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Article

Behavioural Patterns of Plastic Use by Indigenes of Ho: Influence of Awareness Levels, Attitudinal Change and Legislative Frameworks

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Abstract: Most research findings in Ghana and all over the globe lay much emphasis on the technical knowledge of plastics; especially giving preference to the biodegradable over the synthetic/Single-Use plastics. Questionnaires were administered to about 200 respondents in the Ho Municipality out of which 163 responses were filled and returned. Results showed that of all the variables tested only Legislative Framework has a meaningful impact on the behaviour of Ho indigenes. Awareness level: (Synthetic Plastics and Biodegradable Plastics) as well as Attitudinal Change do not influence people's behaviour when using plastics. Findings from this study are further discussed and recommendations were proffered to instil eco-friendly behaviour among people.

Keywords: legislative framework; attitudinal change; synthetic plastic; biodegradable plastics; behavioural pattern

1. Introduction

Recently, the use of plastics form an integral part of our everyday lives globally (Alam et al., 2018). Due to the daily consumption of plastics, there is excessive plastic production with more than 350 million tons every year (Liang et al., 2021; Plastic Europe, 2020). Globally, 335 million metric tons of plastics are generated as reported in 2016 (Plastic Europe, 2017). Plastics produced globally shot up to 348 million tons in 2017 and 359 million in 2018. The whole of Europe produced 18.5% while China produced 29.4% with the African continent producing 7.1% in 2017 (Plastic Europe, 2018 & Plastic Europe, 2019). Due to incessant release of plastic waste biodiversity is negatively impacted thus affecting ecosystem services (Adane & Muleta, 2011).

Because plastics play a pivotal role in economic development there will be huge numbers of plastic waste pollution in Macao due to an increase in population growth, advancement in the tourism industry and many more. As a result of this phenomenon much is expected from environmental management and recycling experts (Liang et al., 2021; Song et al., 2016). Most researchers across the globe carry out research mainly focused on the legislative frameworks regulating the consumption and production of plastics, but with little study on the awareness levels of indigenes regarding the types of plastics as well as understanding their perceptions towards the consumption of plastics (Adam et al., 2021). In the developed countries, many people now perceive the use of plastics as on a slippery slope which will have more devastating consequences on the environment years to come. Unfortunately, Africa and Asia are yet to achieve this feat (Dikgang et al., 2012; Zen et al., 2013). Africa is yet to be at par with Europe because majority in Africans do not understand efficient waste management practices and lack the skills. In Asia; taking China and India as examples may be facing plastic waste pollution due to an overwhelming increase in population growth coupled with their strong desires to be economically sufficient with little consideration to the impact of their businesses on the environment.

The perceptions, behaviour and attitude of people towards the use and handling of plastics is the reason for the indiscriminate littering of plastic waste in our environment especially in drainage ways, roads, farms and many more (Afroz et al., 2010; Sarbassov et al., 2019).

Previous studies confirmed that environmental knowledge has a significant impact on an eco-friendly attitude and it enables people to become environmentally responsible. There is therefore a strong positive correlation between environmental awareness and the behaviours of people concerning the use of plastics (Brundtland, 1987).

Legislations on the use of plastic bags in the form of levies can make a positive impact in society by ensuring sustainable management of plastics since it (levy) makes them become environmentally conscious (Vassanadumrongdee, 2020).

The findings of this study will contribute to the general literature on the perceptions people have concerning plastics' use. To the best of our knowledge there was no study conducted in the Ho Municipality to test the awareness levels of indigenes on plastics' use. The results can guide policy makers adopt and implement the most appropriate measures in regulating human behaviour on the use of plastics in the Ho Municipality.

1.1. Conceptualization and Hypotheses Development

A review of literature on the factors that influence people's choices on the use of plastics provided information on understanding people's behaviour towards plastics, and argues that there is little work done in this regard (Adam et al., 2021). The hypothesis for each latent variable is further explained in the following subsections.

