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## Attitudinal, habitual and behavioral modeling for waste disposal interventions: A precondition for sustainable waste management system

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### Abstract

Over the last decade, solid waste generation in the world has increased conspicuously. However, the waste management system in most of developing countries is either absent or far from satisfactory. Considerable amount of waste is left uncollected, as well as intentionally disposed of in public and private open spaces. The study highlights role of emotional, psychological, relational, norms as well as individual and group attitude on waste disposal undertakings. The study is anchored on three theories; Ajzen and Fishbein theory of reasoned action (TRA), Ajzen theory of planned behavior and Schwartz norm activation model. This paper uses qualitative meta-analysis research methodology, a comprehensive systematic review of the literature thereby highlighting the main themes and results from the existing literature. The study findings indicate that waste disposal attitude and behavior is deeply rooted in daily relationships and routines, which result into habits, assumed to be predictors of repeated waste disposal practices.

**Keywords:** Waste disposal, waste disposal behaviors, waste disposal attitude, waste disposal interventions, sustainable waste management system

### 1. Introduction

Environment protection has become a buzz word for everyone from the young to the old, from environment activists to dilettante, and from government to government. Surveys of public opinion identify a population concerned about the quality of the environment including waste management, but few people take individual actions that would help to safeguard or enhance the beauty and cleanliness of their environment (Drury, 2003; Davies *et al.*, 2005; Blackman, 2008; Ofstad, 2017) <sup>[1, 2, 3, 4]</sup>. Recent high levels of population growth, economic growth and consumption in the world have led to increasing pressures on the environment. The growing volume of waste being produced is a particularly visible manifestation of these processes (Srun and Kurisu, 2019) <sup>[5]</sup>. As a consequence, the effective disposal of waste in the world has become increasingly important for the governments, activists, policy-makers', householders and individuals (Davies, 2005) <sup>[2]</sup>.

Waste disposal interventions are the activities and actions required to manage waste from its inception to its final disposal, reuse or recycling (Davies *et al.*, 2005; Walker and Boyer, 2005; Ojedokun and Balogun, 2013) <sup>[2, 6, 7]</sup>. Similarly, Pugot (2017) <sup>[8]</sup> indicates that waste disposal intervention can be defined as any undertaking or method used to reduce amount of waste we make, reusing by finding a new way to use trash so that it does not have to be disposed out, recycling by using the waste to remake new goods that can be used again or discard the unwanted substances or materials altogether. Additionally, Pugot (2017) <sup>[8]</sup> observes that poor waste disposal activities engender severe environmental problems on a location. Waste disposal intervention includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process (Tchobanoglous 1993; Kum *et al.*, 2005; Seng *et al.*, 2010; Stoeva and Alriksson, 2017) <sup>[9, 10, 11, 12]</sup>. The goal of waste disposal is to reduce adverse effects of waste on the environment or aesthetics and human health through; 1) prevent the production of waste; 2) promote reuse of waste; 3) promote biological recovery of waste, reuse and recycling of materials; 4) promote energy use of waste not suited for recycling and; 5) ensure that the treatment and disposal of waste does not cause any harmful impacts (Chasek *et al.*, 2000; Sreenivasan *et al.*, 2012; Facts, 2017; Mintz *et al.*, 2019) <sup>[13, 14, 15, 16]</sup>.

Waste disposal attitude and behavior is a generic term covering intention and actual littering, reduction, reuse and recycling practices, which are intertwined and used in the same context of environment protection (Dobbs, 1991; Srun and Kurisu, 2019) [17, 5]. Previous studies have been carried out to investigate and apply strategies to reduce environmental pollution. These surveys have included indicators such as factor that influence waste management and levels of waste recycling (Nishio and Takeuchi, 2005; Thøgersen, 2006; Grønhoj and Thøgersen, 2012; Matthies *et al.*, 2012) [18, 19, 20, 21], factors of waste reduction and reuse (Nguyen *et al.*, 2019; Matthies *et al.* 2012; Davies *et al.*, 2005) [52, 21, 21] and factor of waste littering (Al-Khatib *et al.*, 2009; Schultz *et al.*, 2013; Srun and Kurisu, 2019) [22, 23, 5] but there has been limited in-depth analysis of waste disposal attitude and behaviour modeling in more broader terms. This paper is a synthesis of previous study findings that sought to address this gap.

