

Using an extended model of the reasoned action approach to explore individual behavioral intentions regarding litter prevention in a developing country

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Abstract

Implementing litter prevention strategies is essential for cities of developing countries, especially due to the prevailing high incidence of littering and the urgent need to realize the adverse per capita environmental impact target of the sustainable development goals. In this article, we report the use of the prominent reasoned action approach – in its original state and in an extended model with moral norms – for exploring the key socio-cognitive determinants of individuals' litter prevention intentions in Ghana. By analyzing the valid answers of 447 participants to a structured questionnaire on litter prevention, we found attitudes ($\beta = 0.35$, $SE = 0.014$, $p < 0.001$) and moral norms ($\beta = 0.57$, $SE = 0.099$, $p < 0.001$) as the most influencing determinants to individual intentions in the original and the extended models, respectively. The analysis suggests that individuals will stop littering their environments through the implementation of eco-friendly interventions aimed at eliciting self-responsibility and moral obligation. Campaigns targeted at demonstrating the effects of littering on drain blockage, flooding, and disease outbreaks may improve individual litter prevention attitudes. Installing waste receptacles in public spaces along with persuasive messages may also facilitate individual antilittering intentions. Apart from contributing to the implementation of a litter management strategy to reduce the flood risk and enhance the resilience of the Greater Accra region of Ghana, this research helps to close the literature gaps in litter prevention behavior, as well as support the modernization of the municipal solid waste management systems in developing countries.

1 Introduction

Starting from 2025, the world's oceans will receive an estimated 17.5 million tonnes of mismanaged plastic waste annually from coastal cities within the globe (Jambeck et al., 2015). Rivers are reported to contribute an average of 1.8 million tonnes of mismanaged plastics annually via inland sources to the oceans (Lebreton et al., 2017). This will affect not only marine life and the environment but also public health and livelihoods (Beaumont et al., 2019; Agamuthu et al., 2019; Welden, 2020; Jambeck et al., 2018). Estimates show that developing countries will contribute at least 80% of the total mismanaged waste that will move from land to the oceans (Schmidt et al., 2017). In most cities of such economies, the solid waste management (SWM) systems are highly underdeveloped with low-to-medium collection coverage and waste capture (Wilson et al., 2015; Godfrey et al., 2019; Oduro-Appiah et al., 2020; Guerrero et al., 2013). Consequently, significant amounts of uncollected municipal solid waste (MSW) are disposed of in drains and on vacant lands; which are washed down eventually by stormwater into rivers and the oceans (Godfrey et al., 2018).

In the year 2020, Ghana was reported to have leaked about "80,000 tonnes of plastic waste into water bodies" (Global Plastic Action Partnership, 2021). Insufficient MSW collection coverage (Oduro-Appiah et al., 2020) as well as littering on land and along beaches are major contributory factors to the plastic leakage. The leakage is projected to increase by four folds within the next two decades with an anticipated increase in economic growth and plastic consumption, (Global Plastic Action Partnership, 2021). Reversing the increasing trends of plastic pollution in freshwater bodies and the growth of waste

patches within the world's oceans would call for modernization in both municipal solid waste management (MSWM) and litter prevention, especially in developing country cities (Leal Filho et al., 2021).

Littering is the inappropriate discarding of any piece of solid waste (SW) in a public place outside designated trash receptacles; it is a persistent problem in the world with prominence in most developing countries (Tjell, 2010; Moqbel et al., 2020). In Ghana, littering is rampant and somehow socially acceptable, as it is in other developing countries of the global south (Farage et al., 2021). Neither MSW professionals nor the government have sustainable policies to address the problem; the prevailing system being an end-of-pipe management technique where communities are allowed to litter their environment before cleaning and evacuation.

Within the past decade, the closest the government of Ghana has come to solve the problem of littering and the leakage of MSW into freshwater and marine environments has been the introduction of a national sanitation day and a tax on some imported plastic materials (Adam et al., 2020); with the objectives to promote community inclusive cleaning of the environment and to decrease the consumption and leakage of single-use plastics, respectively. However, the outcomes have been counterproductive and far from the goal (Adam et al., 2020; Mensah, 2020; Abalo et al., 2017), notwithstanding the huge costs of such interventions to the state. It is thus not uncommon to see litter and uncollected MSW washed into drains, streams and rivers (Odonkor and Sallar, 2021); contributing to perennial flooding with loss of lives and properties, especially in the capital city, Accra (Mensah and Ahadzie, 2020; Amoako and Inkoom, 2018).

One of such floods, which occurred on June 3, 2015, in the greater Accra region of the country had a devastating effect – over 50,000 inhabitants were displaced, along with the loss of 150 human lives and an estimated US\$ 100 million in properties (Kpanou et al., 2021); compelling politicians and professionals alike to seek a comprehensive pathway with regard to the implementation of an MSW collection improvement and a litter control strategy, as part of other interventions aimed at reducing the flood risk and enhancing the resilience of the region (Government of Ghana, 2017; World Bank, 2019).

However, because litter prevention is considered a pro-environmental behavior (Homburg and Stolberg, 2006), an understanding of the prominent determinants and values that inform individual litter prevention intentions may offer significant clues to support and sustain the development and implementation of evidenced-based and theory-driven antilittering behavior change interventions (Gifford and Nilsson, 2014; Steg, 2016; Chaudhary et al., 2021).

The scholarly literature on littering and litter prevention recommends the provision of adequate trash receptacles, the promotion of environmental-cleanliness, social norms, personal norms, penalties, incentives and social marketing tools to address littering behavior (Chaudhary et al., 2021; Moqbel et al., 2020; Ojedokun, 2013); however, the paucity of such literature on developed countries (Al-mosa et al., 2017a), alongside the varying outcomes of such interventions suggests that litter prevention beliefs and

intentions may be context-specific (Weaver, 2015; Al-mosa et al., 2020), varying from place to place (Freije et al., 2019).