1.1.1. Awareness Level: Synthetic Plastics (Responses)

The availability of plastics play a critical role in the world's industrial revolution, synthetic plastics are made from fossils (World Economic Forum, 2016; Gu et al., 2017). The use of plastics is inevitable and this has caused a surge in their demand. To make matters worse for environmentalists, this demand is likely to double in the next two (2) decades to come (World Economic Forum, 2016; Gu et al., 2017). A lot more people patronize synthetic plastics many years back (though made from petrochemicals) due to their low cost of production making them affordable for businesses, durability and strength, provision of insulation, and their resistance to chemicals and corrosion (Filho et al., 2021).

Study conducted by Adam et al., 2021 found out three (3) behavioural patterns people displayed in the use of synthetic plastics. These behavioural patterns are categorized into: (i) Complete avoidance of synthetic plastics (ii) Potential avoiders of synthetic plastics and (iii) Patrons of synthetic plastics. Based on the above literature, we hypothesize that:

H1: *Awareness levels of Ho indigenes on what synthetic plastics have an effect on their Behavioural Patterns*

1.1.2. Awareness Level: Biodegradable Plastics (Responses)

One of the underlying factors underpinning plastic pollution in our environment is that people do not show interest in environmental issues. One reason for this is because people are already addicted to the use of conventional plastics where they are disposed off after usage (UN Environment, 2018). This statement is consistent with the findings of Mestec (2018), who also agreed that a large chunk of plastics that we use are destined for landfills and water bodies each year due to their inability to be recycled and recovered (Gourmelon, 2015). Understanding environmental issues is also another reason why many people do not patronize biodegradable plastics. Most consumers do not have expert knowledge when it comes to environmental sustainability although they may be highly educated. Many consumers have general knowledge of the environment, but not on critical Environmental issues (Ahmad et al., 2010). This is because issues on Environmental Sustainability is a specialist niche which requires adequate training and continual reading.

When it happens this way people will begin to appreciate the value nature presents to us and this will reflect in the daily handling of plastics by people. Based on the above available information, we propose the following hypothesis:

H2: *Awareness levels of people of what biodegradable plastics are will reflect in their daily handling of plastics.*

1.1.3. Attitudinal Change (Responses)

Merriam Webster's Online Dictionary defines Attitude as a "feeling or way of thinking that affects a person's behaviour."

Transition to a circular economy in the plastic economy has seen the support of practitioners and academics. In as much as it inures to the benefit of society and meets all the pillars of sustainability, engaging indigenes in communities is fraught with several challenges (Kolade et al., 2022). These challenges include; institutional, infrastructural and socio-cultural factors despite the enthusiasm, expertise and commitment of change makers (Kolade et al., 2022).

Circular plastic economy has a great potential for the creation of jobs and enhancement of skills which the African continent needs to address youth unemployment (Berg et al., 2018).

Based on the above submissions, we hypothesize that:

H3: *Attitudinal Change (preconceived mentality) of indigenes has an effect on the behaviors of people.*

1.1.4. Legislative Framework (Responses)

One thing peculiar to regulatory frameworks is that sanctions are applied to people who refuse to comply with them (Scott, 2014). Government agencies, companies, international organizations and other relevant stakeholders are responsible for the implementation of these laws. Researches conducted in the past have it that legislative instruments are the most powerful tools in forcing firms to implement environmental practices and most importantly making them become environmentally conscious (Oliver, 1997). Based on the findings of Chen et al., 2019 regulations on good environmental practices are the most influential drivers that cause managers of firms to adopt sustainable practices.

In Ghana, it is evident that we tend to comply with laws when sanctions are meted out to culprits, and when we become aware that laws exist. To support the above statement; all landlords have toilet facilities for their tenants which was not the case previously. This is because of the putting into force the Local Government Act (Act 462). Based on the above literature, we hypothesize that:

H4: *Legislative framework affects the way people manage plastic wastes (and waste in general)*

2. Methodology

2.1. Measurement of Constructs

A structured questionnaire was adopted in this study to collect data from consumers of plastics such as traders and storekeepers to test the developed hypotheses. The items for the constructs were adapted from previous studies. This is to make sure that there is content validity among the constructs and measured on five-point Likert scales ranging from "strongly disagree" to "strongly agree" (see supplementary Materials). Items for legal framework and awareness level (synthetic) were adapted from Adam et al., 2021. The items for attitudinal change and effects on behavioural patterns were adapted from Ezcurra & Bisogno, 2022 and Shen et al., 2020 respectively. The items for biodegradable plastics were adapted from Moshood et al., 2022.