### 1.1 Attitude and behaviour towards waste disposal and management: A paradigm shift.

As population increases, production and consumption of goods increase as well (Davies *et al.*, 2005; Srun and Kurisu, 2019) [2, 5]. Consequentially, a growing volume of waste is generated. The populace is aware of the many challenges associated with waste production and the possible behavioural and policy approaches to meet those challenges (Davies *et al.*, 2005; Niaura, 2013) [2, 24]. However, according to Davies *et al.* (2005) [2] few of the populace recognizes the role of individual and group consumption and waste disposal patterns in producing increasing volumes of waste and the resultant poor waste management especially in the developing countries. Also, proper consumption patterns and waste management depends not only on the external factors such as laws, policies, insufficient facilities and failure of the government to collect refuse but also the populace internal factors such as individual and group attitudes, habits and behaviour (Niaura, 2013; Srun and Kurisu, 2019) [24, 5]. Thus, to achieve suitable sustainable waste disposal practices, there must be a shift from focusing only on waste management external factors, but also understanding people's internal conditions that shape their behaviour towards disposal and management of waste (Thondhlana and Hlatshwayo, 2018) [25].

An individual or group waste disposal attitude results to a habit which consequently results to a behaviour. For example, Ojedokun and Balogun (2013) [7] asserts that the populace has a natural aversion for littering which is a positive waste disposal attitude and could lead to a decision of not to litter. Nevertheless, Ojedokun and Balogun (2013) [7] observed that the populace still litter, might be because littering is an involuntary and repetitive behaviour or may be people repeat the littering behaviour probably because it is easy, and convenience. However, people might differ on their attitude towards waste disposal. A number of approaches to predict behaviour in the peer reviewed literature are based on the assumption that behaviour is either a product of the individuals' psychological processes (Clark *et al.*, 2000; Biel, 2003; Drury, 2003; Milfont, 2007) [26, 27, 1, 28] or the sociocultural context (Davies, 2002, 2003; Taberner *et al.*, 2015; Xu *et al.*, 2017) [29, 30, 31, 32].

On the one hand, proponents of individuals' psychological approach to waste disposal behaviour argue that personality

traits are conceived as stable and relatively permanent, nonetheless, behaviour and attitude will be consistent from one situation to another (Ojedokun and Balogun, 2013) [7]. Therefore, this perspective carries an implicit assumption of individuals as isolated agents independent of the social structure. On the other hand, advocates of socio-cultural context approach studies behaviour and attitude as largely being determined by situational factors external to the individual for example, economic status, urban planning, institutional and legal policies, and social practices (Ojedokun and Balogun, 2013) [7] thus, will vary considerably across situations. This implies that the latter perspective sees individuals being heavily influenced by external forces beyond their understanding or control.

The main focus of the study is in-depth analysis of attitudes towards, habits for and behaviour in relation to waste disposal practices. The study analysis attitude, habits and behaviour (negative, passive or proactive) in relation to waste disposal in the context of relationships (influenced behaviour), personality (intrinsic behaviour), practicality (extrinsic behaviour), responsibility (intrinsic behaviour) and culture (influenced behaviour). For this purpose, the present study has been organized in five sections. Section 1 explains the introductory part, Section 2 describes the research design of the study comprising its objectives and methodology, Section 3 reviews the previous literature while Section 4 presents the analysis and findings of the study. Lastly Section 5, describes recommendations and implications of the study.

## 2. Research design

### 2.1 Objectives of the study

In this present study, an attempt was made to explore the diverse literature available on the attitudes, habits and behaviour towards waste disposal undertakings worldwide but focusing more on the context of developing countries. The specific objectives of the study are:

1. To identify the significant constructs which capture attitude, habits and behaviour of individuals and groups towards waste disposal and ultimately lead to positive or negative waste disposal practices.
2. To understand the trend of various research aspects prevailing in the field of environment protection related to waste disposal practices as shaped by individuals and group attitude, habits and behaviour through scholarly research articles.

