removing obstacles to change, their effectiveness are expected to rise. As a result, a number of studies have merged concepts and

variables from several theoretical frameworks to demonstrate that behaviour is influenced by a wide range of factors (Russell et al., 2017; Wang et al., 2018). Fostering of positive attitudes towards intentions has the potential to enhance household waste disposal practises, however research shows that these factors only explain around 52% of the variance in actual behaviour (Tweneboah-Koduah., 2019). As a result, other contextual factors, such as waste bin accessibility, awareness campaigns, incentives, and other environmental factors, need to be considered as possible mediators or moderators through the integration of other theoretical models to help enhance the TPB's predictive power.

Furthermore, previous research on pro-environmental behaviour in a variety of contexts, including organic food consumption (Tandon et al., 2020a), anti-littering behaviour (Ibrahim et al., 2021), food waste (Khoo et al., 2022), and using electric vehicles (Gulzari et al., 2022), has shown that people's positive attitudes translate to an increased level of intention. Although previous research by researchers including Bardus and Massoud (2022), Dixit and Badgaiyan (2016), and Khan et al. (2019) find attitudes to have little effect on intention to engage in pro-environmental behaviour, the results regarding attitudes are ambiguous, necessitating further research into this association. Taking the TPB model's central premise into account, this study reveals that if people perceive waste recycling as an appropriate and responsible behaviour, their motivation to recycle will improve.

Zulu, Zulu and Chabala (2021) examine the variables that affect households' intentions to use solar energy solutions in Zambia. Drawing from the TPB framework the study reveal that attitude, trust, benefits and subjective

norms positively and significantly predicted intention to embrace solar energy solutions. Through attitude, trust and benefits also affect the intention to embrace solar energy solutions. The study therefore, suggests that actions taken to promote the use of solar energy solutions should concentrate on enhancing attitudes, benefits felt, trust in the solutions and consideration of subjective norms. Yet, there has been an overemphasis on the role of psychological elements on intention to the exclusion of the stimulation or inhibition of external conditions. Because of this limitation, the factors that influence pro-environmental intentions are not sufficiently understood.

Govindan, Zhuang, and Cheng (2022) examine the factors influencing Shanghai residents' waste sorting behaviour. Using the TPB, the study demonstrates that residents' waste sorting intentions are positively and significantly connected to attitude, subjective norms and perceived behavioural control. Furthermore, the findings show that Shanghai residents' intentions influenced their sorting behaviour. Accordingly, context-specific factors including infrastructure and incentive positively also impacted the link between intention and behaviour, allowing for greater understanding of households' waste-separation behaviour through the consideration of additional factors.

In spite of the significant contribution made by the study however, this may not be applicable in Ghana. Besides, the study did not establish direct relationships between the contextual factors, neither with intention or behaviour in addition to their moderating effects. Although it is important for residents to be provided with bins and bags that enable ease the separation of waste, the study excluded behaviour change awareness campaigns to increase citizens' perceived control to improve attitude by reinforcing the usability, simplicity and

value of separating at source through instructional tutorials and motivational messaging.

Perceived Norms and Intentions to Recycle Waste

The socio-psychological concept of conformity, which holds that human behaviour is often modelled and understood in terms of other people's behaviour, is the foundation for the concept of social norms. Tweneboah-Koduah et al. (2019) employ a social marketing tool for predicting waste disposal behaviour in Ghanaian households. Using the TPB, the analysis reveals that subjective norm was the strongest predictor of intention, providing evidence for future research and managerial guidelines. While perceived norms emerged as the most powerful predictor, the study only used the TPB constructs to predict and analyse households' waste disposal behaviour, ignoring environmental awareness and other contextual factors. Furthermore, the study did not take into account the integration of multiple theoretical frameworks in predicting the other equally important factors that could influence the adoption of proper waste disposal behaviour.

Issock et al. (2020) look into the moderating effect of sociodemographic traits and policy implementation, as well as normative influences on domestic waste separation. The study especially investigates how normative cues influence one's tendency to separate waste from home and how these effects are moderated by sociodemographic characteristics, upstream social marketing endeavours, and policy implementation. Several theoretical frameworks were used in the study, including the social norm theory, the focus theory of normative behaviour and the norm activation model. The data was analysed using a cross-sectional design approach and SEM, and the findings indicate that

normative determinants have a positive and significant impact. This demonstrates the significance of both external (social) and internal (moral) norms in influencing the decision to engage in domestic waste separation.

The sample population was selected via nonprobability sampling without taking into account statistical power in an effort to ascertain sample size, regardless of the study's theoretical, policy and empirical implications. The study also neglected to address the notion of behavioural control, which could be operationalized to incorporate additional elements of convenience, particularly with regard to storage space and access to recycling facilities as external motivators instead of overestimating normative and persuasive tools. Convenience is regarded as one of the most crucial elements needed to undertake successful recycling policy interventions.

Pathak, Yadav, Sharma, and Bhardwa (2022) looked at the intentions of young residents to recycle household waste. The study's primary objective is to understand young residents' intentions for recycling household waste using a place attachment strategy, in which place dependence (PD) and place identification (PI) were predicted to have an impact. Additionally, the impact of norms (both moral and subjective) on residents' link with location identification was examined. With the addition of a place-based strategy in the TPB and norms (subjective and moral) in predicting place identity of young residents, all alternative hypotheses in the proposed model were accepted, with intention having an accuracy rate of 41.4%.

The study suggests that place attachment warrants the inclusion of the TPB for investigating intentions in young residents. The findings add to the body of knowledge on pro-environmental behaviour using a place-based

approach. Furthermore, the study includes a novel layer of thought about how social and moral norms might be precursors to place identity and influence attitudes to recycle household waste. However, the survey was limited to only the educated class of society, which included young people who may have been motivated by social pressure rather than genuine intentions. Moreover, the prediction power of 41.4% indicates that the model was open to further research in which other factors, such as awareness campaigns, convenience and access to facilities might be incorporated to provide a better representation of household waste recycling intentions among the youth.

Hameed, Khan, Waris, and Zainab (2022) examine what factors impacting sustainable consumer behaviour regarding plastic waste recycling. The study's findings, which make use of the TPB and social influence theory (SIT), demonstrate that individual norms and perceived behavioural control play a positive and significant role in recycling intentions. In addition, normative social (NSI) and informational social impacts (ISI) equally have a significant impact on the intentions of individuals to recycle. Despite the fact that the study makes the case that society's influence, whether through normative or informational social impact, encourages consumers to engage in recycling activities, it neglected to examine the indirect effects on the model. As a result, incorporating other variables such as environmental awareness is crucial. Furthermore, in many developing countries, such as Pakistan, where recycling infrastructure is limited, convenience and access to recycling facilities, are all critical.

Berglund, Söderholm, and Hage (2022) investigate the impact of norms and convenience in the packaging waste segregation behaviours of households.

This study's theoretical foundation is a basic economic model that incorporates norm-motivated behaviour into neoclassical utility theory by presuming that the person has a preference for upholding a self-image as a principled (norm-compliant) individual. They conducted an empirical analysis of survey data from 398 households in the Swedish city of Eskilstuna. The findings demonstrate that availability to property-close collection programmes and convenience are significant drivers of household recycling contributions. Personal norms are primarily activated by the existence of social, legal and descriptive norms.

Perceived Behavioural Control and Intention to Recycle Waste

Using the snowball sampling technique, Wang and Li (2022) conduct a survey on a sample of 361 Chinese consumers to investigate their intention to bring a reusable bag for shopping based on the theory of planned behaviour. To increase the explaining power for behavioural intention, this study extended the TPB by adding two additional variables: locus of control and environmental concern. Data was analyzed using the structural equation modeling technique. Results show that attitude, perceived behavioural control, and subjective norm exert significant and positive influence on consumers' intention to bring reusable bags for shopping, and the perceived behavioural control exerts the greatest influence, followed by attitude and subjective norm. Both locus of control and environmental concern fail to directly impact consumers' bringing intention, but they could impact consumers' intention indirectly.

This study suggests that the resources required to bring a reusable shopping bag is the key driver of this behavioural intention. To urge people to continue using reusable shopping bags, policymakers should put more effort

into making this behaviour more manageable and convenient for consumers. Specifically, the external locus of control exerts a negative influence on attitude and perceived behavioural control. Environmental concern positively impacts consumers' attitudes towards bringing reusable bags for shopping. Results of this study could provide valuable insights into plastics management and policy design to promote consumers' green shopping behaviours. For instance, the finding that perceived behavioural control is the greatest contributor to consumers' intention to bring reusable bags highlights the importance of clearing reusable bag preparation and use barriers.

Regardless of the study's contribution, the absence of consumer awareness creation about the benefits of returning a reusable bag for shopping. Thus, deeper awareness and understanding usually precede a product's or behaviour's rating. According to Castagna et al. (2013), people who do not care about the environment are less likely to change their behaviour to reduce the amount of municipal solid waste generated. Similarly, Karaeva, Cioca, Ionescu, Magaril and RadaKaraeva (2019) discover that students who are more informed on renewable energy are more supportive of green energy technologies. Under certain circumstances, residents may create strong opposition if their perceptions of waste management facilities are either misconstrued or undervalued.

Al Mamun et al. (2018) examine the intentions and behaviours of low-income households with regard to recycling. The study employs a cross-sectional design, where 380 low-income households were interviewed in the Malaysia's peninsular region. Using the TPB model, the findings demonstrate that perceived behavioural control has a positive and significant effect on

recycling intention and behaviour. The results provide researchers and decision-makers with crucial information about how to promote recycling practises, which are anticipated to improve the environment and lower the financial vulnerability of low-income households. This notwithstanding, the study's emphasis on a particular socioeconomic group from a single nation may, limit its ability to generalise to other contexts. In addition, as the study's focus is on low-income populations, it did not analyse the impact of policy inducements such as incentives and tax rebates which could be critical indicators.

Tian, Pu, Chen, and Zhu (2019) analyse Chinese consumers' intentions on waste classification. Specifically, the study aims to investigate how customer willingness to classify waste in the waste management process is affected by government publicity, consumer attitudes, subjective norms, perceived behavioural control and consumer knowledge. Using the TPB model, the authors discover that perceived behavioural control influences waste sorting intentions in a positive and significant way. However, the study overlooks the importance of incentive or policy inducement as a key factor. Scholars assert that incentive provision is critical at the early stages of any waste classification programme and thus, inclusion of government incentive is highly important.

However, a different study by Yan, Zhao, Zhang Deng, and Zhang (2022) that looks at the associated factors of pesticide packaging waste recycling behaviour based on the theory of planned behaviour in Chinese Fruit Farmers discovers that perceived behavioural control exhibited a statistically insignificant association with intention. Nonetheless, there was a statistically significant link between fruit farmers' behaviour and perceived behavioural control with relation to recycling pesticide packaging material. The accessibility

of centralised facilities for recycling or treatment, the time required for domestic processing, the availability of information about waste recycling, and the perceived difficulty of recycling are only a few of the numerous variables that affect how easy recycling is. So, the aforementioned factors are essential for every waste recovery system.

Rahman, Ai Ping, Mubeen, Mahmud and Abbasi (2022) investigate the factors that influence home gardeners' intention to compost food waste in high-rise buildings in Dhaka, Bangladesh. Using the combined model of TPB and Dualistic Passion Model (DMP), the results show that perceived behavioural control positively and significantly predicted intention. The outcome of perceived behavioural control demonstrates that an individual is more likely to compost if they have more knowledge and skill about the stages of home composting. Yet, despite this condition, the study failed to consider the respondents' convenience needs and the factor of compost bin availability.

In their 2022 study, Pathak et al. investigated the intentions of young residents regarding household waste management using a place attachment (PA) approach. They explored how place dependency (PD) and place identity (PI) influence recycling intentions (RIs) in this demographic. Additionally, the study examined the impact of norms, both subjective and moral, on residents' association with PLI. This research extended the theory of planned behaviour (TPB) through a place-based perspective, shedding light on how young residents perceive and act on household waste management, a critical aspect of environmental sustainability. The norms (SN and MN) served as antecedents to PI, and PI served as an antecedent to RA, PBC and RI of young consumers.

The proposed conceptual model presented a unique perspective by repositioning norms (subjective and moral) as antecedents to PLI within the extended and modified TPB model. With the younger generation taking a prominent role in advocating for a cleaner environment, this study serves as a valuable resource for environmental enthusiasts and social scientists. It helps foster a better understanding of recycling intentions among young residents, encouraging them to adopt greener practices in their daily waste disposal habits. The data collection process involved the distribution of online questionnaires through digital devices. These questionnaires included both objective items, gathering sociodemographic information, and five-point Likert scale questions related to the constructs of the proposed model. Before the widespread distribution of the questionnaires, a pilot test was conducted with 30 respondents to identify and address any potential issues with question completion. The positive outcomes of the pilot study instilled confidence in the full-scale distribution of the questionnaire.

The convenience sampling approach was utilized to distribute questionnaire links to young residents who were university students residing in the urban region of Agra. A total of 200 links were distributed, resulting in 118 responses and a response rate of 59%. After a careful review of the collected data, 18 responses were excluded due to inconsistent, increasing, or decreasing scale responses, leaving a final sample size of 100 responses. Statistical analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) due to its independence from strict data distribution assumptions, making it preferable to covariance-based models in certain contexts. The analysis proceeded in two phases. First, the outer measurement model was tested,

encompassing reliability and validity assessments, indicator reliability, internal consistency, and assessments of convergent and discriminant validity. The second phase involved the measurement of the structural model, where hypotheses were tested using the bootstrapping method with 5,000 sub-samples.

The study's results provided strong support for the incorporation of a place-based approach within the TPB framework and the significance of norms (subjective and moral) in predicting PI among young residents. All alternative hypotheses proposed in the model were accepted. The model's predictive power for RIs was determined to be 41.4%. Interestingly, while previous literature did not find subjective norms (SN) and moral norms (MN) to be robust antecedents of recycling intentions in young residents, this study revealed that SN had an influence on MN, whereas MN did not establish a strong connection with PLI.

The findings reinforced the role of attitude (RA) and perceived behavioural control (PBC) in shaping recycling intentions and highlighted the relevance of the PA-based approach in understanding recycling intentions.

However, the study had certain limitations. It focused solely on educated young individuals who may have been inclined to provide socially desirable responses rather than reflecting their true intentions. Furthermore, the study only measured recycling intentions, and future research could explore actual recycling behaviour. The model's predictive power for recycling intentions was 41.4%, leaving room for further research to incorporate additional variables, such as waste sorting at the source, awareness of the consequences, costs associated with waste disposal, and more, for a more comprehensive understanding of household waste recycling intentions within a place-based framework. Additionally, the study could benefit from examining the influence

of social media on recycling intentions in conjunction with place attachment. Finally, the study's findings cannot be generalized to all regions, and it would be valuable to replicate the research in rural areas of India with a larger and more diverse sample, particularly in areas where waste collection and management systems are less established.

Moderating Role of Policy Inducement on Perceived Norms and Intention to Recycle Waste

According to the literature reviewed in this study, the majority of previous research has mostly concentrated on the influence of policy incentives on intention and actual behaviour. The moderating influence of incentive packages on the link between social norms and intention has received little attention. This comes as a surprise, given the fact that social norms related to a given behaviour are largely modified by external policy incentives (Cossu & Masi, 2013; Kelly & Stanley, 2014). According to Wang et al, (2017), incentives are requirements, needed to orient motivations in the desired course of action. Studies have shown that, beside the direct effect on intention, inducements are also known to moderate the subjective norm-intention relationship (Liao et al., 2018).

However, Wan et al. (2014), on the other hand, show how perceived policy efficacy has a negative impact on the links between subjective norms and recycling intention. Khalil et al. (2017) note that, in Nigeria, the TPB components and families' intentions were shown to be significantly moderated by perceived absence of conducive conditions. However, Liao et al. (2018) find that, while perceived policy inducement has a negative impact on the link between subjective norms and intention, it also showed a positive moderating

impact on the association between attitude and separation intention. Despite the fact that the results offer policy guidance, the survey was mostly limited to the province of Sichuan's rural areas, thus its applicability to urban settings may not be guaranteed.

Indeed, incentive packages are oftentimes introduced as motivational tools. It is worthy to note that motivations are known to play important moderating role on the attitude-behaviour gap (MacKenzie & Spreng, 1992). Wan and Shen (2018) find that incentive packages, in addition to their direct influence on intention among Hong Kong residents, play an essential moderating role in the link between normative pressures and intention. It is therefore critical to investigate if policy incentives play a moderating role in the associations between TPB predictors and recycling intention in a typical developing country's context. Furthermore, the impacts of social and economic incentives vary depending on context, necessitating additional research in other cultural settings.

This notwithstanding, only a few studies have looked into this as a lacuna in the literature, particularly in a developing country like Ghana. In other jurisdictions, inducement policies are significant in determining the levels of recycling intention (Barr & Gilg, 2006; Tucker & Speirs, 2002) and this can offer the pathway toward evaluating and improving the recycling process through enhanced services offered. Ghana is a typical developing country with highly underdeveloped waste infrastructure, and as indicated in the work of Khalil and colleagues, the absence of recycling facilities was discovered to have a considerable moderating effect on residents' recycling intentions. Thus, in addition to the direct effect on intention, the reviewed literature establishes the

potential moderating role of policy inducement on the perceived norms-intention relationship.

Mediating Effect of Attitude on the Relationship between Environmental Awareness and Recycling Intentions

Proper knowledge of the factors that influence recycling behaviour can aid in the development of more efficient recycling systems in society to improve household participation. Nonetheless, when compared to other advanced countries, public awareness of recycling in Ghana is weak. Ramayah, Lee and Lim (2010) use the TPB to study the predictors of attitudes toward recycling behaviour among 200 university students. Structural Equation Modeling was used to analyse the data and the findings reveal that environmental awareness is strongly linked to attitudes towards recycling. Similarly, Indriani, Rahayu and Hadiwidjojo (2019) demonstrate in their study that environmental awareness has a positive and significant effect on green purchasing intention via attitude as a mediator. Afroz et al. (2020) find that environmental awareness has a substantial effect on attitudes toward recycling intention.

Using a case study, Li et al. (2019) investigate the impact of environmental awareness on households' intentions to purchase energy-efficient equipment in Shanxi, China. According to the findings, residents' propensity to purchase energy-efficient appliances is strongly and positively connected with their level of environmental awareness. More crucially, environmental awareness has an indirect positive impact on residents' willingness to acquire energy-efficient appliances via the mediating role of attitude. The findings show that residents' environmental awareness can significantly enhance household

purchase intentions by acting as a mediator through attitudes towards energy-efficient appliances.

Apart from these findings, a thorough examination of the literature demonstrates that environmental awareness has a direct influence on attitude (Ramayah et al., 2012; Peattie, 2010). As a result, attitude mediates the relationship between environmental awareness and recycling intentions (Scott, et al., 2014). Yet, past studies on model development have concentrated largely on the direct influence of environmental awareness on intention (Fu et al., 2019; Paul et al., 2016; Tan et al., 2017; Wang et al., 2017; Yadav & Pathak, 2016). Thus, the literature on the indirect influence of environmental awareness on intention is often restricted. The importance of attitude as a mediating factor needs to be examined to prevent underestimating the effect of environmental awareness on intentions.

It is essential to understand the value of knowledge and the effect of its absence in making decisions. Moisander (2000) demonstrates that information promotes pro-environmental attitudes, which in turn motivates ecologically responsible behaviour. Similarly, other research studies show that recycling information and knowledge are both significant predictors of recycling intention. Decision-making is strongly influenced by one's knowledge of a subject (Kaplan, 1991). As a result, it may be claimed that environmental awareness provides a framework to help individuals understand how their actions affect the environment. This study suggests that, in addition to its direct impact on intention, environmental awareness also indirectly affects households' intentions to recycle through the mediation effect of attitude.

Juliana et al. (2022) conducted a study aimed at exploring the factors influencing recycling behaviour while extending the theory of planned behaviour to analyze how recycling practices are fostered among citizens and how they align with sustainable development goals (SDGs). Their extended TPB model integrated moral norms, convenience, and the cost of recycling. The research employed a quantitative research design, utilizing a structured questionnaire with question statements adapted from various sources. The questionnaire was organized into distinct sections to evaluate all variables and was assessed using a 5-point Likert scale, where 1 indicated strong disagreement and 5 indicated strong agreement. The study received a total of 170 responses through purposive sampling. The researchers analyzed the research model using the partial least squares structural equation modeling technique (PLS-SEM) with SmartPLS 3 software. PLS-SEM was chosen due to its relevance in predicting the determinants of recycling behaviour.

The results of the study revealed that subjective norms, moral norms, convenience, and the cost of recycling positively influenced recycling behaviour. Environmental awareness was found to significantly impact attitudes, but interestingly, attitudes did not necessarily translate into actual recycling behaviour. This research provided valuable insights into recycling behaviour and contributed to the existing literature in this field. Knowledge and awareness about recycling can be disseminated through the education system or informally through word of mouth and social media. Participants in the study demonstrated an ability to link their knowledge about recycling to pollution reduction, reduced landfill usage, and the conservation of natural resources. Despite the contributions made by this study, it is essential to acknowledge

certain limitations that could enhance our understanding of the determinants of recycling behaviour in the future.

Firstly, it's important to note that this study was conducted in Malaysia, making it valuable for future research to replicate the study with samples from different countries or conduct cross-cultural comparisons. This approach can help substantiate the influence of various factors on recycling behaviour across diverse cultural contexts and different stakeholder groups. Additionally, exploring different sample groups can help confirm the generalizability of both the previous and current study's findings. Furthermore, researchers might consider incorporating the concept of temporal orientation, which has a significant yet often overlooked impact on human behaviour. This construct has been found to strengthen the relationship between predictors and environmentally friendly behaviour, highlighting its pervasive effect on people's choices and actions. Including temporal orientation as a variable in future research could provide deeper insights into its role in shaping recycling behaviour and help develop more comprehensive models for understanding and predicting environmentally responsible actions.

Households' Waste Recycling Intentions

The TPB's emphasis on volitional behaviours is compatible with its assertion that someone's intention to carry out or refrain from carrying out a behaviour is the immediate determinant of that behaviour. According to the TPB framework, intention is the point at which all of the motivating elements that influence a certain behaviour converge (Ajzen, 1991). Therefore, barring unforeseen events, people should behave in accordance with their intentions. An intention is the readiness to respond to a certain event in a particular manner.

An individual's intention, according to Abadi et al. (2021), originates from their mental framework and defines their subjective readiness to engage in a behaviour. Thus, a person's intention represents their motivation to attempt to act or behave in a particular way (Sari et al., 2021).

Hence, as a direct predictor of action, intention totally mediates the effects of attitudes, subjective norms and perceived behavioural control (Ajzen, 1991, 2002; Han et al., 2010; Wu & Chen, 2014). Past research has found that intentions are the most dependable predictor of behaviour (Ajzen, 2015). For example, Pakpour et al. (2014) discover that intention highly predicted household waste behaviours in Iran. According to Li et al. (2018), behavioural intentions influence waste reduction behaviour. Similarly, Aktas et al. (2018) investigate household waste reduction and discover that higher waste reduction intention leads to lower food waste.

Lessons Learned, Research Gaps and a Framework for Contextual and Behavioural Factors and Households' Waste Recycling Intentions

Previous research studies on recycling behavioural intentions have often fallen short in providing a comprehensive understanding by neglecting the intricate interplay between contextual and behavioural factors. While some studies have focused on individual-level factors such as attitudes, subjective norms, environmental awareness and perceived behavioural control as suggested by the TPB, as well as recycling convenience, awareness creation, and policy inducement as proposed by the ABC theory, a significant research gap exists in the failure of previous studies to integrate these diverse factors within a single study.

This study aims to address this gap by developing an integrated framework that brings together individual-level factors and contextual influences, recognizing that recycling behaviour is shaped by a complex interplay of both. By combining the insights from the TPB, the ABC theory, CUMT, and the NT, this study seeks to provide a more holistic perspective on recycling behaviour. The integration of these various theories allows for a more nuanced understanding of how both internal beliefs and external factors jointly influence recycling intentions and behaviours. In essence, this research endeavours to fill the void left by previous studies that often approached contextual and behavioural factors in isolation.

By offering a comprehensive framework that considers both dimensions simultaneously, the study aims to contribute significantly to the literature on recycling behaviour. This integrated approach not only acknowledges the complexity of individual beliefs and external influences but also underscores the importance of a unified understanding. Through this, the research seeks to provide more robust insights, enabling policymakers and practitioners to develop all-encompassing strategies that effectively promote sustainable waste management practices tailored to the diverse dynamics of recycling behaviour. In recognizing the interdependence of individual attitudes and contextual elements, this study aspires to bridge theoretical gaps and offer practical solutions for fostering positive recycling intentions and behaviours.

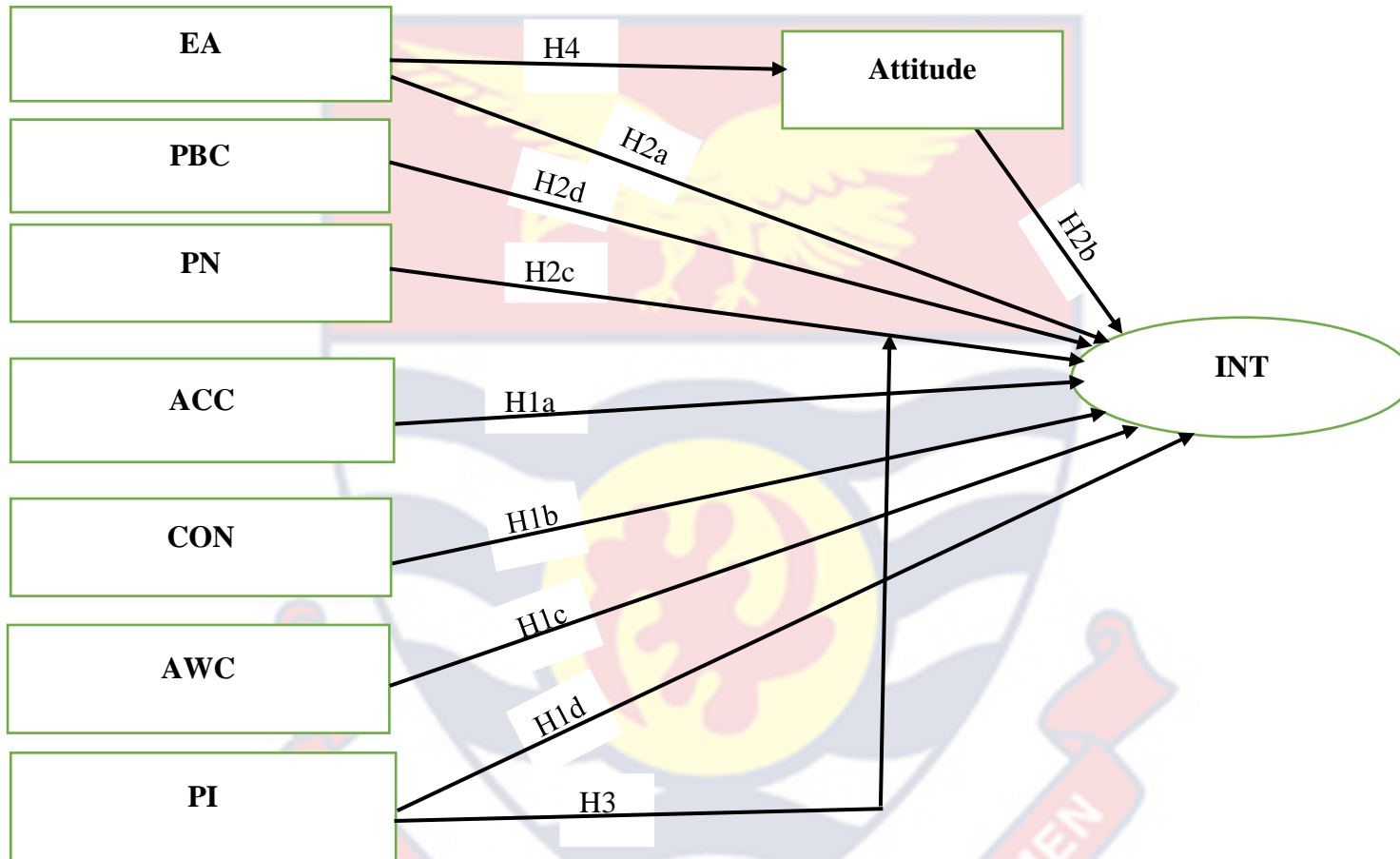


Figure 12: Conceptual Framework Constructed from Review of Related Literature

Source: Author's construct (Dapilah, 2022) based on literature review

CHAPTER FOUR

RESEARCH METHODS

Introduction

This chapter provides a concise overview of the research methods for a doctoral thesis focused on examining contextual and behavioural factors influencing households' participation in recycling initiatives. Grounded in the ecological modernization thinking, the fundamental premise of this research asserts that environmental crises are authentic, objective, and tangible components of the broader social system and thus, employs a quantitative approach to rigorously test hypotheses and establish significant relationships among key variables. The chapter covers essential components such as research philosophy, approach, design, target population, sample selection, and the accompanying sampling procedures. It also addresses data collection instruments, strategies for ensuring data reliability and validity, and ethical considerations in this research.