To date, only three studies related to littering and litter prevention behavior in Ghana have been identified in the peer-reviewed literature. One assessed the extent of litter pollution at four beaches along the coast in the greater Accra region through a survey (Van Dyck et al., 2016). Another explored the antecedents of littering behavior among University students through interviews (Amankwah-Poku and Ofori, 2020) and the third used a socio-cognitive theory of behavior to predict household's waste disposal behavior (Tweneboah-Koduah et al., 2019), with an implied reference to littering.

This article uses an extended model of the reasoned action approach (RAA) to explore the predominant latent constructs and beliefs that may influence individual intentions with regard to litter prevention in Ghana. The use of theory and especially the RAA for the prediction and design of interventions targeted at reducing littering behavior has been found to be applicable in the scholarly literature (Al-mosa et al., 2017a; Chaudhary et al., 2021; Ojedokun et al., 2022; Brown et al., 2010). Being the first of its kind within the country, the objective is two-fold, namely: (1) to determine the influencing factors that may support practitioners to develop research-based litter prevention behavior change interventions for the region, and (2) to provide a baseline data that may support the implementation of the behavioral components of a national plastic action roadmap that seeks to reduce plastic leakage in Ghanaian waters and the oceans (Global Plastic Action Partnership, 2021).

The article builds further on the work of Tweneboah-Kodua et al., 2019, with a point of departure in two key areas, namely: (1) the use of formative research to elicit the relevant beliefs within the target population and (2) the addition of a fourth latent construct, moral norms, to extend the original RAA. Moral norms are individual perceptions of the ethical appropriateness or inappropriateness of performing a behavior (McMahon and Byrne, 2008), and it is reported to improve the predictive viability of pro-environmental behaviors such as litter prevention and source separation (Godin et al., 2005; Oduro-Appiah et al., 2022). This research defines moral norms as the individuals' perceived principles about the ethical appropriateness of preventing the littering of the environment.

Formative research supports researchers in the design of applicable survey instruments by providing them with the prominent beliefs of the intended audience (Downs and Hausenblas, 2005); thereby preventing them from using previous research items and/or predetermined beliefs, both of which may lead to unreliable and unrealistic outcomes (Ajzen, 2015). The RAA was selected for this research because of its ability to support the prediction of pro-environmental behaviors (Yuriev et al., 2020; Ojedokun et al., 2022; Cudjoe et al., 2022), alongside its adaptability to the addition of new constructs onto the original model (Miller, 2017). Extending the RAA to increase its predictive viability is also recommended in literature (Graham-Rowe et al., 2015; Fishbein and Ajzen, 2011; Wang et al., 2022).

The rest of this article consist of seven sections: section 2 describes the RAA theoretical framework; the study area and its prevalence to flooding are discussed in section 3, whilst section 4 discusses the

research methodology. Sections 5 and 6 present and discuss the statistical results, whilst Sections 7 and 8 are dedicated to the study limitations and conclusions, respectively.

2 The Reasoned Action Approach

The reasoned action approach (RAA) is a theoretical model for the prediction of peoples intentions and behavior (Fishbein and Ajzen, 2011), and has been used extensively to predict several human social and pro-environmental behaviors (Yuriev et al., 2020; Hardeman et al., 2002; Cudjoe et al., 2022). Primarily, the RAA explains the relationships that exist between individuals' beliefs, attitudes, norms, behavior control, intentions and actual behavior. The theory postulates that behavioral intention is the immediate precursor to actual behavior (Ajzen, 1991), and that behavioral intention itself is best predicted by three sub-determinants of behavior, namely: attitudes, subjective norms, and perceived behavioral control (Fig. 1).

The RAA defines intention as a person's willingness to perform a behavior (Fishbein and Ajzen, 2011); attitude as a person's assessment of the perceived favorable and unfavorable outcomes of performing a behavior; subjective norms as the perceived social pressure from significant others that influences an individual to perform or not to perform a behavior, and perceived behavioral control as the extent to which individuals' perceive the behavior to be carried out to be under their control. According to the theory, perceived behavioral control may also influence actual behavior directly. (see Fig. 1).

According to the RAA, each of the three latent predictors of intention are determined from the multiplicative amalgamation of individual belief outcomes and the evaluations of the outcomes. Thus, attitude is drawn from behavioural belief outcomes, which represent the individual's beliefs of the consequences of performing the behaviour, and the evaluations of the outcomes. Subjective norms are expressed from normative beliefs, which represent the individua's beliefs of what other significant others expect them to do, as well as the individual's motivations to comply with such expectations, and perceived behavioral control is drawn from control beliefs, which represent the individuals' beliefs of the factor(s) that could enable or hinder them from executing the behavior, as well as their power to manage the behaviour. The reasoning of the RAA is that individuals' will conduct a behavior when: (1) they perceive positive outcomes from it, (2) they feel strong social pressure from significant others to conduct the behaviour, and (3) they are convinced that they can accomplish the behavior.

In this study, the attitude of individuals' is described as the degree to which they expect favorable or unfavorable outcomes in preventing littering. Where individuals perceive positive outcomes, they will likely stop littering. Subjective norms refers to the perceived influence from significant others that will compel an individual to stop littering, whilst perceived behavioral control refers to the individual's perceived capability to stop littering. Thus, according to the RAA, it is expected that individuals' would have strong intentions to stop littering when they: perceive positive outcomes to be associated to litter prevention, believe significant others in their lives will expect them to stop littering, and when they are confident of themselves to have what it takes to stop littering.

Moral norms was added as a fourth construct (Fig. 2) to the original RAA model to assess its power to improve the predictive viability in individual litter prevention intentions. The RAA has proven—throughout the years—to be adaptable to the addition of new latent constructs, and evidence abounds to the improvement in model performance and in the variance in pro-environmental behavioral intentions upon such additions (Sandberg and Conner, 2008; Yuriev et al., 2020). For example, moral norms have been used as an additional construct in the RAA to predict: hotel guest energy saving behavior (Wang et al., 2021), household source separation intentions (Razali et al., 2020; Oduro-Appiah et al., 2022), recycling behavior (Tonglet et al., 2004), food waste reduction and source separation behavior (Yuan et al., 2016; Graham-Rowe et al., 2015; Wang et al., 2022), and particulate matter reduction behavior (Ru et al., 2019).