### 2.2 Methodology

In order to review the relevant literature, research papers have been collected from the refereed journals related to environment protection through waste disposal practices, and internal factors that trigger waste disposal habits.

The criteria followed for selecting the articles as empirical support for this study is as follows:

1. The articles which explore the factors influencing waste disposal practices by individuals or groups.
2. The articles in which Ajzen and Fishbein theory of reasoned action (TRA), Ajzen theory of planned behaviour and Schwartz norm activation model have been used to explain waste disposal attitude and behaviour and other additional internal factors driving the habits towards waste disposal and management.

Qualitative approaches to study these scholarly papers have been used in order to analyse and compare their main

findings and applicability of the academic papers. According to Reiter (2017) [33] qualitative method is always useful for inductive and exploratory research as it leads to the understanding of phenomenon and theory generation particularly where human behaviour and functions are concerned. Using an interpretative and critical approach through content analysis of the studies reviewed, the important measures through analyzing the papers research methodology, sample, delimitation, respondent profile, theory and model applied as well as study constructs were taken into account for further inquiry. This study builds up a strong conceptual framework for the researchers by thoroughly analyzing the empirical studies which further links individual and group attitude, habits and behaviour towards waste disposal and management to practical implications.

### Theoretical underpinning

Ajzen and Fishbein theory of reasoned action (TRA), Ajzen Theory of planned behavior (TPB) and Schwartz norm activation model were used to examine attitude and behavioral towards waste disposal. Ofstad *et al.* (2017) [4] noted that a key implication of past studies applying these theories is that they focus on one facet of a theory and underestimate the other aspects consequently, one model that fits to one specific situation might not be applicable to another situation. For example, TRA emphasizes on person's intention to perform a behavior and ignores perceived behavioural control. On the other hand, TPB focuses on intention and behavioural control and disregards personal norms, while NAT focuses on personal norms but underestimates the role of situational constraint. Thus in order to better understand waste disposal behaviour and attitude it was paramount to use a combination of the three theories.

The main feature of Ajzen and Fishbein theory of reasoned action (TRA), Ajzen theory of planned behavior and Schwartz norm activation model is behavioral intentions which are identified as the central elements to predict the actual individual or group behavior. Behavioral intention can be described as individual's perceived likelihood that he or she will engage in a given behavior. In this study, waste disposal habit and behavior refers to a socially-conscious habit or behavior which is based on individual or group attitude and social responsibility. It involves individual and social aims that a person wants to achieve by behaving in a particular way towards waste disposal undertaking. Due to waste disposal undertaking diverse processes, levels, laws and stakeholders involved, environmentally friendly habit or behavior can be rather complex (Barr and Gilg, 2007) [34]. Thus, TRA, TPB and NAM were employed in this study to simplify the understanding of attitude, habit and behaviour towards waste disposal.

Theory of Reasoned Action (TRA) was propounded by Ajzen and Fishbein (1969) [35]. The theory suggested that *behaviour* was defined by *intention*, which was in turn determined by *attitude* toward the *behaviour* and *subjective norms*. According to Carrera (2012) [36], *intention* is a mental condition that represents an obligation to carry out an action or actions in the future. *Attitude* refers to the opinion or feeling about something or someone, or a way of behaving. Perloff (2016) [37] indicated that *attitude* is the degree that an individual or a group value the behavior positively or negatively. *Subjective norms* are the perceived social

pressure from those an individual is close to, such as family, colleagues, and friends, regarding whether to engage in the behaviour or not (Ham *et al.*, 2015) [38]. TRA model implies that if a person valued a behaviour positively and perceived that their friends, colleagues, and/ or family envisaged them to perform the behavior, they would aim and strive to perform the behaviour.