Research Philosophy

Social science research is often categorized into objectivist and subjectivist approaches, as delineated by Burrell and Morgan (1979). These approaches suggest that the analysis of social phenomena hinges on either objective or subjective perspectives (Sławecki, 2018). To navigate the challenge of simultaneously adopting strict objectivity and subjectivity in the social realm, Burrell and Morgan (1979) introduced a matrix. This matrix comprises two axes: the subjectivist-objectivist dimension, which delves into the nature of social phenomena as either objective facts or socially constructed realities, and the regulation-radical change axis, which prompts scholars to ponder their stance

on maintaining the status quo (regulation) or advocating for transformative, radical change (Ardalan, 2019).

Consequently, conceptions of society's essence revolve around the spectrum of social regulation or radical change. By juxtaposing these two dimensions, Burren and Morgan (1979) delineate four paradigms within the field of social sciences: the functionalist, interpretivist, radical structuralist, and radical humanist perspectives. The functionalist paradigm, also known as the objective-regulation perspective, combines objectivity with the pursuit of order (Kuada, 2009). Grounded in positivism, this paradigm draws its inspiration from the belief in the existence of an objective reality within the social sphere. It is built upon the notion that society possesses a concrete existence and follows a systematic structure aimed at establishing order and regulation (Sawecki, 2018).

Within this context, the researcher can distance themselves from the subject matter through the rigorous application of scientific methodologies. A fundamental premise of this approach is that social phenomena are rational entities, and rational explanations can provide solutions to rational questions (Bryman & Bell, 2007; Saunders, 2009). Within this framework, issues in the realms of business and management are presumed to be objective and devoid of values, which predominantly guides quantitative investigations (Jariya & Velnampy, 2021). Consequently, research conducted under the functionalist paradigm is often described as adopting a positivist-functionalist research approach, as it is substantively underpinned by this ideology.

In a broad sense, positivist investigations employ deductive reasoning, focusing on observable and quantifiable facts to derive law-like generalizations about social reality (Carminati, 2018; Smith, 2018). This approach contends that

deductive research generates universal knowledge representative of a larger population via random sample selection (Gunbayi & Sorm, 2018). In contrast, the interpretivist paradigm, in opposition to the functionalist perspective, is deeply rooted in the subjectivist conception of the social realm and predominantly informs qualitative research methods like case studies and grounded theory (Hays & McKibben, 2020). Interpretivism seeks to fathom reality through the perspectives of individuals or groups. It endeavors to uncover answers by exploring the consciousness, experiences, beliefs, and ideas of those who continuously shape and reconstruct their actions (Sawecki, 2020).

The social world is perceived as an ever-evolving social process instigated by human actions. Holloway and Wheeler (2010) contend that the qualitative approach asserts that human experiences and social realities are inherently context-bound, making them inseparable from time, place, and individual perspectives. Consequently, social reality lacks a concrete, objective form and relies on the subjective interpretation of the researcher. As a result, the social world can only be understood subjectively (Creswell & Hirose, 2019, 2022). In summary, interpretivists endorse relativism, acknowledging the existence of multiple locally constructed and reconstructed realities, and embrace a subjectivist stance towards understanding reality.

While pursuing radical transformation, radical humanism recognizes the significance of subjectivity. The interpretative paradigm, founded on the notion that reality is socially constructed, aligns with the radical humanism paradigm (subjective-radical transformation) (Kodua, 2009). As reality is apprehended solely through the lens of the human mind, it is inherently subjective. Radical humanism's core principle emphasizes the holistic perspective, asserting that the

whole outweighs its individual parts. Consequently, truth is temporally specific within a particular context. Given these premises, it is deemed inappropriate to seek generalizations for the governing principles of societal dynamics (Ardalan, 2020).

Conversely, the radical structuralism paradigm, grounded in a materialist comprehension of both the natural and social realms, posits that reality is objective and tangible (Gunbayi, 2019). Consequently, the social world exists independently of human cognition and possesses its own autonomous existence, akin to the natural world (Gunbayi & Sorm, 2018). Within the framework of radical structuralism, social class profoundly influences our perception of knowledge's nature (Burrell & Morgan, 1979). It asserts that all knowledge exhibits class-specific characteristics, and one's position in the production process determines their social class affiliation (Saunders, 2009).

Hence, knowledge faithfully mirrors the physical world within cognition, contingent upon one's connection to that reality. Diverse types of knowledge emerge because distinct social classes fulfill varying roles in the production process. Consequently, knowledge is considered class-specific, originating from and serving specific classes, engaging in an ongoing struggle for dominance (Gunbayi, 2020). Knowledge thus assumes an ideological dimension, shaping perceptions of the world and proffering solutions through the lens of particular social classes. In light of the examination of various paradigms in business research, only two extreme approaches exhibit defining characteristics, namely, functionalism and interpretivism.

The radical structuralism and radical humanist approaches align with functionalism and interpretivism, respectively. Žukauskas et al. (2018) characterize these paradigms as intermediary philosophical positions that adeptly harmonize philosophy, methodology, and research inquiries in a coherent manner. Consequently, when a researcher embraces a positivist perspective, the research design naturally centers on quantifying the phenomena under study, thereby adopting a quantitative research strategy. These nuanced philosophical perspectives enable researchers to bridge theory and practice effectively, enhancing their ability to tackle diverse research challenges in the social sciences.

On the other hand, when the researcher embraces an interpretivist orientation, the study's design necessitates a nuanced exploration of the research phenomena, resulting in the adoption of a qualitative research strategy. However, in cases where the researcher exhibits both positivist and interpretivist inclinations, the research phenomena undergo both quantification and qualification, giving rise to a mixed methodologies approach or mixed research. Mixed methodologies research seamlessly integrates elements of both quantitative and qualitative research, offering a comprehensive perspective on the subject of study (Venkatesh et al., 2013; Creswell & Hirose, 2019). This dynamic blend of approaches enriches the toolkit available for social research, allowing for a more holistic understanding of complex phenomena.

This thesis aims to rigorously examine the contextual and behavioural determinants influencing households' inclination to participate in waste recycling, utilizing quantitative methodologies. As outlined by Saunders (2009), scholars rooted in the regulation perspective are primarily concerned

with the imperative of governing societies and human conduct. Furthermore, the desire to enhance the study's broader applicability serves as an impetus for embracing the functionalist paradigm. According to Gunbayi and Sorm (2018), the functionalist approach demonstrates a practical orientation by actively seeking feasible solutions to real-world issues, making it a fitting choice for this research endeavour.

After an extensive exploration of their applicability in social research methods, it becomes evident that the functionalist paradigm seamlessly aligns with quantitative research approaches. This is attributed to its underlying assumptions, where functionalists employ methods akin to those in natural sciences, employing structured questionnaires, precise measurements, tests, and statistical analyses to explain relationships among variables (Creswell & Hirose, 2019). In contrast, the interpretivist approach is intricately linked to qualitative research methodologies, finding its expression in techniques like interviews and focus groups. The choice between these paradigms rests on the researcher's objectives and the nature of the research questions being pursued.

This thesis aims to investigate the factors influencing households' waste recycling participation intentions through rigorous hypothesis testing. The functionalist philosophy is a suitable framework due to its quantitative precision and structured approach. It advocates for natural science methods, such as structured questionnaires and statistical analyses, enabling the establishment and validation of variable relationships. This approach facilitates empirically grounded and generalizable findings, aligning with the study's objectives. Functionalism's emphasis on objectivity and order ensures evidence-based outcomes that can withstand scrutiny. In conclusion, adopting functionalism in

a quantitative framework is a robust and methodologically sound approach for efficient achievement of the study's objectives.

Research Approach

This study tests hypotheses, provides a theoretical framework for building upon previous research, and generates new knowledge. It employs the TPB, ABC theory, CUMT, and NT to specifically explore the contextual and behavioural determinants of household waste recycling intentions. Utilizing a quantitative approach, it assesses and quantifies households' attitudes toward waste recycling intentions, testing objective hypotheses by examining measurable variables with structured instruments for subsequent statistical analysis (Pandey & Pandey, 2021).

In the onto-epistemological framework, there traditionally exist two polarized research approaches, namely quantitative and qualitative methods (Mathieu et al., 2018). However, within these opposing paradigms, a third approach, known as the mixed methods, emerges to foster inclusive research with liberative methodological possibilities (Price, 2013; Žukauskas et al., 2018). This mixed research methods integrates both quantitative and qualitative data sets, explicitly connecting subsequent findings to yield well-grounded conclusions (Ivankova & Wingo, 2018), providing a versatile and balanced approach to scientific inquiry.

Aligned with the four study objectives, this research employs a quantitative approach. These objectives encompass:

1. Investigating the impact of contextual factors (access to recycling facilities, convenience, awareness creation, and policy inducement) on household waste recycling intentions.

2. Examining the influence of behavioural factors (environmental awareness, attitude, perceived norms, and behavioural control).
3. Assessing the moderating role of policy inducement in the connection between perceived norms and household waste recycling intentions.
4. Determining the mediating effect of attitude on the link between environmental awareness and household intentions to recycle waste.

Quantitative research serves the primary purpose of quantifying behaviours, opinions, attitudes, and various variables for the sake of generalizability (Creswell & Creswell, 2017; Smith, 2018). It is primarily concerned with providing insights into the frequency and extent of the impact of phenomena. In this study, the analysis of correlations between independent and dependent variables within a sampled community facilitates the generalization of research findings to the entire population (Barth & Blasius, 2021). Given the extensive population and large sample size involved in this study, the quantitative research approach is deemed essential, as it is well-suited to handle vast and quantifiable data, ensuring the delivery of highly accurate outcomes, as emphasized by Abuhamda et al. (2021).

While the qualitative research approach is invaluable for initially developing and expanding theories, it poses substantial challenges for researchers, particularly in terms of ongoing access to participants for data collection and the time required for fieldwork across multiple time points (Paoletti et al., 2021). A significant drawback of qualitative research is the absence of quantification, making it difficult to gauge the relative importance of various elements within a phenomenon and their interrelationships. Additionally, findings from qualitative research are seldom generalizable to

other contexts or amenable to translation into statistical outcomes reliant on assumptions like normal distributions and specific significance thresholds (Ranganathan, 2021; Ziliak & McCloskey, 2008).

Considering the challenges posed by both approaches, the adoption of mixed methods and the practice of triangulation has emerged as a solution, emphasizing the need for proficiency in both traditional methods to prevent misapplication (Schoonenboom, 2018). Mixed methods research is a strategy that involves the collection and analysis of data using both quantitative and qualitative approaches. It employs unique designs guided by diverse yet valid philosophical assumptions and theoretical frameworks, yielding results that neither purely quantitative nor purely qualitative methods can achieve independently. Consequently, blended techniques occupy a middle ground on the qualitative-quantitative continuum, harnessing the strengths of both approaches while mitigating their respective weaknesses (Bell et al., 2018).

The choice of research approach for this thesis is crucial, aligning closely with its purpose. To test hypotheses and establish relationships regarding households' waste recycling intentions, the quantitative approach is the most suitable. Quantitative research, emphasizing numerical data, statistical analysis, and quantifiable outcomes, equips us to rigorously examine the complex factors influencing waste recycling intentions. It facilitates systematic data collection from a substantial household sample, enabling broader generalizability. Additionally, it is structured for hypothesis testing and establishing causal relationships, aligning perfectly with the study's objectives. Surveys, questionnaires, and statistical analyses will uncover patterns, correlations, and significant associations within the variables under

investigation, ensuring precision in addressing the research objectives and hypotheses.

Study Design

This behaviour-focused thesis explores the determinants of households' intentions to separate waste at the source for recycling. Given its alignment with functionalist-objectivist assumptions, which typically favour quantitative methods, the chosen approach is a cross-sectional survey research design, well-suited to fulfill the study's overarching purpose. Furthermore, this study involves the collection of quantitative data through a structured questionnaire. Cross-sectional survey research entails a series of steps wherein researchers administer questionnaires to a sample or the entire population to capture their attitudes, opinions, beliefs, perceptions, behaviours, or characteristics at a specific point in time (Creswell & Hirose, 2018). This methodological choice aligns with the study's objectives to comprehensively analyze the factors influencing waste separation intentions.

The choice of a cross-sectional study design for this thesis is appropriate because it aligns with the researcher's limited influence over actual behavioural events and focuses on current rather than past occurrences. According to Crano, Brewer, and Lac (2014), quantitative research in the social and behavioural sciences falls into two broad categories: surveys and experiments. Surveys encompass all observations taking place in natural, non-laboratory settings and aim to minimize interference with people's typical behaviour, thus ensuring accurate and honest data collection (Kabir, 2016). In contrast, experiments are observational studies conducted either in a laboratory or a field setting. They involve data collection under conditions where behavioural choices are

restricted or manipulated by the researcher's controlled variables and measures (Brychkov et al., 2022). This distinction underscores the appropriateness of the chosen cross-sectional approach for investigating households' waste separation intentions.

This study aimed to investigate the impact of contextual and behavioural determinants on households' intentions to recycle waste from a reverse logistics perspective. The choice of this research direction was influenced by the need for an interdisciplinary and integrative approach to understanding recycling behaviour. The study design was motivated by the observed lack of empirical research attempting to establish relationships among these two sets of factors. To achieve this objective, the theory of planned behaviour, the attitude-behaviour-context theory, the consumer utility maximization theory, and nudge theory were employed. These theories guided the extraction of various factors identified in the literature as critical in influencing households' intentions to recycle waste. Subsequently, these factors underwent factor and regression analysis to provide valuable insights into the recycling behaviour of households.

Given the time constraints for thesis submission and the study's objectives, the choice of a cross-sectional study design was apt for several compelling reasons. Firstly, it offers the advantage of efficiently collecting data from a large and diverse population in a cost-effective, accurate, and objective manner, allowing for a rapid characterization of a real-world phenomenon (Creswell, 2012). Secondly, the cross-sectional study design facilitates the collection of quantitative data, which can be analyzed using both descriptive and inferential statistics, providing a robust framework for examining the research questions. Thirdly, data gathered through cross-sectional surveys can

be leveraged to construct models that elucidate specific correlations between and among variables, offering valuable insights into the study's objectives (Creswell & Creswell, 2017).

While cross-sectional surveys may present challenges in achieving a representative sample and dealing with potential non-response bias, the researcher took diligent steps to address these issues. Addressing challenges associated with cross-sectional surveys, the researcher employed rigorous techniques for enhancing sample representativeness, including multistage sampling (Smith, 2020). Furthermore, advanced survey methodologies were utilized, and studies were meticulously designed to improve data quality and facilitate accurate interpretation. In addition to these methodological considerations, proactive steps such as implementing follow-up reminders and offering incentives were taken to mitigate potential non-response bias, thereby ensuring the data collected maintained its quality and comprehensiveness (Johnson & Brown, 2019).

Population

This study's target population encompasses all households situated within AMA, estimated at approximately 139,165 households (source: www.ama.org). According to the United Nations World Urbanization Prospects (2018), the population of Accra in 2020 is estimated to be around 2.5 million, with a projected increase to 2.7 million by 2025 and 3.6 million by 2035. Furthermore, it is of significance to underscore that, from a demographic perspective, AMA constitutes a substantial segment, accounting for 44% of the Greater Accra Metropolitan Area (GAMA) (UN World Urbanization Prospects, 2018). This particular choice of the AMA as the primary study area is motivated

by its demographic prominence and its integral role within the broader GAMA context, allowing for an extensive exploration of urban dynamics within this vital Ghanaian setting.

In the Accra Metropolitan Assembly (AMA), each individual contributes approximately 0.7 kilograms of municipal solid waste daily, with a composition of 54% biodegradables and 16% plastics, 13% inert materials, 3.7% glass, 3.2% textiles, 2% paper, and 2% metals, according to a study by Oduro-Appiah et al. (2022). The focus on AMA is propelled by the multifaceted challenges posed by uncontrolled urbanization in the capital city of Ghana. This aligns with the government's commitment to redirect waste away from landfills, emphasizing the reclamation of value from waste. These efforts not only address flood risk reduction but also aim to enhance the management of solid waste in the region.

Notably, the presence of organic waste and plastics in the waste stream (70%) highlights the pressing need for strategic action plans to divert these materials from disposal. Furthermore, the study recognizes the significance of introducing results-based financing mechanisms as incentives to promote effective waste management practices. Additionally, the study delves into the impact of belief systems on behavioural intentions related to waste separation, emphasizing the pivotal role of addressing these beliefs. These comprehensive initiatives are seen as essential in advancing the overall waste management system in the AMA and aligning it with broader sustainability objectives.

This study aimed to develop a strategy for municipal solid waste source separation and recycling in AMA and targeted municipalities, aligned with a government project to improve waste collection and reduce landfilling of

biodegradable and recyclable materials. It integrated several behavioural theories, including the theory of planned behaviour, attitude-behaviour-context theory, consumer utility maximization theory, and nudge theory, to identify both contextual and behavioural factors influencing waste recycling intentions and guide evidence-based interventions. The key objectives were to enhance waste storage, source separation and collection coverage, recycling practices, and controlled disposal methods in AMA, preparing the city for future waste recovery initiatives. Meeting circular economy goals and sustainable development objectives emphasize the importance of evaluating solid waste management systems in emerging economies, with a focus on sustainable strategies and support systems to drive modernization.



Figure 13: Map showing the study area (Accra Metropolitan Area)

Sample Size and Sampling Procedure

Given that it is extremely unlikely for a complete community of interest to participate in the great majority of research studies, sampling is the only practical method for gathering data (Denscombe, 2017). Sampling from the population is frequently more practicable and makes it possible to acquire data more quickly and economically than trying to reach every member of the population. But in order to draw accurate conclusions from the sample, which will be used to derive conclusions about the population, it is essential to comprehend how the data enter the database.

Given the research objectives, which involve analyzing household intentions related to waste separation for recycling using a structured questionnaire to establish connections, a probability sampling method was chosen. Due to the study's broad geographical scope, a multistage sampling approach was adopted. Multistage sampling combines multiple phases of random sampling, considering the natural hierarchy of clusters within the population (Sedgwick, 2015). Specifically, area probability sampling was utilized, as it is well-suited for situations where the sample size needs to be drawn from residents in extensive neighborhoods, cities, or geographically defined communities (Fowler Jr & Proctor, 2014; Chauvet, 2015).

As previously mentioned, this research study focuses on the Accra AMA as its targeted geographical region. Employing a multistage sampling technique, the study initially divided the AMA into its natural three Sub Metros: Ashiedu Keteke, Ablekuma South, and Okaikoi South. These Sub Metros were further subdivided into twenty electoral areas. The households within these delineated electoral areas were treated as clusters from which the samples were selected

(Table 2). To identify the houses within the different electoral areas, the Land Use and Spatial Planning Authority's (LUSPA's) list of properties was utilized, which included house numbers.

It is crucial to emphasize that within the cultural and societal framework of Ghana, this study places a primary focus on women who serve as household heads as the unit of analysis. In Ghana, as in many other African cultures, women often hold a central role in managing and maintaining households, including responsibilities related to waste management and disposal (Oteng-Ababio et al., 2017). This role encompasses a spectrum of tasks, from daily household maintenance to making critical decisions regarding waste handling and environmental stewardship. These women household heads, through their multifaceted responsibilities, play a pivotal role in shaping the overall household dynamics and influencing waste-related practices.

Their influence extends beyond the domestic sphere, as they often serve as key decision-makers regarding waste separation, recycling, and disposal strategies, which can significantly impact the local environment and community well-being. Recognizing and studying the experiences, challenges, and decision-making processes of these women household heads is not only vital for understanding household waste management but also for comprehending the broader gender dynamics and cultural aspects that influence sustainable practices in Ghana. By delving into their roles and experiences, this study seeks to shed light on the intersection of gender, culture, and waste management, ultimately contributing to more contextually informed and effective strategies for environmental sustainability.

The study primarily focused on women as household heads in Ghana, recognizing their central role in waste management. However, it is crucial to acknowledge that exceptions exist, and men may take up women's roles such as household maintenance, waste management and disposal due to various reasons, such as being single, divorce, separation, or the passing of their spouses. In such cases, the study includes male household heads for interviews and data collection to gain a comprehensive understanding of waste management practices in diverse household structures. This approach considers evolving family dynamics, highlighting the importance of inclusivity and recognizing that gender roles and household leadership can vary. Understanding these nuances is essential for developing effective waste management strategies that cater to the needs and experiences of all household heads within the Ghanaian cultural context.

Respondents for the questions were selected randomly from the mentioned residences, with careful consideration of each electoral region's weighting based on the number of households. This approach was taken to prevent any potential biases stemming from population disparities among the electoral areas. The study's required sample size of 585 was determined using a proportional random sampling method that took into account the number of households in each electoral area, following the guidance of McMillan (2008). This technique ensured that all individuals within the sample frame had an equal opportunity to be selected for participation in the study, aligning with the recommendations put forth by Morstatter, Pfeffer and Carley (2013) (Table 2).

Table 2: Sub Metros and Electoral Areas in AMA and Sample Selection

Procedure				
Sub Metro	Electoral Area	No.of Households	Sample Size	Response Rate
Ablekuma	Korle Gonno	11,561	49	32
South				
	Korlebu	13,121	55	36
	Chorkor	19,155	81	53
	Mamprobi	15,032	63	42
	New Mamprobi	10, 532	36	29
	Sub Total	69401	102	188
Ashiedu	Ngleshie	5920	25	16
Keteke				
	Mudor	4972	16	14
	Kinka	3756	18	11
	Nmlitsagonno	4211	21	12
	Amamomo	5023	23	14
	Korle Wonkon	5515	23	15
	Korle Dudor	5567	23	15
	Sub Total	34964	107	91
Okaikoi	Awudome	2340	17	7
South				
	Goten,	3021	18	8
	Kaatsean	3922	21	11
	Mukose,	4350	22	12
	Bubuashie,	5112	24	14
	Bubui,	5351	25	15
	Avenor	4078	21	11
	Kaneshie.	6626	28	18
	Sub Total	34,800	106	90
Total		139,165	585	385

Source: Dapilah (2022)

In this research, the researcher's focus encompassed an examination of households across all the 20 electoral areas within three sub metros of AMA, comprising a total of 585 households. Great care was taken in defining this population and assigning distinct numerical identifiers to each household, a practice commonly used in survey research (Smith et al., 2020). This approach to selecting respondents from each electoral area was characterized by its rigour and randomness, aligning with established sampling principles (Jones & Williams, 2019). Before initiating this selection process, meticulous calculations were carried out to ascertain the proportion of households within each electoral area relative to the aggregate number of households across all electoral areas. These proportions were documented and can be found in Table 2.

In conducting this study, the lottery technique was purposefully adopted for the selection of respondents, recognized for its equitable and impartial nature in affording each eligible household an unbiased chance of participation (Anderson & White, 2021). The procedural steps encompassing the application of the lottery technique in this research are delineated as follows: First, enumeration involved the comprehensive listing of all eligible households within the designated study area. Second, each eligible household within the sampling frame was systematically assigned a unique identification number. Third, a method of random selection of drawing numbers from a container, was systematically employed to ascertain the requisite sample size.

Following the random selection, the selected households were duly notified of their inclusion in the study, accompanied by a formal request for their voluntary participation. Contingencies were accounted for, including the

provision for replacement in instances where a selected household declined participation. This involved the random selection of an alternate household from the existing sampling frame. The subsequent phase involved the meticulous collection of data from the participating households in accordance with the delineated research objectives. This judicious selection technique fortified the methodological integrity of the study and mitigating potential biases associated with population distribution (Garcia & Martinez, 2016; Harris & Davis, 2020).

Sample size justification in a research project plays a pivotal role in elucidating how the gathered data will effectively cater to the researcher's inferential objectives, encompassing tasks like forecasting effect sizes or scrutinizing hypotheses, as underscored by Lakens (2020). Cohen (1992) reinforces the importance of opting for a larger sample size, particularly when other factors are held constant, as it contributes to more reliable outcomes by mitigating the influence of errors. Therefore, it is prudent to consider utilizing a fully representative sample drawn from the broader population, a strategic approach advocated by Funder and Ozer (2019), which can bestow notable advantages upon the research endeavour. Such a comprehensive and inclusive sampling strategy not only bolsters the robustness of the findings but also enhances their generalizability and relevance in the broader context of the study.

In adherence to Cohen's foundational principle, the onus of determining an appropriate sample size squarely falls upon the researcher, particularly vital in quantitative research. This decision necessitates a strong theoretical foundation and methodological rigour. In this study, a thorough analysis of the significant number of housing units in the AMA has led to the establishment of a minimum sample size of 585 participants. Employing Taro Yamane's (1967)

formula, this meticulous calculation ensures the methodological robustness of our study and its potential to yield reliable insights. This approach enhances the study's statistical power and its ability to produce meaningful findings within the broader research context.

According to Adam (2020), Yamane's formula for determining sample size is one of the most appropriate for categorical and continuous variables because it only applies when the confidence coefficient is 95% and the population proportion is between 0.5 and 0.3. Since the variables used for this study consist of both categorical and continuous variables, the study adopted the adjusted Taro Yamane formula for the sample size determination, which caters for the two groups of variables (Adam, 2020). Using n to represent the sample size, the study's sample size was calculated by applying the adjusted Taro Yamane formula by Adam (2020).

$$n = \frac{N}{1+N\epsilon^2}$$

Where n = minimum sample size

N = population size of 139,165

$$\epsilon = \text{adjust margin of error} \left[\epsilon = \left(\frac{pe}{t} \right) \right] \epsilon = \frac{2(0.05)}{1.96} = 0.051$$

e = margin of error expressed as a proportion = 0.05

ρ = Estimated proportion = 2

t = t-value for the selected alpha level of confidence level = 1.96

$$\epsilon = \text{adjust margin of error} \left[\epsilon = \left(\frac{pe}{t} \right) \right] \epsilon = \frac{2(0.05)}{1.96} = 0.051$$

The rationale for this choice is supported by the works of Rasmussen (1989), Owuor (2001), Norman (2010), Cochran (1977), and Adam (2020). It is emphasized that studies involving both categorical and continuous variables

should adopt the sample size determination formula yielding the highest minimum sample size. In the present context, a sample size of $n=2$ is recommended for categorical data, and $n=4$ for continuous data, particularly in situations with a tightly constrained sample size range. This method ensures a higher level of certainty in achieving the requisite precision for the study. The researchers, following these recommendations, computed a minimum sample size of $n=585$ based on Adam's (2020) adjusted Yamane method for categorical data.

The study computed the minimal sample size based on their recommendations by utilising Adam's (2020) adjusted Yamane method for

$$\text{categorical data. } n = \frac{139,165}{1+139,165(0.051)^2} = 585$$

Following this, the determined sample size for this study was derived and represented in Table 3, showing the number of study participants chosen to represent the sample size from each cluster. For the purposes of this study, 585 questionnaires were distributed proportionally among household members in each of the twenty (20) electoral zones. A good sample size, according to Israel (1992), should range between 200 and 500, especially for statistical analysis employing multiple regression analysis. Howell (2011) asserts that a study's sample size is crucial in determining its outcome because a smaller sample size results in a power value that is less than 0.80, which is unacceptable. In line with Israel's (1992) estimates, a sample size of 585 was sufficient for this study's analysis.