2.2. Sample Size Determination

The sample size was determined using Krejcie and Morgan (1970) formula. It was calculated referencing Krejcie and Morgan Table of Sample Size Determination. Using a table value of chi-square for 1⁰ confidence level of 95%, margin of error of 5%, a population size of 290, population proportion of 50% the sample size of 163 was obtained; where:

n = sample size

N = the total population size

e = margin of error

p = population proportion

χ^2 = Chi- square

2.3. Sample and Data Collection

Data were collected from commercial areas such as markets, and around tertiary institutions in the Ho Municipality using questionnaires. The target population consisted of only Ho residents and all respondents were 18 years and above. A simple random sampling was employed to collect data (Adichwal et al., 2022).

The respondents included traders, University Students, Senior High Students and business people. The percentage of male respondents were higher than the female respondents because the male respondents showed willingness to participate in the study and demonstrated keen interest in environmental issues. Most of the females we approached with the questionnaire survey were either unreceptive or unconcerned. Google forms were distributed on social media platforms (specifically WhatsApp) and complemented with survey questionnaires (Ahsan et al., 2020). English was the medium of communication so that majority of respondents could understand which was mixed with the local language (Ewe).

The questionnaire was adopted from research articles specific to the various themes (as elaborated above under Section 2.1: Measurement of Constructs. Participants were first informed about the purpose of carrying out this questionnaire before we administered the survey questionnaire.

2.4. Data Analysis

Statistical Package for the Social Sciences (SPSS) was employed in this study for generating data on the demographics. Structural Equation Modelling (SEM) using Partial Least Squares (PLS) was the software used in testing the research model (Ringle et al., 2015). Partial Least Squares (PLS) was chosen because of its suitability in identifying key variables and this meets the objective of this study (Ali et al., 2019)

Out of a total of 163 respondents who partook in the study, 86.5% were males whereas 13.5% were females. Majority of the respondents (98.2%) were within the age range of 18-39 years. Also, 86.5% of the respondents had tertiary qualifications while 4.3% and 6.7% has Technical/ Vocational and secondary education respectively. Then again, 49.1% of the respondents are comfortable using plastic bags while 39.9% are not. However, 11% are indecisive. These outcomes are exhibited in Table 1 above.

Table 1. Demographic Characteristics of Respondents.

Demographics	Frequency	Percent
Sex:		
Male	141	86.5
Female	72	13.5
Age:		
18-24	93	57.0
25-29	41	25.2
30-39	26	16.0
40-49	3	1.8
50-Above	0	0
Occupation:		
Farmers	20	12.3
Artisans	7	4.3

Trader	11	6.7
Civil/Public servant	27	16.6
Unemployed	98	60.1
Location:		
Urban Ho	97	59.5
Sub-Urban Ho	22	13.5
Rural Ho	44	27.0
Literacy Level:		
Basic/Primary Education	0	0
Secondary Education	11	6.7
Tertiary Education	141	86.5
Technical/Vocational	7	4.3
No Formal Education	4	2.5
Are you comfortable using a plastic bag?		
Yes	80	49.1
No	65	39.9
Can't Tell	18	11.0
Total	163	100.0

Source: Survey Data, 2022.

Table 2. Adapted instruments and Cronbach's Alpha.