However, although many research findings agree with this theory for example (Park *et al.*, 2009; Trafimow, 2009; Niaura, 2013) [39, 40, 24], it has also received a great deal of criticism for its assumption that people's behavior is determined solely by their intention and external influence (Smedslund, 2000; Greve, 2001; Ogden, 2003) [41, 42, 43]. Such critiques noted that the model applies only when the behavior is under voluntary control. Consequently, Ajzen (1991) [44] introduced another theory to predict people's behavior; the theory of planned behavior (TPB). This theory, a revision of the controversial TRA, introduced one more predictor in the model, perceived behavioral control (PBC), which determines intention and behavior. PBC signifies how much the intended behaviour can be controlled by an actor himself/herself. For example, to litter or not to litter, to reduce or not to reduce, to reuse or not to reuse, and to recycle or not to recycle. Inversely, TPB has been applied widely to waste-related behaviors such as recycling (White *et al.*, 2009; Chan and Bishop, 2013) [45, 46] and waste prevention behaviour (Tucker and Douglas, 2007; Bortoleto *et al.*, 2012) [47, 48].

Schwartz (1977) [49] introduced the norm activation model (NAM), a vested model that explains philanthropic and environmentally friendly behaviour. According Srun and Kurusu (2019) [5] NAM explained that the activation of personal norms is an important process in determining humane behavior. Thus, NAM is associated with the anticipated pride and guilt that cause individuals or groups to behave themselves in a manner that is in line with personal norms. Personal norms are the expectations people hold for themselves regarding whether they should or should not perform a certain behavior (Onwezen *et al.*, 2013) [50]. Further, the model also explains that personal norms are created through individual internalization of social norms (Thøgersen, 2006) [19]. Schwartz (1977) [49] averred that moral norms, such as respect for the health, comfort and propriety of others, would be expected to influence environmentally friendly related behavior.

### Empirical studies relating to attitude and behaviour on waste disposal ventures

The dynamics of interventions related to waste disposal and management are of particular interest for the overall discussion around the sustainable environment protection strategies as most players believe that there is a new dispensing where the waste disposal and management must be looked at not only from laws and policies point of view but from individual and group attitude and behaviours that result to actions (Hornik *et al.*, 1995; Nguyen *et al.*, 2019; Srun and Kurisu, 2019) [51, 52, 5]. The increasing awareness of waste and concern about its negative effects if not well managed has led to a wide range of studies aimed at understanding factors that may affect waste disposal behavior.

Srun and Kurisu (2019) [5] carried out a quantitative questionnaire survey to examine the influence internal and external factors on people's intention not to dispose of waste

in public open spaces. The study was carried out in four sites in Phnom Penh, Cambodia that differed in waste collection frequency and population density. The study obtained 413 valid responses from survey questionnaires and developed a structural equation model to explain people's intentions not to dispose of waste in public open spaces. The results showed that individual and shared norms, such as perception of social pressure from family, colleagues, friends, and the government, had significant influence on intention not to dispose of waste in public open spaces, whereas the influence of external factors such as low collection frequency, low cleaning services, and insufficient facilities such as small dumpsters was much smaller. These results collaborated the findings of other studies that indicated that attitude and personality had a high correlation with behaviour and actions towards waste disposal and waste management systems (Arbuthnot, 1977; Eagly and Chaiken, 1993; Davies *et al.*, 2002; Tabernero *et al.*, 2015; Thondhlana and Hlatshwayo, 2018)<sup>[53, 54, 29, 31, 25]</sup>.

Nguyen *et al.* (2019)<sup>[52]</sup> in their study anchored on the theory of planned behavior (TPB) employed the structural equation modeling (SEM) to examine the key factors influencing e-waste recycling behavioral intention of residents in Danang city, Vietnam. Data was analyzed from 520 questionnaires on five constructs which included; environmental attitude and awareness towards recycling aspects (cost and inconvenience), social pressure as well laws and regulations. The study findings indicated that laws and regulations had the strongest influence on individuals' e-waste recycling intention with inconvenience of recycling having a negative impact on residents' recycling behavioral intention. The results validated other studies that inferred that individuals behaviour is subject to the law of nature (Edgerton *et al.*, 2009)<sup>[55]</sup> as well as law of the land (Xu *et al.*, 2017; Conke, 2018)<sup>[32, 56]</sup>. As such, a person's intention to behave is controlled by individual's attitude can be attributed to individual's perception of the external factors that affect waste disposal.