Operationalisation of Concepts and Measurement

In the current study, constructs were assessed by drawing upon prior research in the relevant fields. This approach was employed to assist the

researcher in formulating a questionnaire featuring questions that have been rigorously tested and validated for their efficacy in yielding relevant data for the study. Table 19 provides a comprehensive overview of the measurements of these constructs. The dependent variable under investigation in this study is recycling intention, which was assessed through a composite of four distinct measurement items. Participants were tasked with providing ratings for each of these items on a seven-point Likert scale, wherein 1 represented the lowest rating and 7 signified the highest rating on the scale.

In prior investigations, the construct had a Cronbach's alpha of 0.88. The questionnaire's various sections were designed largely based on the tenets of the theory of planned behaviour (Ajzen, 1991; 2013) and lessons learned from related empirical studies such as Wan et al. (2014) and Khalil et al. (2018) on recycling intentions, Xu et al. (2017) on household waste separation behaviour, Do Valle et al. (2009) on reverse logistics customer service determinants and Li et al. (2019) on environmental awareness and knowledge and households' desire to purchase energy-efficient equipment.

To help raise the level of specificity, Ajzen and Fishbein (1977) outline four elements that should be taken into account when evaluating attitudes and behaviours. These factors include target, action, context and time (TACT). The purpose of this thesis is to examine the influence of contextual and behavioural factors on households' participation intentions to recycle plastic waste. Thus, applying the TACT principle, the target is the object the action is directed towards, which in this case is solid waste, action refers to the specific behaviour in question, which is recycling, context means the location of the action which

is at the household level and time refers to when the action is to be performed and, in this case, daily, as indicated in figure 14.

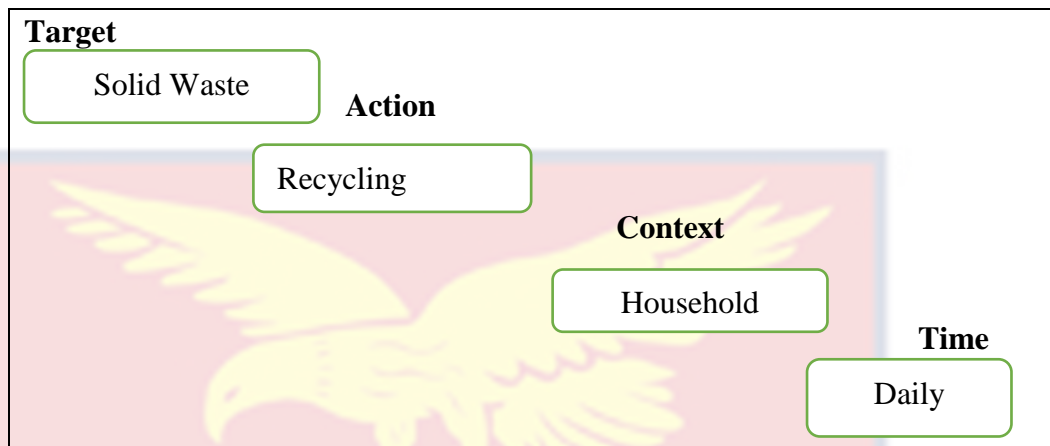


Figure 14: Attitude Factors towards Behaviour (TACT Principle)

Source: Adapted from Frymier and Nadler (2017)

Accordingly, when attitude and behaviour are measured with the same level of specificity, (that is, when TACT all match), measurement specificity is greater, which in turn, will result in stronger attitude-behaviour relationship (Ajzen & Fishbein, 1977). The purpose of the TACT principle indicates that a specific behaviour can only be predicted when a specific attitude is used. Ajzen and Fishbein (2005) also emphasise the principle of aggregation in support, which implies that a general attitude can only predict what they refer to as behavioural domain or a set of related behaviours. For example, if one has a favourable attitude towards the environment, (general attitude), then the expectation is a combination of several behaviours such as recycling, installation of solar panel, drive a hybrid car, etc.

In this situation, it becomes difficult, if not impossible to predict which of these specific behaviours would be performed. Furthermore, when defining the TACT, the idea of compatibility must be followed. According to Ajzen (2002) and Espetvedt et al. (2013), the concept of compatibility holds that

attitudes will better predict behaviour if the specificity of a measured attitude matches the behaviour under consideration. The purpose of this study focuses on households' attitudes towards their intention to recycle waste and for this reason, the Likert scale is adopted as it was originally developed to measure the attitude of individuals towards a certain phenomenon.

The Likert scale was chosen to achieve the objectives of the study because it is frequently used to measure opinions, attitudes, or behaviours and is well-liked in survey research since it makes it easy for the researcher to operationalize personality traits or perceptions (Lange & Dewitte, 2019). Typically, Likert scales are added to structured questionnaires (questionnaires with pre-determined or closed questions and responses) in conjunction with scales that assess particular theoretical constructs or merely to assist in answering closed questions.

Additionally, Likert scales are inexpensive, simple to use, and provide for uniform data collection for researchers (Rattray & Jones, 2007). Furthermore, using parametric tests to compare and evaluate data from a representative sample with a trustworthy and well-validated scale makes it simple to draw conclusions about the larger population and make comparisons between groups (Ho, 2017). From the aforementioned, the adoption of the cross-sectional survey explicitly reflects that the use of the Likert scale in this thesis is appropriate for the study. Further details of the operationalisation of variables of the study are provided in Table 3.

Table 3: Constructs Operationalisation and Measurement

Variable	Operationalisation	No. of Items	Measurement	Cronbach Alpha	Origin
Environmental awareness	The degree to which people are aware and knowledgeable of environmental problems and support efforts to solve them	9	7-point Likert scale	0.90	Mostafa, 2009
Accessibility	How widely, readily, easily, and conveniently to access recycling facilities	6	7-point Likert scale	0.92	Do Valle et al., 2009
Convenience	The level of hardship with which to conduct household recycling	7	7-point Likert scale	0.87	Do Valle et al., 2009
Awareness creation	Information dissemination to educate the public on recycling issues and possible solutions	6	7-point Likert scale	0.87	Do Valle et al., 2009
Policy inducement	The kind of policy measure that if provided would best stimulate recycling behaviour	6	7-point Likert scale	0.83	Do Valle et al., 2009
Attitude	Attitude refers to the positive or negative evaluation of a behaviour	5	7-point Likert scale	0.76	Wan et al., 2014 Icek Ajzen & B.L. Driver, 1992
Perceived norms	Perceived social influences from family, friends, and other significant relations to engage in a recycling activity	6	7-point Likert scale	0.76	Icek Ajzen & B.L. Driver, 1992, Wan et al. (2014)
Perceived behavioural control	Perception of whether or not one can perform a specific behaviour	6	7-point Likert scale	0.70	Icek Ajzen & B.L. Driver, 1992
Intention to recycle	Subjective probability that one will engage in a given behaviour	4	7-point Likert scale	0.88	Icek Ajzen & B.L. Driver, 1992

Source: Dapilah (2022)

Common Method Bias (CMB)

Any academic research that is worth its sort must be supported by rigorous procedures that are characterised by robustness, precision and reliability. CMB, on the other hand, is a special phenomenon that can have an impact on research rigour, particularly in quantitative survey investigations (Antonakis, 2017; Jordan & Troth, 2020; Podsakoff et al., 2012; Spector, 2019). This is because structured questionnaire surveys are one of the most regularly utilised data collection strategies in quantitative research. These self-report surveys often provide the data required to measure both the independent and dependent variables in an analysis (Jakobsen & Jensen 2015).

When two or more constructs are measured using the same approach, CMB happens when the estimations of the relationships between them are skewed (Podsakoff et al., 2012). The respondents' consistent patterns of responding across measures are the main contributor to CMB. This might be mostly the result of respondents' propensities for social desirability, dispositional moods, or answers that are mild, moderate, or extreme (Jakobsen & Jensen 2015; Jordan & Troth, 2020). CMB can also result from respondents' propensity to give consistent responses across items. The difficulty, ambiguity and abstractness of the items themselves in the respondents' thinking can result in CMB, as advanced by Podsakoff et al. (2012).

Two key negative impacts caused by CMB may generally be identified (Podsakoff et al., 2012; Williams et al., 2010). The first notable difficulty with CMB is that it can produce false estimates of the sufficiency of a scale's reliability and convergent validity, which can influence the reliability and validity of measurements. In addition, it could lead to biased parameter

estimates for the relationships between two separate constructs, resulting in inflated or deflated study findings on the estimations of the two constructs. This would affect the credibility of the scale's discriminant validity, erroneous estimates of the proportion of variance that the predictor variable attributes to a criterion and hypothesis testing.

Given that all of the data for the study was gathered from self-reports from the same source at the same time, there is a possibility that CMB may exist and can call into question the validity of the study based on the literature. According to Podsakoff et al. (2012), procedural and statistical approaches are the two main ways to mitigate CMB. The optimal answer to CMB, according to Podsakoff et al. (2003), depends primarily on a strategy and research design that have been carefully thought out before data collection. Galbreath and Shum (2012) offer the procedural recommendations of random question ordering, using reversed scored items and making sure the dependent and independent survey variables are clearly identified, participants are helped to provide more accurate responses by keeping the survey brief and reducing redundant measurements, overlapping and unclear scale items.

Following the guidance of Podsakoff et al. (2003), this study diligently organized and executed the research methodology, design, and instrument construction prior to the commencement of data collection. Additionally, a preliminary process of instrument validation, referred to as a pre-test, was carried out within the Sekondi-Takoradi Metropolitan Area (STMA). The pre-test involved a sample of 60 respondents, all comprising of females. Convenience-purposive sampling was employed to select four individuals from each of the 15 electoral areas within the metropolis.

The pre-test played a pivotal role in the research process by accomplishing the following objectives: identifying potential sources of measurement errors, evaluating whether respondents correctly interpreted the survey questions and ensuring that the sequence of questions in the survey did not influence respondents' response patterns. This meticulous quality control step was invaluable in enhancing the precision of the research instruments. Its implementation was aimed at ensuring that the data collected would be reliable and accurately align with the research objectives. Further details of the findings and outcomes of this pre-test are provided in Table 4.

Table 4: Pre-test Construct Reliability Results

Construct	Indicators	No of Items	No of Items retained	Mean	Standard deviation	Cronbach Alpha
Access to recycling facilities	ACC1	8	4			.877
	ACC2			3.445	1.934	
	ACC3			3.388	1.348	
	ACC4			2.643	1.522	
	ACC5			3.455	1.324	
	ACC6					
	ACC7					
	ACC8					
Convenience	CON1	8	6	3.221	1.667	.910
	CON2			2.876	1.878	
	CON3			4.543	1.766	
	CON4			4.331	1.893	
	CON5			3.544	1.454	
	CON6			4.542	1.882	
	CON7					
	CON8					
Awareness creation	AWNC1	9	6	4.66	1.774	.888
	AWCN2			3.543	1.348	
	AWCN3			2.976	1.771	
	AWCN4			3.893	1.333	
	AWCN5			4.232	1.674	
	AWCN6			3.444	1.459	
	AWCN7					
	AWCN8					
	AWNC9					
Policy inducement	PI1	7	5	3.554	1.354	.875
	PI2			3.784	1.248	
	PI3			4.548	1.284	
	PI4			3.721	1.250	

Table 4: Cont'd

	PI5			3.354	1.257	
	PI6				1.217	
	PI7					
Attitude	ATT1	8	5	4.263	1.349	.765
	ATT2			3.800	1.647	
	ATT3			4.100	1.284	
	ATT4			3.733	1.112	
	ATT5			4.233	1.278	
	ATT6					
	ATT7					
	ATT8					
Environmental awareness	EA1	11	7	4.264	1.2847	.892
	EA2			4.433	1.2507	
	EA3			3.266	1.2576	
	EA4			3.366	1.2172	
	EA5			3.566	1.2228	
	EA6			3.400	1.35443	
	EA7			3.2000	1.24845	
	EA8					
	EA9					
	EA10					
	EA11					
Perceived norms	PN1	7	6	3.9667	1.11675	.910
	PN2			3.7000	1.48556	
	PN3			4.1667	1.41624	
	PN4			4.0667	1.24291	
	PN5			4.2667	1.29943	
	PN6			4.3333	1.10433	
	PN7					
Perceived behavioural control	PBC1	8	5	4.366	1.633	.819
	PBC2			4.433	1.367	
	PBC3			4.366	1.344	
	PCB4			3.600	1.544	
	PBC5			3.500	1.222	
	PBC6			4.233	1.475	
	PBC7					
	PBC8					
INT	INT1	6	4	4.366	1.232	.894
	INT2			3.966	1.433	
	INT3			3.700	1.034	
	INT4			4.166	1.376	
	INT5					
	INT6					

Source: Pre-test survey (2021)

ACC=Access to recycling facilities

CON=Convenience

AWNC=Awareness creation

PI=Policy inducement

ATT=Attitude

EA=Environmental awareness

PN=Perceived norms

PBC=Perceived behavioural control

INT=Intention to recycle

Table 10 displays the preliminary results of the pre-test, providing insights into the various constructs under examination. At this early research stage, the assessment involved the number of indicators, items that were retained, as well as the mean, standard deviation, and Cronbach's Alpha reliability coefficient for each construct.

- **ACC:** Following a review of eight items, four were retained to best represent the accuracy of the construct.
- **CON:** Among the initial eight items, six were identified as the most relevant for capturing the Convenience construct.
- **AWNC:** Six items out of the nine initially considered were selected to represent the Awareness construct.
- **PI:** In the case of the Policy inducement construct, five out of the seven original items were retained.
- **ATT:** For the Attitude construct, five out of the initial eight items were retained.
- **EA:** Seven items out of the eleven initially assessed were chosen for the External Availability construct.
- **PN:** Six out of the seven initial items were selected to represent the Perceived Need construct.
- **PBC:** In the context of the Perceived Behavioural Control construct, five out of the eight original items were retained.
- **INT:** In the Intention construct, four out of the six initial items were retained.

The presented findings are the initial steps in the construct validation process. It starts by selecting relevant items crucial for our research objectives. We evaluated the internal consistency of these chosen items using Cronbach's Alpha, laying a strong foundation for refining our measurement model to accurately represent the central constructs. However, acknowledging the potential for human error in research, we incorporated Harman's one-factor test. This statistical measure is well-regarded for identifying Common Method Bias (CMB), enhancing the reliability and validity of our research (Mathies & Ngo, 2014; Jordan & Troth, 2020). This comprehensive approach is aimed at producing robust and credible research results that can withstand rigorous scrutiny.

Data Collection Instrument

In this study, data collection relied on a questionnaire following the recommendations of Cooper and Schindler (2011) and Zikmund et al. (2013). Participants were given a carefully structured questionnaire with five sections: A for demographic information, B for past disposal behaviour, and C, D, and E dedicated to the nine constructs with 55 indicators. This design ensured comprehensive data collection. The questionnaire accommodated both categorical and ordinal variables, using closed-ended questions for clarity. A seven-point Likert scale was employed, enabling participants to express their agreement or disagreement effectively on a scale from 1 (strongly disagree) to 7 (strongly agree) when responding to construct-related questions.

While Likert scales are fundamentally ordinal in nature, they are often subject to parametric analysis when individual Likert items are examined and aggregated into a composite score scale, as supported by Harpe (2015).

Consequently, there is a consensus that a Likert-type scale, when utilized to derive a total score from all items, can be considered an interval scale, permitting parametric analysis. This perspective aligns with the original intent of Likert scales, which was to gauge the intensity of a particular phenomenon of interest by combining all items on the scale, as emphasized by Sangthong (2019) and Tanujaya, Prahmana, and Mumu (2022). This argument underscores that latent variables, being unobservable, necessitate the measurement of all indicators and the aggregation or averaging of each indicator to obtain an overall score for the construct, a practice accepted within parametric research approaches.

The statements examined the impact of motivational factors on households' inclination to engage in waste recycling. As cautioned by Leedy and Ormrod (2011), surveys often encounter challenges such as a high non-return rate and response bias. Respondents may consciously or unconsciously provide skewed responses that do not accurately reflect reality, as highlighted by Zikmund et al. (2013). To mitigate this, the questionnaire was designed using simple, easily understandable, and plain language. Furthermore, the order of the questionnaire's questions deviated from the sequence of the study's objectives to facilitate active and effective participation from respondents. Following the guidance of Cooper and Schindler (2011) and Zikmund et al. (2015), general questions or items were positioned at the beginning, with specialized questions reserved for the later sections of the instrument.

As indicated earlier, the questionnaire consisted of five sections: A, B, C, D and E. The first gathered respondents' background information, followed by the second assessing their prior disposal behaviour and knowledge.

Subsequently, the third section focused on measuring environmental awareness, while the fourth and fifth sections delved into contextual and behavioural factors. The final part of the instrument evaluated respondents' recycling intentions. To ensure instrument reliability, a pre-test was conducted within the Sekondi-Takoradi Metropolitan Area (STMA). This pre-test aimed to identify and rectify measurement errors, ensure respondents' comprehension of questions, and verify that question structure did not impact response patterns. Pre-testing also helps detect sources of measurement errors and common method biases, as suggested by Collins (2003) and Podsakoff et al. (2003). Data Collection Procedure

Data Collection Procedure

The study utilized a cross-sectional survey design in research, recognized for its flexible research approach. Questionnaires were distributed in all 20 electoral areas within the Accra Metropolis, supervised by the principal investigator. A team of four highly trained graduate research assistants, guided by local Assembly Men/Women and Unit Committee Leaders familiar with residents, administered the questionnaires face-to-face, contributing to a commendable response rate. This method accommodated individuals with limited English proficiency. Direct question administration was chosen for its history of higher response rates, cost-effectiveness, and maintaining respondent focus. Additionally, standardized instructions ensured response consistency, enhancing study rigour.

Data collection for this study took place between March 26 and April 20, 2021, following the receipt of ethical clearance from the University of Cape Coast Institutional Review Board on March 15th, 2021. A face-to-face survey

approach was adopted. In order to ensure a high response rate and to prepare respondents for the face-to-face survey, a consent form was disseminated to all selected households within each electoral area, seeking approval from prospective respondents. This consent-seeking process commenced on March 20, 2021.

Consent from prospective respondents was received within one week on 26th March 2021. For those who accepted to participate, questionnaires were distributed to them through the field assistants from 26th 2021. However, due to the COVID-19 pandemic, the following protocols were strictly adhered to: first, all field assistants were made to put on nose masks and change them every day till the end of the exercise, second, no handshakes in a form of greetings, third, the standard two metres social distancing was strictly observed and finally, bottled water and hand sanitizers were provided to field assistants to wash and sanitize their hands after every encounter with a respondent

A total of 585 questionnaires were systematically distributed across the 20 electoral zones in strict accordance with the study's objectives. To achieve a higher response rate, a strategy was implemented with careful consideration given to the diverse work schedules of respondents within the study area. Data collection was conducted on a daily basis throughout the entire study duration, persisting until the requisite dataset was attained. However, there was a deliberate emphasis on the intensification of data collection efforts during weekends as recommended by Fowler Jr. (2014). This approach was critical as it was anticipated that weekends would afford a greater likelihood of residents being present at home. Among others, this methodological adaptation contributed significantly to the high response rate of the study.

One of the primary potential sources of survey inaccuracies lies in the failure to collect data from a significant portion of the selected sample, as highlighted by Fowler Jr. (2014). Non-response rates can pose a substantial challenge, particularly when probability sampling methods are employed. Given that this study utilized a multi-stage sampling technique, it was imperative to address strategies for mitigating non-response issues. The approach to reducing non-response rates varies depending on the survey's nature. Moreover, it is well-established that household surveys often encounter lower response rates. Fowler Jr. (2014) reports that face-to-face surveys tend to yield response rates ranging from 60 to 75%, while online surveys typically yield rates between 40 to 55%. In the realm of social sciences, Kaye, Gresty, and Stubbs-Ennis (2017) suggest a 50% response rate as an acceptable benchmark.

Postal survey procedures present distinctions when compared to telephone and in-person survey methodologies. In the context of face-to-face questionnaire administration, it is vital to employ strategies to mitigate nonresponse, as outlined by Fowler Jr. (2014). These measures, customized to meet the rigorous standards include the following: first, offering flexible appointment options, including weekends when individuals are more likely to be available, is paramount. This approach demonstrates a commitment to accommodating participants' schedules and enhances the likelihood of their participation. Second, establishing effective interpersonal interactions and providing a clear understanding of the research project's objectives are essential prerequisites. Ensuring that participants comprehend the research's purpose fosters trust and a sense of purpose, encouraging their active involvement.

Third, where feasible, involving local opinion leaders within the community can be a valuable strategy. These influential figures possess the ability to endorse the research and inspire participation among their peers, enhancing response rates. Fourth, the provision of thorough interviewer training is imperative. Interviewers must be equipped with the requisite skills and knowledge to administer questionnaires competently and address any inquiries or concerns raised by participants. Fifth, interviewers should be stationed at data collection sites to offer immediate clarification and address questions from study participants. This physical presence ensures a real-time connection between the research team and respondents, contributing to higher response rates. Thus, the presence of research assistants at the study site proved instrumental. Their active engagement with residents facilitated meaningful conversations and the collection of completed questionnaires.

Throughout the questionnaire distribution process, respondents who indicated their inability to read or write in English received support from field assistants, along with the assistance of unit committee and assembly members who helped explain the questions in their native language. This approach facilitated a better understanding of the questions, enabled respondents to provide answers, and ensured accurate record-keeping. Additionally, to alleviate concerns and enhance the response rate, unit committee and assembly members were engaged to accompany research assistants when needed. By the conclusion of the data collection period, a total of 385 (66%) of valid questionnaires were successfully retrieved and utilized in the subsequent analysis.

Reliability and Validity

Reliability and validity, as highlighted by Mohajan (2017), constitute the foremost criteria for evaluating research measurement instruments, essential for effective research. Kimberlin and Winterstein (2008) provide a succinct definition of measurement as the process of assigning numerical values to observations to quantify phenomena. Patton (1999) emphasizes the intrinsic link between validity and reliability, asserting that valid data must possess dependability for practical use. Hair et al. (2006) stress the importance of considering measurement accuracy, a critical factor in determining the consistency of research findings. In essence, reliability and validity, as underscored by the aforementioned scholars stand as pivotal criteria in research instrument evaluation. Accurate measurement provides fundamental insight, and reinforces the interdependence of validity, reliability, and accuracy in research endeavours.

To assess the construct reliability and validity of the EQS-SEM assessment model, it is essential to analyze the convergent and discriminant validity of its indicators. Convergent validity and composite reliability are critical aspects that scrutinize the relationship between indicators measuring the same construct, ensuring their meaningful correlation. In this study, we employed Fornell's measure of composite reliability (Fornell & Larcker, 1981) and Cronbach's alpha to evaluate the internal reliability of the measurement model. These methods collectively enable us to gauge the robustness and consistency of the model's measurements, ensuring that the indicators effectively represent the intended construct.

Indicator Reliability

In evaluating indicator reliability, as proposed by Hulland (1999), we scrutinize the loadings of each measure with its corresponding constructs. In EQS research, a common guideline is that each item's loading should ideally be 0.7 or higher. This criterion ensures that the shared variance between latent variables and their measures surpasses error variance (Hulland, 1999). For reflective models, Gotz et al. (2010) suggest that indicator loadings below 0.4 should be eliminated. Hulland (1999) further emphasizes that, considering loadings as correlations, over 50% of the observed variable's variance must be attributed to the construct. In this study, we apply this reliability test to examine the item loadings of various latent variables. An item loading exceeding 0.4 is deemed acceptable for further analysis, given the study's adoption of a reflective model approach. To calculate indicator reliability, we square each outer loading.

Internal Consistency Reliability

While Wong (2013) asserts that Cronbach's alpha stands as the most reliable measure of internal consistency in social science research, it finds limited application in PLS (Partial Least Squares). In PLS, the composite reliability serves as the prevalent measure of construct reliability. Gotz et al. (2010) stress the importance of ensuring that all construct indicators effectively collaborate to accurately measure the intended construct, reflecting the precision of these designated indicators in assessing the construct. Hair et al. (2012) align with Nunnally's (1978) recommendation of a benchmark of 0.7 for internal consistency, a threshold that has received widespread endorsement, as noted by Bagozzi and Yi (1988). In line with these established criteria, this study employs a 0.7 threshold as a measure of its internal consistency reliability.

Convergent Validity

To assess the factor loadings of individual items within constructs, a pooled Confirmatory Factor Analysis (CFA) is conducted, as outlined by Khalil et al. (2017). Factor loadings play a pivotal role in determining convergent validity, with higher loadings indicating stronger convergent validity. Wong (2013) emphasizes the importance of establishing the Average Variance Extracted (AVE) as a crucial step in assessing convergent validity. According to Gotz et al. (2012), the estimated AVE represents the potential amount of variation that a latent construct can theoretically account for in the observed variables of a study. To meet the criterion of acceptable convergence, as suggested by Hayes and Preacher (2013), an AVE of 0.5 or higher is typically required. In this study, all AVE values exceeded the threshold of 0.5, affirming the attainment of the necessary level of convergent validity for all constructs.

Discriminant Validity

Discriminant validity, as per Hulland (1999), gauges how well measurements of one concept differ from those of other constructs in a model. Confirming that variables representing different constructs are distinct is achieved through tests, following Campbell and Fiske's (1959) approach, emphasizing that survey items measuring distinct constructs should not be linked. A practical guideline to assess discriminant validity is comparing the square root of Average Variance Extracted (AVE) with correlations between variables and other model components, as proposed by Fornell and Larcker (1981). This study applied the Fornell-Lacker criterion, where the square root of AVE for constructs should exceed correlations among them to pass the discriminant validity test. To facilitate comparison, latent variable relationships

were presented in a correlation table, with manually calculated square roots of AVE highlighted in bold on the diagonal, following Wong's (2013) methodology.

Data Preparation and Management

The process of data preparation and management involves ensuring the accuracy of collected quantitative data obtained through a questionnaire. Initial steps include screening for errors, assigning unique identifiers for error tracking, and utilizing IBM SPSS for coding. Descriptive statistics, such as minimum and maximum values, are then generated to verify the correctness of code entries. The questionnaire, organized into five sections, covers socio-demographic details, past disposal behaviour, behavioural factors, contextual variables, and waste recycling intentions.

The management of missing data adhered to procedures outlined in the data processing software. Strategies recommended by Allison (2001) and Barladi and Enders (2010) were implemented, encompassing mean replacement, pairwise deletion, and casewise deletion. These methods are widely incorporated in prominent multivariate data analysis tools such as IBM SPSS and EQS. Mean replacement, the initial approach, involves substituting missing values with the mean of the remaining data points, maintaining sample size while potentially impacting estimated path coefficients. This method is suitable when the percentage of missing values is below 5% of the total sample size (Hair Jr. et al., 2017). Alternatively, case deletion, or listwise deletion, removes entire rows or cases with missing data. This method is recommended for larger sample sizes where the reduction in sample size does not compromise statistical power.

Pairwise deletion selectively removes observations with missing values, apt for surveys constrained by sample size. When missing data are random, this approach may result in varying sample sizes for calculating model estimates. Processed data were securely stored in cloud storage (Dropbox) and externally backed up on an external hard disk drive. Prior to data entry, questionnaires underwent screening for non-responses and poorly answered sections. Questionnaires exhibiting suspected response patterns were excluded following procedures outlined by Peat, Mellis, Williams, and Xuan (2002), and Miller and Baker-Prewitt (2009). The generation of minimum and maximum values served to verify the accuracy of codes entered during the data entry process. In instances where a code outside the designated scale was identified, the questionnaire was retrieved, and the correct code was entered.

Data Process and Analysis

In the data processing and analysis phase, the dataset underwent transformation using descriptive statistics (IBM SPSS) to organize and summarize respondent characteristics. This served as a foundational understanding of the dataset. Moving to inferential analysis, EQS is employed to draw broader inferences about the population based on sample estimates, offering nuanced insights. The outcomes from this phase contribute significantly to decision-making and policy formulation, providing actionable recommendations and strategies. This process underscores meticulous data handling for accuracy, followed by insightful analysis, combining to yield informed decision-making and policy insights.

For the mediating and moderating analysis, it necessary to methodically articulate the research hypotheses related to the mediating and moderating

analysis for the relationships between key variables. The independent variable (IV), the mediator/moderator, and the dependent variable (DV) were identified to form a coherent conceptual framework as advanced by Baron and Kenny (1986). Subsequent to this, a rigorous data preparation phase ensued, adhering to the prerequisites for mediation and moderation analysis. This included the examination of outliers, missing values, and variable distributions to ensure the integrity and validity of the dataset.