Items	Factor Loadings	CA	Source
Synthetic Plastic			
Synthetic plastics do not break down in the environment; but stay for many years.	0.838	0.793	Adam et al., 2021. Yuan & Cummins, 2022. Shen et al., 2020.
Synthetic plastics are harmful to the environment	0.818		
Synthetic plastics are harmful to human health	0.685		
Synthetic plastics are dangerous to aquatic life	0.689		
Synthetic plastics contribute immensely to greenhouse gas emissions	0.602		
Attitudinal Change			
Perceived high cost of production makes people not to patronize biodegradable plastics	0.730	0.827	Ezcurra & Bisogno, 2022. Shen et al., 2020
Traders & consumers doubts gradable plastics make them	0.700		
Indigenes have limited alternatives to biodegradable plastic in the market unlike synthetics	0.821		
Less attention given to environmental Issues by social media as well as-online media.	0.884		
Biodegradable Plastics			
Biodegradable plastics decay upon their release into the environment	0.886	0.855	Moshood et al., 2022
Biodegradable plastics pose less danger to the environment	0.850		
Biodegradable plastics pose less danger to human health	0.797		

Subsidies should be put on biodegradable plastics in the form of tax waivers	0.793		
Legal Framework			
There is no effort made to educate indigenes on sanitation laws.	0.831	0.700	Adam et al., 2021
There is lack of adequate legislation for enforcement	0.720		
There is lack of enforcement for the already existing laws.	0.780		
Effect on Behavioural Patterns			
Having adequate knowledge about synthetic plastics affect Behavioural Patterns	0.810		
Having adequate knowledge about biodegradable plastics affect Behavioural patterns	0.874	0.901	Shen et al., 2020 Bucknall, 2020
Having pre-conceived notion about plastics influences the daily handling of plastic	0.844		
Awareness about the legislative frameworks of plastics influences daily handling of plastics	0.830		
	0.870		

3. Results: Measurement model assessment

The model's reliability and validity are reported in Table 3. The findings reveal that all the measures have satisfactory level of internal consistency. Thus, both indices of Cronbach alpha (CA) values ranging from (0.700 to 0.901) and Composite Reliability (CR) values ranging from (0.821 to 0.926) exceeded the recommended thresholds of 0.7 (Bagozzi and Yi, 1988; Nunnally, 1978). Regarding convergent validity, all the outer loadings are between 0.602 and 0.886, and the indices of Average Variance Extractor (AVE) values ranges from (0.536 to 0.716), exceeding the acceptable threshold of 0.50 (Fornell and Larcker, 1981). The evidence suggests the measures have an acceptable degree of convergent validity (Hair *et al.*, 2014).

Table 3. Factor Loadings, VIF, Validity and Reliability of Latent Construct.

Items	Loadings	t-Values	p-Values	VIF	CA	Rho_A	CR	AVE
AC2	0.730	2.554	0.011	1.742	0.827	0.810	0.866	0.620
AC3	0.700	2.252	0.024	2.080				
AC5	0.821	3.243	0.001	1.577				
AC6	0.884	3.487	0.000	1.812				
BP1	0.886	4.224	0.000	2.252	0.855	0.889	0.900	0.692
BP2	0.850	3.416	0.001	2.351				
BP3	0.797	3.248	0.001	2.094				
BP4	0.793	3.486	0.000	1.560				
EBP1	0.810	14.676	0.000	1.989	0.901	0.912	0.926	0.716
EBP2	0.874	20.177	0.000	2.941				
EBP3	0.844	15.823	0.000	2.968				
EBP4	0.830	11.450	0.000	2.104				
EBP5	0.870	20.636	0.000	2.986				
LF1	0.831	7.702	0.000	1.386	0.700	0.701	0.821	0.606
LF2	0.720	4.613	0.000	1.309				
LF3	0.780	6.294	0.000	1.282				

SP1	0.838	3.410	0.001	2.366	0.793	0.826	0.850	0.536
SP2	0.818	3.462	0.001	2.083				
SP3	0.685	2.668	0.008	1.889				
SP4	0.689	3.041	0.002	1.698				
SP6	0.602	2.663	0.008	1.944				

CA-Cronbach alpha, CR-Composite Reliability, AVE- Average Variance Extractor, VIF-Variance Inflation Factor.