We employed moral obligation, personal values, responsibility, environmental respect and feelings of guilt as a measure of moral norms. In relation to the focus of the study, we defined moral obligation as the individual's perception of the moral appropriateness to stop littering; values as goals that serve as guiding principles for individuals' to stop littering (Schwartz, 1992); responsibility as the individuals' involvement in litter prevention programs by reason of their understanding and commitment to keep to their obligations (Moretto et al., 2011) and feelings of guilt as the self-conscious negative emotional state aroused in an individual for not participating in a litter prevention program (Tangney et al., 2007). Moral obligation, values, responsibility and emotions have been used before to favorably predict moral norms and pro-environmental behaviors (Steg, 2016; Sandberg and Conner, 2008).

3 The Study Setting: The Odaw River Catchment

The research for this article was conducted within the catchment of the Odaw river in Ghana. The river is about 30 km long and covers an estimated area of 270 km². It is regarded as the most polluted catchment within the country (Amoako and Frimpong Boamah, 2015; Ackom et al., 2020), serving as both a water source and a solid waste sink (Ansa et al., 2017). The river originates from the Eastern region of the country and flows through about 70% of the greater Accra region, discharging into the Atlantic Ocean via the Korle Lagoon (Fig. 3). Inadequate MSWM, littering and siltation contribute to the frequent flooding of the river and the region (Erman et al., 2018; Amaglo et al., 2022).

The population of the basin is estimated to be about 3.2 million (Ghana Statistical Services, 2020) with a daily MSW generation rate of 2240 tonnes of which 37% is left uncollected. Most inhabitants of dense settlements (houses and small businesses) along the entire stretch of the river dispose waste directly into it (Ntajal et al., 2022). This, as well as wind-blown litter and run-off washed MSW account for about 410 tonnes of SW daily into the river.

Littering is rampant within the basin (Fig. 4) but the MSW system handlers seem to have no sustainable strategy to prevent it. Apart from the government's institutionalized national sanitation day, which is intended to clean the region of litter and MSW once every month, the ministry in charge of sanitation and water resources do seldomly install few 240-litre plastic bins along some major roads within the central business districts to promote anti-littering behavior. However, such interventions have failed because of

the lack of participatory planning processes between stakeholders. Paradoxically, the inability of system handlers to educate the inhabitants on the purpose of the waste receptacles and the absence of an emptying plan has turned most of such locations to temporal disposal sites, with extremely high incidence of littering.

We selected the basin for this study because of an ongoing project intervention to strengthen the regions resilience by reducing flood risk, partly through MSW collection service delivery and litter prevention improvements (World Bank, 2019; Government of Ghana, 2017; Global Plastic Action Partnership, 2021).

4 Methodology

4.1 Design, sample description and procedure

The study was conducted as part of a data collection exercise to support the development of a MSW collection improvement and litter management strategy for the region. Structured questionnaires were administered continuously by two of the authors and five trained investigators for eight days in October 2020. The questionnaire was categorized into two; one on individual demographics and the other on the extended latent variables. Belief items elicited in a formative study were used indirectly to measure the original RAA constructs. In total 451 randomly selected individuals from 22 communities participated in the research (Fig. 3). The communities were representative of the three socio-economic divides of the region, namely: low-, middle- and high-income. The target participants were approached in their homes and environs and were encouraged to voluntarily take part in the survey. Computer-assisted personal interviewing was used to capture participants responses and also to monitor the questionnaire administration process in real time.

4.2 Formative research

Formative research is a critical requirement of the RAA (Ajzen, 2015) and supports the use of the predominant beliefs of the target audience in the development of survey instruments, rather than the prearranged beliefs of researchers (Downs and Hausenblas, 2005). We conducted the formative research for this study by administering beliefs-related questions to 30 participants who were selected randomly within the target population (Fishbein and Ajzen, 2011). Behavioral beliefs were elicited by asking the participants to write down or mention three or more anticipated merits and demerits of individual litter prevention to their environment. Normative beliefs were obtained by asking the participants to list separately the significant others who would endorse or disapprove of them stopping littering. Finally, control beliefs were elicited by asking the participants to separately list at least three factors each that would make it easy or difficult for them to stop littering. The investigators explained the concept of littering and litter prevention to all participants before proceeding to ask the questions. The three most prominent behavioral, normative and control beliefs each within the population were gleaned—after a content analysis of the responses, using Microsoft Excel.

4.3 Materials, measures and pretesting for the main study

We used the prominent belief outcomes from the formative research to prepare the questionnaires for the study. Based on the recommendations of the proponents of the RAA, we measured the original RAA sub-determinants with belief outcomes and their evaluations (Fishbein and Ajzen, 2011), while the fourth sub-determinant, moral norms, and the dependent determinant, intention, were measured with only belief outcomes. Attitudes, subjective norms and perceived behavioral control were each measured with three belief items. Moral norms and behavioural intention were measured with five and two belief items, respectively. Behavioural belief outcomes related to the prevention of drain blockage, disease and flooding were used to assess participants beliefs about the consequence of stopping littering. Neighbors, family members and community leaders were used as the normative beliefs to assess participants perception of the significant others that may compel them to stop littering, whilst the provision of waste bins at vantage points, education and enforcing penalties were used as the control beliefs to assess participants perception of the factors that would make it easy for them to stop littering. All belief items and their outcome evaluations were measured as statements on a 5-point Likert scale. The construct validity and consistency of the questionnaire were improved upon after pretesting them on 50 individuals outside the drainage basin. The final questionnaires were modified to suit its objectives based in part on the recommendations of a social psychologist and after the computation of correlation coefficients.