Bootstrapping, which is a resampling technique entrenched in statistical analysis (Sardeshmukh & Vandenberg, 2017), was employed in the analysis. This method, involving the iterative resampling of the dataset with replacement, proved instrumental in estimating the distribution of a statistic. In the specific context of mediation, bootstrapping assumes a critical role in evaluating the significance of indirect effects, thus enhancing the robustness of the analysis (Preacher, Rucker & Hayes, 2007). The structural foundation of the mediation model was established, delineating the paths from the IV to the mediator and subsequently from the mediator to the DV. The software EQS is then leveraged to estimate the parameters intrinsic to the mediation model, with careful consideration given to the selection of an appropriate estimation method.

This methodological rigour was paramount in ensuring the accuracy and reliability of the analytical outcomes. Furthermore, the identical procedural framework was replicated in the examination of moderating effect, adhering to the same systematic and rigorous approach. This scholarly methodology, characterized by precision and thoroughness, underscores the commitment to sound research practices and contributes to the scholarly discourse on mediation and moderation analyses as indicated by Baron and Kenny (1986).

Ethical Considerations

On October 10, 2020, researcher initiated the process of obtaining ethical clearance from the University of Cape Coast's Institutional Review Board. To support this request, two letters of endorsement from my Head of Department and Principal Supervisor was secured. Subsequently, the ethical clearance with the reference ID (UCCIRB/CHLS/2020/49) was received from the board on March 15, 2021. To facilitate the data collection process, field assistants were recruited, trained and entrusted with the responsibility of delivering consent letters to households designated within each electoral area in the study area. These letters served as a means to seek consent and approval from potential respondents. In these consent letters, were outlined the interview procedure, the study's objectives, and the nature of the questions to be posed. Furthermore, within the questionnaire's introduction, was included a clause guaranteeing the confidentiality and anonymity of all respondents

Respondents were provided with a clear understanding of the data collection process for the study. They were assured that any personal information gathered from them would exclusively serve the study's purposes. Additionally, respondents were informed that they would be consulted and given the opportunity to consent if their information were to be employed for any other purposes. The potential advantages of participating in the study were explicitly outlined to the respondents. Furthermore, it was explicitly communicated to them by the researcher that there would be no monetary compensation for their participation, emphasizing that their involvement was entirely voluntary. Respondents were assured that they had the freedom to discontinue or withdraw from the study at any point in time.

CHAPTER FIVE

RESULTS AND DISCUSSION OF FINDINGS

Introduction

This chapter presents the research findings and analyses of our study, which focuses on understanding households' intentions to participate in waste recycling in Accra. To address our research objectives effectively, this chapter was divided into three main sections. The first section examined the demographic characteristics of the respondents, providing a comprehensive overview. The second section offers detailed descriptive statistics, offering insights into various aspects of the research population. Specifically, the second section analyzed the waste generation and disposal habits of the research participants, providing a deeper understanding of their environmental practices..

In the third section, the study's model underwent evaluation. During this phase, a meticulous examination was conducted, encompassing both the measurement model and the structural models. Within the measurement model, the analysis focused on indicator loadings, composite reliability and average variance extracted (AVE), as well as the assessment of discriminant validity. The structural models were subjected to an examination that included key factors such as the coefficient of determination, path coefficient, predictive relevance, and effect size. All of these analytical procedures were executed with precision using EQS 6 SEM software, which served as an invaluable tool for conducting these comprehensive assessments. These rigorous and multifaceted analyses played a pivotal role in achieving the overarching objectives of the study, particularly in addressing the central hypotheses that formed the basis of the research inquiry.

Demographic and Descriptive Statistics

Demographics

Within this section, the study delved into a comprehensive discussion of the demographic characteristics pertaining to the survey respondents. Both household heads and their spouses were queried on various aspects, including gender, place of residence, family size, age, educational attainment, income, marital status, and occupation. To gain a thorough understanding of these demographic attributes among respondents, we employed a range of descriptive statistics. These statistics encompassed key measures such as frequencies, percentages, means, and standard deviations. Such an approach enabled us to effectively measure and elucidate the diverse demographic profiles of the study's participants.

Table 5: Gender Characteristics of Respondents

Gender	Frequency	Percent (%)
Male	115	30
Female	270	70
Total	385	100

Source: Dapilah (2022)

As illustrated in Table 5, our sample exhibits a discernible gender distribution imbalance, with approximately 70% of respondents being of the female gender, while the male contingent comprises the remaining 30%. This skew in gender representation is purposeful, reflecting our specific research emphasis on women, who traditionally bear the principal duties associated with household maintenance and waste management in the context of Ghana. This

strategic alignment with the study's objectives, which are centered on scrutinizing the determinants of household waste management, provides a well-defined framework for the attainment of substantiated and robust conclusions.

Table 6: Educational Level of Respondents

Education Level	Frequency	Percentage (%)
Middle/JHS	21	5.0%
SHS (Senior High School)	30	8.0%
Artisan/Vocational Certificate	50	13%
Technical/Vocational Diploma	53	14%
Tertiary	231	60%
Total	385	100%

Source: Dapilah (2022)

According to the data presented in Table 5, the educational attainment of the respondents exhibits notable trends. The majority of the participants have achieved tertiary education, comprising 60% of the total. Subsequently, 14% of the respondents possess technical/vocational diplomas. A smaller segment of the sample population has completed middle or junior high school education (5.0%) or senior high school education (8.0%). Furthermore, 13% of the participants hold artisan or vocational certificates. Understanding the educational background of the population can help authorities design educational and outreach programs that are appropriate for the target audience. For example, individuals with higher levels of education may respond better to in-depth information on the environmental impact of waste, while those with lower education levels may benefit from simpler, more visual materials.

Table 7: Age Distribution of Respondents

Age Range	Frequency	Percentage (%)
18-27	84	22.22
28-37	174	45.87
38-47	89	23.54
48-57	21	5.56
58-67	10	2.65
> 68	7	1.85
Total	385	100.00

Source: Dapilah (2022)

Table 7 shows that the largest age group in the sample falls within the 28-37 category, comprising 45% of the population. The 18-27 and 38-47 age groups represent 22% and 23% of the population, respectively. The older age groups, including 48-57, 58-67, and those above 68, make up smaller percentages of the population, with 5%, 3%, and 2%, respectively. The fact that the largest age group falls within the 28-37 range suggests that targeting this group with education and outreach efforts is vital, as they are likely to be open to adopting recycling practices. Secondly, the 18-27 age group, although smaller in percentage, presents an opportunity for establishing a long-term recycling culture. To engage them effectively, innovative and technology-driven recycling initiatives should be considered. For the 38-47 age group, it's advisable to design strategies that prioritize convenience and practical solutions to encourage recycling.

Recognizing the varying levels of awareness and attitudes toward recycling among different age groups, customized approaches should be

developed. Additionally, promoting recycling within families can be a strategy to influence younger family members positively. Emphasizing innovation and convenience is essential to attract tech-savvy younger age groups. Focusing on the 18-37 age groups is key for building a sustainable recycling culture in the long term. Leveraging peer and community influence, particularly among the 18-37 age group, can effectively encourage recycling behaviours and promote environmental sustainability. In summary, tailoring recycling programs and campaigns to the preferences and characteristics of different age groups is crucial to maximize the impact of these efforts, ultimately fostering a culture of sustainability in waste management practices.

Table 8: Employment Status

Employment Status	Frequency	Percentage (%)
Employed	293	76%
Student	50	13%
Unemployed	42	11%
Total	385	100%

Source: Dapilah (2022)

The figures in Table 8 represent the employment status of a group, with the majority being employed (76%), followed by students (13%) and the unemployed (11%). The implications on household waste recycling intentions are as follows: Employment status affects income and time availability, with employed individuals having more stable income but less time for recycling. Students have limited income but more time, while the unemployed have time but may face financial constraints. Motivation and awareness about recycling vary with employment status, with employed individuals being more aware due

to their financial resources. Students may be more motivated and environmentally conscious, while the unemployed can be resourceful. Each group faces unique barriers to recycling, such as time constraints for the employed, financial limitations for students, and a combination of financial and access barriers for the unemployed.

Table 9: Annual Income of Respondents

Annual Income	Frequency	Percentage (%)
< 4,255	166	43
4,256 to 6,255	35	9
6,256 to 10,255	31	8
10,256 to 30,255	86	22
30,256 to 250,000	56	15
>251,000	11	3
Total	385	100

Source: Dapilah (2022)

The fact that 43% of respondents have an annual income below GHC4,255 suggests that a significant portion of the population may have limited financial resources. This could impact their ability to invest in recycling infrastructure or purchase eco-friendly products. Therefore, recycling programs should be affordable and accessible to accommodate this group. The 22% who earn between GHC10,255 and GHC30,255 annually may have more financial flexibility to engage in recycling efforts. They could be a target audience for initiatives promoting eco-friendly practices and products. Notably, 15% of respondents earn between GHC30,256 to GHC250,000, and 3% earn above GHC251,000.

These higher-income groups may have the means to invest in more sustainable and environmentally friendly products and services. Recycling programs can cater to their willingness to pay for eco-friendly options and offer premium recycling services or products that align with their values. This income-based variations within the population should inform the design of recycling programs. They should be inclusive and affordable for those with limited financial resources, while also appealing to higher-income groups through targeted initiatives that align with their ability and willingness to support eco-friendly practices.

Table 10: Housing Type of Respondents

Housing Type	Frequency	Percentage (%)
Detached	85	22
Semi-detached	49	13
Flats	155	40
Compound	96	25
Total	385	100

Source: Dapilah (2022)

In terms of residential apartment, Table 10 shows that the highest proportion of respondents live in flats (40%), followed by detached houses (22%) and Semi-detached houses (15%). A substantial number reside in compound houses (25%). Given that 40% of respondents live in flats, it's important to ensure that recycling infrastructure is available and accessible in multi-unit dwellings (Dai et al., 2015). This includes providing designated recycling bins in common areas or facilitating easy access to recycling centers within apartment complexes. Detached houses (22%) may have more space for

recycling. Homeowners in these settings could be encouraged to engage in activities like composting and storing larger recycling bins. Specialized outreach programs can help them maximize their recycling efforts. With 25% residing in compounds, there's an opportunity to promote community recycling efforts. Compounds can benefit from shared recycling facilities and communal education programs. These programs can help foster a sense of collective responsibility for waste reduction.

Table 11: Family Size of Respondents

Family Size	Number of Respondents	Percentage
2 Members	164	43%
3 Members	100	25%
4 Members	65	17%
5 Members	33	9%
Above 5 Members	25	6%
Total	385	100

Source: Dapilah (2022)

The data in Table 11 show a relatively balanced distribution of family sizes among the respondents. This balance is essential for understanding the varying waste generation patterns and recycling needs of households in the study. The most common family sizes among the respondents are 2 members and 3 members, constituting 43% and 25% of the total respondents, respectively. This suggests that a significant portion of the surveyed population consists of smaller households, which may produce less waste but are still essential for recycling efforts. The data indicates diversity in family sizes, ranging from 2 members to households with more than 5 members. This

variation is crucial for tailoring recycling programs to meet the specific needs of different household sizes. About 6% of respondents have households with more than 5 members. These larger households typically generate more waste, and they can play a significant role in waste management and recycling efforts.

Table 12: Marital Staus of Respondents

Marital Status	Frequency	Percentage (%)
Married	195	51%
Widowed	12	3%
Divorced	12	3%
Not married	166	43%
Total	385	100

Source: Dapilah (2022)

From Table 12, the largest group of individuals are married, accounting for 51% of the total population. The next largest group are those who are not married, making up 43% of the total population. There are 11 individuals (3%) who are widowed. Similarly, there are 12 individuals (3%) who are divorced.

Table 13: Waste generation proportion

Type of Waste	Frequency	Percent (%)
Organic/Food	359	34
Plastic	311	30
Paper	204	19
Glass	41	4
Metal	67	6
Others	71	7
Total	1053	100

Source: Dapilah (2022)

Table 13 provides an overview of waste generation proportions, recording a total of 1,053 instances. The predominant types are organic/food waste (34%) and plastic waste (30%), with 359 and 311 instances, respectively. Paper waste follows at 19% (204 instances), while glass (4%) and metal (6%) have lower frequencies. Other waste types contribute 7% (71 instances). Key observations emphasize the dominance of organic/food and plastic waste, warranting focused waste management strategies and recycling programs. Despite its significance, paper constitutes a smaller portion, while glass, metal, and other waste types make minor contributions. The substantial presence of these recoverable waste materials underscores the opportunity for environmentally responsible waste management practices and the promotion of recycling initiatives (Oduro-Appiah et al., 2022).

Waste Disposal Practices

The data from Tables 14 and 15 collectively indicates that respondents generally engage in waste separation, with 50% reporting sometimes separating waste. The mean value of 1.71, with a standard deviation of 0.650, from Table 14 suggests a moderate level of variability in individual responses regarding waste separation. Waste dustbin ownership is widespread, with 90% of respondents having a dustbin according to Table 15. The mean value of 1.09 from Table 14, with a standard deviation of 0.295, supports this, indicating high average ownership and relatively consistent responses.

Regarding the acquisition of waste dustbins, Table 15 shows 82% acquiring it themselves. The mean value of 1.17 from Table 14, with a standard deviation of 0.384, suggests a predominant tendency for personal acquisition, with some variability in methods. Table 15 reveals a preference for registered

waste collectors (63.4%), and Table 14 indicates a mean value of 1.47, with a standard deviation of 0.699, suggesting a moderate tendency toward registered collectors, with notable variability in responses. For waste disposal methods, 68% of respondents in Table 15 dispose of waste at community collection centers. The mean value of 1.39 from Table 14, with a standard deviation of 0.629, indicates a tendency toward this disposal method, with moderate variability in responses.

Table 14: Descriptive for waste disposal practices

Question	Mean	Standard Deviation
Have you separated your waste before?	1.71	.650
Do you have waste dustbin?	1.09	.295
How did you acquire it?	1.17	.384
Who comes to collect your waste?	1.47	.699
How do you dispose of your waste?	1.39	.629
How often do you dispose of your waste?	1.73	.515
Are you satisfied with the current waste collection services offered?	1.54	.505

Source: Dapilah (2022)

Table 15: Waste disposal practices

Question	Frequency	Percent (%)
Have you separated waste from other waste before?		
Never	150	39
Sometimes	192	50
Always	42	11
Do you have waste dust bin?		
Yes	345	90
No	40	10
How did you acquire it?		
Myself	314	82
Provided by the assembly	71	18
Who comes to collect your waste?		
Registered waste collectors	244	63.4
Unregistered waste collectors	94	24.4
Myself	47	12.2
How do you dispose of your waste?		
At community collection center	261	68
I burn it	89	23
I throw it away	35	9
How often do you dispose of your waste?		
Daily	256	66
Weekly	117	30
Monthly	14	4
Are you satisfied with the current waste collection services offered?		
Yes	175	45
No	210	55

Source: Dapilah (2022)

Daily waste disposal is prevalent, with 66% of respondents in Table 15, and the mean value of 1.73 from Table 14, with a standard deviation of 0.515, signifies a high average frequency of daily disposal. Table 15 reveals that 45%

of respondents are satisfied with current waste collection services, while Table 14 indicates a mean value of 1.54, with a standard deviation of 0.505, suggesting a tendency toward dissatisfaction with notable consistency in responses. Collectively, the data highlights positive trends in waste disposal practices, such as waste separation, widespread ownership of waste dustbins, and frequent waste disposal. However, variations exist, underscoring the need to address issues related to satisfaction with existing waste collection services within the surveyed community.

Descriptive Statistics for the Independent Variables

This section underscores the importance of conducting a preliminary descriptive analysis in quantitative survey studies, especially when exploring the influence of contextual and behavioural factors on household recycling intentions. This initial step is essential before moving on to more advanced statistical techniques like correlation and regression. The descriptive analysis involves the utilization of descriptive statistics, such as mean and standard deviation, to gauge central tendencies. These statistics offer insights into the degree of agreement or disagreement among survey participants regarding the questionnaire statements.

The descriptive statistical analyses for the independent variables are presented in Table 15. The mean values for all independent variables indicate a predominantly positive inclination among study participants toward recycling waste. Moreover, the relatively low standard deviations suggest that these mean values closely approximate the true mean for the entire sample. In this study, the measurement scales and indicators used to assess the variables were adapted and validated from established scales by Ajzen (1991), Do Valle et al., (2009),

Wang et al. (2014) and Mostafa (2009). A seven-point Likert rating scale was employed to measure agreement levels, with "completely disagree" to "completely agree" for contextual factors and "strongly disagree" to "strongly agree" for behavioural factors in the questionnaire.

Influence of Access to Recycling Facilities on Households' Recycling

Intentions

This study investigated the impact of access to recycling facility on household waste recycling intentions. Table 15 presents the data from three research items assessing participants' intentions to engage in recycling activities if adequate facilities were available. A 7-point Likert scale (ranging from 1 for "completely disagree" to 7 for "completely agree") was used for respondents to rate each item. In the descriptive analysis, the statement "the distance to the waste disposal containers is of much concern to me" exhibited the highest mean (5.64) and a corresponding standard deviation of (1.695). This indicates that participants expressed significant concern about the proximity of waste disposal containers, highlighting the importance of accessibility in shaping their recycling intentions.

Table 16: Influence of Access to Recycling facilities on Households' Recycling Intentions

Questions	Standard		
	Label	Mean	Deviation
I have access to a convenient waste collection centre where I can properly dispose of my waste	ACC1	5.272	1.664
Having adequate collection centres encourages me to properly dispose of my waste	ACC2	4.363	2.105
Separating my waste from the other waste will not bother me if I have access to waste containers for that purpose	ACC3	5.433	1.811
The distance to the waste disposal containers is of much concern to me	ACC4	5.64	1.695
The location of waste disposal containers is of much concern to me	ACC5	5.074	1.981
Availability of waste bins alone is sufficient to facilitate waste separation	ACC6	5.24	1.924

Source: Field Study, Dapilah (2022)

The statement "having adequate collection centres encourages me to properly dispose of my waste" had the lowest mean (4.363) and a corresponding standard deviation of (2.105). This suggests that respondents viewed convenient waste collection centers as less influential in promoting proper waste disposal

compared to other factors. Overall, the participants expressed agreement with all questions related to this variable, indicating that the availability and accessibility of recycling facilities are of significant concern to them. This consensus is reflected in Table 16, where the means of all study items were relatively high, showing that a majority of households provided positive responses regarding their recycling intentions. Additionally, the small standard deviations for all study items suggest that the means are close to the true mean of the overall research items.

Influence of Convenience on Households' Recycling Intentions

In this study, the research aimed to evaluate the role of convenience in encouraging household participation in recycling activities. Table 17 outlines the indicators used to gauge participants' recycling intentions based on the level of ease or difficulty associated with recycling. Seven research items were presented for this purpose, employing a 7-point Likert scale that ranged from 1 (representing "completely disagree") to 7 (representing "completely agree") for respondents to rate each item. As observed in Table 17, the statement "clear guidelines on the role I should play in recycling waste is necessary to me" displayed the highest mean (6.067) along with a corresponding standard deviation of (1.503). This result indicates that participants consider clear recycling guidelines as a significant factor influencing their recycling intentions, highlighting the importance of guidance and ease of participation in recycling activities.

Table 17: Influence of Convenience on Households' Recycling Intentions

Questions	Label	Mean	Standard Deviation
I have enough space to keep my waste till the collectors come for it	CON1	4.693	2.076
The use of a single dustbin/waste container by multiple households is a bother to me	CON2	4.007	2.225
The frequency of waste collection is very important factor in my waste disposal	CON3	5.221	1.864
The ability to reach out to waste collectors via a communication channel is important	CON4	5.7	1.664
Cleaning and maintenance of waste containers and collection centres is a hygiene issue I consider important	CON5	5.821	1.575
Waste left to rot due to late collection is a major issue that bothers me	CON6	5.991	1.519
Clear guidelines on the role I should play in recycling waste is necessary to me	CON7	6.067	1.503

Source: Field Study, Dapilah (2022)

The statement "the use of a single dustbin/waste container by multiple households is a bother to me" yielded the lowest mean (4.007), accompanied by a corresponding standard deviation of (2.225). This suggests that the practice of using a single waste container for multiple households was perceived as less bothersome compared to other factors when it comes to influencing recycling

intentions. In general, the study participants exhibited positive responses to the influence of convenience on recycling intention. The indicators in Table 16 reflected this sentiment, with relatively high means across all items, indicating that a majority of households provided positive responses regarding their recycling intentions. Furthermore, the low standard deviations for all indicators suggest that the means closely approximate the true mean of the overall research items.

Influence of Awareness Creation on Recycling Intentions

This study explored the relationship between awareness creation and its influence on households' recycling intentions. Employing descriptive analysis, the research aimed to ascertain whether awareness creation could enhance participants' recycling intentions. To assess this construct, four research items were used, and the results are summarized in Table 6. Respondents rated each item using a 7-point Likert scale, ranging from 1 (representing "completely disagree") to 7 (representing "completely agree"). Table 18 revealed that the statement "public engagement to create environmental awareness is important to me" had the highest mean (5.874) and a corresponding standard deviation of (1.553). This result indicates that study participants place a significant emphasis on public engagement in fostering environmental awareness, suggesting that awareness creation positively affects their recycling intentions.

Table 18: Influence of Awareness Creation on Recycling Intentions

Questions	Standard		
	Label	Mean	Deviation
Community-driven campaigns can clearly explain the benefits of waste separation	AWC1	5.8	1.632
Public engagement to create environmental awareness is important to me	AWC2	5.874	1.553
To me there is enough awareness creation of environmental issues in my area	AWC3	5.793	1.623
I am aware of a community awareness campaign in my area to educate us on the benefits of waste recycling	AWC4	3.435	2.004
Knowing the environmental impact of not recycling is important to me	AWC5	3.277	2.081
Community-driven separation campaigns can effectively improve waste separation awareness of residents	AWC6	5.393	1.819

Source: Field Study, Dapilah (2022)

The statement "knowing the environmental impact of not recycling is important to me" had the lowest mean (3.277), along with a corresponding standard deviation of (2.081). This suggests that the awareness of the environmental consequences of not recycling was perceived as relatively less important compared to other factors in influencing recycling intentions. Overall, the study participants emphasized the significance of information dissemination and public education regarding environmental protection. This highlights the

importance of local initiatives aimed at creating awareness in this regard. The findings in Table 18 confirm this trend, with relatively high means for all research items, indicating that the majority of households expressed positive intentions toward recycling. Additionally, the standard deviations for all variables were reasonably low, indicating that the means closely approximate the true mean of the combined items.

Influence of Policy Inducement on Households' Recycling Intentions

This study focused on evaluating the relevance of policy inducement in encouraging households to participate in waste separation and recycling. Specifically, it sought to understand the impact of policy inducement on households' recycling intentions through descriptive analysis. The study assumed that policy inducement would enhance participants' recycling intentions. Table 19 examined the effect of inducement, encompassing both formal and informal incentives, on households to encourage their participation in, and compliance with, waste recycling practices. To measure this variable, six research items were employed. Respondents were asked to rate each item on a 7-point Likert scale, ranging from 1 (representing "completely disagree") to 7 (representing "completely agree").

Table 19: Influence of Policy inducement on households' recycling intentions

Questions	Label	Mean	Standard Deviation
The pay as you dump your waste policy is good to me	PIN1	5.849	1.535
The charges/fees I pay for disposing my waste is reasonable	PIN2	4.17	2.088
Being paid a little money for separating my waste will encourage me to always do the right thing	PIN3	4.374	2.032
Rules and regulations on waste recycling will compel me to separate my plastic waste for recycling if available	PIN4	4.867	1.959
I will comply with rules and regulations on waste recycling if they are available	PIN5	5.27	1.719
I am willing to pay more for improved waste management facilities	PIN6	5.665	1.647

Source: Field Study, Dapilah (2022)

In Table 19, the statement "the pay as you dump your waste policy is good to me" received the highest mean (5.849), showing its effectiveness in motivating recycling intentions. Conversely, "the charges/fees I pay for disposing my waste is reasonable" had the lowest mean (4.17), indicating dissatisfaction with the associated costs. Overall, the study participants expressed the importance of policy inducement in motivating recycling. Table 6 displayed relatively high means for all items, indicating that most households had positive recycling intentions. Additionally, low standard deviations across all items suggest that the means closely represent the true mean of the combined items.

Influence of Households' Environmental awareness on Recycling

Intention

The study assessed how households' environmental awareness influenced their recycling intentions. It employed a 7-point Likert scale for 12 research items to measure this influence. The scale ranged from 1 ("highly false") to 7 ("highly true"). Descriptive analysis was used to summarize the results, and Table 20 presented the findings. Overall, the mean scores for all 12 items were relatively high, indicating that most households had a strong environmental knowledge and showed concern for environmental issues. This suggests a positive correlation between environmental knowledge and recycling intentions, which can be valuable for policymakers and organizations promoting recycling and environmental awareness in households.

Table 20: Influence of Households' Environmental awareness on Recycling Intention

Questions	Label	Mean	Standard Deviation
I know more about recycling than the average person does	EA1	4.914	1.62
Solid waste pollution is a major cause of the spread of many diseases	EA2	6.086	1.617
Solid waste is a major cause of flooding during heavy rainfalls	EA3	6.07	1.514
I know that indiscriminate solid waste disposal can block gutters and water ways	EA4	5.833	1.525
I know that improper solid waste disposal is harmful to the environment	EA5	5.958	1.365
Using environmentally sustainable products is a primary means to reduce pollution	EA6	6.198	2.889

Source: Field Study, Dapilah (2022)

Table 20 revealed that the highest mean (6.198) and standard deviation (2.889) were associated with the statement "using environmentally sustainable products is a primary means to reduce pollution." Conversely, the lowest mean (4.914) and standard deviation (1.62) were found for the statement "I know more about recycling than the average person does." In terms of respondents' environmental awareness and its impact on society, the study demonstrated that participants were well-informed about environmental issues and could assess their societal and environmental consequences. Furthermore, Table 4 indicated that the mean scores for all items related to recycling intentions were generally high, implying positive responses from the majority of households. Additionally, the small standard deviations indicated that the mean scores were close to the true mean for the combined items, suggesting a high level of agreement among respondents.

Influence of Households' Attitude on Recycling Intentions

The study assessed household attitudes towards waste recycling using a 7-point Likert scale, consisting of six items measuring value judgments related to recycling intentions, perceived social benefits, and self-interest. Table 21 presented descriptive results for these items. Table 8 revealed that the statement "being environmentally responsible is important to me" had the highest mean (5.97) and a corresponding standard deviation of (1.351). In contrast, the statement "engaging in proper waste disposal makes me feel environmentally responsible" had the lowest mean (5.144) and a corresponding standard deviation of (1.745). Overall, the generally higher scores on all attitude-related items indicated that the study participants held a positive attitude toward waste recycling.

Table 21: Influence of Households' Attitude on Recycling Intentions

Questions	Standard		
	Label	Mean	Deviation
Engaging in proper waste disposal makes me feel environmentally responsible	ATT1	5.144	1.745
For me to contribute to making this city clean is good	ATT2	5.294	1.576
Recycling waste is beneficial to society	ATT3	5.802	1.453
Being environmentally responsible is important for me	ATT4	5.97	1.351
Waste separation for recycling helps to protect the environment and conserve natural resources	ATT5	5.653	1.567
My separating from other waste at source for recycling purposes will extend the life span of landfills	ATT6	5.967	2.379

Source: Field Study, Dapilah (2022)

Influence of Perceived Norms on Households' Recycling Intentions

Subjective norm was evaluated using a set of six items that assessed the expectations and support from significant social influences like family members, neighbors, friends, and colleagues. Participants used a 7-point Likert scale (ranging from 1 to 7, with descriptors from "highly false" to "highly true") to rate these items, as detailed in Table 22. The statement "most people would like me to separate my waste at home for recycling purposes" had the highest mean (5.967) and a corresponding standard deviation of (2.379). This indicates that respondents felt a relatively strong social pressure or expectation from others to engage in waste separation for recycling in their homes.