Strydom (2018)<sup>[57]</sup> applied the theory of planned behavior (TPB) to evaluate and understand the relationships between the latent variables in the theory of planned behavior variables. Data was collected from South Africa large urban areas (n = 2004) and analyzed the data using Structural Equation Modeling (SEM). The results of the SEM analysis indicated a suitable fit of the survey data to the theory of planned behavior model. According to the study, TPB explained 26.4% of the variance in recycling behavior and 46.4% of the variance in intention to recycle. While only 3.3% of the respondents in large urban areas showed committed recycling behavior, where the recycling of five materials: plastic, paper, metal, glass, and compostable organic waste was considered. The study inferred that lack of sufficient knowledge, positive attitudes, social pressure, and perceived control that would encourage recycling behavior lacked among the respondents. The study recommended environmental related awareness drives containing moral values (injunctive norms) and information about existing recycling schemes, combined with the provision for recyclables services, had the greatest chance to positively influence recycling behavior amongst the target population. While the TPB may not fully explain the attitude and behaviour towards waste disposal, it has been broadly used in waste management domain (Trumbo and

O'Keefe, 2001; Davies *et al.*, 2002; Ioannou *et al.*, 2011; Chan and Bishop, 2013; Wang *et al.*, 2016)<sup>[58, 29, 59, 46, 60]</sup>

Xu *et al.* (2017)<sup>[32]</sup> carried out a study aimed at investigating key determinants influencing household waste separation intention and behaviour. Grounded on the theory of planned behaviour (TPB), a survey questionnaire was employed taking in to account variables such as subjective norm, moral obligation, residents' attitude, perceived behavioural control, past behaviour, and demographic factors. The study employed 628 survey questionnaires with the study population being households in the city of Hangzhou, China. For data analysis, the partial least squares structural equation modelling (PLS-SEM) was conducted to assess the effectiveness of each construct in relation to waste separation intention and behaviour. The results indicated that all the constructs significantly predicted household waste separation intention behaviour, with past behaviour being the most significant predictor. The study also tested the moderating effect of different kinds of individuals' demographic characteristics in terms of their ages, genders, income levels and perceived policy effectiveness, to further evoke household waste separation behaviour was carried out. The findings suggested formulation of intuitive future policies that could focus on peoples' habit formation by encouraging market-driven recycling programs, providing the convenient location of waste separation, disposal and collection facilities, promoting community education and campaigns. The study implied that intuitive policies could help residents to form favourable habits for sustaining and protecting the environment.

Other studies that validated the effectiveness of waste policies or programs on individual and citizens' habitual changes included; curbside recycling and environment education (Sidique, 2010; Grazhdani, 2016; Kirakozian, 2016)<sup>[61, 62, 63]</sup>; effectiveness of refundable deposit policy in the case of illegal dumping (Dinan, 1993; Babaei *et al.*, 2015)<sup>[64, 65]</sup> and public private partnership (PPP) programs for waste separation and disposal to promote the waste reuse and reduction (Scheinberg *et al.*, 2011; Nzeadibe and Anyadike, 2012; Sternberg, 2013)<sup>[66, 67, 68]</sup>.

Stoeva and Alriksson (2017)<sup>[12]</sup> carried out on waste separation behaviour of 111 university students from Kalmar, Sweden and 112 students from Plovdiv, Bulgaria. Using the Theory of Planned Behaviour framework, the study aimed at assessing how recycling programmes in Sweden and Bulgaria influenced inhabitants' participation in separation of household waste. The results indicated that a lack of proper conditions for waste separation prevented individuals from participating in this process, regardless of their attitudes. When respondents were satisfied with the local conditions for waste separation, then their behaviour was subject to their personal attitudes towards waste separation and recycling. A study by Wadehraa and Mishrac (2018)<sup>[69]</sup> substantiated these findings and deduced that interventions such as a combination of information and economic incentives played a critical role in inducing the households to segregated at source and was effective in changing household waste disposal behaviour. Similarly, (Starr and Nicolson, 2015)<sup>[70]</sup> indicated that accessibility and convenience of the recycling schemes were key factors in the up-take of segregation of waste. To achieve greater efficacy in behavioural change towards recycling and segregation of waste, Miliute-Plepiene *et al.* (2016)<sup>[71]</sup>

recommended use of positive social norms in combination with simple instructions.