4.4 Analysis of data and fit indices

There were no missing data, but four responses were identified as outliers after screening, leaving 447 valid responses for confirmatory analysis. SPSS, release 24 and AMOS, release 24, were used for data analysis. Based on recommendations, we recoded the Likert scale range of 1 to 5 of all belief outcomes to -2 to + 2, (Ajzen and Fishbein, 2008; Fishbein and Ajzen, 2011). Both the original and the extended RAA models were then fitted to the data by means of structural equation modeling. Because the data was normally distributed, the models were run after performing confirmatory factor analysis using the maximum likely parameter estimation. The scale measuring the constructs were also improved upon by deleting two belief items with low loading factors, namely: “enforcement of penalties” and “feeling guilty.” As recommended by (Schreiber et al., 2006), we evaluated both the original and the extended RAA models using the root mean square error of approximation (RMSEA), the normed fit index (NFI), the Tucker-Lewis Index (TLI), the comparative fit index (CFI), the incremental fit index (IFI) and the goodness of fit index (GFI). Generally, NFI, TFI, CFI, ranging between 0.90 and 0.95, and RMSEA values ranging between 0.06 and 0.08 are considered as adequate fits. For good fits RMSEA is expected to be lower than 0.06, with the other indices recording more than 0.95.

5 Results

5.1 Descriptive statistics

The demographics of the survey participants are in Table 1. The total number of valid responses was 447 with 60% females and 40% males. The mean age was 40 years and about 85% of respondents had completed primary school through to tertiary. Participants exhibited positive intentions, favorable

attitudes, moderately high social norms, moderate controllability and high moral norms in preventing littering of their environment (Table 2). All the constructs correlated significantly with intention to stop littering.

Table 1
Demographic details of the participants

Variable	Category	Frequency	Percent
1.Gender	Male	179	40
	Female	268	60
2.Educational level	No education	67	15
	Primary school	54	12.1
	Junior high school	149	33.3
	Senior high school	122	27.3
	Technical/Vocational certificate	11	2.5
	Technical/Vocational diploma	13	2.9
	Tertiary school	31	6.9

Table 2
Summary of covariances and means

	Cronbach's Alpha	Mean	S.D	A	B	C	D	E
A. Attitude ¹	0.87	7.79	0.42	1				
B. Subjective norms ¹	0.67	5.11	1.17	0.34**	1			
C. Perceived Control ¹	0.55	4.14	0.75	0.11**	0.38**	1		
D. Moral norms ²	0.80	4.38	0.08	0.43**	0.57**	0.17**	1	
E. Intention ²	0.84	4.51	0.01	0.20**	0.15**	0.31**	0.50**	1
**p < 0.05, Theoretical range (-10–10) ¹ , (1–5) ²								

5.2 Analysis of the original model

The original structural equation model depicting individuals intention to stop littering within the catchment is displayed in Fig. 5. The model fitted the data adequately (RMSEA = 0.073, NFI = 0.95, TLI = 0.94, CFI = 0.96, IFI = 0.96, IFI = 0.96, GFI = 0.96) and accounted for 30% of the variance in participants

behavioral intentions. Attitude ($\beta = 0.35$, $SE = 0.014$, $p < 0.001$) appeared as the strongest predictor of participants intention to stop littering followed by perceived behavioral control ($\beta = 0.29$, $SE = 0.020$, $p < 0.05$). Subjective norm ($\beta = 0.12$, $SE = 0.012$, $p = 0.64$) could not significantly predict individual intentions to stop littering. The prevention of drain blockage ($\lambda = 0.95$), flooding ($\lambda = 0.91$) and disease outbreaks ($\lambda = 0.69$) came up as the salient behavioral beliefs with regard to litter prevention within the catchment (Fig. 5).

5.3 Analysis of the extended model

In Fig. 6 is the extended model with moral norms as the additional determinant of intentions. This model improved the prediction of intentions, by being able to explain 50% of the variance in behavioral intentions to stop littering, as well providing a good fit to the data (RMSEA = 0.06, NFI = 0.94, TLI = 0.94, CFI = 0.96, IFI = 0.96 and GFI = 0.95). Moral norms ($\beta = 0.57$, $SE = 0.099$, $p < 0.001$) emerged as the strongest construct to influence the behavioral intentions of participants with regard to litter prevention, followed by perceived behavioral control ($\beta = 0.31$, $SE = 0.013$, $p < 0.001$) and then attitudes ($\beta = 0.20$, $SE = 0.014$, $p < 0.001$). Subjective norm ($\beta = -0.15$, $SE = 0.014$, $p = 0.03$) was statistically significant but could not predict behavioral intentions. Overall, we found moral norm, perceived behavioral control and attitude as the predominant predictors of individuals intentions to stop littering. Beliefs related to the provision of waste bins ($\lambda = 0.85$), individual responsibility ($\lambda = 0.82$), environmental respect ($\lambda = 0.79$) and moral obligation ($\lambda = 0.60$) appeared to be the most influential with regard to individuals intentions to stop littering in the region (Fig. 6).

6 Discussion And Implications

The prediction of behavioral intentions and the design of effective behavior change interventions require considerable amount of planning and research (Ajzen, 2015). This study used the RAA to predict the predominant latent constructs and also to understand the most readily accessible beliefs with regard to litter prevention intentions in the greater Accra region of Ghana. Theory provides a foundational platform to support the identification of the complex relationships between constructs and the development of evidence-based behavioral change interventions (Glanz and Bishop, 2010; Ojedokun et al., 2022; Conner and Norman, 2015).

Two structural models were tested: (1) the original model with the three RAA constructs as the predictors of individuals litter prevention intentions (Fig. 5) and (2) an extended model where moral norms was added as a fourth construct to the original model (Fig. 6). In the original model, attitudes emerged as the most influential construct to individual behavioral intentions with regard to litter prevention in the region; consistent with findings on waste disposal and litter prevention behaviors in Ghana and other developing countries (Tweneboah-Koduah et al., 2019; Singh and Kaur, 2021; Ibrahim et al., 2021). In the extended model, moral norms appeared as the dominant construct that influenced individual intentions; similar to findings on pro-environmental behaviors and litter prevention in developing countries, in which moral

and/or personal norms were reported to influence individuals antilittering intentions and behavior (Moqbel et al., 2020; Gifford and Nilsson, 2014; Farage et al., 2021).