Table 22: Influence of Perceived Norms on Households' Recycling**Intentions**

Questions	Label	Standard	
		Mean	Deviation
My family members will expect me to properly dispose of my waste for recycling purposes	PN1	5.265	1.591
My neighbours will expect me to properly dispose of my waste for recycling purposes	PN2	5.407	1.456
For purposes of recycling, my family members will properly dispose of their waste for recycling	PN3	5.6	1.414
For purposes of recycling, my neighbours will separate waste from other solid waste components	PN4	5.484	3.66
Most people who are important to me would think that I should separate plastic waste from other waste at home for recycling purposes.	PN5	5.37	1.51
Most people like me would separate plastic waste from other waste at home for recycling purposes.	ATT6	5.967	2.379

Source: Field Study, Dapilah (2022)

The lowest mean (5.265) and a corresponding standard deviation of (1.591) were observed for the statement "my family members will expect me to properly dispose of my waste for recycling purposes." In summary, the findings from Table 22 suggest that the study participants perceived their significant others as important influencers of their recycling intentions.

Influence of Perceived Behavioural Control on Households' Recycling

Intention

The study utilized six items to evaluate perceived behavioural control, focusing on the possession and significance of various behavioural resources related to recycling participation. Table 23 aimed to assess households' perceptions of their ability to engage in recycling. The statement "I have enough knowledge on proper waste management practices" had the highest mean (5.686) and a corresponding standard deviation of (1.548). This suggests that study participants felt relatively confident in their knowledge and abilities related to proper waste management practices, indicating a level of perceived behavioural control in their recycling efforts.

Table 23: Influence of Perceived Behavioural Control on Households' Recycling Intention

Questions	Label	Mean	Standard Deviation
Knowledge of the different components in the solid waste stream will enable me to separate plastic waste from other solid waste at home for recycling purposes	PBC1	5.591	1.644
I will get the know-how of the different components within my solid waste stream	PBC2	5.393	1.595
I have enough knowledge on proper waste management practices	PBC3	5.686	1.548
I am confident that I can separate waste from other waste at home for recycling purposes.	PBC4	4.8	1.908
I have the resources and opportunity to acquire dustbins for recycling purposes	PBC5	5.665	1.565
For me to separating waste at home for recycling purposes is under my control	PBC1	5.591	1.644

Source: Field Study, Dapilah (2022)

The statement "I am confident that I can separate waste from other waste at home for recycling purposes" had the lowest mean (4.8) and a corresponding standard deviation of (1.908). However, it's worth noting that, in general, the study participants expressed a belief in their ability to engage in recycling activities, as evidenced by the overall positive perception of their capacity to participate in recycling efforts.

Dependent Variable

The study employed four research items to gauge waste recycling intentions, as outlined in Table 24. Participants used a 7-point Likert scale, ranging from 1 ("definitely will not") to 7 ("definitely will"), to rate each item. The statement "I intend to recycle if I am made aware of the specific waste to separate for recycling" had the highest mean (5.481) and a corresponding standard deviation of (1.514). On the other hand, the statement "I intend to separate my waste from other waste at home for recycling purposes when the time comes" had the lowest mean (4.584) and a standard deviation of (1.129). The study participants generally indicated a willingness to recycle their waste if the necessary conditions were in place, as reflected by the relatively high mean scores and low standard deviations across all the study items.

Table 24: Recycling Intention

Question	Label	Mean	Standard Deviation
I intend to separate my waste from other waste at home for recycling purposes when the time comes	INT1	4.584	1.129
I am willing to separate my waste from the other waste at home for recycling purposes when the time comes	INT2	5.393	1.441
I intend to recycle if I am made aware of the specific waste to separate for recycling	INT3	5.481	1.514
I plan to separate my waste from other waste at home for recycling purposes when the time comes.	INT	4.643	1.322

Source: Field Study, Dapilah (2022)

Exploratory Factor Analysis (EFA), Validity and Reliability Tests

This section focuses on evaluating the convergent, discriminant, and content validity of the measurement instruments used in the study. To validate the hypotheses of the study, an Exploratory Factor Analysis (EFA) was conducted initially to assess the statistical appropriateness of the factor groupings. This step aimed to validate the factor structure of the measurement variables. This study is of significant importance because the survey items were adapted from various previous publications, necessitating a careful examination to ensure the accuracy of the item grouping. To achieve this, the data was analyzed using Principal Components Analysis (PCA) with varimax rotation in SPSS version 25. This analysis helped determine whether the variables were suitable for conducting the subsequent factor analysis.

In this study, 55 carefully selected items were utilized to investigate independent factors through exploratory factor analysis (EFA). The robustness of our analysis was substantiated by a notably high Kaiser-Meyer-Olkin (KMO) test score of 0.951, affirming the adequacy of our sample and dataset for factor analysis. Table 24 presented the results of Bartlett's Test of Sphericity, delivering a highly significant result of 0.000 ($p < 0.05$), in accordance with Pallant (2010). This outcome signaled a substantial level of interdependence among the variables, confirming the data's readiness for comprehensive analysis. This statistical validation bolstered confidence in the dataset, establishing a robust foundation for in-depth factor analysis. It enabled the researcher to explore the underlying dimensions and intricate patterns within the dataset, enhancing the overall rigour and reliability of the research findings.

Table 25: Kaiser-Meyer-Olkin and Bartlett's Test of Sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.951
Bartlett's Test of Sphericity	Approx. Chi-Square	23043.513
	df	1378
	Sig.	.000

Source: Dapilah (2022)

In this study, we subjected the scale to a rigorous evaluation using Ladhari's (2012) stringent retention criteria. These criteria ensured that each item (a) displayed a robust factor loading of 0.6 or higher on at least one factor, signifying a strong association with that specific factor. (b) items were constrained to not exceed a factor loading of 0.50 on more than two factors, affirming their primary contribution to a single underlying dimension. (c) item-to-total correlations were mandated to exceed 0.50, reaffirming the items' overall relevance to their intended construct. (d) examined items for eigenvalues greater than 1, adhering to the Guttman-Kaiser rule, which aided in identifying latent factors within the data. This comprehensive analysis yielded the emergence of eight distinct factors from the dataset, offering a detailed and nuanced understanding of the underlying dimensions inherent in the scale employed for this study.

Table 26 presents the results of the exploratory factor analysis (EFA), revealing the identification of nine components with eigenvalues surpassing 1. However, it is important to note that only eight of these components were deemed valid for inclusion. The decision to accept these eight components involved eliminating all variables that retained only a single item from their

original dimension. This selective approach was taken due to the rejection of the ninth factor, which loaded only one item. Altogether, these eight chosen EFA components collectively accounted for a substantial portion, specifically 74.62%, of the sample's variance. It's noteworthy that these eight components presented in Table 26 exhibit no overlap with the original dimensions, signifying their distinct and unique contributions to the analysis.

Table 26: Factor Analysis

Rotated Component Matrix ^a								
	1- AWCN	2-PN	3-ATT	4- CON	5-EA	6-PBC	7-PI	8-ACC
AWCN5	.880	.057	.161	.164	.198	.102	.109	.109
AWCN4	.868	.068	.142	.200	.249	.085	.139	.134
AWCN2	.865	.077	.182	.215	.271	.068	.118	.080
AWCN1	.858	.103	.164	.219	.256	.063	.098	.028
AWCN3	.854	.089	.185	.188	.234	.071	.160	.113
AWCN6	.748	.101	.064	.087	.167	.201	.134	.176
PN2	.045	.859	.159	.145	.097	.172	.103	.088
PN4	.065	.852	.151	.106	.121	.147	.077	.094
PN3	.084	.844	.206	.151	.110	.199	.119	.125
PN5	.099	.833	.147	.110	.072	.225	.092	.062
PN1	.089	.825	.190	.156	.092	.179	.119	.072
PN6	.123	.743	.213	.130	.072	.258	.164	.056
ATT4	.203	.260	.796	.255	.147	.173	.189	.112
ATT3	.227	.227	.786	.289	.131	.182	.199	.133
ATT2	.166	.221	.782	.245	.196	.196	.188	.100
ATT5	.203	.292	.778	.245	.155	.198	.155	.130
ATT6	.181	.306	.718	.242	.178	.162	.110	.153
ATT1	.138	.235	.662	.229	.221	.344	.193	.115
CON4	.259	.110	.242	.784	.170	.139	.133	.143
CON5	.232	.180	.291	.780	.134	.138	.124	.205
CON6	.274	.142	.301	.758	.220	.135	.125	.146

Table 26: Cont'D

CON3	.191	.154	.225	.729	.155	.085	.120	.109
CON2	.121	.162	.108	.677	.146	.154	.129	.264
CON7	.136	.225	.286	.649	.177	.108	.169	.248
EA5	.441	.208	.162	.215	.733	.135	.086	.088
EA2	.473	.155	.207	.224	.728	.071	.131	.074
EA3	.469	.075	.195	.201	.719	.073	.149	.071
EA4	.516	.174	.210	.214	.718	.085	.120	.069
EA1	.467	.090	.233	.195	.716	.089	.133	.039
EA6	.491	.190	.196	.227	.656	.107	.139	.090
PBC4	.040	.218	.117	.059	.061	.736	.110	.045
PBC5	.063	.328	.122	.130	.064	.723	.153	.080
PBC3	.152	.325	.345	.213	.131	.694	.160	.092
PBC6	.152	.350	.366	.258	.039	.643	.097	.050
PBC2	.214	.370	.250	.158	.100	.618	.118	.180
PI2	.127	.199	.075	.077	.040	.063	.797	-.009
PI3	.186	.083	.143	.162	.090	.075	.730	.150
PI1	.210	.133	.124	.065	-.038	-.011	.704	.138
PI4	.090	.090	.223	.212	.293	.329	.628	.179
PI6	.005	.127	.228	.191	.295	.354	.619	.020
ACC4	.185	.071	.187	.218	.058	.085	.058	.851
ACC3	.142	.055	.182	.202	.051	.082	.070	.832
ACC5	.022	.188	.015	.188	.050	.033	.164	.611
% of Variance	13.06	11.09	11.00	10.84	7.99	7.97	6.98	5.69

Source: Dapilah (2022)

The construct of Awareness Creation (AWCN) remained intact, preserving all six of its original items (AWCN1, AWCN2, AWCN3, AWCN4, AWCN5, and AWCN6) during the factor analysis process. This construct was designed to gauge the effectiveness of information dissemination in promoting

public awareness regarding the advantages of waste recycling. Remarkably, this unaltered retention of all six items within the AWCN dimension accounted for a notable portion, specifically 13.06%, of the variance observed in the dataset. In essence, AWCN serves as a crucial component within the study, providing a comprehensive understanding of how information dissemination strategies contribute to raising awareness about the benefits associated with waste recycling. This construct's preservation underscores its significance and relevance within the broader context of the research.

The construct of Perceived Norms (PN) similarly retained its integrity, keeping all six of its original items (PN1, PN2, PN3, PN4, PN5, and PN6) intact throughout the factor analysis. This construct plays a pivotal role in assessing how perceived social influences emanating from various sources, such as family, friends, and other significant individuals, can exert a substantial impact on households' willingness to engage in a recycling program. This preservation of all six items within the PN dimension is particularly noteworthy as it contributes significantly, explaining 11.09% of the variance observed in the dataset. It highlights the essential role of perceived social norms and influences in shaping individuals' recycling behaviours within the context of household waste management. Consequently, the PN construct offers valuable insights into the intricate dynamics of social influence on recycling participation.

The construct of Attitude (ATT) demonstrated remarkable consistency by retaining all six of its original items (ATT1, ATT2, ATT3, ATT4, ATT5, and ATT6) without any loss during the factor analysis process. This construct is a pivotal component of the study, serving as a robust tool for assessing the extent to which individuals hold positive or negative evaluations of recycling

behaviour. What's particularly noteworthy is that the preservation of all six items within the ATT dimension accounted for a substantial proportion, precisely 11.00%, of the total variance observed in the dataset. This underscores the significance of attitude as a driving force behind recycling behaviours within the context of household waste management. The comprehensive nature of ATT allows us to delve deeply into individuals' evaluations of recycling, shedding light on their motivations and perceptions that influence their recycling decisions.

The construct of Convenience (CON) maintained its overall structure, albeit with the loss of one item from its original set of seven (CON2, CON3, CON4, CON5, CON6, and CON7) during the factor analysis process. This construct plays a crucial role in gauging the extent to which the convenience factor impacts households' decisions to engage in waste recycling activities. Despite the loss of one item, it is noteworthy that the remaining items within the CON dimension still contributed significantly, explaining a substantial portion (10.84%) of the total variance observed in the dataset. This underscores the salience of convenience as a key determinant influencing household participation in waste recycling. By exploring this construct, we gain valuable insights into how practical considerations and ease of recycling can shape individuals' behaviours and attitudes towards sustainable waste management practices.

The Environmental Awareness (EA) construct retained a substantial portion of its original content, preserving six out of its ten items (EA1, EA2, EA3, EA4, EA5, and EA6) throughout the factor analysis. EA is a pivotal measure in assessing households' awareness of environmental issues and their

knowledge of how their actions impact the environment, which subsequently influences their intention to partake in waste recycling endeavours. Despite the reduction in the number of items, these retained six items within the EA dimension still made a significant contribution, explaining 7.99% of the dataset's variance. This underscores the pivotal role of environmental awareness in motivating individuals to engage in recycling practices. Examining this construct provides valuable insights into how households' environmental concerns and knowledge influence their willingness to participate in recycling initiatives, thereby contributing to a more sustainable future.

The Perceived Behavioural Control (PBC) construct exhibited a remarkable consistency by retaining all six of its original items (PBC1, PBC2, PBC3, PBC4, PBC5, and PBC6) throughout the factor analysis process. PBC serves as a crucial measure in assessing an individual's perception of their capability to execute a specific behaviour, in this context, participating in a recycling program. It is noteworthy that the preservation of all six items within the PBC dimension accounted for a variance of 7.97% in the dataset. This emphasizes the pivotal role of perceived behavioural control in shaping individuals' intentions and actions regarding recycling. By examining this construct, valuable insights gained into how individuals' self-perceived capabilities influence their actual participation in recycling programs, shedding light on the dynamics that drive pro-environmental behaviours and sustainable waste management practices.

The construct of Policy Inducement (PI) demonstrated robustness by retaining all six of its original items (PI1, PI2, PI3, PI4, PI5, and PI6) throughout the factor analysis process. PI serves as a crucial measure in assessing the types

of policy measures that, when implemented or removed, would most effectively stimulate recycling intentions. Notably, the preservation of all six items within the PI dimension accounted for a variance of 6.98% in the dataset. This underscores the significance of policy inducement as a factor influencing individuals' recycling intentions. By examining this construct, valuable insights emerge into how policy measures can be leveraged to encourage and incentivize recycling behaviours, thereby contributing to more effective waste management practices and sustainable environmental outcomes.

Table 27: Factor Structure after EFA

1	AWC	AWC1	AWC2	AWC3	AWC4	AWC5	AWC6
2	PN	PN1	PN2	PN3	PN4	PN5	PN6
3	ATT	ATT1	ATT2	ATT3	ATT4	ATT5	ATT6
4	CON	CON2	CON3	CON4	CON5	CON6	CON7
5	EA	EA1	EA2	EA3	EA4	EA5	EA6
6	PBC	PBC1	PBC2	PBC3	PBC4	PBC5	PBC6
7	PI	PI1	PI2	PI3	PI4	PI6	
8	ACC	ACC3	ACC4	ACC5			
<hr/>							
1	INT	INT1	INT2	INT3			
<hr/>							

Source: Dapilah (2022)

The Accessibility (ACC) construct retained three of its original five items (ACC3, ACC4, and ACC5) during the factor analysis, explaining a total variance of 5.69%. ACC assesses the impact of the widespread and easy availability of recycling facilities on individuals' intentions to recycle. Notably, there was no overlap with the original dimensions after the EFA grouping, and

as a result, no label changes were suggested. Table 26 offers a comprehensive overview of the factor structure post-exploratory factor analysis, highlighting the distinct factors that emerged from the analysis. This underscores the relevance of ACC in examining how accessibility to recycling facilities influences recycling intentions, emphasizing the importance of convenient access to these resources for promoting sustainable waste management practices.

In the subsequent phase, we conducted eight additional independent factor analyses using varimax rotation, focusing exclusively on the items highlighted in Table 26. This step aimed to ascertain the unidimensionality of the newly identified factors. Our approach was validated successfully as each of the eight factors extracted exhibited a single clear dimension. Table 27 presents the outcomes of this analysis, specifically featuring component loadings that exceeded 0.6 and significantly contributed to explaining each category. Additionally, Table 28 furnishes reliability and convergent validity statistics for the eight components derived from the analysis. The robust loadings of each item demonstrated their reliability, surpassing the threshold of 0.6. As per the recommendation of Shemwell (2015), both Cronbach's alpha and composite reliability for all elements exceeded the minimum value of 0.7, attesting to the internal consistency and reliability of our measurement model.

Table 27 data reveals that each factor's Average Variance Extracted (AVE) surpassed the critical threshold of 0.5, meeting Fornell and Larcker's (1981) requirements. Except for AWCN, CON, and ACC, even when specific items were removed, item-to-scale correlations remained above 0.5, and Cronbach's alpha values remained stable. Notably, no items were removed from

AWCN, CON, and ACC, as revised Cronbach's alpha values matched the prior levels, consistently exceeding 0.7. Additionally, item loadings ($t > 2.58$) and convergent validity met Malhotra's (1999) recommendations. This comprehensive assessment reaffirms the reliability and validity of our measurement model, ensuring the robustness of our findings.



Table 28: Factor loads and their reliability statistics

	1	2	3	4	5	6	7	8
	AWC	PN	ATT	CON	EA	PBC	PI	ACC
AWC1	0.949	PN1	ATT1	CON2	EA1	PBC2	PI1	ACC3
AWC2	0.967	PN2	ATT2	CON3	EA2	PBC3	PI2	ACC4
AWC3	0.954	PN3	ATT3	CON4	EA3	PBC4	PI3	ACC5
AWC4	0.965	PN4	ATT4	CON5	EA4	PBC5	PI4	
AWC5	0.951	PN5	ATT5	CON6	EA5	PBC6	PI6	
AWC6	0.824	PN6	ATT6	CON7	EA6			
Alpha Cronbach	0.971	0.955	0.968	0.938	0.972	0.904	0.848	0.811
Range of Cronbach's alpha if one item is deleted	0.961-0.980	0.942-0.954	0.958-0.967	0.917-0.941	0.962-0.969	0.870-0.897	0.803-0.834	0.619-0.913
Range of correlations between items and total corrected scale	0.762-0.948	0.794-901	0.834-0.939	0.721-0.901	0.875-0.951	0.705-0.826	0.597-0.705	0.491-0.780
Composite Reliability	0.977	0.964	0.975	0.954	0.976	0.931	0.893	0.892
AVE	0.877	0.818	0.866	0.775	0.879	0.730	0.626	0.736
sqrt (AVE)	0.936	0.904	0.930	0.880	0.937	0.855	0.791	0.858

Source: Dapilah (2022)

The study evaluated discriminant validity by examining standardized covariances or linear correlations among latent variables. This analysis aimed to ensure that inter-factor correlations remained below the square root of the Average Variance Extracted (AVE), adhering to Fornell and Larcker's (1981) guidelines. Table 29 presents the results, revealing that, for each AVE value, the square roots of diagonal elements (representing correlations or standardized covariances among latent variables) consistently exceeded their off-diagonal counterparts. This reaffirms the validity of discriminant validity, as advocated by Hair et al. (2010). These findings provide robust evidence of the distinctiveness of each factor, validating their ability to measure unique dimensions within the study's framework. Discriminant validity is a crucial component of construct validation, and these results underscore the reliability and soundness of our measurement model.

The cumulative results confirm the measurement model's robustness, affirming its ability to capture distinct dimensions in the study. Meeting strict thresholds for factor loadings, reliability, and convergent validity strengthens the research findings' validity and reliability. These achievements provide a solid foundation for ongoing research. A validated model paves the way to explore the factors impacting waste recycling intentions and sustainable waste management further. This study advances a deeper understanding of sustainable waste management dynamics and offers a reliable framework for future investigations.

Table 29: Correlation matrix of latent factors

	1	2	3	4	5	6	7	8
AWC	0.936							
PN	0.305**	0.904						
ATT	0.501**	0.569**	0.930					
CON	0.540**	0.453**	0.676**	0.880				
EA	0.768**	0.387**	0.578**	0.590**	0.937			
PBC	0.383**	0.648**	0.663**	0.532**	0.426**	0.855		
PI	0.420**	0.415**	0.544**	0.498**	0.468**	0.510**	0.791	
ACC	0.355**	0.305**	0.430**	0.535**	0.319**	0.362**	0.352**	0.858

Source: Dapilah (2022). The main diagonal = the square root of AVE of each construct.* Correlation significant at p -value = 0.05 **Correlation significant at p -value = 0.01

To ensure the robustness of the statistical findings, this study employed an additional method for validity assessment: the traditional Fornell–Larcker criterion and the alternative Heterotrait–Monotrait Ratio (HTMT). The purpose was to thoroughly examine whether different constructs in the study are distinct from each other. The results presented in Table 28 indicate that the shared variance among all the constructs does not exceed their Average Variance Extracted (AVEs), which is highlighted in bold. This finding aligns with the guidelines set by Hair et al. (2019), where they describe how the HTMT method compares the average correlations between constructs measuring a common target construct in the model.

For structural models, a predefined threshold value of 0.90, as established by Henseler et al. (2015), is used to determine whether discriminant validity is met. In this study, all the HTMT values were found to be below this threshold (Table 30), indicating that discriminant validity was indeed achieved. The inclusion of the HTMT ratio alongside the Fornell-Larcker criterion in this study was motivated by the insights of Henseler, Ringle, and Sarstedt (2015), who argued that the Fornell-Larcker criterion might not be sensitive enough to effectively detect discriminant validity when compared to the HTMT criterion. Therefore, the adoption of the HTMT criterion in this study was meant to ensure that the interpretation of causal effects in the modeling analysis remains accurate and does not lead to misleading conclusions.

Table 30: Heterotrait-monotrait (HTMT) Ratio

	ACC	ATT	AWCN	CON	EA	PBC	PN	PIN	RI
Accessibility	0.821								
Attitude	0.404	0.830							
Awareness	0.630	0.538	0.839						
Creation									
Convenience	0.648	0.453	0.777	0.886					
Environmental	0.457	0.355	0.530	0.519	0.888				
Awareness									
Perceived	0.516	0.492	0.661	0.568	0.444	0.910			
Behavioural									
Control									
Perceived	0.384	0.309	0.432	0.392	0.268	0.565	0.830		
Norms									
Policy	0.592	0.528	0.741	0.636	0.505	0.646	0.415	0.838	
Inducement									
Recycling	0.469	0.382	0.652	0.561	0.443	0.659	0.453	0.606	0.805
Intention									

Source: Field Study, Dapilah (2021)

Structural Equation Modelling

Next in the process, was to conduct a second-order Confirmatory Factor Analysis (CFA) to analyze the eight dimensions and determine the final scale. The researcher employed the robust maximum likelihood method to estimate the asymptotic variance-covariance matrix. Table 30 presents the fit statistics from the measurement model estimation, indicating that the variables converged towards the CFA components. The Satorra–Bentler χ^2 was 2916.644, with 349 degrees of freedom and a p-value of 0.000. The χ^2/df ratio was 2.976, the root mean-square error of approximation (RMSEA) was 0.048, and the comparative

fit index (CFI) was 0.95. Additionally, the 90% confidence interval of RMSEA fell between 0.024 and 0.046. A closer examination of Figure 14, depicting this study's measurement model, confirms that the model met the recommended cut-off fit index values.

Table 31: Fit Indices

Goodness of fit summary	
Satorra–Bentler scaled χ^2	2916.644
Degrees of freedom (df)	349
<i>p</i> -value	0.000
χ^2/df	2.976
Comparative fit index (CFI)	0.95
Root mean-square error of approximation (RMSEA)	0.048
90% confidence interval of RMSEA	(0.024 – 0.046)
Cronbach's Alpha	0.971
Reliability Coefficient Rho	0.942

Source: Dapilah (2022)

Cronbach's Alpha and the Reliability Coefficient Rho were both reported as 0.971 and 0.942, respectively. These global indicators, along with the robust chi-square statistic, indicate that the overall model fit was satisfactory. In Table 26, the loadings and test statistics for the items used in the Confirmatory Factor Analysis (CFA) are presented. The table reveals that all of the items had robust loadings, exceeding 0.7, affirming that they effectively measured the underlying dimensions. Furthermore, Table 26 illustrates that the *t*-values for all the items were statistically significant ($t > 2.58$), confirming the items' precision in capturing their respective dimensions. The factor means for

each dimension are also provided in the same table, along with the considerably high values (r^2) at which the items account for variance in their respective dimensions.

Table 32: Confirmatory Factor Analysis

Dimension	Item	Load	t-value	r^2	Factor Means
Awareness Creation	AWCN1	.945	–	.893	5.874
	AWCN2	.973	50.180*	.947	
	AWCN3	.948	42.392*	.899	
	AWCN4	.962	48.708*	.926	
	AWCN5	.934	44.942*	.873	
	AWCN6	.764	29.819*	.584	
Convenience	CON2	.723	–	.523	5.248
	CON3	.802	20.047*	.642	
	CON4	.917	25.118*	.841	
	CON5	.946	27.860*	.895	
	CON6	.922	20.783*	.851	
	CON7	.803	20.519*	.645	
	Policy Inducement	PI1	.645	–	
PI2		.749	16.941*	.560	
PI3		.758	14.047*	.575	
PI4		.763	12.768*	.581	
PI6		.731	12.748*	.534	
Accessibility		ACC3	.868	–	.753
	ACC4	.969	20.083*	.939	
	ACC5	.510	10.316*	.260	
Environmental Awareness	EA1	.912	–	.831	5.774
	EA2	.938	37.166*	.879	
	EA3	.904	38.639*	.817	
	EA4	.968	44.486*	.938	
	EA5	.929	38.620*	.863	
	EA6	.895	20.566*	.801	

Table 32: Cont

	ATT1	.844	–	.712	
	ATT2	.919	21.140*	.844	
	ATT3	.963	22.560*	.927	
Attitude	ATT4	.961	20.948*	.924	5.922
	ATT5	.944	19.452*	.890	
	ATT6	.863	17.382*	.744	
	PBC2	.788	–	.621	
	PBC3	.904	19.656*	.817	
Perceived Behavioural Control	PBC4	.713	16.006*	.508	5.344
	PBC5	.793	18.150*	.628	
	PBC6	.863	15.007*	.745	
	PN1	.893	–	.798	
	PN2	.914	35.952*	.835	
	PN3	.928	33.025*	.861	
Perceived Norm	PN4	.887	26.588*	.787	5.102
	PN5	.871	25.743*	.758	
	PN6	.804	19.435*	.647	

Source: Dapilah (2022)

The Level of Statistical Significance

Through hypothesis testing, the study examined the connections between the constructs under investigation. The structural model in Figure 15, derived from the data in Table 32, illustrates the factors influencing recycling intentions via path relationships. Each of these pathways was originally hypothesized based on a comprehensive review of the relevant literature. Figure

15 presents the structural model, including the path coefficients that represent the relationships between latent variables in the study and households' intentions to participate in recycling waste. The path coefficients describe how each exogenous construct affects the endogenous construct. Table 33 provides the standardized coefficients and t-values for the correlations in the model. These values were used to derive the primary findings of the study.

In summary, Table 33 reveals a coefficient of determination (r^2) of 0.603, indicating a strong predictive power of the model in this study. This means that at least one of the independent variables can effectively predict the dependent variable, households' participation intention to recycle waste. Furthermore, the table suggests that 60.3% of the variations in households' participation intention to recycle waste can be explained by the eight independent variables (awareness creation, convenience, access to recycling facilities, policy inducement, environmental awareness, attitudes, perceived norms, and perceived behavioural control) considered in this study. The remaining 39.7% of the variations are attributed to other variables not included in the research.