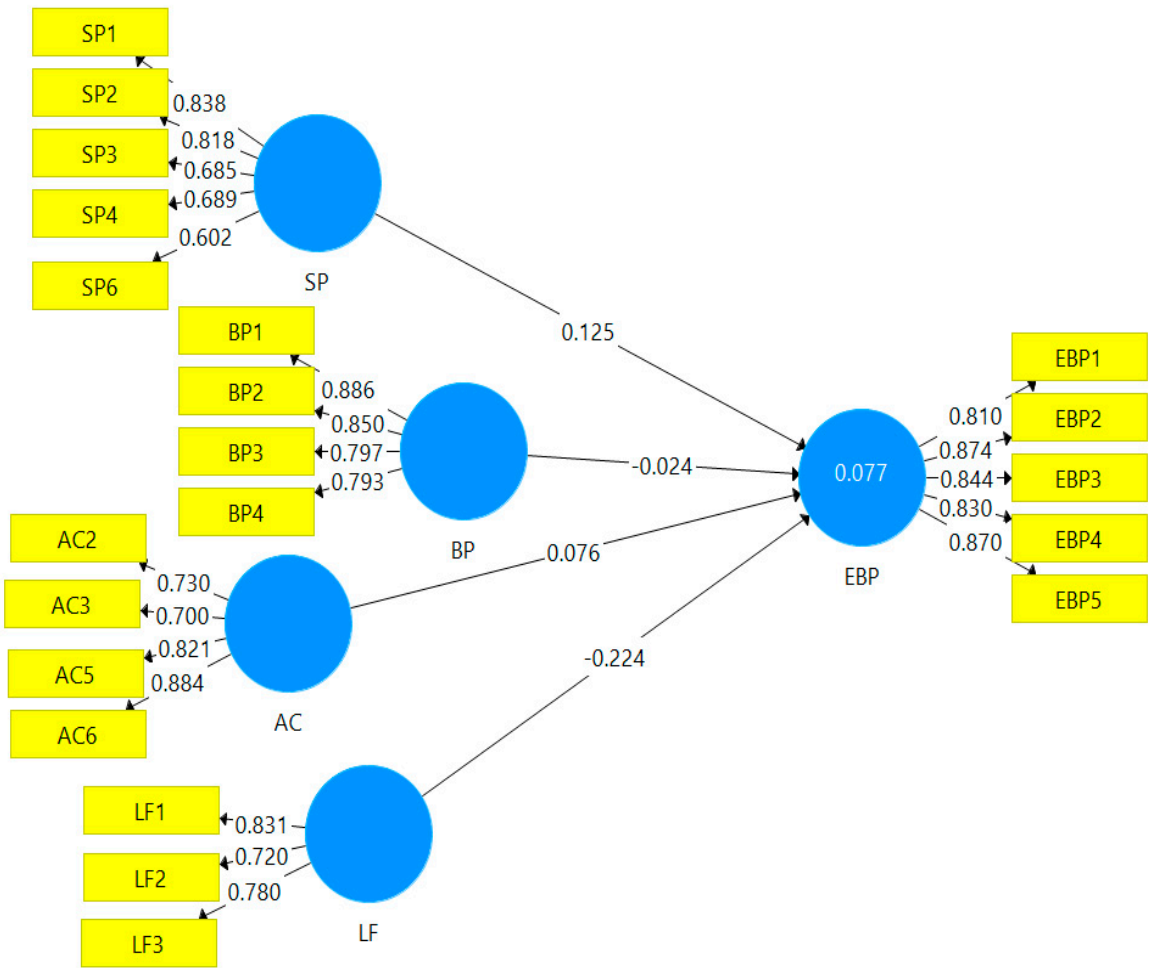


Figure 1. Measurement Model. Source: Estimate from SmartPLS

3.1. Discriminant Validity

The study employed cross loading, Fornell-Larcker (1981) criterion, and Heterotrait-Monotrait (HTMT) approach (Henseler *et al.*, 2015) to determine the discriminant validity of the scale used for the study.

As depicted in Table 4, all figures on the diagonals are greater than the figures below them indicating that discriminant validity is attained. According to Hair, Sarstedt, Ringle and Mena (2012), discriminant validity using the Fornell-Larcker criterion at the construct level can be achieved if the square-root of the AVE is greater than the highest correlation between the latent variable and the other constructs.