Overall, we found moral norms, perceived behavioral control and attitudes as the three most significant constructs that influence individual litter prevention intentions. The relatively strong prevalence of the perceived behavioral construct in both models is also supported in literature (Ojedokun et al., 2022); more often than not, limited financing, low levels of spending and the absence of user inclusivity strategies in the MSWM systems of most developing countries (Oduro-Appiah et al., 2017; Wilson et al., 2013; Kanhai et al., 2021) restricts residents access to waste receptacles and knowhow, affecting their motivation and ability to perform pro-environmental behaviors.

The original model fitted the data adequately and explained 30% of the variance in individuals intentions to stop littering, whilst the extended model provided a good fit to the data, explaining 50% in the variance in intentions. In conformity with literature and expectations, the addition of the moral norms construct improved the predictive power of the RAA both in the explained variance and in the fit indices (Yuriev et al., 2020; Walsh et al., 2005).

However, subjective norms significantly failed to influence intentions in both structural models; consistent with earlier findings in which subjective norms were found to be a weak predictor of litter prevention intentions (Carmi et al., 2015; Tweneboah-Koduah et al., 2019).

The use of formative research contributed to an understanding of the readily accessible individual beliefs with regard to litter prevention in the region. We found positive behavioral belief outcomes related to the prevention of drain blockage, flooding and disease outbreak as the most prominent beliefs to influence individual attitudes towards litter prevention. Control beliefs related to individuals' accessibility to waste receptacles appeared as the most influential to encourage participants to stop littering; consistent with earlier findings in Ghana in which accessibility, time and convenience to locating waste bins are reported to improve individual waste disposal behaviors (Tweneboah-Koduah et al., 2019).

Even though subjective norms failed to influence individual intentions, families and neighbours emerged as the most influential referents to compel individuals to stop littering, similar to results in other developing countries like India and Nigeria (Singh and Kaur, 2021; Ojedokun et al., 2022). Evaluation of the beliefs that influence moral norms points to individual responsibility, environmental respect and moral obligation as the most influential factors, which is consistent with similar findings in developing country cities (Farage et al., 2021; Moqbel et al., 2020).

What the findings mean to MSW and litter management modernization in the catchment and perhaps the country is that decision makers would have to implement a comprehensive litter management strategy that integrates both social-psychological and technical factors towards litter prevention (Ojedokun, 2011). MSW system handlers may have to work together with communication professionals to educate the inhabitants of the region on the linkages between litter prevention and the reduction in the incidence of waste-related drain blockage, flooding and disease outbreak. This should be done alongside an

investment in locally appropriate trash receptacles in all public places within the catchment to persuade inhabitants to dispose SW in an eco-friendly manner (De Kort et al., 2008; Kombiok and Naa Jaaga, 2022). System handlers should design the trash receptacles to allow users practice at least a two-stream waste separation of biodegradables and all others to promote recycling and divert organic waste from landfills (Oduro-Appiah et al., 2022). Because the extent of cleanliness of an environment is reported to be positively associated with litter prevention behavior (Rangoni and Jager, 2017; Al-mosa et al., 2017b), implementing a sustainable waste collection plan may prevent the incidence of littering around the receptacles.

The considerable extent of the littering problem in the region calls for the use of inclusive governance approaches to engage all stakeholders – policy makers, financiers, researchers, waste experts, social psychologists, communication strategists, MSW system handlers, service providers and especially the citizens – to systematically implement and monitor interventions. This, in addition to the use of persuasive and demonstrative messages that hinges on individual self-responsibility, moral obligation and respect for the environment would create ownership of interventions and empower the inhabitants to stop littering (Cingolani et al., 2016).

7 Limitations And Recommendations For Future Research

The study used a cross-sectional methodological approach and could not measure actual behavior, partly because litter prevention is not officially promoted and practiced in the region, neither is there evidence of the infrastructural and social psychological investments to encourage individuals to partake in antilittering. Although a recent study in Nigeria (Ojedokun et al., 2022) positively correlated litter prevention intentions to actual behavior, we recommend a further longitudinal study during the implementation of interventions to study the relationship between behavioral intentions and actual behavior.

Secondly, the current study was limited to only individuals within the Odaw river basin of Ghana and may thus restrict the generalizability of the findings to the country. We recommend similar studies in different regions to support system handlers to understand better the complex mix of latent variables and beliefs with regard to litter prevention in the country.

Further research using other behavioral theories such as the focus theory of normative conduct and the norm activation model may help stakeholders to compare the research outcomes to sustain the implementation of interventions.

8 Conclusions

The main objective of the study was to use an extended model of the reasoned action approach (RAA) to predict the social psychological determinants and also understand the prominent beliefs that influence individuals litter prevention intentions in the Odaw river catchment of the greater Accra metropolitan area

of Ghana. The study constitutes part of interventions to develop a litter management strategy that ultimately will reduce flooding and enhance the region's resilience. By means of structural equation modeling, two models were evaluated—first, the original RAA model, and second, an extended model in which moral norms was added as a fourth latent construct to the original model. The original model fitted the data adequately and explained 30% of the variance in intentions, whilst the extended model improved the predictability in intentions with a good fit to the data and explaining 50% in the variance in litter prevention intentions. We found moral norms ($\beta = 0.57$, $SE = 0.099$, $p < 0.001$), perceived behavioral control ($\beta = 0.31$, $SE = 0.013$, $p < 0.001$) and attitudes ($\beta = 0.20$, $SE = 0.014$, $p < 0.001$) as the predominant constructs that influence individual intentions with regard to litter prevention in the region. Subjective norms failed to significantly predict intentions in both models. Well organized pro-environmental campaigns that promotes self-responsibility ($\lambda = 0.82$), environmental respect ($\lambda = 0.79$), and moral obligation ($\lambda = 0.60$) presents the greatest opportunity to support litter prevention within the region. Educational campaigns that clearly establishes the linkage between littering and drain blockage ($\lambda = 0.95$), flooding ($\lambda = 0.91$) and disease outbreaks ($\lambda = 0.69$) may improve individual attitudes with regard to antilittering; whilst the provision of waste receptacles at public places and at vantage points ($\lambda = 0.85$), along with the publication of persuasive messages via the electronic, print and social media platforms may likely empower individuals to dispose of solid waste in an environmentally-friendly manner. System handlers are encouraged to include the citizenry during project implementation to increase participation in the litter prevention process. Rewarding clean communities may improve upon subjective norms. Apart from contributing to narrow the literature gap in littering and litter prevention in emerging economies, this research provide sustainable pathways to researchers and policy makers to address their MSW and littering problems with regard to the attainment of clean cities.

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Figures

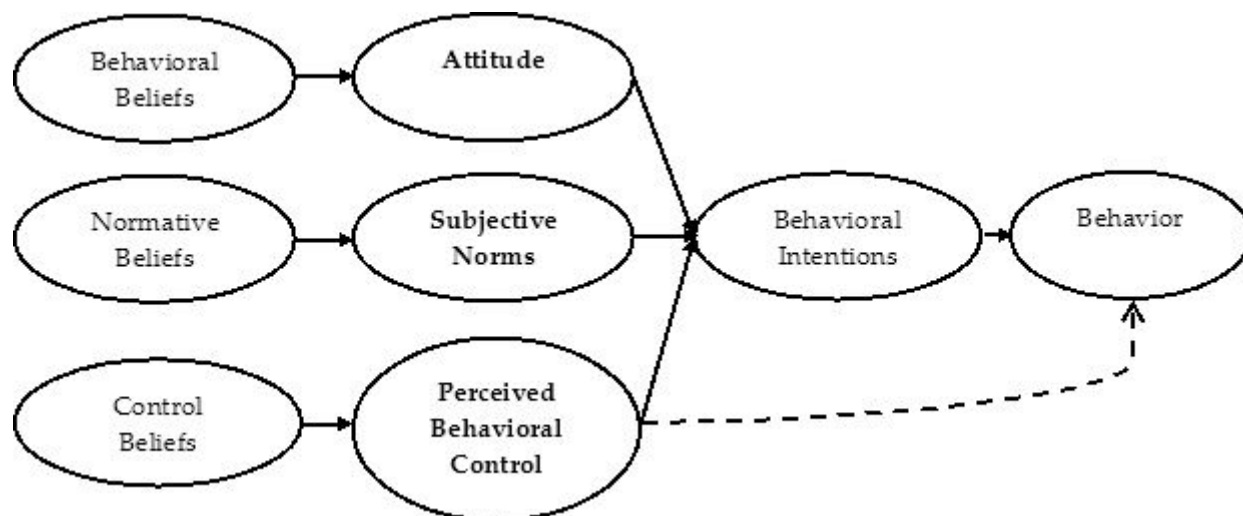


Figure 1

The original RAA framework

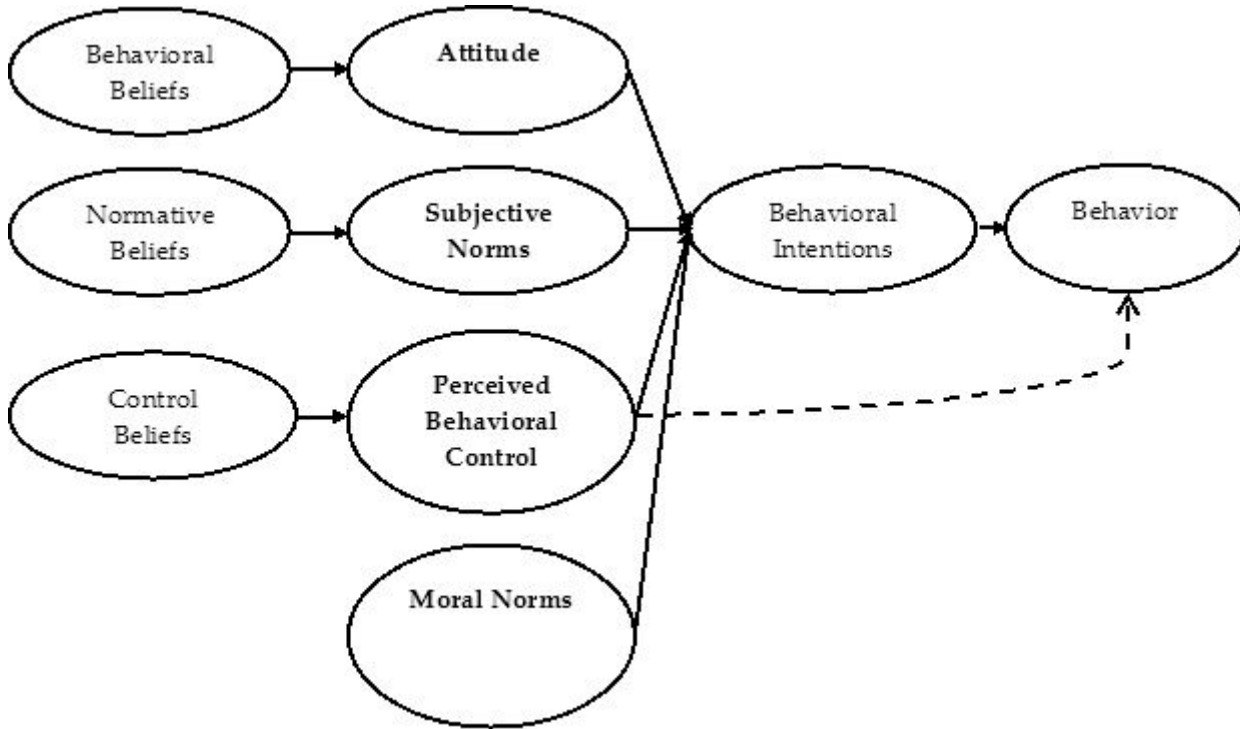


Figure 2

Extended RAA model with moral norms

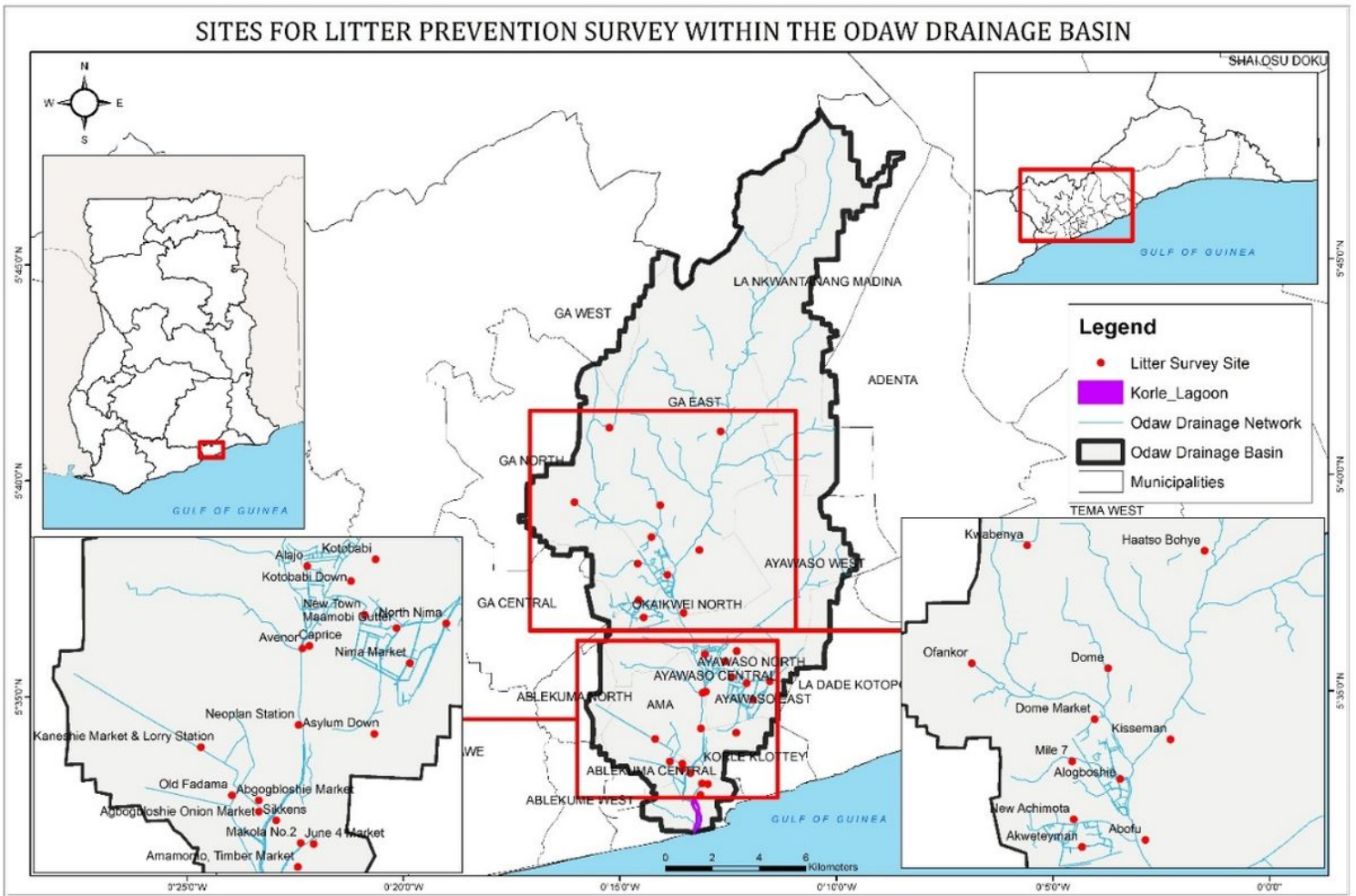


Figure 3

The Odaw drainage basin showing communities in which the litter prevention survey was conducted