Table 33. Standardized Coefficients

	Standardized Coefficient	t-value	r^2
AWCN → INT	.160	2.015**	
CON → INT	.196	2.005**	
PI → INT	.159	2.072**	
ACC → INT	.117	1.771*	
EA → INT	.079	1.492*	
ATT → INT	.153	1.445*	0.603
PBC → INT	.214	2.285**	
PN → INT	.152	2.011**	
EA → ATT → INT	.580	6.429**	
PN*PI → INT	.744	18.929*	
		*	

Source: Dapilah (2022)

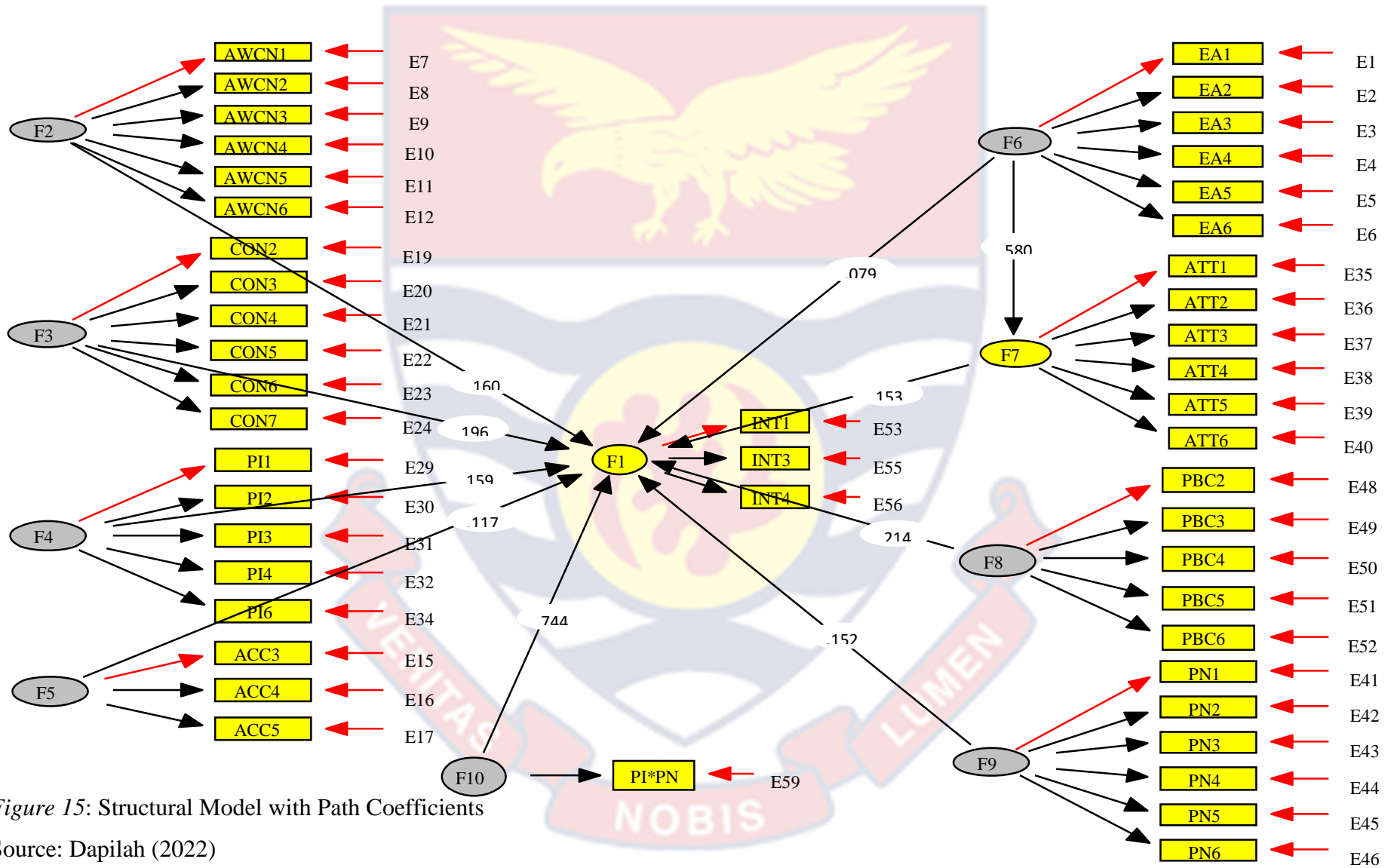


Figure 15: Structural Model with Path Coefficients

Source: Dapilah (2022)

The pronounced relationship between "awareness creation" and the recycling intentions of households is conspicuously affirmed through Table 33, where a standardized coefficient of 0.160 and a t-value of 2.015** validate this notable and statistically significant linkage. This signifies that heightened awareness initiatives wield a constructive influence on recycling intentions, portraying that well-informed households are more disposed to engage in recycling initiatives. Inversely, the absence of such awareness emerges as a consequential impediment to recycling endeavors. This discovery underscores the inherent worth of educational campaigns geared toward closing the knowledge gap and stimulating recycling behaviours.

Table 33 brings to the forefront a noteworthy and positive association between "convenience" and the recycling intentions of households. This relationship is validated by a standardized coefficient of 0.196 and a t-value of 2.005**, signifying a substantial and statistically significant correlation. In practical terms, this implies that as the level of convenience in waste recycling heightens within households, their inclination to partake in recycling likewise experiences a corresponding elevation, and conversely, when convenience diminishes, so does the intention to recycle. These findings underscore the principle that households are more inclined to engage in recycling behaviours when the process is characterized by convenience and ease of access. On the contrary, when recycling conditions prove to be less favourable or hindered by inconvenience, household motivation to participate is correspondingly diminished.

As presented in Table 33, it becomes evident that "policy inducement" exerts a substantial and statistically significant impact on the recycling

intentions of households. This assertion is corroborated by a standardized coefficient of 0.159 and a t-value of 2.072, underscoring a tangible and statistically meaningful relationship. In practical terms, this indicates that with each incremental unit of improvement in recycling policy effectiveness, there is a corresponding 0.159-unit augmentation in households' proclivity to actively participate in recycling initiatives, as ascertained from Table 33. In contrast, the existence of unfavourable or inadequately structured policies may function as deterrent factors, potentially impeding household participation.

The outcomes associated with the accessibility of recycling facilities manifest a constructive and statistically significant influence on "household intention to recycle waste." This observation is substantiated by a standardized coefficient of 0.117 and a t-value of 1.771*, underscoring a discernible statistical linkage. In practical terms, this suggests that for each incremental unit of enhancement in access to recycling facilities, there corresponds a 0.117-unit elevation in households' intentions to actively partake in recycling endeavours. Essentially, when households have access to appropriately equipped recycling facilities, their propensity to articulate an intention to engage in recycling practices is heightened. On the other hand, restricted or unavailable access to such recycling infrastructure may serve as a deterrent, potentially diminishing the likelihood of household participation.

As delineated in Table 33, the variable "environmental awareness" exerts a statistically significant and positive influence on "household involvement intention to recycle waste." This observation is underpinned by a standardized coefficient of 0.079 and a t-value of 1.492*, reflecting a discernible statistical correlation. In practical terms, this signifies that each

incremental unit of engagement in environmental awareness activities corresponds to a 0.079-unit elevation in households' intentions to actively partake in recycling endeavors. Essentially, when households demonstrate a heightened level of environmental awareness, they exhibit an increased propensity to articulate an intention to participate in waste recycling practices. Conversely, the absence of such environmental consciousness may serve as a deterrent, potentially impeding their participation in recycling initiatives.

Furthermore, in accordance with the findings presented in Table 33, it is apparent that "attitude" exerts a constructive and statistically significant influence on household waste recycling intentions. This is substantiated by a standardized coefficient of 0.153 and a t-value of 1.445*, indicative of a measurable statistical association. In practical terms, this suggests that for every unit of enhancement in households' perceptions of recycling, there corresponds a 0.153-unit augmentation in their intention to actively engage in waste recycling practices. Essentially, when households hold favourable attitudes toward recycling, they are predisposed to manifest an intention to diligently separate their waste for recycling purposes. Conversely, the harboring of unfavourable attitudes pertaining to waste recycling may serve as a deterrent, potentially impeding the household's active participation.

As depicted in Table 33, it is evident that perceived behavioural control exerts a significant and positive influence on households' intentions to partake in waste recycling. This is corroborated by a noteworthy standardized coefficient of 0.214, accompanied by a t-value of 2.285**, indicative of a robust statistical association. In practical terms, this implies that for each unit of improvement in a household's confidence regarding their recycling

competencies, there is a corresponding increase of 0.214 units in their inclination to engage in recycling practices. In essence, when residents possess a positive perception of their abilities in the domain of recycling, they are more inclined and motivated to participate in waste recycling activities. Conversely, the presence of misconceptions or doubts concerning their recycling capabilities may serve as impediments to their recycling intentions.

In accordance with the findings presented in Table 33, it is evident that "perceived norms" wield a noteworthy and positive influence on households' intentions to engage in waste recycling. This is substantiated by a substantial standardized coefficient of 0.152, accompanied by a t-value of 2.011**, denoting a significant statistical relationship. In practical terms, this implies that for each 0.152-unit increase in the perceived social pressure experienced by household members, there is a corresponding 0.152-unit increase in their intention to partake in recycling activities, and vice versa. In essence, when households perceive a pronounced societal influence encouraging recycling, they are more likely to manifest an intention to actively participate in the recycling of waste. Conversely, the absence of such prevalent social norms may act as a deterrent, potentially dissuading household members from actively engaging in recycling endeavors.

Table 33 reveals a remarkable finding: it demonstrates a significant positive moderating effect where the influence of perceived social norms on household recycling intentions is strengthened by the presence of policy inducements. This effect is characterized by a substantial coefficient of 0.744 and an exceptionally high t-value of 18.929**. This result underscores the intricate interplay between policy incentives and perceived social norms in

shaping and promoting household recycling intentions. It suggests that when individuals perceive the presence of policies and incentives encouraging recycling, the impact of social norms on their intention to recycle is magnified. This insight highlights the role of external factors, such as policies and inducements, in augmenting the influence of social norms on individuals' recycling behaviour, ultimately contributing to the broader goal of encouraging sustainable practices like recycling.

Furthermore, in addition to its direct influence on intention, it is evident that attitude plays a partial mediating role in the association between environmental awareness and households' participation intention concerning waste recycling. This observation is substantiated by a standardized coefficient of 0.580, accompanied by a notable t-value of 6.429**, indicating a high degree of statistical significance. Specifically, this implies that a one-unit alteration in environmental awareness corresponds to a 0.580-unit adjustment in households' attitudes toward waste recycling, leading to a subsequent alteration of 0.153 (EA→ATT →INT) in their participation intention to recycle waste.

This discovery underscores the significance of households' environmental consciousness. When households possess a heightened sense of environmental awareness, there is a heightened probability that their attitudes toward waste recycling will become more favourable, consequently fostering their willingness to engage in waste recycling activities. Conversely, households with lower levels of environmental awareness are more likely to foster negative attitudes towards waste recycling, which, in turn, may serve as the foundational cause for their reluctance to participate in waste recycling initiatives. This insight carries meaningful implications for environmental

policy and interventions, emphasizing the pivotal role of environmental awareness in shaping individuals' attitudes and, subsequently, their intentions regarding sustainable waste management practices.

Discussion of Findings

This section outlines the study's findings, focused on comprehending households' recycling intentions within the context of reverse logistics. Employing an interdisciplinary framework, the study synthesized perspectives from four prominent theories: TPB, ABC theory, CUMT, and NT. Each theory contributed distinct viewpoints, facilitating a comprehensive analysis of recycling behaviour. The study formulated four research objectives and ten hypotheses, grounded in these theories, to explore contextual factors such as awareness, convenience, policy, and access to recycling facilities, as well as behavioural factors including environmental awareness, attitudes, perceived norms, and perceived behavioural control. The results, systematically analyzed in the preceding chapter, unveil significant relationships, thereby contributing to the advancement of both theoretical knowledge and practical implications in the domain of sustainable waste management.

Objective one of the study delves into the examination of contextual factors crucial for fostering household waste recycling intentions. The effectiveness of recycling initiatives is intricately linked to specific factors, namely awareness creation, recycling convenience, policy inducement, and access to recycling facilities. Within the dynamic waste management landscape, household-level recycling decisions are intricately influenced by the nuanced interplay of these contextual elements, transcending individual preferences. The imperative lies in comprehending and effectively addressing these interrelated

factors to catalyze positive intentions towards household waste recycling. This, in turn, lays the foundation for a sustainable and environmentally conscious future.

Awareness creation and recycling intentions

Effective awareness creation for recycling intentions should encompass all three elements of TPB. Studies have shown that interventions focusing on changing attitudes, subjective norms, and perceived behavioural control can significantly influence recycling intentions and behaviours. For instance, a campaign emphasizing the positive environmental impact of recycling can alter individuals' attitudes toward recycling (Vijayan et al., 2023). Moreover, highlighting the social expectation and norm of recycling within a community can foster a sense of responsibility, which is integral to enhancing recycling intentions. Furthermore, providing information on the practical aspects of recycling, such as collection schedules, nearby recycling centers, and how to properly sort recyclables, can address perceived behavioural control issues (Arkorful et al., 2023). In this way, awareness campaigns serve not only to inform but also to empower individuals to overcome obstacles to recycling.

Assessing the impact of raising awareness on households' waste recycling intentions revealed a statistically significant relationship between awareness creations and recycling intentions. This implies that as households become more aware of their disposal behaviours and their environmental consequences, their willingness to engage in waste recycling increases. These findings align with Nanath and Kumar (2021), who found that providing comprehensive information on e-waste recycling positively influenced participants' attitudes and intentions. The study underscores the significance of

effective awareness-raising efforts, as a lack thereof could hinder waste recycling initiatives. Oke and Kruijsen (2016) also highlight the importance of knowledge about recycling, acquired through recycling information and feedback, in fostering a positive attitude towards recycling. Overall, the research emphasizes the crucial role of informed awareness in shaping pro-environmental behaviours like recycling.

The hypothesized relationship between awareness creation and households' recycling intentions is substantiated by a wealth of empirical studies in the recycling field (Jalil et al., 2016; Joukainen, 2022; Strydom, 2018; Ling & Xu, 2020). These findings align with numerous studies demonstrating the significant predictive influence of awareness creation on households' intentions to engage in waste recycling (Wu & Mweemba, 2010; Elshof, 2021; Martin et al., 2006; Dai et al., 2015; Islam, Dias & Huda, 2021). Theoretical support is provided by Kaplan (1991) and Jarreau et al. (2017), who assert that an individual's knowledge of an issue significantly shapes their decision-making process. Consequently, the provision of comprehensive information about the benefits of recycling waste, coupled with details about waste disposal locations, methods, and incentives, assumes critical importance in enhancing household knowledge and, consequently, their recycling intentions. These insights collectively underscore the central role of informed awareness in motivating pro-environmental behaviours, particularly within the context of waste recycling.

Furthermore, individuals often steer clear of situations in which they lack the requisite information to exercise control over their actions, especially when uncertainty looms large. This elucidates why some individuals may opt

out of sustainable behaviours, like recycling, as they perceive a deficiency in their knowledge. A plethora of studies underscores the significance of knowledge and the consequences of making decisions with limited comprehension. Guerrero et al. (2013) support the findings presented in this report, revealing that residents are more inclined to participate in recycling schemes when provided with guidance on waste sorting.

Establishing sustainable waste management systems necessitates comprehensive information dissemination within the local population. This information should encompass the importance of proper waste management, its advantages, waste separation methods, storage guidelines, the necessity of consistent deposits, and the adverse consequences of non-compliance. Environmental education emerges as a crucial tool in waste awareness, as recommended by Leicht et al. (2018). Effective promotional communication must be precise, tailored to the targeted behaviour change, address the underlying factors of the behaviour in question, and present intervention strategies and their benefits. Abila et al. (2019) underscore that a primary motivating factor for municipal waste recycling is an awareness of the benefits associated with recycling. Hence, creating awareness and providing comprehensive information are pivotal in fostering pro-environmental behaviours like waste recycling.

The insights gleaned from the results underscore that households, when made aware of the advantages of domestic recycling compared to traditional waste disposal methods, are more likely to alter their behaviour and exhibit a greater willingness to engage in waste separation for recycling. Awareness of the environmental repercussions of irresponsible waste disposal and the benefits

of repurposing waste represents the initial step toward reconsidering alternative waste management approaches (Cudjoe et al., 2020). Therefore, it becomes crucial to employ context-specific awareness creation tools to emphasize the risks associated with not recycling and the benefits of adopting recycling practices. This approach aids in shifting public perceptions towards a circular economy perspective, transforming waste management from a mere disposal concern into an integrated system (Abila et al., 2019).

Awareness creation plays a pivotal role in shaping recycling intentions using the theory of planned behaviour. By targeting attitudes, subjective norms, and perceived behavioural control, awareness campaigns can promote a positive view of recycling, strengthen social norms, and address practical barriers. Implementing these strategies in awareness campaigns can effectively boost recycling intentions and contribute to a more sustainable future (Xu, Liu & Rustam, 2023). Further research and practical applications in this area are critical for advancing our understanding of how awareness creation can support recycling intentions and sustainable waste management.

Convenience and recycling intentions

Efficient recycling services involve well-organized and streamlined processes, ensuring that the recycling infrastructure operates smoothly. This includes timely collection schedules, clearly marked bins, and effective communication about recycling guidelines. Simplified and user-friendly processes contribute to recycling convenience. Several studies have highlighted that the inconvenience of recycling infrastructure is a major deterrent to recycling efforts (Saphores et al., 2012). This includes clear instructions, straightforward sorting systems, and easily understandable guidelines, making

recycling a straightforward task. Any hindrances or barriers that may impede individuals from participating in recycling, such as complex sorting requirements or inconvenient collection schedules, should be minimized or eliminated to enhance convenience (Sarath et al., 2015). Furthermore, it is essential to minimize the distance to recycling bins and remove any obstacles that might hinder participation (Amutenya et al., 2009). These findings underscore the importance of convenient and accessible recycling infrastructure in promoting recycling behaviours.

Mohamad Zuhdi et al. (2023) and Chen and Lee (2020) integrated the TPB with nudge theory to explore the role of convenience in recycling intentions and behaviours. This approach highlights the interplay between individual attitudes, social norms, and perceived behavioural control from the TPB, and external factors that enhance recycling convenience. The integration shows that both individual intentions and external factors significantly influence recycling behaviours. Nudge theory emphasizes shaping the choice architecture to make recycling the easiest and most attractive option (Stoknes, 2015). Strategies include placing recycling bins conveniently, streamlining recycling processes, and offering incentives. The synergy of these theories offers valuable insights into creating an environment where recycling is both a social norm and the most convenient choice for individuals.

In line with our findings, Lou, Zhang and Zhang (2022) affirm that recycling convenience directly influences recycling intention, aligning with the extended framework of planned behaviour in recycling research. Similarly, Laeequddin et al. (2022) observe a strong positive impact of convenience on safe disposal intentions, especially regarding mobile phone waste, echoing prior

research emphasizing proximity, infrastructure, collection methods, and incentives as pivotal in shaping consumer choices. Krueger et al. (2000) underscore the centrality of personal attitudes, subjective norms, and perceived behavioural control in the theory of planned behaviour. Our study reveals a positive association between subjective norms and the intention to safely dispose of mobile phone waste, reinforcing the role of peer pressure and societal expectations (Kochan et al., 2016). These studies collectively underscore the significance of convenience and social factors in molding recycling and safe disposal intentions.

The investigation into the impact of convenience on individuals' recycling intentions has consistently revealed a positive correlation. This finding aligns with the central principles of nudge theory, which highlight the significant influence of improving convenience on decision-making and behaviour (Thaler & Sunstein, 2008). In the context of recycling, convenience stands out as a crucial factor, as supported by extensive research (Barr & Gilg, 2007; Conke, 2018; Knickmeyer, 2019). This body of work suggests that user-friendly recycling programs increase household engagement in waste recycling, while intricate or inconvenient processes tend to reduce participation rates. Therefore, further research is essential to delve deeper into and reinforce the connection between convenience and individuals' intentions to recycle household waste, aligning with the principles of nudge theory.

This study's findings further align with existing literature, as supported by Jalil et al. (2016), Dixon and Parker (2021), and Negash et al. (2021). Additionally, Stoeva and Alriksson (2017) highlight the instrumental role of convenience in predicting recycling intentions, a sentiment echoed by Khan et

al. (2018) and Wang et al. (2021), who establish a significant direct effect of convenience on recycling intentions. Collectively, these prior findings emphasize the importance of establishing efficient waste management systems and providing convenience to households to enhance their behavioural intentions to recycle waste (Wang et al., 2019). The empirical evidence underscores that a convenient system is a key means of creating value for households and promoting their active participation in recycling. Consequently, households are more likely to choose recycling when it is perceived as a convenient and accessible activity.

Policy inducement and recycling intentions

Addressing municipal solid waste is a top priority for policymakers, underscoring the need for a complete overhaul of waste management systems. The existing systems have notable deficiencies, leading to the mishandling of a significant portion of urban waste. Utilizing the framework of CUMT, this research seeks to determine the most effective combination of policies for tackling the waste problem. These policy interventions include implementing disposal fees, offering recycling subsidies, establishing curbside recycling facilities, and, in specific circumstances, imposing bans. One of the central aims of this research is to investigate how these policy incentives impact individuals' intentions to recycle household waste, all within the context of consumers striving to maximize their utility.

As mentioned previously, one of the primary constructs of this research was to investigate the relationship between policy inducement and household intentions to participate in waste recycling. The research findings reveal a positive correlation between policy inducement and households' intentions to

engage in waste recycling. This aligns with the findings of Matiuk and Liobikiene (2021), who emphasized that incentives were the most significant motivators for sorting behaviours. Likewise, research by Xu et al. (2018) and the work of Ling and Xu (2021) demonstrated that incentive programs had a substantial impact on individuals' recycling behaviours. Additionally, Liu et al. (2022) established that perceived policy effectiveness has a positive and significant effect on attitudes and waste sorting intentions. Therefore, our study contributes valuable data that supports and extends these existing research findings.

The CUMT suggests that individuals prioritize their well-being and tend to engage in desired behaviours when suitable incentives are provided (Alhassan et al., 2020). Our research shows a positive correlation between policy incentives and household recycling intentions, aligning with existing studies and indicating rational decision-making. Recycling's additional effort in collecting and sorting materials distinguishes it from other disposal methods (Jare, 1995), highlighting the importance of policy inducements like incentives and rewards. Recognizing the role of policy inducements, we acknowledge their ability to motivate positive changes in household recycling behaviours. Well-formulated waste management policies have the potential to positively shape consumer behaviour, aligning with the principles outlined in CUMT as discussed by Yusop and Othman (2021).

Policy inducements come in various forms, including waste charging, enforcing local laws, providing economic rewards, and public recognition (Liao et al., 2018). These options offer flexibility in motivating individuals to actively engage in recycling. Waste charging creates a financial incentive to recycle and

reduce waste, while legal enforcement ensures compliance with recycling regulations. Economic rewards, like financial incentives and tax benefits, serve as effective motivators. Public recognition for sustainable practices also inspires recycling participation. Policymakers can tailor inducement strategies to local community needs, recognizing that no one-size-fits-all solution exists, and a combination of inducements may be necessary for effective behaviour change in diverse populations.

Our research findings are consistent with Zhu et al.'s (2023) study, which also highlights a positive relationship between material and spiritual incentive policies and individuals' recycling intentions. Notably, our findings emphasize the significant impact of material incentives, such as financial rewards and discounts, in motivating people to participate actively in recycling efforts. These material incentives serve as strong motivators, encouraging recycling behaviours. For decision-makers and policymakers, our research outcomes offer valuable and actionable insights. Recognizing the effectiveness of material incentives, they can craft policies that leverage financial rewards and incentives to promote and incentivize recycling behaviours. This understanding is instrumental in designing and implementing policies that encourage sustainable waste management practices in communities.

Policy inducement in waste recycling is of paramount importance, as it serves as a catalyst for positive behavioural change, fostering a more sustainable and environmentally conscious society (Ma et al., 2023). These policies play a crucial role in reducing the environmental impact of waste disposal by encouraging resource conservation and minimizing greenhouse gas emissions. They not only promote the economic benefits of recycling but also create jobs,

reduce landfill costs, and generate revenue from the sale of recyclable materials (Yoro & Moustafa, 2023). Furthermore, policy measures help curtail the volume of waste entering landfills or incinerators, alleviating the pressure on waste management infrastructure and diminishing associated environmental and health risks (Yang et al., 2022). They engage communities and heighten public awareness, instilling a sense of environmental responsibility. In addition to compliance and enforcement, policies establish a legal framework for waste management regulations, maintaining order and efficiency (Vorobeva, Scott, Oliveira & Neto, 2022).

Access to recycling facilities and recycling intentions

Waste recycling facilities, guided by behavioural theories, significantly influence household recycling engagement. Drawing from the ABC theory (Guagnano et al., 1995), these facilities simplify recycling by providing accessible locations, fostering a context that translates positive attitudes into action. The TPB (Ajzen, 1991) underscores the importance of intentions and perceived control. Recycling facilities make recycling more convenient, enabling individuals to act on their recycling intentions, with incentives like deposit return systems further motivating participation. The NT (Thaler & Sunstein, 2008) is evident in recycling facilities' choice architecture, making recycling the default option through prominent placement of recycling containers and clear guidance. Positive reinforcement, through incentives and recognition, encourages sustainable choices. In essence, recycling facilities, informed by these theories, create an environment conducive to recycling, fostering an eco-conscious and responsible society.

In this study, the relationship between access to recycling facilities and households' intentions to recycle waste was investigated, revealing a positive association. These results align with previous empirical findings, including studies by Sheau-Tinga et al. (2016), Meng et al. (2019), Sari et al. (2021), and Zhang et al. (2016), which indicate that accessibility positively influences actual recycling behaviour. The findings of this study are further corroborated by the research on plastic recycling conducted by Cheung et al. (2018), which underscores that significant changes in attitudes toward plastic recycling are primarily attributed to the availability and use of recycling bins. Additionally, Khalil et al. (2017) discovered in their research that providing households with recycling facilities and local collection services significantly predict households' inclination to recycle. These collective findings highlight the crucial role of accessible recycling facilities in not only shaping intentions but also driving actual recycling behaviours, underscoring their significance in fostering sustainable waste management practices.

Zhang et al.'s (2019) findings highlight the crucial role of accessibility in the transition from intention to waste separation behaviour, differing from Li et al. (2018) and Pan and Truong (2018), who emphasize the dominance of individual attitudes and subjective norms in shaping recycling intentions. Our present research aligns with Abdullah et al.'s (2022) revelation that residents in Shah Alam, Malaysia, are more inclined to recycle when recycling facilities are conveniently nearby. This suggests that accessibility, rather than just intention, drives recycling behaviour, as accessible facilities ease the recycling process. The interplay of individual attitudes, intentions, and facility accessibility can be comprehensively understood using the attitude-behaviour context theory, the

theory of planned behaviour, and nudge theory. These theories collectively recognize the significance of personal motivations, social norms, and environmental cues in shaping recycling practices

Some experts propose that individuals may not always plan to sort their waste but could decide to do so when they encounter sorting bins at collection centers (Zhang et al., 2016). This is supported by Luyben and Bailey (1979), who noted a 47% increase in recyclable waste in a national park after adding more recycling bins. It's also possible that people intend to segregate their waste but don't follow through when there are no sorting facilities at drop-off points. Despite ongoing debates, our study suggests that improving recycling facilities can increase households' intentions to recycle. This implies that providing waste containers in neighborhoods and sharing waste management information can enhance household participation in effective waste management practices.

Environmental awareness and recycling intentions

Environmental awareness refers to the consciousness and understanding of the natural environment, including its ecosystems, resources, and the impact of human activities on the environment (Kousar, Afzal, Ahmed & Bojnec, (2022). It involves recognizing the value of the environment, its fragility, and the need to protect and preserve it for current and future generations (Suárez-Varela, Guardiola & González-Gómez, 2022). Within the framework of the theory of planned behaviour, environmental awareness serves as a foundation for shaping attitudes, subjective norms, and perceived behavioural control related to pro-environmental behaviours. As individuals become more environmentally aware, their attitudes become more positive, social norms become more supportive, and they may feel greater control over engaging in

eco-friendly actions, ultimately leading to an increased intention to protect and preserve the environment for current and future generations.