Equally, Ofstad *et al.* (2017) <sup>[4]</sup> using a comprehensive action determination model (CADM) carried out a questionnaire survey study to evaluate the mechanisms behind changing people's recycling behavior at work by mapping the pathways and variables that change in recycling behavior as triggered by interventions. Using a sample of  $n = 1269$  students and employees the study data was collected in two series: before the intervention and after a three-month pilot period after interventions were implemented. The study indicated that the most important psychological variables accounting for waste separation behaviour at the workplace were personal norms, social norms, habits intentions, and perceived behavioural control. Interventions targeting the increase in waste separation through awareness campaigns raised participants' intentions to engage in such behaviour. The study recommended that waste separation at work must go beyond technical aspects to include various key elements of sustainability to ensure success. Moreover, understanding human behavior is crucial in determining the performance and attainment of an integrated and effective recycling intervention strategies.

Using coded observations design, Schultz *et al.* (2013) <sup>[23]</sup> carried out a study on littering behavior among 9,757 individuals at 130 outdoor public locations in the United States. The focus was on littering behavior of any item, nonetheless a separate sample was used to study the littering behavior of only smokers. Statistical analyses using multilevel modeling showed that age negatively predicted individual littering. At the level of the site, while the presence of existing litter positively predicted individual littering behaviour, the availability of trash containers negatively predicted littering. Supplemental analyses showed that among individuals who disposed of an item, distance to the trash containers was a positive predictor of littering.

Similarly, Niaura (2013) <sup>[24]</sup> used the theory of planned behavior (TPB) to examine the gap between the environmental attitudes and the actual behavior of young people (youth). An online survey was conducted among the respondents aged 17-36 ( $n = 459$ ). The results of this study showed that the correlation between the respondents' behavior and intentions was more significant than the relationship between their behavior and attitudes. Study results further revealed that social pressure had less impact on youth's behavioral intentions in comparison to perceived behavioral control.

Bortoleto *et al.* (2012) <sup>[48]</sup> using the theory of planned behaviour (TPB) and of Schwartz's altruistic behaviour model as bases for modelling participation in waste prevention interventions carried out a postal survey of 158 respondents to provide empirical support for the study hypotheses. The proposed structural equation model indicated that perceived behaviour control and personal norms were the main predictors for participation in waste prevention and that, unlike the case of waste recycling, subjective norms had a weak effect on WPB. The study results also suggested that, since social norms did not present a direct influence, WPB was likely to be influenced by an individual concern for the environment and the community in addition to the perceptions of moral obligation. Results also indicated that recycling and waste prevention represented different dimensions of waste management

behaviour requiring particular strategies to increase individuals' engagement in future waste disposal policies. Matthies *et al.* (2012) <sup>[21]</sup> developed hypothesis about how parents may influence specific pro-environmental behaviour such as re-use and recycling on their children (age 8-10). Based on the Schwartz norm activation theory, the study used a sample of 206 parent-child-dyads. Using survey questionnaires norm activation model variables for children which included awareness of need, awareness of consequences, personal norm, subjective norm, pro-environmental behaviour, communication behaviour, and actual behaviour of parents were evaluated. The study results showed that norm activation model can be applied to pro-environmental behaviour of young children. Further the study indicated that, while parents seemed to influence their children's recycling behaviour via sanctions as well as their own behaviour, re-use was mainly influenced through communication and creation of awareness.

Using multistage sampling technique, Ojedokun (2011) <sup>[72]</sup> investigated whether attitude towards littering mediated the relationship between personality traits such (as locus of control and altruism) and responsible environmental behavior (REB) among some residents of Ibadan metropolis, Nigeria. Measures of each construct were administered to 1360 participants through survey questionnaires. Results showed significant independent and joint effect of personality traits on attitude towards littering and REB. Further, attitude towards littering mediated the relationship between personality traits and REB. These findings implied that people who possessed certain desirable personality traits and who had unfavorable attitude towards littering was more likely to engage in behavior that consciously sought to minimize the negative impact on the environment.

Ojedokun and Balogun (2013) <sup>[7]</sup> examined the influence of age, gender, level of education environmental self-efficacy, altruism, self-concept, and locus of control as predictors of attitude towards littering among residents of some selected communities in Ibadan metropolis. Using a multi-stage sampling technique, 1360 respondents between the age of 18 to 65 years participated in the study. The study was adopted an ex-post cross-sectional research design with data collected through questionnaire. Hypotheses were tested using Pearson product-moment correlation, hierarchical multiple regression, and One-Way ANOVA. Findings indicated that a combination of age, gender environmental altruism, self-efficacy, locus of control, and self-concept, explained 57% of the variance in attitude towards littering. Further the results showed that environmental altruism, self-efficacy, locus of control, self-concept contribute, and level of educational had a significant relationship with attitude towards littering. On the other hand, age, and gender showed an insignificant relationship with attitude towards littering. The findings provided association between psychological factors and attitude towards littering. Thus, the study recommended that psychological variables had implications for interventions on littering attitude.

Davies *et al.* (2005) <sup>[2]</sup> carried out a longitudinal study as part environmental research technological development and innovation programme 2000-2006 in Ireland. The study indicated that while most respondents acknowledged that waste management was a problematic area of environmental policy, they felt that they were doing a good job at managing their waste in their homes. A further examination

in the study indicated that most householders benchmarked their waste management behaviour against the requirements of the door-to-door collection services they receive. Conversely, few respondents actively sought out ways to reduce or recycle their waste if waste collection facilities were not on their doorstep. The study pointed at the apparent mismatch between views of waste management performance and low levels of recycling.

Based on an integrated waste reduction model, Nishio and Takeuchi (2005) <sup>[18]</sup> evaluated the precursors of recycling and reducing household waste. The model was tested using Japanese household recycling and waste reduction data. The results suggested that the model fitted the data well and confirmed the assumption that attitude toward waste reduction behavior had a strongly effect on both recycling and waste reduction behavior. Further, the findings indicated that attitude towards waste reduction was determined by involvement of individual on environmental protection activities, subjective norm perceived benefit and cost, as well as awareness and accessibility of a recycling program.

Whyntie (2003) <sup>[73]</sup> carried out a study with an aim of determining whether participating in an environmental education programme (GLOBE) was positively manifested in participants' environmental attitudes, perceptions, and level of environmentally responsible behaviour. The study used a homogeneous sample consisting of 40 Grade 8 GLOBE participants and 40 non GLOBE participants. The research employed multiple regression analyses, Pearson correlation coefficients, and t-tests to compare the groups. Results showed unlike non-GLOBE participants, GLOBE participants were more positive in their attitudes and actions toward the environment. However, GLOBE participants were not environmentally more perceptive than non-GLOBE participants. Analysing responses of the GLOBE participants in terms of gender and place of residency was ineffective as the sample was too small to yield significant results. The study recommended a more controlled and use of a large sample size for a replica of the study, focusing on initial motivations for participation/non-participation in the GLOBE programme.

### Analysis of findings and conclusion

The analysis of literature reviews not only facilitated clarification of different views of waste disposal attitude and behaviour, it further explored the theory of reasoned action, theory of planned behaviour and norm activation model. Additionally, the study provided insight on the reasons why levels of concern about waste disposal practices are not always matched by appropriate behaviour. Rather than indicating a simple picture of attitudes towards waste leading to appropriate actions in waste disposal, results from the literature review reveal a complex backdrop of waste disposal concerns, attitude and behaviour. A range of factors including individual personality, family and group relationships, socio- culture, economic situation, the geographical setting (house hold, workplace and leisure places) and environmental worldview complicate the attitudes and actions of people with respect to waste and waste disposal.

A recurrent theme in the literature reviewed was the significance of relationships between different segments of communities and waste management practices. The status and nature of these relationships affect individuals perceived

attitude and behaviour and subsequently capacity to make a decision and an impact on waste disposal action (habit formation). The relations affect the willingness and moral standing to become either pro-active, reactive, passive or indifferent in relation to waste management actions such as seeking out opportunities for preventing and minimizing waste. This study thus concluded that the power to affect behaviour change for positive waste disposal lies within relationships.

Further, the study affirmed that, sometimes patterns of waste disposal behaviour and habits are attributed to individual instinctive reactions to situations. Personality of an individual is used to explain both positive and negative waste disposal behaviour. For example, Ojedokun and Balogun (2013) <sup>[7]</sup> indicated that there is internal-external divergence in perspectives of individual instinctive in the area of environmental related attitude. While on the one hand internalist approaches focus exclusively on personality factors as predictors of environmental related attitude (Al-Khatib *et al.*, 2009) <sup>[22]</sup>, on the other hand externalist perspectives indicate that socio-cultural factors such as gender, marital status, income, religious convictions, education level, age, and type of residence promote waste disposal decisions and habits such as littering (Zelezny *et al.*, 2000) <sup>[74]</sup>. While personality traits are assumed to be fixed (Davies *et al.*, 2005) <sup>[2]</sup>, negative waste disposal habitual behaviour can be modified although with some difficulty (Biel, 2003) <sup>[27]</sup>.

Another recurring theme of waste management attitude and behaviour was whether action (s) were practical or not. Literature indicated that if the positive waste disposal options and interventions were easy to do and compatible with the lifestyle of individuals, positive action was more likely to be undertaken. For example, availability and accessibility of disposal bins, frequency of waste collection, conducting cleaning campaigns, raising public awareness, this in addition to formulating fair, favourable, strict and actualized waste disposal legislation. Additionally, accessibility and timely information as well as motivation towards appropriate waste disposal behaviour could enhance practicality of positive waste disposal activities.

As seen in Schwartz (1977) <sup>[49]</sup> norm activation model, individuals and groups are influenced by a sense of duty to the environment, to other people and to future generations as a factor contributing to their positive disposal of waste. The reviewed literature indicated that fundamentally it is individual responsibility to tackle the waste disposal problem rather than pointing the finger to others. This implies that, sustainable clean environment starts with an individual, transmitted to a group resulting to a common course.

Lastly, although reasons related to relationships, individual traits, applicable options for waste management and views of responsibility towards the environment explained both positive and negative waste disposal behaviour, a more culturally based consideration also emerged from the reviewed literature. For example, negative reactions toward inappropriate waste disposal could be an indicator of culture of cleanliness and community shared responsibility or even promoting anti-littering culture through education from early ages.

The findings of this study show that the most important characteristics and predictors of the waste disposal behaviour are relationships, intentions, perceived

behavioural control, habits, personal norms, social norms, and situational factors. Therefore, pre-designed waste disposal intervention such as campaigns, awareness through education, role modeling and change of norms that affect psychological variables can result to behaviour change. Consequently, individual and group psychological variables should be blended with external interventions such as laws, policies, availability and accessibility of waste disposal facilities, and recycling programmes for attainable and sustainable appropriate waste disposal interventions.

### Policy implication and suggestion for future research

Understanding waste disposal attitude and behaviour could enable national and local governments as well as decision makers to design more-effective policies for reducing the amount of waste that is generated, while at the same time encouraging reduction, reuse and recycling of waste. Waste disposal attitude and behavior is deeply rooted in daily relationships and routines, which result into habits, assumed to be predictors of repeated waste disposal practices. In the context of waste disposal issues, bad habits are usually conceived as barriers against environmental friendly behavior. However, reviewed literature indicated that habitual behaviour related to the environment protection can be changed through blending the right interventions in the right situational context. The current study moved toward a better understanding of the mechanisms behind changing people's waste disposal behavior by mapping out which pathways and variables change in disposal behavior as triggered by interventions.

Generally, past literature reflects a deeper insight of the impact of psychological factors with regard to waste disposal behavior (littering, separation, reuse and recycle). Conversely, most literature has focused more on household waste disposal overlooking work place and leisure time waste disposal attitude and behaviour. Therefore, a future research could be carried out to address this gap.

### Declarations

#### Author contribution statement

The authors Conceived and designed the study; Performed the study; Analyzed and interpreted the literature reviewed; Contributed materials, analysis tools or data; Wrote the paper.

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The authors declare no conflict of interest.

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