Figure 4

Extremely high incidence of littering within the Odaw river basin

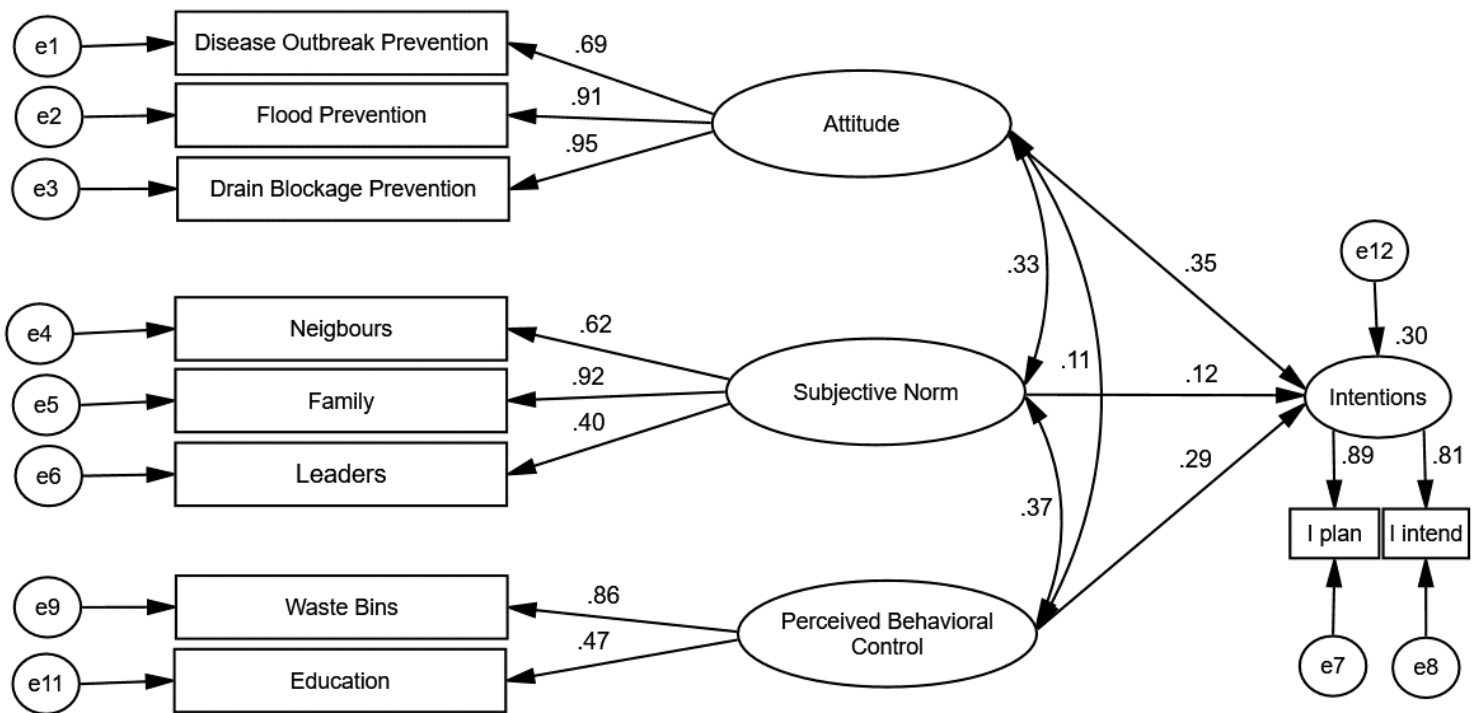


Figure 5

The original model

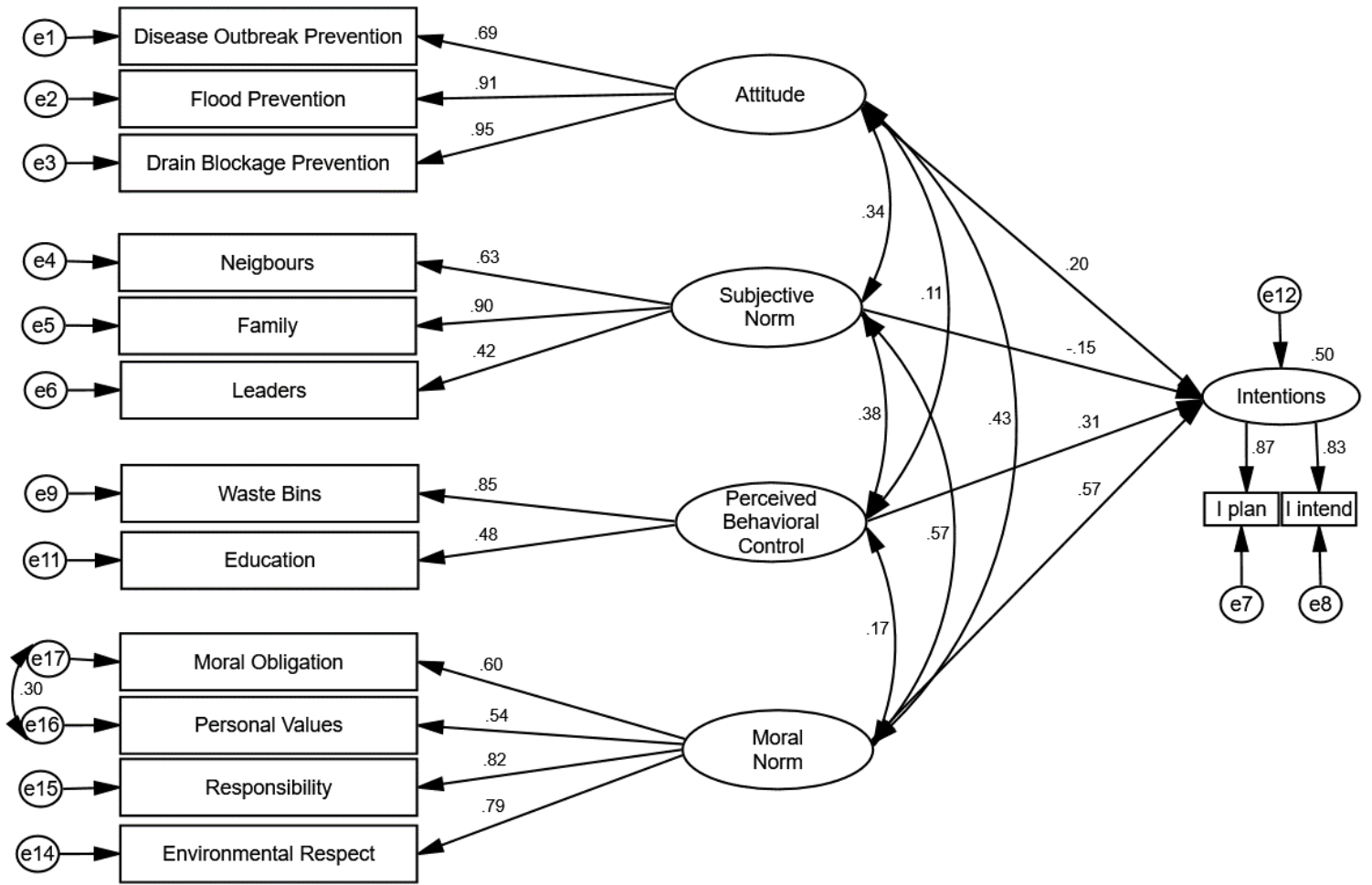


Figure 6

The extended model