The central aim of this construct was to delve into the intricate relationship between environmental awareness and household recycling intentions, and the findings unequivocally established a positive and robust correlation. These outcomes harmonize seamlessly with the seminal research conducted by Fu et al. (2019), Zameer and Yasmeen (2022), and Ahmad et al. (2021), underlining the consistent nature of this connection. Furthermore, this robust association has been substantiated by Geiger et al. (2018), Sugandini et al. (2019), and Garaika and Sugandini (2021) in their independent investigations, reinforcing the pivotal role of environmental awareness in shaping recycling intentions. Sugandini et al. (2018) added an illuminating dimension to the discourse, unveiling a compelling revelation that individuals' attitudes toward recycling are profoundly molded by the depth of their awareness and their sensitivity to environmental issues.

Moreover, the meticulous inquiries carried out by Sekhokoane et al. (2017) and Liu et al. (2020) furnished compelling and irrefutable evidence, affirming that individuals who possess an elevated level of environmental awareness invariably exhibit an amplified concern for the environment. This heightened concern is seamlessly linked to the cultivation of a positive attitude toward environmental conservation and, most significantly, the cultivation of a robust intention to actively participate in pro-environmental behaviours as advanced by Debrah et al. (2021). Notably, these revelations are consonant with the illuminating research conducted by Orbanić & Kovač (2021). Their work accentuates that students who harbor a deeply ingrained environmental

awareness overwhelmingly exhibit a profoundly favourable disposition toward nature and its conservation, further underscoring the profound impact of environmental awareness on pro-environmental attitudes and actions.

The passage emphasizes the vital role of fostering environmental consciousness in addressing urban waste challenges. It highlights the significance of environmental awareness for effective environmental protection (Keinonen et al., 2016). To achieve this, the passage promotes environmental education as a powerful strategy. Education deepens people's understanding of environmental issues and raises awareness of the environmental consequences of their actions, while also equipping them with the skills for responsible environmental behaviour. The metaphor of the "conscious box" is introduced to represent individuals' awareness of their environmental impact, and increasing this awareness is seen as essential in dealing with urban waste problems. Ultimately, the passage suggests that elevating individuals' environmental conscience through awareness is a promising approach to tackle current municipal solid waste challenges (Kaya & Elster, 2019). In essence, it underscores the central role of awareness and education in promoting responsible environmental behaviour and resolving urban waste issues.

Attitudes and recycling intentions

Attitudes toward household waste recycling reflect people's beliefs and emotions about recycling at home. These attitudes influence recycling behaviours. Understanding these attitudes is vital for promoting sustainable waste management practices. This introduction lays the foundation for exploring the factors shaping individuals' attitudes toward recycling household waste. The results of this investigation unveiled a noteworthy and positive

correlation between people's attitudes and their intention to recycle waste. These findings are consistent with the conclusions drawn by previous empirical studies, such as those conducted by Alhassan et al. (2018), Chen and Lee (2020), and Wang et al. (2020). These earlier studies also emphasized the significance of one's attitude towards waste separation as a crucial determinant of their intention to engage in waste separation practices.

In essence, the current findings reinforce and validate the central role of attitude within the TPB. According to the TPB, attitudes significantly influence one's intention to perform a specific behaviour, and in the context of waste recycling, it is evident that a positive attitude towards the practice fosters a stronger intention to participate (Ajzen, 2015). Furthermore, the alignment of the recent findings with the research of Sari et al. (2021) underscores the broader applicability of these results. Sari et al. demonstrated that attitudes also play a substantial and positive role in motivating consumers to partake in e-waste collection programs.

This consistency across various waste-related behaviours, from waste separation to e-waste collection, strengthens the argument that attitudes are indeed critical components of individuals' intentions in the context of recycling and waste management. The present study's results, showing a positive relationship between attitudes and household participation intentions in waste recycling, harmonize with earlier empirical studies rooted in the TPB framework. These findings collectively highlight the importance of addressing and influencing individuals' attitudes to foster greater participation in sustainable waste management practices.

This study found attitude had a positive and statistically significant impact on recycling intention. However, they noted that this impact was not as strong as in previous studies conducted by Tonglet et al. (2004) and Khalil et al. (2017), where attitude was the most influential factor in predicting recycling intentions among all the variables they investigated. The reason for this difference in predictive power could be attributed to the incorporation of additional constructs into the TPB model. When more variables are added to the model, it is possible that the influence of attitude becomes less pronounced. The passage also suggests that understanding environmentally responsible behaviour is a complex matter. Therefore, a more comprehensive and integrative model might be necessary to account for all the factors that contribute to such behaviour. In essence, this implies that solely relying on attitude as a predictor may not be sufficient to explain the full range of behaviours related to recycling and environmental responsibility.

The study's findings may also be influenced by the fact that the majority of households in Ghana lack familiarity with recycling and waste separation practices. Consequently, attitude alone might not serve as a strong predictor of recycling intention in this context. To address this situation, it is recommended that recycling programs prioritize educating households about the health and environmental consequences of improper garbage disposal. Chen and Lee's (2020) research supports this approach, indicating that policy has a substantial external influence on attitude, while an individual's awareness of the consequences of their actions is the most significant internal factor affecting attitude. Furthermore, Monnot et al.'s (2015) findings underscore that consumer recycling behaviour is greatly affected by logistics and external incentives. This

implies that the availability of recycling infrastructure and external motivators can play a pivotal role in promoting recycling behaviour.

As suggested, the unfamiliarity of Ghanaian households with recycling and waste separation may weaken the predictive power of attitude in recycling intention. To address this, it is recommended to educate households about the environmental consequences of poor garbage disposal. This aligns with research indicating the importance of policy and individual awareness in shaping attitudes. Additionally, the study highlights the role of logistics and external incentives in influencing recycling behaviour, emphasizing the need to improve recycling infrastructure and incentives for promoting recycling. Thus, raising awareness of the consequences of poor waste disposal practices and enhancing the logistics of recycling programs are crucial steps in encouraging recycling in the Ghanaian context.

Perceived behavioural control and recycling intentions

Perceived behavioural control (PBC), a critical component within the TPB, delves into an individual's perception of how attainable or challenging it appears to engage in a specific behaviour. It takes into account their past experiences and envisions potential obstacles on the path to that behaviour (López-Mosquera et al., 2014). In simpler terms, it assesses a person's belief in their capacity to carry out a particular action. The aim of this objective was to ascertain the connection between perceived behavioural control and the intentions of households when it comes to waste recycling. This study found that there was a significant and positive correlation between perceived behavioural control and households' intentions to participate in waste recycling.

This is supported by Labib et al. (2021) who discover that households are more likely to engage in waste sorting and recycling when they believe they have control over these activities. Similarly, Zhang et al. (2019) reported that residents are more inclined to participate in trash management when they perceive control over their actions. These findings reinforce the idea that a sense of control plays a pivotal role in promoting responsible waste management. In the context of waste classification in China, Shi et al. (2021) revealed that people's intentions and practices are significantly shaped by their perceptions of behavioural control. This finding aligns with your research, suggesting that when individuals believe they have control over their waste sorting habits, they are more likely to engage in responsible practices. Moreover, your research resonates with the studies by Ayob et al. (2016) and Huang et al. (2021), which highlight that perceived behavioural control has a positive impact on people's willingness to recycle.

It implies that when individuals feel in control of their recycling actions, they are more likely to participate, which is crucial for successful recycling efforts. In the context of sustainable e-waste management in Ghana, Ofori and Mensah (2021) conducted research and found that perceived behavioural control was the most influential factor, with a 54.6% prediction rate for individuals' waste management practices. This underscores the critical role of perceived control in shaping waste management behaviours. Additionally, Wang et al. (2019) found that behavioural intentions are significantly influenced by perceived behavioural control. This suggests that when people believe they can control their actions related to waste management, their intentions to act in an environmentally responsible manner are stronger.

The collective body of research highlights the paramount significance of fostering a sense of control over individuals' actions in the realm of waste management. These efforts can prove instrumental in motivating people to actively participate in recycling, waste sorting, and other environmentally friendly practices. The studies referenced shed light on the importance of individuals feeling in control of their actions when it comes to managing waste responsibly. The current research findings echo and reinforce these insights, underscoring the pivotal role of perceived control in the promotion of responsible waste management and sustainability. This emphasis on empowering individuals to take charge of their actions in waste management is a crucial step toward achieving a more environmentally conscious and responsible society.

Given that this study identified perceived behavioural control as a key construct, it is crucial ensure families with a can do spirit or the impression that they are in possession of the ability to sort their waste proper management. Residents' ability and perceived challenges in adopting waste separation can have a negative impact on policy acceptability. People may have the intention to participate in a specific behaviour if they have a positive mindset towards the behaviour, in addition to the impression that the behaviour is under their personal control. Consequently, it is necessary to provide easy access to collection locations in order to minimise their perception of the existence of challenges.

Perceived norms and recycling intentions

Perceived norms, within the theory of planned behaviour, pertain to how individuals perceive societal expectations and pressures regarding specific

behaviours. The theory of planned behaviour is a psychological framework that aims to elucidate and forecast human behaviour, particularly decision-making and actions. The aim of this objective was to establish a connection between perceived norms and households' intentions to engage in waste recycling. The results demonstrated a substantial positive impact of perceived norms on households' willingness to recycle waste. These findings corroborate previous empirical research, emphasizing that when family members exert social pressure, individuals are more likely to participate in waste recycling. Conversely, the absence of such social norms may justify households' reluctance to participate in recycling activities.

The study's findings underscore the significance of normative predictors in understanding the intention to recycle waste, both in practical and theoretical terms. However, it is worth noting a contrast with Wang et al.'s 2020 study, which found that subjective norms didn't influence household waste sorting intentions. In this regard, our study aligns with the results of Liobikiene et al. (2016), Mi et al. (2019), Joshi and Rahman (2019), Wang et al. (2018b), and Zhang et al. (2019). Furthermore, this study's results are consistent with those of Issock et al. (2020) and Singh and Kaur (2021), who also observed a strong positive link between social norms and the intention to separate waste. Similarly, the findings of Fang et al. (2021) and Kopaei et al. (2021) support the idea that social norms play a positive role in influencing recycling intentions.

One possible explanation for these findings could be rooted in the cultural context of Ghana, where the society is often considered collectivist. In such cultures, people are more inclined to adhere to social norms. This perspective is supported by Smith et al. (2012), who suggest that norms tend to

carry more weight in collectivist societies compared to individualist ones. While social norms provide a cultural backdrop for pro-environmental behaviours, it is important to recognize that not everyone possesses the same level of self-motivation to engage in these behaviours. Therefore, there is a vital need for the provision of essential facilities and information. These resources play a crucial role in motivating consumers to actively participate in pro-environmental actions, as emphasized by Martin et al. (2006). Ghana's collectivist culture may place a stronger emphasis on social norms, but the support of infrastructure and information is equally crucial in driving pro-environmental behaviours.

The Moderating Role of Policy Inducement on the Relationship between Perceived Norms and Recycling Intentions

In examining the link between perceived norms and households' recycling intentions, this study delved into the moderating impact of policy inducement. The findings revealed a noteworthy positive moderating effect of policy inducement on the relationship between perceived norms and households' intentions to recycle waste. This outcome aligns with the results of Wan and Shen (2018), who noted that incentive programs played a substantial moderating role in the connection between normative pressures and intention among residents in Hong Kong. Similarly, Xu et al. (2017) found a significant moderating effect on the relationship between policy and subjective norms.

Integrating these findings into the TPB, we can understand that when well-designed policies related to waste recycling are introduced by municipal authorities, they can serve as a catalyst for strengthening social norms and creating added pressure within households. In TPB terms, this means that when individuals perceive that recycling is not only socially expected (perceived

norms) but also positively influenced by supportive policies (policy inducement), their intention to engage in recycling becomes more robust. In essence, good policies can enhance the influence of social norms on recycling behaviour and vice versa. This highlights the synergy between policy measures and social factors in promoting pro-environmental actions like waste recycling.

In a series of studies, researchers have uncovered intriguing insights about the connection between people's intentions to recycle and various factors, particularly those related to policies. In a study conducted by Wan et al. (2014), they found that people's personal beliefs about recycling can be negatively influenced by their perception of how effective recycling policies are. This implies that even if individuals have a desire to recycle, they may be less likely to do so if they don't believe in the effectiveness of recycling policies. This finding underscores the need for effective communication and awareness campaigns to build public confidence in recycling policies. In a study by Nduneseokwu et al. (2017), it was discovered that policy incentives, such as rewards for recycling, do not necessarily make people more inclined to recycle if their personal beliefs and norms do not align with recycling practices. In essence, the effectiveness of incentives depends on individuals already having an intrinsic motivation to recycle.

The research by Issock et al. (2020) further supported this idea by indicating that policies may not significantly moderate the relationship between societal norms and the intention to separate household waste for recycling. This suggests that recycling policies should complement existing societal norms rather than trying to forcefully change them. The key takeaway here is that a nuanced approach is needed, one that acknowledges and works with the existing

attitudes and practices of the community. These studies collectively suggest that relying solely on strategic policy interventions might not be the most effective solution for encouraging recycling behaviours. Instead, the success of recycling initiatives lies in not only having the right policies in place but also ensuring that individuals are motivated and have the necessary resources to engage in recycling practices. This involves effective communication, intrinsic motivation, complementing existing norms, and making recycling services and incentives readily available.

The Mediating Effect of Environmental Awareness on the Relationship between Attitudes and Intentions to Recycle Waste

This objective aimed to investigate the role of attitude within the theory of planned behaviour in the context of household waste recycling and environmental awareness. Our findings indicate that attitude partially mediated the connection between environmental awareness and households' waste recycling intentions. In other words, while attitude accounts for some of the link between environmental awareness and recycling intentions, there is also a direct relationship between these variables that was not entirely explained by attitude. Our research suggests that environmental awareness influences waste recycling intentions, with attitude as a contributing factor but not the sole one. This conclusion aligns with Liu et al.'s (2020) findings, which similarly found attitude to be a mediator, though not the exclusive mediator, in the relationship between environmental awareness and recycling intentions within the TPB framework.

In a similar vein, the outcomes of this study are consistent with earlier research conducted by Laroche et al. (2001) and Cheah and Phau (2011),

underscoring the influential role of environmental awareness in cultivating positive attitudes toward recycling intentions. This implies that individuals who possess a heightened sense of environmental consciousness are more likely to exhibit favourable inclinations toward recycling practices. Furthermore, the present study lends additional support to the conclusions drawn by Al Mamun et al. (2018), reinforcing the notion that environmental awareness plays a pivotal role in shaping robustly positive attitudes toward environmental protection. The findings suggest that a heightened understanding of environmental issues and concerns contributes significantly to the development of a proactive stance on environmental protection, emphasizing the interconnectedness between environmental awareness and positive attitudes towards sustainable behaviours.

Based on our research within the TPB, attitude significantly influences the link between environmental awareness and household waste recycling intentions, though it only partially mediates this connection. This implies that a positive attitude toward recycling contributes to motivation, but does not entirely explain recycling intentions. Our study underscores the complexity of this relationship, highlighting that environmental awareness is a key factor, but other variables are also at play. Yushkova and Feng (2017) also support these conclusions, affirming that attitude is a mediator but not the sole one. Practically, this suggests recycling initiatives should consider factors beyond attitudes and incorporate strategies to enhance environmental awareness, which can positively shape household attitudes and boost recycling intentions.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter delineates the key findings, draws conclusions, and provides recommendations rooted in the study's outcomes. Additionally, it sheds light on the theoretical, methodological, and practical contributions that the study imparts. In light of the identified limitations and empirical insights, several prospects for future research are posited. A critical aspect of these conclusions and related recommendations lies in acknowledging that the achievement of sustainable municipal solid waste management among households is informed by diverse theoretical perspectives. This implies a collective and public-oriented approach to foster the evolution of sustainable waste management practices.

Summary

The purpose of the study was to investigate the determinants of household waste recycling intentions within the framework of reverse logistics, focusing on contextual factors (access to recycling facilities, convenience, awareness creation, and policy inducement) and behavioural determinants (environmental awareness, attitude, perceived norms, and perceived behavioural control). Employing a quantitative approach and cross-sectional design survey, the study addressed four objectives and ten hypotheses, contributing to the understanding of factors influencing recycling intentions. A summary of the context, purpose, objectives, methods, major findings, conclusions, recommendations, contributions, limitations, and future research areas for this Chapter of the study.

The study focused on the Accra Metropolitan Area, grappling with waste challenges due to rapid urbanization. Sustainable waste management, particularly recycling, was identified as crucial. The research sought to bridge the knowledge gap on household recycling intentions in the area, contributing to effective waste management strategies. Rooted in the urgency to address waste management challenges, the study emphasized the need for structured household waste source separation in the absence of a formal mechanism. Effective recycling was highlighted for its potential to reduce environmental impact, conserve resources, and contribute to a circular economy. The study aligned with global sustainability goals, especially UN-SDGs related to responsible consumption and production.

Theoretical frameworks, including the theory of planned behaviour, attitude-behaviour-context theory, consumer utility maximization theory, and nudge theory, informed the study, offering a comprehensive exploration of factors shaping household recycling intentions. Four main research objectives were formulated, assessing contextual and behavioural variables, testing ten hypotheses, and exploring moderating and mediating effects. Following a positivist paradigm, the study employed a structured questionnaire for data collection. The target population comprised of households in the Greater Accra Metropolitan Area, and a representative sample was selected through a multistage sampling technique. Ethical considerations were prioritized, obtaining clearance from the University of Cape Coast Institutional Review Board and consent from study participants.

Data analysis involved descriptive measures, correlation assessments, and structural equation modeling using IBM SPSS and EQS-SEM software. The

methodological rigour supported empirical investigation and analysis. The study's findings contribute to enhancing waste management strategies, emphasizing the importance of understanding and addressing factors influencing household recycling intentions for sustainable urban development.

The study's findings, emanating from this rigorous analytical approach, contribute significantly to the enhancement of waste management strategies. By shedding light on the multifaceted factors influencing household recycling intentions, the research provides valuable insights for stakeholders engaged in sustainable urban development. Recognizing and addressing these factors are pivotal steps toward fostering more effective waste management practices, thereby promoting the overarching goal of sustainable and resilient urban ecosystems.

Key Findings

The study, encompassing 385 respondents, intentionally skews toward a 70% female and 30% male distribution, aligning with the research focus on women, who traditionally handle household maintenance and waste management in Ghana. Educational levels are predominantly tertiary (60%), followed by technical/vocational diplomas (14%). The largest age group (45%) falls between 28-37 years, suggesting a key target for recycling initiatives. Regarding employment, 76% of respondents are employed, 13% are students, and 11% are unemployed. Income distribution reveals 43% earning below GHC4, 255, while 15% earn between GHC30, 255 and GHC250, 000. Housing predominantly consists of flats (40%), emphasizing the need for multi-unit dwelling-specific recycling infrastructure.

Family sizes are well-distributed, with 43% having two members and 25% in compound houses. Marital status shows 51% married and 43% not married. Waste generation is primarily organic/food (34%) and plastic (30%). Waste disposal practices indicate that 50% sometimes separate waste, 90% own a dustbin (82% acquired themselves), and 68% dispose of waste at community collection centers. Daily waste disposal is prevalent (66%), but 45% express dissatisfaction with current waste collection services. These figures reveal positive waste disposal practices but highlights the need for tailored recycling programs considering demographics, income levels, and housing types. Community engagement and education are crucial for fostering sustainable waste management practices.

All indicator loadings were above the standard threshold of 0.6. This suggests that the measured variables are strongly related to their respective latent constructs. Composite reliability, which measures the internal consistency of the latent constructs, was above 0.7. This indicates that the latent constructs are reliable and internally consistent. Discriminant validity, which assesses whether the latent constructs are distinct from each other, was above 0.6. This suggests that the constructs are sufficiently distinct from one another. The average variance extracted was above the threshold of 0.5. This indicates that a substantial proportion of the variance in the observed variables is accounted for by the underlying latent constructs. The robust chi-square statistic was 2916.644 with 349 degrees of freedom, and the p-value was 0.000. A p-value of 0.000 indicates that the model fits the data well in this context.

The χ^2/df ratio was 2.976, which is below 3.0, suggesting a reasonable fit to the data. The RMSEA was 0.048, which is below the commonly used

threshold of 0.08. This indicates a reasonably good fit to the data. The CFI was 0.95, which is close to the desirable value of 1.0, suggesting a good fit to the data. The 90% confidence interval of RMSEA fell between 0.024 and 0.046, which is also an indicator of a reasonably good fit. Both Cronbach's Alpha and the Reliability Coefficient Rho were high (0.971 and 0.942, respectively), indicating strong internal consistency and reliability of the latent constructs. These findings indicate that the model has a satisfactory overall fit, and the latent constructs demonstrate good reliability and discriminant validity. Overall, the coefficient of determination (r^2) is 0.603, indicating a good predicting power of the model in the study.

The research encompassed four primary objectives, each delving into distinct facets of recycling behaviour. Firstly, a comprehensive analysis of contextual factors such as access to recycling facilities, convenience, policy inducement, and awareness creation was conducted. Secondly, the study investigated various behavioural factors, including attitudes, environmental awareness, perceived norms, and perceived behavioural control. Furthermore, the research aimed to examine the moderating influence of policy inducement on the relationship between perceived norms and recycling intentions. Lastly, the investigation explored the mediating effect of attitude on the connection between environmental awareness and recycling intentions. The findings derived from these objectives are elucidated as follows:

Objective 1: Contextual Factors:

H1a: Access to recycling facilities has a positive and statistically significant influence on household intention to recycle waste (Standardized Coefficient = 0.117, t-value = 1.771*). This suggests that improving access to recycling

facilities can promote recycling behaviour among households, emphasizing the importance of infrastructure development and accessibility in waste management.

H1b: The positive association between recycling convenience and waste recycling intentions is evident (Standardized Coefficient = 0.196, t-value = 2.005**). This indicates that making recycling more convenient for households can have a substantial impact on their recycling intentions, emphasizing the need for user-friendly recycling programs and services.

H1c: There is a positive relationship between awareness creation and households' recycling intentions (Standardized Coefficient = 0.160, t-value = 2.015**). This underscores the role of public awareness campaigns and education in promoting environmentally responsible behaviours.

H1d: Policy inducement significantly influences households' recycling intentions (Standardized Coefficient = 0.159, t-value = 2.072**). This finding underscores the significance of government policies and incentives in driving recycling behaviours, highlighting the need for well-designed and supportive environmental policies.

Objective 2: Behavioural Factors:

H2a: Environmental awareness positively impacts household involvement intention to recycle waste (Standardized Coefficient = 0.079, t-value = 1.492*). This highlights the importance of raising environmental consciousness among households to encourage recycling.

H2b: Attitude exhibited a positive and statistically significant influence on household waste recycling intentions (Standardized Coefficient = 0.153, t-value

= 1.445*). This suggests that shaping positive attitudes towards recycling can be an effective strategy in promoting recycling behaviour.

H2d: Perceived behavioural control significantly and positively influences households' intention to recycle waste (Standardized Coefficient = 0.214, t-value = 2.285**). This finding underscores the role of perceived self-efficacy in recycling decisions and emphasizes the importance of empowering individuals with the belief that they can make a difference through recycling.

H2c: Perceived norms positively impacted households' intentions to recycle waste (Standardized Coefficient = 0.152, t-value = 2.011**). This suggests that the influence of social norms and community support plays a crucial role in shaping recycling intentions.

Objective 3: Moderation Role of Policy Inducement

H3: Perceived norms' impact on household recycling intentions is positively moderated by policy inducement (Coefficient = 0.744, t-value = 18.929**). This implies that policy support enhances the effect of social norms on recycling intentions, suggesting a synergistic relationship between government policies and community norms in driving recycling behaviours.

Objective 4: Mediation Effect of Attitude:

H4: Besides the direct effect on intention, attitude partially mediated the link between environmental awareness and households' participation intention to recycle waste (Standardized Coefficient = 0.580, t-value = 6.429**). This underscores the role of attitude as an intermediary factor in translating environmental awareness into recycling intentions. These findings provide valuable insights for policymakers and practitioners in waste management and environmental conservation, suggesting the need for a multifaceted approach

that combines infrastructure development, supportive policies, awareness campaigns, and attitude-shaping initiatives to promote recycling behaviours within households.

Conclusions

In the global discourse addressing the escalating challenges of waste generation, household recycling emerges as a prominent response. However, in numerous emerging economies, including Ghana, conventional landfilling and open dumping practices for MSW persist. The absence of formalized waste source separation at the household level in Ghana underscores a significant lacuna in contemporary waste management practices. Confronting the imperatives of the circular economy and the pursuit of the UN-SDGs necessitates a rigorous evaluation of the solid waste management systems in developing economies. This evaluation is indispensable for steering decision-making processes towards formulating sustainable strategies and support systems aligned with modernization principles.

The implementation of efficacious recycling schemes mandates a nuanced understanding of the determinants influencing households' participation intentions in recycling waste. A comprehensive examination of both contextual and behavioural factors shaping the efficacy and extent of individuals' engagement in recycling is imperative for optimizing recycling outcomes. The intricacies inherent in human behaviour, as substantiated by the extant literature, underscore the imperative of drawing insights from diverse disciplines for a comprehensive understanding. In essence, bridging the extant gap between traditional waste management practices and the requisites of a

circular economy necessitates a holistic exploration of the both contextual and behavioural dimensions underpinning households' recycling intentions.

The substantial and positively impactful role of contextual factors, including access to recycling facilities, convenience in recycling processes, awareness initiatives, and policy incentives, emphasizes the critical importance of infrastructure development, user-friendly recycling programs, and effective public awareness campaigns. Together, these factors serve as foundational catalysts for promoting environmentally responsible behaviours. This underscores the pivotal role of well-designed governmental policies and incentives in driving recycling behaviours, aligning with theoretical frameworks such as the TPB, the ABC model, the CUMT and the NT. The synergy of these elements not only enhances the theoretical underpinnings but also contributes practically to fostering a culture of sustainable and responsible recycling practices.

The imperative to enhance accessibility to recycling facilities emerges as a strategic mandate for fostering a culture of recycling among households. Similarly, the substantiated correlation between recycling convenience and waste recycling intentions emphasizes the substantial impact of tailored initiatives aimed at convenience enhancement. Crafting user-friendly recycling programs aligned to nudging emerges as a potent strategy, holding the potential to significantly bolster households' recycling intentions, thereby contributing to the evolution of a more sustainable waste management paradigm.

The intricate interplay of environmental awareness, attitudes, perceived behavioural control, and norms is crucial in driving recycling behaviours. Cultivating positive attitudes taps into the psychological roots of behaviour

change, connecting with individuals' values. The significance of perceived behavioural control underscores the empowering role of self-efficacy in recycling decisions and personal agency. Simultaneously, the positive impact of perceived norms enhances communal influence on recycling intentions, emphasizing the role of social expectations. These elements collectively form a comprehensive framework for promoting sustainable practices. In this convergence of awareness, attitudes, control, and social norms, a shared commitment to recycling and environmental responsibility is inspired.

The identified synergistic relationship between perceived norms and policy inducement accentuates the collaborative impact of community norms and government policies in steering recycling behaviours. This underscores the imperative for a harmonized approach that amalgamates grassroots community influences with top-down policy interventions, thereby highlighting the catalytic role of policy support in amplifying the influence of social norms. Moreover, the revelation of attitude as a partial mediator in the link between environmental awareness and households' participation intention to recycle waste unveils the nuanced interplay of cognitive factors in recycling decisions. Attitude emerges as a crucial intermediary factor, serving to translate environmental awareness into tangible and committed recycling intentions.

In navigating the intricacies of waste management, the scholarly significance of this research lies not only in its empirical findings but also in its potential to precipitate transformative paradigms in household recycling. Discerning the symbiotic relationship between contextual and behavioural dimensions, this research serves as a foundational milestone in the trajectory towards a more sustainable future. It calls for collective endeavors, aligning

communities and policies in the pursuit of responsible waste management practices, thereby offering a substantive contribution to the academic canon and practical frameworks for sustainable waste management.