Table 4. Discriminant validity by Fornell Lacker criterion.

	AC	BP	EBP	LF	SP
AC	0.787				
BP	0.576	0.832			
EBP	0.119	0.114	0.846		
LF	-0.007	-0.083	-0.229	0.778	
SP	0.439	0.606	0.156	-0.052	0.732

Results presented in Table 5 show the outer loadings of each indicator been greater on its respective latent variable than its cross-loadings on any other latent variables. This also confirms the attainment of discriminant validity.

Table 5. Discriminant Validity by cross loading.

	AC	BP_	EBP	LF	SP
AC2	0.730	0.496	0.062	-0.018	0.476
AC3	0.700	0.564	-0.001	0.010	0.486
AC5	0.821	0.526	0.094	-0.058	0.352
AC6	0.884	0.431	0.120	0.042	0.317
BP1	0.426	0.886	0.118	-0.071	0.544
BP2	0.571	0.850	0.081	-0.015	0.485
BP3	0.541	0.797	0.061	-0.029	0.433
BP4	0.441	0.793	0.102	-0.136	0.527
EBP1	0.115	0.152	0.810	-0.192	0.186
EBP2	0.134	0.106	0.874	-0.169	0.108
EBP3	0.135	0.136	0.844	-0.173	-0.011
EBP4	-0.007	-0.001	0.830	-0.253	0.154
EBP5	0.154	0.114	0.870	-0.158	0.162
LF1	0.012	-0.051	-0.202	0.831	-0.005
LF2	-0.043	-0.059	-0.139	0.720	-0.070
LF3	0.004	-0.086	-0.185	0.780	-0.058
SP1	0.274	0.360	0.143	-0.058	0.838
SP2	0.241	0.343	0.136	-0.081	0.818
SP3	0.350	0.568	0.051	-0.008	0.685
SP4	0.427	0.512	0.121	-0.044	0.689
SP6	0.455	0.726	0.063	0.078	0.602

Further, the HTMT values ranging from (0.070 to 0.815), is below the threshold value of 0.85 (Henseler et al., 2015) or 0.90 (Hair et al., 2013) as indicated in Table 6 provides evidence of discriminant validity (Henseler *et al.*, 2015).

Table 6. Discriminant validity by Heterotrait-Monotrait (HTMT).

	AC	BP_	EBP	LF	SP
AC					
BP_	0.757				
EBP	0.143	0.137			
LF	0.070	0.101	0.281		
SP	0.661	0.815	0.168	0.105	

3.2. Hypothesis Testing

From the results shown in Table 7, it indicates that, the path coefficients and the *p-values* showed that out of the four (4) hypotheses tested, only one (1) path relationship (LF->EBP) was significant

(i.e., H₃). Specifically, AC insignificantly predicted EBP ($\beta = 0.088$; $t = 0.573$; $p = 0.567$) indicating a one-unit decrease in AC will decrease the expected value of EBP by 0.088 thereby rejecting H₁. Also, BP and SP did not significantly predict EBP as indicated in the Table 7 above because their p -values are greater than 0.05. Therefore, hypothesis (H₁, H₂, H₄) are rejected whilst Hypothesis (H₃) is supported respectively.

Table 7. Path Relationship.

Hypothesis	Path	VIF	B	SE	T-Statistics	P-Values	Decision
H ₁	AC -> EBP	0.076	0.088	0.133	0.573	0.567	Rejected
H ₂	BP -> EBP	-0.024	0.009	0.115	0.207	0.836	Rejected
H ₃	LF -> EBP	-0.224	-0.234	0.067	3.317	0.001	Supported
H ₄	SP -> EBP	0.125	0.131	0.133	0.936	0.349	Rejected

The Table 8 above shows the predictive relevance (Q²) and predictive power (R²) of the dependent variable. From the Table 8, it indicates that, the structural model has acceptable level of predictive relevance (Q²>0.043) and predictive power (R²>0.077) (Hair et al., 2019; Usakli & Kucukergin, 2018). Specifically, the R² value of 0.077 indicates that the model explains 7.7% of variation in EBP. Also, Q² of the model was 0.043 which is > 0.0, establishing the fact that the PLS structural model has predictive relevance.

Table 8. Results showing predictive relevance and predictive power.

Latent	Q ²	R ²	AJ. R ²
EBP	0.043	0.077	0.053

3.3. Ethical Considerations/Research Ethics

Research ethics was strictly adhered to respondents. The purpose of the study was communicated to the respondents.

4. Discussion and Implications

It is an undeniable fact that the environment has reached its threshold and can no longer contain the ever-increasing plastic waste accumulation which has dire impact on the environment (Derraik, 2002). Due to the numerous benefits plastics provide us which include their affordability, portability, and easy way of production. However, we are not yet in the position to effectively manage the amount of plastic waste we churn out. This can only be achieved through a change of mind and behaviour in the way we manufacture, use and manage plastics (Giacovelli, 2018). Nonetheless, in our present study, attitudinal change has no effect on the behaviour of people which is not consistent with the findings of (Clearsky, 2021 and Trubetskaya et al., 2022) who argued that in order to have a greener plastic economy, there must be a systematic mental shift in making people accept eco-friendly packaging materials.

Based on the results, legislative framework has a positive effect on the behaviour of Ho indigenes and this is in agreement with the findings of (Addaney & Oppong 2015) who found out that effective implementation of legal frameworks will help manage solid waste more efficiently and sustainably. Furthermore, our result is consistent with the findings of Lissah et al., 2021 which also states that strict implementation of regulations will help minimize urban solid waste in Ghana as a whole. This suggests the crucial impacts legislative frameworks have on sanitation in Ghana. Effective implementation of the legislative instruments particularly in the Municipalities will automatically have a positive impact on the behaviour of indigenes in the Ho Municipality.

According to our result, being aware of the different types of plastics and their environmental impact has no effect on the behaviour of Ho indigenes which is not consistent with the findings of Adam et al., 2021. Our findings suggest that some indigenes have adequate knowledge of the types of plastics and their impact on the environment but are not environmentally conscious rather the

introduction of plastic bag levies (as done in England) will force them to become environmentally responsible.

Our findings provided us with information that even though majority are willing to change their behaviours to live more sustainably, they still need financial and logistics support especially the producers. They argued that having brilliant ideas alone will not make them produce eco-friendly plastics and promote green living like recycling.

Understanding how the awareness levels, legislative framework and attitudinal change influence the behaviour of Ho indigenes towards the use of plastics will help local policymakers (Districts, Municipal) review policies and strategies in ways that will enable Ho to maintain its enviable status of being the oxygen city in Ghana even as population increases.

5. Conclusions and Recommendations

Plastic consumption plays a major role in the economic lives of people and this accounts for the increase in plastic bottles churned out everyday (Nielsen et al., 2019). Even though there are calls for the reduction of plastic waste by stakeholders and government institutions. There is very little empirical study on understanding people's behaviour towards the handling of plastics. It is in this regard that this study sought to understand the behaviour of Ho indigenes on the consumption of plastics.

In conclusion, the level of awareness of the types of plastics (whether synthetic/biodegradable) has no meaningful impact on how people handle plastics which is not in agreement with (Adam et al., 2021 and Shen et al., 2020). In this present study, efforts made by stakeholders to make people have a positive mental attitude has no effect on how people use plastics which is also not in line with (Clearsky, 2021). The results showed clearly that people can only change their behaviours as a result of implementing legislations regulating the consumption and production of plastics. Member states commit themselves to achieving their global environmental goals between now and 2030 through effective implementation of regulatory measures (Directive EU, 2019). This study implies that policy frameworks and regulatory measures aimed at minimizing the plastic waste menace should be developed to protect the environment (Bezerra et al., 2021; Clayton et al., 2020; Diggle & Walker, 2020) and by this many would shun away from disposing off plastics indiscriminately.

6. Limitations and Future Studies

Although the objectives of our study were addressed, there is one limitation that should be considered and can be a starting point for future studies in other regions of Ghana. This is because the study was limited to Ho and therefore further studies are needed to measure these variables in other parts of Ghana.

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