Recommendations

The study delves into the pressing issue of unsustainable waste management practices within the Accra Metropolitan Area, shedding light on critical recommendations to bring about positive change in waste management processes. A focal point of intervention lies in the urgent need to improve access to recycling facilities. This involves not only strategically placing these centers but also extending their operational hours to accommodate diverse schedules. The introduction of mobile recycling units, especially in underserved areas, is advocated to overcome accessibility challenges. Furthermore, fostering collaboration between governmental bodies and private waste management companies is emphasized to navigate financial constraints and bolster the overall effectiveness of the recycling infrastructure.

In addition to enhancing physical infrastructure, the study emphasizes the significance of compelling public awareness campaigns. These campaigns go beyond the conventional narrative of environmental benefits and extend their scope to highlight the social advantages tied to recycling. The approach involves tailoring messages to resonate with diverse demographics, leveraging influencers to amplify the reach, and integrating environmental education seamlessly into school curricula. The overarching goal is to create a comprehensive understanding of the importance of responsible waste practices. Notably, securing governmental support through well-crafted policies and

incentives, such as tax benefits for recycling, is underscored as a vital pillar to galvanize widespread public engagement and support.

Cultivating positive attitudes toward recycling is identified as a linchpin for fostering broad public participation. The proposed strategies encompass robust community engagement programs, innovative school initiatives, and impactful media campaigns, all designed not merely to convey information but to empower individuals. The suggestion of regular recycling drives, clean-up initiatives, and friendly competitions serves as a tangible means to create a sense of shared achievement and community pride. Ultimately, this holistic approach seeks to instill a profound sense of collective responsibility in waste management practices, contributing to the establishment of a more sustainable and community-driven waste management ecosystem in the Accra Metropolitan Area

In the fourth recommendation, the focus is on harnessing social norms to foster widespread community support for recycling. Proposed programs aim to go beyond awareness, actively engaging communities through healthy competition among households. The goal is to cultivate positive attitudes toward recycling, transforming it into a communal achievement. Additionally, the recommendation stresses the importance of strengthening the link between government policies and established community norms. It advocates for the formalization of waste separation schemes and community-level education, emphasizing systematic approaches at the grassroots level. This community-centric strategy aims to establish a resilient foundation for sustainable recycling practices rooted in shared responsibility and engagement.

Moreover, the integration of reverse logistics principles into municipal solid waste management is emphasized as a progressive step. This involves aligning these logistical systems with the specific needs of households, ensuring that the recycling processes are transparent and easily understood. Actively involving end-consumers in the waste supply chains is underscored, recognizing them as integral contributors to a sustainable recycling ecosystem. An innovative approach is suggested, exploring novel waste design systems that not only enhance the efficiency of reverse logistics but also make the process more appealing and convenient for end-consumers. The overall aim is to create a seamless and attractive reverse logistics network that optimally serves both households and the broader waste management objectives.

The multifaceted approach proposed aims to create a sustainable waste recycling ecosystem in Ghana, serving as a model for regions facing similar challenges. The strategy involves infrastructure development for efficient recycling facilities, policy support through incentives like tax benefits, and awareness campaigns emphasizing not just environmental but also social advantages. Attitude-shaping initiatives target individual behaviours, utilizing community engagement and media campaigns to instill a sense of responsibility. Active engagement of end-consumers is crucial, treating them as contributors to the waste supply chain. The goal is to establish a holistic and replicable framework for responsible waste management, integrating infrastructure, policies, awareness, attitudes, as well as consumer participation.

Contribution of the Study

Household participation in recycling plays a crucial role in urban sustainability, with a particular focus on the Accra Metropolitan Area. This PhD

thesis, titled "households' participation intentions to recycle waste in the Accra Metropolitan Area from a reverse logistics perspective," integrates four behavioural and rational-based theories to explore how contextual factors including access to recycling facilities, recycling convenience, policy inducement, and awareness creation interact with behavioural factors such as attitudes, environmental awareness, perceived norms, and behavioural perceived control to influence waste recycling intentions. This unique theoretical fusion and the reverse logistics perspective offer innovative insights into waste recycling dynamics. The thesis's implications span theory, policy, and practice, enhancing a comprehensive grasp of household waste recycling and informing sustainable waste management strategies, not only in the Accra Metropolis but also in similar urban contexts.

Theoretical Contribution

By integrating four complementary theories (TPB, ABC theory, CUMT and NT), the thesis advances the theoretical understanding of household recycling intentions. By this, the thesis provides a more comprehensive and nuanced framework for analyzing the various factors that influence recycling intentions. The study's focus on both contextual and behavioural factors contributes to a more holistic understanding of recycling intention and behaviour. This can serve as a model for future research, helping researchers explore similar topics in other contexts and regions. Moreover, the application of a reverse logistics perspective to the study of household recycling is a novel theoretical approach. It expands the application of this logistics concept to the field of waste management, offering a fresh perspective on how waste flows and recycling can be optimized.

Policy Implications

The research provides insights into the specific factors that influence recycling intentions in the Accra Metropolitan Area. Policymakers can use this information to design more targeted and effective interventions. For example, if a lack of recycling facilities is a significant barrier, investment in infrastructure can be prioritized. The thesis highlights the importance of awareness creation as a policy tool. Policymakers can develop campaigns to raise awareness about the benefits of recycling and the availability of recycling facilities. These campaigns can be designed to align with the theoretical insights regarding attitudes and norms. Understanding the impact of policy inducements on recycling intentions can guide the design of incentives and regulations. This can include financial incentives, tax breaks, or other policies that encourage households to recycle waste.

Practical Implications

Municipal authorities and waste management agencies can use the findings to enhance their recycling programs. This may involve optimizing the location and accessibility of recycling facilities, streamlining collection systems, and tailoring educational campaigns to promote recycling. Practitioners can engage with local communities to promote environmental awareness and create a culture of recycling. This can involve working with schools, community organizations, and local leaders to foster a sense of environmental responsibility. By improving household recycling intentions, practical implications may include reducing the volume of waste sent to landfills, leading to cost savings and environmental benefits. Practitioners can use the empirical insights generated by the study to inform data-driven decision-

making. This can help in resource allocation, program evaluation, and the continuous improvement of waste management practices.

Limitation of the Study

The limitations of this thesis encompass its scope and methodology. The research exclusively focused on the Accra Metropolitan Area, Ghana's primary urban center, thus restricting its generalizability to other regions. With a sample size of 385 households, the study may not have fully captured the diversity of the entire study area, potentially limiting the broader applicability of its findings. Moreover, the reliance on a quantitative approach precluded the collection of qualitative data, which could have offered valuable insights into how households in this area manage their waste, thus representing a significant methodological constraint. Consequently, the research's conclusions primarily pertain to urban communities, thereby limiting their relevance to rural areas within Ghana.

Another limitation of the thesis lies in the measurement of household intentions for waste recycling, which heavily relies on self-reporting. Despite rigorous efforts to elicit accurate responses, this approach could introduce biases into the data. Consequently, some studies opt for an alternative method: assessing respondents' behaviour through independent observation. Observation has proven valuable as a data collection technique in various pro-recycling research endeavours, encompassing aspects such as indiscriminate disposal and waste segregation. This method becomes particularly advantageous when there is a need to compare individuals' stated intentions with their actual actions. However, it is important to acknowledge that achieving reliable results through observation typically requires smaller sample sizes.

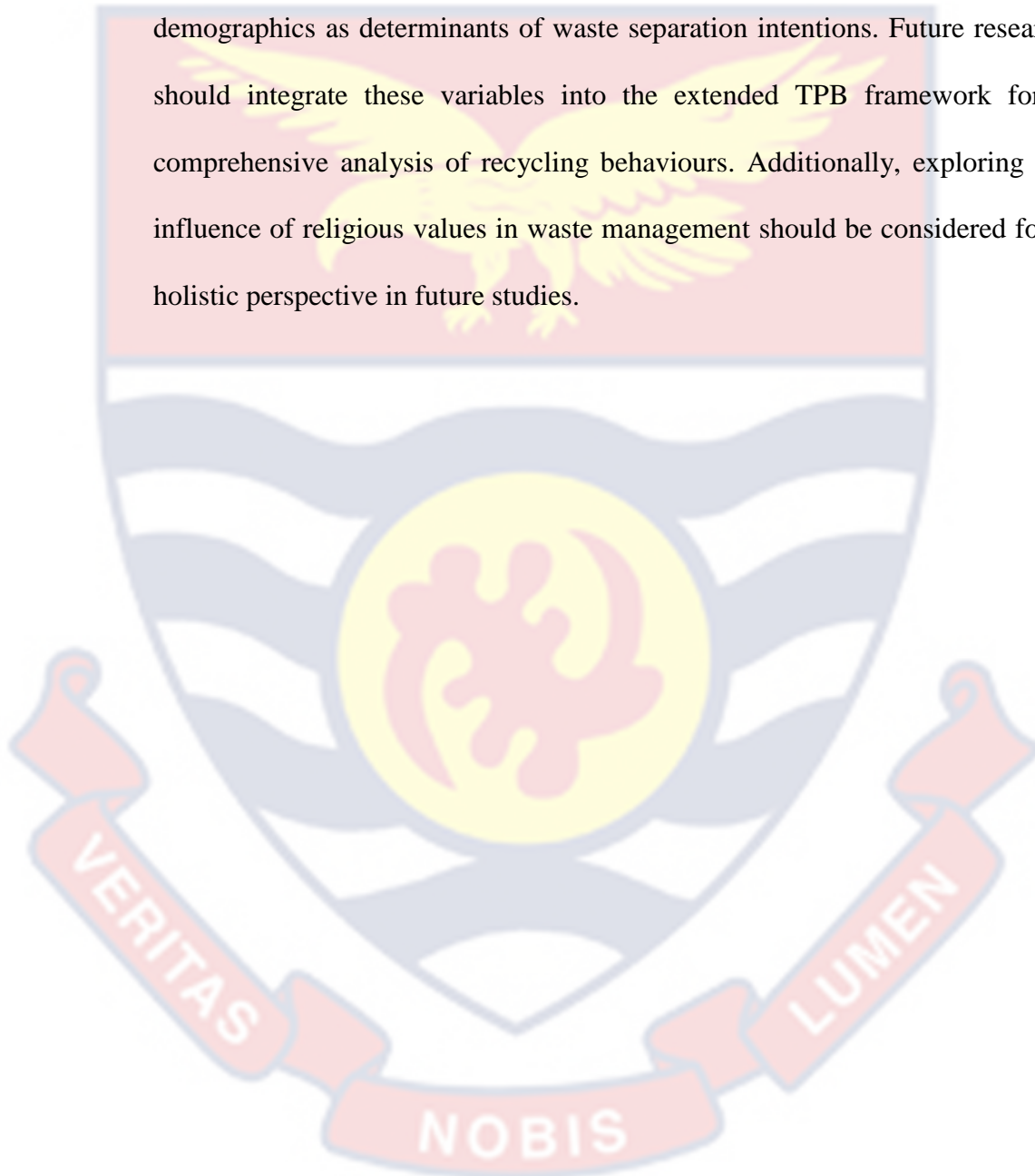
Also, one other notable limitation in this study pertains to the utilization of field support staff for translating certain questions, potentially introducing an element of influence on the study participants. However, this approach was deemed the most effective means of addressing the language barrier. It is essential to note that precautions were taken to mitigate any potential impact on the study's findings stemming from the administration of questionnaires by field assistants. Additionally, because the study relied on structured, closed-ended questionnaires, respondents had limited scope to provide in-depth information. The inability to control the social context, owing to the questionnaire-based approach, may have also exerted an influence on the study's outcomes.

Moreover, an important limitation of this thesis lies in the potential influence of respondents' circumstances and the timing of questionnaire delivery on their responses. It is plausible that the reactions of participants may have been influenced by their immediate situations, introducing the possibility of response bias and potentially impacting the study's findings. The collection of data pertaining to pro-environmental intentions relied on a single instrument, raising concerns about the presence of social desirability bias. Nevertheless, in order to ensure a comprehensive assessment of intentions, the study rigorously followed the TPB's TACT (time, action, context and target) technique to mitigate potential biases and enhance the reliability of the collected data.

Suggestions for Further Research

This study rigorously examined household waste separation intentions and provided vital policy recommendations. However, it has limitations, as it relies on a cross-sectional survey, establishing correlations but not causation. To overcome this, future research should use experimental methods to assess

the extended TPB model's impact on actual recycling behaviour. Expanding the sample diversity in Ghana, covering both urban and rural areas, is essential for better generalizability and this should also be considered in future research endeavours. The study did not consider factors like moral obligation and demographics as determinants of waste separation intentions. Future research should integrate these variables into the extended TPB framework for a comprehensive analysis of recycling behaviours. Additionally, exploring the influence of religious values in waste management should be considered for a holistic perspective in future studies.



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APPENDICES



UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL

STUDIES

SCHOOL OF BUSINESS

A Questionnaire

Dear Respondent,

I write to invite you to share your opinions on the topic. **“Households Participation Intentions in Waste Recycling: A Reverse Logistics Perspective”**.

It may take you about 25 minutes to answer the complete questionnaire. By answering these questions honestly, you will making a significant contribution to the success of this study and the advancement of knowledge. Your views are strictly anonymous, and participation is voluntary. If this research is published, no information provided will be identifiable to you since only aggregated data will be reported in this study.

The study's findings are expected to have implications for the Ghana's municipal solid waste management, as well as the design of reverse flow systems by local authorities, service providers and households as suppliers of waste for recovery and recycling. I would appreciate it if you could complete the questionnaire within a week. Should you need further clarification on the questionnaire, its

purpose or if you wish to be informed on the results of the study, contact me at 0267420241/0207420241 or jacobdapilah@gmail.com

Thank you for your valuable time and inputs.



August 2020.

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender		2. Highest Educational Level Completed						3. Age
1. Male	2. Female	1. No Formal Education	2. Primary School	3. Middle School JSS/JHS	4. SSS / SHS	5. Artisan/ Vocation Certificate	6. Technical/ Vocational Diploma	7. Tertiary

4. Working Status			5. Occupation
1. Employed	2. Not Working	3. Unemployed	

6. Annual Income Status (GHC)					
1.Up to 4,255	2.Over 4,255 to 6,255	3. Over 6,255 to 10,255	4. Over 10,255 to 30,255	5. Over 30,255 to 250,000	6. Above 250,000

7. Housing Type			
1. Detached	2. Semi-detached	3. Flats	4. Compound

8. Family Size					9. Marital Status			
2	3	4	5	Above 5	Married	Widowed	Divorced	Not Married

SECTION B: PAST DISPOSAL BEHAVIOUR AND KNOW-HOW

11. What are some of the waste materials you generate at home?

1. Organic/food [] 2. Plastic [] 3. Paper [] 4. Glass [] 5.
Metal [] 6. Others []

12. Have you separated your waste before?

1. Never [] 2. Sometimes [] 3. Always []

13. Do you have waste dustbin?

1. Yes [] 2. No []

If 'Yes' answer questions 14 and 15. If 'No' continue from question 16

14. How did you acquire it?

1. Myself [] 2. Given by Assembly []

15. Who comes to collect your waste?

1. Registered waste collectors [] 2. Unregistered waste collectors [] 3.
Myself []

16. How do you dispose of your waste?

1. Community collection center [] 2. I burn it [] 3. I throw it away []

17. How often do you dispose of your waste?

1. Daily [] 2. Weekly [] 3. Monthly []

18. Are you satisfied with the current waste collection services offered?

1. Yes [] 2. No []

SECTION C: CONTEXTUAL FACTORS

Please indicate the degree of your agreement with the following statements by **ticking** (✓) or **circling** the appropriate box against each statement in the table below where:

1	2	3	4	5	6	7
Completel y Disagree	Disagre e	Somewha t Disagree	Neutra l	Somewha t Agree	Agre e	Completel y Agree

Part 1: Access to recycling facilities

. I have access to a convenient waste collection centre where I can properly dispose of my waste

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. Having a convenient collection centre encourages me to properly dispose of my waste

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. Separating my waste from the other waste will not bother me if I have access to waste containers for that purpose

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. The distance to the waste disposal containers is of much concern to me.

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. The location of waste disposal containers is of much concern to me

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. Availability of waste bins alone is sufficient to facilitate my waste separation

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

Part 2: Convenience

- . I have enough space to keep my waste till the collectors come for it

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

- . The use of a single dustbin/waste container by multiple households is a bother to me

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

- . The frequency of waste collection is very important factor in my waste disposal

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

- . The ability to reach out to waste collectors via a communication channel is important

Completely disagree [1] [2] [3] [4] [5] [6] [7] **Completely agree**

- . Cleaning and maintenance of waste containers and collection centres is a hygiene issue

I consider important

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

- . Waste left to rot due to late collection is a major issue that bothers me

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

- . Clear guidelines on the role I should play in recycling waste is necessary to me

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

Part 3: Awareness Creation

. Community-driven campaigns can clearly explain the benefits of waste separation.

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely**

Agree

. Public engagement to create environmental awareness is important to me

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely**

Agree

. To me there is enough awareness creation of environmental issues in my area

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely**

Agree

. I am aware of a community awareness campaign in my area to educate us on the benefits of waste recycling

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely**

Agree

. Knowing the environmental impact of not recycling is important to me

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely**

Agree

. Community-driven separation campaigns can effectively improve waste separation awareness of residents

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely**

Agree

Part 4: Policy Inducement

. The pay as you dump your waste policy is good to me

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. The charges/fees I pay for disposing of my waste is reasonable

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. Being paid a little money for separating my waste will encourage me to always do the right thing

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. Rules and regulations on waste recycling will compel me to separate my waste for recycling if available

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. I will comply with rules and regulations on waste recycling if they are available

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

. I am willing to pay more for improved waste management facilities

Completely Disagree [1] [2] [3] [4] [5] [6] [7] **Completely Agree**

SECTION D: BEHAVIOURAL FACTORS

Please indicate the degree of your agreement with the following statements by **ticking** (√) or **circling** the appropriate box against each statement in the table below where:

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree

Part 1: Attitude

. Engaging in proper waste disposal makes me feel environmentally responsible

Strongly Disagree	[1]	[2]	[3]	[4]	[5]	[6]	[7]	Strongly Agree
--------------------------	-----	-----	-----	-----	-----	-----	-----	-----------------------

. For me to contribute to making this city clean is good

Strongly Disagree	[1]	[2]	[3]	[4]	[5]	[6]	[7]	Strongly Agree
--------------------------	-----	-----	-----	-----	-----	-----	-----	-----------------------

. Recycling waste is beneficial to society

Strongly Disagree	[1]	[2]	[3]	[4]	[5]	[6]	[7]	Strongly Agree
--------------------------	-----	-----	-----	-----	-----	-----	-----	-----------------------

. Being environmentally responsible is important for me

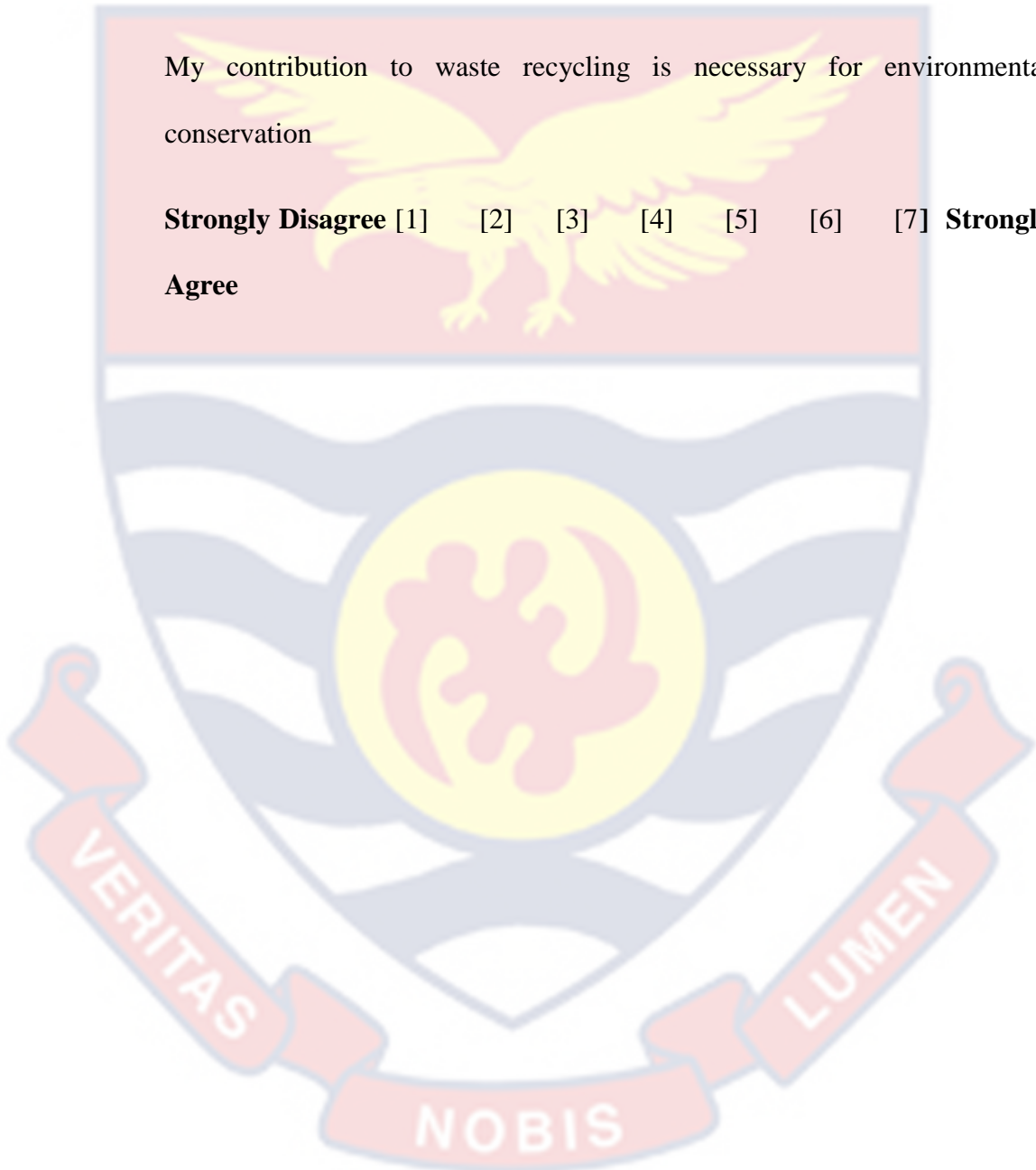
Strongly Disagree	[1]	[2]	[3]	[4]	[5]	[6]	[7]	Strongly Agree
--------------------------	-----	-----	-----	-----	-----	-----	-----	-----------------------

. Waste separation for recycling helps to protect the environment and conserve natural resources

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly Agree**

My contribution to waste recycling is necessary for environmental conservation

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly Agree**



Part 2: Environmental Awareness

. I am concerned about environmental pollution caused by waste

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

. I am worried about air pollution from the burning of waste

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

. It is not good to see waste all over the environment in town

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

. I am worried about future environmental problems caused by improper waste disposal

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

. I often think about how environmental quality can be improved

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

. I know that improper waste disposal is harmful to the environment

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

. I know that indiscriminate waste disposal can block gutters and water ways

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

. Waste is a major cause of flooding during heavy rainfalls

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

Waste pollution is a major cause of the spread of many diseases

Highly False [1] [2] [3] [4] [5] [6] [7] **Highly True**

Part 3: Perceived Norms

. My family members will expect me to separate my waste for recycling purposes.

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly Agree**

. My neighbours will expect me to segregate my waste for recycling purposes.

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly Agree**

. For purposes of recycling, my family members will be willing to separate

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly Agree**

. For purposes of recycling, my neighbours will separate their waste into the various fractions.

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly Agree**

. Most people who are important to me would think that I should separate my waste for recycling purposes.

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly Agree**

. Most people like me would separate their waste from the waste stream for recycling purposes.

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly Agree**

Part 4: Perceived Behavioural Control

- . Getting knowledge of the different components of the solid waste stream will enable me to appropriately separate my waste for recycling purposes.

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly**

Agree

- . I have the ability to know the different components of the solid waste stream.

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly**

Agree

- I have enough knowledge on proper waste management practices

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly**

Agree

- . I am confident that I can separate recyclable waste from the waste stream for recycling purposes.

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly**

Agree

- . I have the resources and opportunity to acquire dustbins for waste recycling purposes

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly**

Agree

- . The ability to separate waste at home for recycling purposes is under my control

Strongly Disagree [1] [2] [3] [4] [5] [6] [7] **Strongly**

Agree

SECTION F: RECYCLING INTENTION

Please indicate the degree of your agreement with the following statements by **ticking** (✓) or **circling** the appropriate box against each statement in the table below where:

	1	2	3	4	5	6	7	
	Definitely Will Not	Will Not	Somewhat Will Not	Neutral	Somewhat Will	Will	Definitely Will	
. I intend to separate my waste from the waste stream at home for recycling purposes when the time comes.	Definitely Will Not	[1]	[2]	[3]	[4]	[5]	[6]	[7] Definitely Will
. I plan to separate my waste from other waste at home for recycling purposes when the time comes.	Definitely Will Not	[1]	[2]	[3]	[4]	[5]	[6]	[7] Definitely Will
. I am willing to separate my waste from the waste stream at home for recycling purposes when the time comes.	Definitely Will Not	[1]	[2]	[3]	[4]	[5]	[6]	[7] Definitely Will
. I intend to recycle if I am made aware of the specific waste components to separate for recycling	Definitely Will Not	[1]	[2]	[3]	[4]	[5]	[6]	[7] Definitely Will



LAND USE AND SPATIAL PLANNING AUTHORITY (LUSPA)
 HEAD OFFICE
 POST OFFICE BOX MB 61
 MINISTRIES - ACCRA

Reference No.....A/TRNG/04/Vol.1

10th June, 2019

MR. JECOB DAPILAH
 DEPT OF MARKETING AND
 SUPPLY CHAIN MANAGEMENT,
 UNIVERSITY OF CAPE COAST
 CAPE COAST

**RESEARCH ON “DRIVERS OF HOUSEHOLDS INTENTION
 TO RECYCLE PLASTIC WASTE IN GHANA”**

Reference is made to the letter of introduction from the Head of Department of Marketing and Supply Chain Management dated 3rd June, 2019 on the above subject matter, a copy of which is attached for your ease of reference.

The Land Use and Spatial Planning Authority (LUSPA) would not be in a position to provide you with the information you would require for your research directly, but could link you up with the relevant institution(s) to collect the data.

Could you therefore liaise with the Regional Directors of the Authority at the regions where the selected pilot cities are located, to discuss your data requirements with them to enable them link you up with the appropriate institution(s).

In view of the relevance of your research to Land Use and Spatial Planning and the Management of Human Settlements, it would be appreciated if you could share the output of your research with the Authority.

By copy of this letter, the Regional Directors of LUSPA for the Greater Accra, Ashanti, Western, Central, Brong Ahafo and Northern Regions are kindly requested to provide the necessary assistance to the student, please.


 L. Z. DAKURAH
 CHIEF EXECUTIVE OFFICER

cc: The Regional Director
 Land Use and Spatial Planning Authority,
 Greater Accra, Ashanti, Western, Central,
 Brong Ahafo, Northern Regions.

(NAME OF DEPARTMENT)

Office Address:
 Land Use and Spatial Planning Authority,
 Head Office,
 Block D Service Drive,
 Ministries Area - Accra

+233 (0) 302 682 052
 +233 (0) 302 682 060
 +233 (0) 302 671 091

 www.luspa.gov.gh
 info@luspa.gov.gh

UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

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OMB NO: 0990-0279
IORG #: IORG0009096

15TH MARCH, 2021

Jacob N. Dapilah
Department of Marketing and Supply Chain Management
University of Cape Coast

Dear Mr. Dapilah,

ETHICAL CLEARANCE – ID (UCCIRB/CHLS/2020/49)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted **Provisional Approval** for the implementation of your research titled **Reverse Logistics Service Elements and Household Plastic Waste Recycling Intentions: The Role of Environmental Awareness and Attitudes**. This approval is valid from 15th March, 2021 to 14th March, 2022. You may apply for a renewal subject to submission of all the required documents that will be prescribed by the UCCIRB.

Please note that any modification to the project must be submitted to the UCCIRB for review and approval before its implementation. You are required to submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

A handwritten signature in black ink, appearing to read 'S. Asiedu Owusu'.

Samuel Asiedu Owusu, PhD
UCCIRB Administrator

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST