

Article

Predicting Pro-Environmental Behaviour amongst Citizens in African Countries: A Cross-National Study amongst Six African Countries

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Abstract: The role of pro-environmental behaviour in environmental care and mitigation of environmental problems is widely recognised. However, most studies on pro-environmental behaviour have focused on populations living in Western and high-income countries and only a few studies are available in developing countries. In this paper, we explored and compared the determinants of pro-environmental behaviour of citizens in six African countries, namely Algeria, Egypt, Ghana, Nigeria, South Africa and Zimbabwe. We examined the relationship between socio-demographic variables and pro-environmental behaviour of citizens within and across these countries using secondary data collected through Wave 6 of the World Value Surveys. The results showed that there were differences and some similarities in pro-environmental behaviour across the selected countries. Factors such as gender, education, social class, membership of environmental organisations and employment status positively correlated with pro-environmental behaviour among the selected respondents. Based on the study findings, recommendations are made within to improve and increase pro-environmental behaviour in the selected countries.

Keywords: pro-environmental behaviour; African countries; survey; socio-demographical factors; hypotheses; similarities; differences



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1. Introduction

During the last four decades and even earlier, the African continent has witnessed considerable human-induced environmental degradation, mainly due to deforestation, fragmentation and the destruction of ecological habitats, solid waste mismanagement, loss of biodiversity as well as air and water pollution [1–3]. In many parts of Africa, higher levels of degradation are leading to various kinds of environmental problems which are impairing the functioning of natural ecosystems and reducing the liveability and quality of human settlements [3–6]. Although some of these environmental challenges may have natural origins, a larger proportion of them are related to what Maloney and Ward [7] describe as “maladaptive human behaviour”. Such behaviour is undesirable from a sustainability perspective and is opposite to the generally acceptable patterns of behaviour across age groups and environmental settings, and it has negative consequences for those who are directly involved and the people around them [8]. Similarly, human behaviour that leads to the destruction of environmental quality and depletion of natural resources is equally undesirable, thus pointing out the need for more pro-environmental behaviour (PEB) which may contribute towards sustainable development and long-term environmental protection.

PEB involves “a set of behaviours practiced by individuals that seek to take measured actions to promote positive changes in the environment and limit the effects of human negligence” [9,10]. What is then required to reduce Africa’s environmental crises is maximising

PEB amongst her inhabitants. Such a behavioural shift means the adoption of environmentally friendly practices and the development of positive attitudes that are conducive for the promotion and realisation of sustainable development [11,12]. Increasing PEB would also lead to the adoption of cleaner production practices amongst human activities and their organisations, thus reducing the generation of waste materials [13,14]. In this way, material or energy conservation will be promoted, thus impacting the environment to a minimal extent as well as preserving environmental quality [15].

While PEB may be seen as environmentally friendly, it is not always easy to achieve amongst individuals, society and even across nations, as it is influenced by an array of many different factors [10,16–19]. Likewise, the extent of environmental attitudes and their influence on environmental behaviour has been researched by the application of different theoretical instruments, including, the Theory of Planned Behaviour (TPB) [20] and the New Environmental Paradigm (NEP) scale, amongst others [21–23]. According to Kollmuss and Agyeman [24] as well as Mikula et al. [16], factors contributing to PEB may be classified into three different categories, namely (1) demographic (for instance, age, gender and educational levels), (2) external (institutional, socio-economic and cultural conditions) and (3) internal (environmental knowledge, values, attitudes, etc.) influences. In a survey conducted amongst university students in the UK and Nigeria, it was found that those with higher knowledge of environmental education issues exhibited relatively higher levels of PEB, thus offering important insights into how education can contribute towards healthier environments [25]. Other studies have examined the influence of socio-demographic factors such as gender, education, income and a number of contextual variables on PEB [26–28]. To this extent, cross-cultural research based on the role of environmental knowledge on PEB amongst students in Brazil, Mexico, Spain and the USA indicated differences in the situational factors between developing and developed countries, thereby highlighting the influence of external factors such as culture, services and environmental structures in the different countries [29]. Furthermore, PEB has been studied from a regional context [30–32]. In one of these studies, the purpose was to generate information on macroeconomic variables relevant for the assessment of PEB in EU countries [16]. The research found that country-level PEB was correlated with various demographic and economic factors [16]. In addition, there were marked spatial variations in PEB within the EU regional bloc, with countries such as Denmark, Finland and Sweden displaying more household PEB than Greece, Malta and Romania [16].

In contrast with the aforementioned studies, the TPB emphasises the role of intentions, subjective norms and perceived control in moderating PEB [20]. According to this theory, the immediate determinant of behaviour is individual intentions, and such intentions are influenced by attitudes, subjective norms and perceived controls [20,30]. This theory has been extensively applied in the studies of recycling behaviour across the world [31–34] and is amenable to the addition of other variables, such as personality and demographical characteristics, that many have a significant contribution towards behavioural outcomes [20]. On the other hand, the NEP scale unravels a wider spectrum of ecological viewpoints, along with environmental items to assess environmental concerns amongst individuals [22]. The original NEP scale was introduced in 1978 and was hinged on 12 items organized within a four-point Likert scale response system [35,36]. In 2000, the NEP scale was subsequently revised to encompass 15 items based on a five-point Likert response scale, the goal being to quantify the five core components of individuals' environmental concern [36]. In Greece, the environmental attitude of citizens was researched by applying this scale to understand their environmental behaviour and perceptions about the environment [23]. The results revealed high environmental concern amongst citizens for the current and future state of the environment. Although this scale has been criticized for its purported one-dimensional character [37], it has been applied to other studies in different countries to show cultural and other influencers of environmental attitudes [22,38–40]. Additionally, similarly, with the TPB, the NEP scale has been broadened and applied to a variety of disciplines such as

education, business, psychology and tourism, where an understanding of environmental attitudes and values was needed to predict PEB [41–43].

Although the current literature contextualisation in this paper is revealing marked proliferation of PEB studies in predominantly highly developed countries, there is limited understanding of how these factors influence PEB in the developing countries of the world with relatively lower human development indices, particularly in Africa. Unlike countries in the developed world, many African countries face multiple development and sustainability challenges that are often aggravated by rapidly growing populations, increasing urbanisation rates and unemployment levels [44]. Such trends are leading to the unprecedented growth of slums and informal settlements, undermining efforts to increase environmental conservation, as well as climate change adaptation and mitigation [45]. Moreover, in some regions, such as Sub-Saharan Africa (SSA), it has been found that despite increased democratisation, rising foreign direct investments and marked economic expansion, there are significant sustainable development challenges [45]. Moreover, the diversification away from primary economic sectors to service-oriented and knowledge economies is not occurring fast enough, creating huge barriers in the management of such transitions while attempting to achieve the 17 Sustainable Development Goals [46].

In light of these development imperatives, our study has investigated the determinants of PEB amongst citizens of six African countries, namely Algeria, Egypt, Ghana, Nigeria, South Africa and Zimbabwe. Of the few studies that were conducted in some of the African countries, none of them performed any comparative cross-national analyses on the various determinants of PEB [27]. Although Berndt and Gikonyo [27] attempted to study environmental concern and behaviour in Africa, theirs was an exploratory and descriptive study; therefore, it was limited from a regional and continental scale of analysis. Given these shortcomings and the demonstrated literature gap, the rationale and justification for the present research is evident. African cross-country studies on PEB have the potential to contribute to the enrichment of existing theory on PEB while indicating similarities and dissimilarities across the chosen study areas. To help illuminate and enrich the understanding of our research problem, five hypotheses were formulated, and they are briefly summarised as follows:

Hypothesis 1. *There are statistically significant differences in PEB according to the gender of respondents in each country.*

Hypothesis 2. *The PEB of respondents from each country differ according to socio-demographic characteristics (e.g., marital status, age, social class, income, employment status, sector of employment and educational level).*

Hypothesis 3. *The PEB of respondents display statistically significant differences amongst countries.*

Hypothesis 4. *Socio-demographic variables are significantly related to the PEB of respondents in each country.*

Hypothesis 5. *Socio-demographic variables are positive predictors of PEB of respondents in each country.*

2. Research Methods

In order to address the aim of this paper and test the formulated hypotheses, the World Value Survey (WVS) data were analysed. The WVS [47] is a globally co-ordinated data collection project organised by the WVS Association on various aspects of human society. The survey has been collecting data since the year 1981 and is widely regarded as a major cross-national data collection project on social parameters or factors such as gender roles, good governance, social capital, environmental protection, as well as subjective well-being [47–51]. The data have been used extensively across the world by various researchers to address their research aims, including to quantify PEB and its determinants [52–55]. Such surveys aimed to learn more about the characteristics of a specific population, but they selected only a sample of the study population to generate insights about the whole population [56].

In terms of the WVS project, data were collected by locally based survey organisations to ensure nationally representative sample frames in each country [47]. As a result, stratified multistage random sampling was used to obtain representative national samples in the respective countries, and the data were collected by means of face-to-face interviews [47]. The first stage of sampling process involved stratification of the sample and the selection of the primary sampling units. In the second stage, the secondary sampling units were selected, while respondents aged 16 years and above were interviewed in the third stage. The sample size was comprised of 3531 respondents and the estimated sampling error was 1.7. The entire fieldwork period started on the 18 August 2013 and lasted until 6 October 2013 [47].

The data relevant for the present study were collected via WVS Wave 6 conducted between the years 2010 and 2014, and it was comprised of datasets from fifty-eight [47] different countries. Ten of these countries are located on the African continent [47]. Amongst the 10 countries, 5 of them are located in North Africa (Algeria, Egypt, Libya, Tunisia and Morocco) while another 5 are in the sub-Saharan region (Ghana, Nigeria, South Africa and Zimbabwe). Out of these 10 countries, Algeria, Egypt, Ghana, Nigeria, South Africa and Zimbabwe were selected for the present study.

Amongst the data sets collected, PEB was conceptualised in this paper as the dependent variable, and it was measured by means of five different environmental items organised on a three-point Likert scale. Statements meant to estimate and represent PEB were as follows: (i) “Caring for nature and saving natural resources”, (ii) “Environmental decline is the most serious problem of the world”, (iii) “Protecting the environment is against economic growth”, (iv) “During past two years, I have given money to an ecological organization” and (v) “During past two years, I have participated in a demonstration for the environment”. On the other hand, the independent variables entailed demographic data such as gender, age, marital status, highest education, employment status, sector of employment, scale of income and active or inactive memberships of environmental groups. Thus, our research sought to assess the relationship between these variables across the respective national populations, with a view of revealing the general patterns that hold for the sample as a whole, as well as enabling predictions of PEB.

2.1. Data Analysis

In analysing the selected data sets, various statistical techniques were performed using SPSS v.20. Firstly, percentages were calculated to measure the responses across the surveyed countries. Secondly, the *t*-test and analysis of variance statistics were used to test for significant differences between the variables. Thirdly, the Pearson product moment correlation test was used to assess the strengths of statistical relationships, while multiple regression was used to determine which socio-demographic variables were best at predicting PEB in the selected countries. The alpha level was set at 0.05 and the regression analysis was used for the prediction of PEB. To test the various hypotheses formulated for the present research, the multiple linear regression equation was used as follows:

$$Y^i = b_0 + b_1X_1 + b_2X_2 + \dots + b_pX_p$$

where Y_i represents the dependent variable, which is pro-environmental behaviour (PEB). The independent variables X_1 through X_p are p independent or predictor variables; b_0 is the value of Y when all of the independent variables (X_1 through X_p) are equal to zero; and b_1 through b_p are the estimated regression coefficients. Each regression coefficient represents the change in Y relative to a one unit change in the respective independent variable.

2.2. Ethical Considerations

All of the data used in this paper were collected anonymously by the WVS organisation and there are no means of tracing the personal information of respondents who participated in the surveys, thus upholding their privacy and confidentiality regarding such interviews.

3. Results

3.1. Demographical Profile of Respondents

Table 1 shows some of the respondents' socio-demographic attributes in each of the six countries selected for the survey. In Algeria (50.7%), Ghana (50.3%), Nigeria (50.5%) and South Africa (50%), the proportion of men relative to that of women was generally around 50%, but Egypt (32.2%) and Zimbabwe (46%) had lower percentages. While there were slightly more men in four of the selected countries, in terms of overall proportions for all countries considered jointly, the percentage of women was 53%, relatively higher than that of men (46.6%). This pattern was caused by a situation where the individual proportions of women were comparatively higher both in Zimbabwe (54%) and Egypt (67.8%), respectively. The percentages of married and single individuals were nearly equally high in all countries compared to individuals that were either divorced or separated (Table 1). In contrast, the proportion of married respondents was particularly high for Egypt (71.5%), while South Africa exhibited the lowest percentage (33.3%). The classification of respondents according to their social categories was dominated by the lower middle class, as it ranged from 17.6% for South Africa to 39.3% in the case of Egypt. Furthermore, the respondents belonging to the lower class were still markedly high for countries such as Nigeria (33.6%) and South Africa (38.2%), respectively.

Table 1. Some of the demographic attributes of respondents.

	Algeria	Ghana	Nigeria	South Africa	Zimbabwe	Egypt
Gender	%	%	%	%	%	%
Male	50.7	50.3	50.5	50.0	46.0	32.2
Female	49.3	49.7	49.5	50.0	54.0	67.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
Marital Status						
Married	46.8	42.1	47.9	33.3	52.9	71.5
Living together as married		2.6	3.3	11.5	2.1	
Divorced	2.0	2.6	0.3	1.6	3.7	0.7
Separated	1.2	1.3	0.4	0.8	3.5	0.7
Widowed	3.2	2.7	2.2	5.1	8.1	11.8
Single	46.8	48.6	45.9	47.7	29.7	15.3
Total	100.0	100.0	100.0	100.0	100.0	100.0
Social Class						
Upper class	2.3	4.4	2.2	1.8	3.9	1.1
Upper middle class	23.8	18.4	12.4	12.1	15.1	9.9
Lower middle class	31.3	27.1	28.7	17.6	34.6	39.3
Working class	23.6	28.7	23.1	25.3	17.5	25.2
Lower class	8.9	21.4	33.6	38.2	29.0	24.5
No answer/Do not know	10.2			4.9		
Total	100.0	100.0	100.0	100.0	100.0	100.0

In terms of educational attainments (Table 2), the proportion of respondents in Zimbabwe who had completed secondary education was as high as 53.7% compared to those from other countries, which was as low as 3.6% (Algeria) and 7.7% (South Africa), respectively. The respondents with university qualifications were relatively low across all countries—a minimum of 4.8% (South Africa) and a maximum of 14.8% (Egypt), respectively.

Table 2. The proportions of respondents according to their educational achievements.

	Algeria	Ghana	Nigeria	South Africa	Zimbabwe	Egypt
Education Background	%	%	%	%	%	%
No formal education	16.6	7.0	9.1	1.6	0.5	30.6
Incomplete primary school	14.5	12.8	3.4	3.3	5.3	5.6
Complete primary school	15.4	25.7	6.9	5.1	5.6	9.6
Incomplete secondary	4.6	11.9	10.5	7.7	14.1	4.0
Complete secondary school	3.6	17.3	34.6	7.7	53.7	24.4
Incomplete university—preparatory	15.1	5.6	6.1	24.5	3.3	1.5
Complete university—preparatory	10.5	8.3	11.7	39.1	6.9	7.8
Some university—without degree	9.9	5.2	10.3	5.2	4.2	1.7
University-level education, with degree	9.8	6.3	7.4	4.8	6.4	14.8
No answer	0.1			0.9		
Total	100.0	100.0	100.0	100.0	100.0	100.0

The statistical patterns of respondents according to their employment status are indicated in Table 3. There are wide variations in the employment status of respondents. For example, the proportion of respondents who were self-employed was 33.9% for Ghana and 40.8% for Nigeria, while other countries, such as South Africa (3.6%) and Egypt (7.6%), exhibited markedly very low proportions in this category. Similarly, the percentages for housewives were generally low in other countries, although higher proportions were recorded for both Algeria (22.4%) and Egypt (54.4%). In nearly the same manner, unemployment amongst respondents was particularly rife amongst South African (34%) and Zimbabwean (32.3%) respondents, while others revealed lower proportions of respondents in this category. Despite the discrepancies amongst the countries represented in this study, the proportion of respondents who were in full time employment was consistently higher than those who were working part-time.

Table 3. The proportions of respondents according to their employment status.

	Algeria	Ghana	Nigeria	South Africa	Zimbabwe	Egypt
Employment Status	%	%	%	%	%	%
Full time	19.7	21.6	12.9	31.2	22.9	15.1
Part time	11.6	4.7	4.7	6.6	7.7	9.3
Self employed	9.0	33.9	40.8	3.6	17.3	7.6
Retired	6.5	1.6	1.2	8.0	2.9	4.1
Housewife	22.4	0.9	10.1	6.4	11.1	54.4
Students	17.2	21.9	23.1	9.9	5.9	4.9
Unemployed	13.2	14.9	7.2	34.3	32.3	4.5
Other	0.5	0.5	0.1			0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

3.2. Testing of Hypotheses

The results on the various hypotheses that were formulated for the study are presented in this section.

3.2.1. Hypothesis 1

In terms of Hypothesis 1, the results from the *t*-test revealed significant statistical differences in PEB between male and female respondents in Ghana (Table 4). However, in Algeria, Nigeria, South Africa, Zimbabwe and Egypt, no significant statistical differences were observed regarding PEB amongst male and female respondents. Furthermore, when data from all countries were aggregated, female respondents tended to exhibit a higher

PEB mean score of 7.930, while male respondents had a mean score of 7.804, thus implying significant statistical differences between the two groups. The finding implies that female respondents on the whole were likely to display more positive PEB than their male counterparts in these countries.

Table 4. Results from the *t*-test on the PEB of male and female respondents.

Countries	Male		Female		Statistics
	Mean	SD	Mean	SD	
Algeria	8.1212	1.65927	8.3995	1.87302	$t = -2.355; p = 0.019$
Ghana	7.2500	1.22566	7.4365	1.21485	$t = -3.011; p = 0.003$
Nigeria	7.4910	1.52614	7.6062	1.33129	$t = -1.688; p = 0.092$
South Africa	7.9810	1.47789	8.0136	1.43064	$t = -0.652; p = 0.515$
Zimbabwe	8.0449	1.52655	8.1185	1.53598	$t = -0.928; p = 0.354$
Egypt	8.0082	1.34755	8.0319	1.31698	$t = -0.324; p = 0.746$
All six countries	7.804	1.495	7.930	1.449	$t = -4.029; p = 0.001$

3.2.2. Hypothesis 2

The results from the analysis of variance (ANOVA) conducted on the socio-demographic variables in the various countries are shown in Table 5. With the exception of Zimbabwe, where there were no significant statistical variations in the PEB of respondents according to socio-demographic variables, most countries exhibited statistically significant variations in PEB based on these factors. For instance, in Algeria, significant statistical differences were observed in the PEB of respondents according to their (1) marital status, (2) age, (3) employment status and (4) educational level. Similarly, South African respondents revealed significant differences in their PEB according to (1) scale of income, (2) social class, (3) employment status, (4) sector of employment and (5) education.

Table 5. Testing of statistical differences between PEB according to socio-demographic variables amongst countries.

	Marital Status		Age		Scale of Income		Social Class		Employment Status		Sector of Employment		Education	
	F	p	F	p	F	p	F	p	F	p	F	p	F	p
Algeria	8.415	0.000	10.538	0.000	3.456	0.032	1.275	0.278	6.822	0.000	0.423	0.516	3.324	0.001
Ghana	2.436	0.033	0.501	0.808	6.786	0.001	3.947	0.003	0.684	0.686	3.400	0.034	2.885	0.003
Nigeria	1.177	0.318	1.191	0.308	0.239	0.787	8.221	0.000	5.070	0.000	10.206	0.000	3.596	0.000
South Africa	2.890	0.013	1.104	0.357	35.895	0.000	24.353	0.000	5.097	0.000	6.150	0.000	10.211	0.000
Zimbabwe	2.966	0.011	1.991	0.064	1.219	0.296	1.976	0.096	0.404	0.877	0.522	0.594	2.238	0.023
Egypt	1.074	0.368	0.453	0.843	10.810	0.000	8.058	0.000	2.935	0.005	3.011	0.029	4.653	0.000
All six countries	4.507	0.000	0.277	0.0948	42.000	0.000	32.147	0.000	17.282	0.000	34.785	0.000	10.720	0.000

3.2.3. Hypothesis 3

The one-way ANOVA revealed statistically significant differences in PEB among the six countries selected for this study (Table 6).

Table 6. Test of significant differences (ANOVA) of PEB among the selected countries.

		Sum of Squares	Df	Mean Square	F	Sig.
Pro-environmental behaviour	Between Groups	907.990	5	181.598	87.185	0.000
	Within Groups	22,066.364	10,594	2.083		
	Total	22,974.355	10,599			

In order to further determine the pattern of differences in PEB between these countries, Tukey HSD pairwise comparison was performed. Results indicated statistically significant differences in the PEB associated with Algeria and Ghana, Nigeria, South Africa and Egypt. However, no significant differences were observed between Algeria and Zimbabwe, although statistical differences were found between Ghana and the other five countries. In the same vein, significant differences were found between Nigeria and the other five countries. Additionally, significant differences were noted between South Africa and Algeria as well as Ghana and Nigeria; although there were no significant differences between South Africa and Zimbabwe on the one hand, and South Africa and Egypt on the other hand.

Differences in PEB amongst the six countries were contrasted with one another by means of pairwise comparisons, and the results are shown in Table 7. With few exceptions, there were statistically significant differences in PEB between all countries. Moreover, PEB amongst the respondents representing Ghana and Nigeria exhibited statistically significant differences with all countries without any exceptions (Table 7). However, this pattern was different for South Africa ($p < 0.372$) and Zimbabwe ($p < 0.860$) as they sometimes revealed no significant statistical disparities with countries such as Egypt, respectively.

Table 7. Pairwise comparisons of differences in PEB and related items.

Pro-environmental Behaviour		Mean Difference (I–J)	SE	Sig.	Lower Bound	Upper Bound
Algeria	Ghana	0.91388 *	0.06047	0.000	0.7415	1.0862
	Nigeria	0.70863 *	0.05915	0.000	0.5400	0.8772
	South Africa	0.25934 *	0.05416	0.000	0.1050	0.4137
	Zimbabwe	0.17200	0.06085	0.053	−0.0014	0.3454
	Egypt	0.23237 *	0.06068	0.002	.0594	0.4053
Ghana	Algeria	−0.91388 *	0.06047	0.000	−1.0862	−0.7415
	Nigeria	−0.20526 *	0.05026	0.001	−0.3485	−0.0620
	South Africa	−0.65454 *	0.04428	0.000	−0.7808	−0.5283
	Zimbabwe	−0.74188 *	0.05226	0.000	−0.8908	−0.5929
	Egypt	−0.68151 *	0.05205	0.000	−0.8299	−0.5331
Nigeria	Algeria	−0.70863 *	0.05915	0.000	−0.8772	−0.5400
	Ghana	0.20526 *	0.05026	0.001	0.0620	0.3485
	South Africa	−0.44929 *	0.04246	0.000	−0.5703	−0.3283
	Zimbabwe	−0.53663 *	0.05072	0.000	−0.6812	−0.3921
	Egypt	−0.47626 *	0.05052	0.000	−0.6202	−0.3323
South Africa	Algeria	−0.25934 *	0.05416	0.000	−0.4137	−0.1050
	Ghana	0.65454 *	0.04428	0.000	0.5283	0.7808
	Nigeria	0.44929 *	0.04246	0.000	0.3283	0.5703
	Zimbabwe	−0.08734	0.04480	0.372	−0.2150	0.0404
	Egypt	−0.02697	0.04457	0.991	−0.1540	0.1001
Zimbabwe	Algeria	−0.17200	0.06085	0.053	−0.3454	0.0014
	Ghana	0.74188 *	0.05226	0.000	0.5929	0.8908
	Nigeria	0.53663 *	0.05072	0.000	0.3921	0.6812
	South Africa	0.08734	0.04480	0.372	−0.0404	0.2150
	Egypt	0.06037	0.05250	0.860	−0.0893	0.2100
Egypt	Algeria	−0.23237 *	0.06068	0.002	−0.4053	−0.0594
	Ghana	0.68151 *	0.05205	0.000	0.5331	0.8299
	Nigeria	0.47626 *	0.05052	0.000	0.3323	0.6202
	South Africa	0.02697	0.04457	0.991	−0.1001	0.1540
	Zimbabwe	−0.06037	0.05250	0.860	−0.2100	0.0893

* The mean difference is significant at the 0.05 level.

3.2.4. Hypothesis 4

The bivariate correlation test was conducted to test the fourth hypothesis. The results are presented in Table 8. For this test, nine socio-demographic characteristics were analysed. Gender, employment status, sector of employment and social class were all positively correlated with the PEB of respondents in some of the countries under consideration. On the contrary, education, scale of income and memberships of environmental organisation were negatively related with PEB. Similarly, age and marital status were not significantly related to PEB. More specifically, in Algeria, there was no significant relationship between factors such as education, sector of employment and social class and PEB. Furthermore, in Ghana, gender, sector of employment and social class were positively correlated with PEB; meanwhile, education, income and environmental organisation membership were significantly negatively correlated with PEB. The results for Nigeria showed that there were no significant relationships between gender, age, marital status, sector of employment and PEB.

Table 8. Summary of correlation analysis of socio-demographic variable and pro-environmental behaviour for the six countries.

	Algeria	Ghana	Nigeria	South Africa	Zimbabwe	Egypt	All
Gender	0.079 *	0.076 **	0.040	0.011	0.024	0.008	0.039 **
Age	−0.182 **	0.000	−0.014	−0.020	−0.060 *	0.032	0.003
Marital status	0.175 **	−0.006	0.008	0.049 **	−0.018	−0.022	0.018
Highest Educational	0.036	−0.117 **	−0.087 **	−0.132 **	−0.058 *	−0.136 **	−0.064 **
Employment status	0.173 **	−0.019	0.102 **	0.081 **	−0.001	0.072 **	0.075 **
Sector of employment	0.030	0.067 *	−0.033	0.062 **	0.030	0.075 **	0.097 **
Social class	0.035	0.098 **	0.125 **	0.168 **	0.036	0.129 **	0.108 **
Scale of incomes	−0.127 **	−0.073 **	−0.057 *	−0.156 **	−0.035	−0.153 **	−0.108 **
Membership: Environmental organisation	−0.142 **	−0.112 **	−0.122 **	−0.190 **	−0.163 **	0.007	−0.141 **

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

For South Africa, the Pearson Product Moment Correlation value for the nine variables of PEB showed that marital status, employment status, sector of employment and social class were positively correlated with PEB. By contrast, education, income and environmental organisation membership were negatively correlated with PEB, whereas gender and age showed no significant correlation.

3.2.5. Hypothesis 5

To test the fifth hypothesis, a multiple regression test was conducted to identify significant socio-demographic variables that best predicted the respondents' PEB in each country. The results for the six countries are presented in Table 9. The most parsimonious sets of predictors of PEB included social class, age, gender, environmental organisation membership, employment status, highest education, marital status, income and sector of employment. Together, these nine variables explained nearly half (49%) of the variance in PEB which was found to be statistically significant ($F(10, 8382) = 43.413, p < 0.005$).

Table 9. Multiple regression analysis of socio-demographic characteristics as predictors of pro-environmental behaviour by countries.

	Algeria			Ghana			Nigeria			South Africa			Zimbabwe			Egypt			Pooled		
	B	β	<i>p</i>	B	β	<i>p</i>	B	β	<i>p</i>	B	B	<i>p</i>	B	β	<i>p</i>	B	B	<i>p</i>	B	β	<i>p</i>
(Constant)	8.921		0.000	7.022		0.000	6.947		0.000	9.027		0.000	8.989		0.000	8.913		0.000	7.587		0.000
Gender	−0.033	−0.009	0.863	0.100	0.042	0.178	−0.006	−0.002	0.941	0.033	0.012	0.504	0.062	0.020	0.524	−0.147	−0.052	0.106	−0.005	−0.002	0.867
Age	−0.227	−0.200	0.004	−0.026	−0.029	0.370	−0.005	−0.004	0.894	−0.042	−0.041	0.048	−0.066	−0.056	0.099	0.001	0.001	0.970	0.009	0.009	0.449
Marital status	0.022	0.032	0.562	0.020	0.039	0.233	0.024	0.040	0.215	0.005	0.009	0.664	−0.009	−0.013	0.677	−0.017	−0.026	0.317	0.016	0.026	0.028
Highest educational status	−0.032	−0.052	0.352	−0.047	−0.082	0.022	−0.029	−0.045	0.191	−0.074	−0.086	0.000	−0.049	−0.052	0.139	−0.036	−0.077	0.011	0.001	0.002	0.870
Employment status	0.065	0.063	0.294	−0.011	−0.016	0.588	0.072	0.065	0.042	0.017	0.031	0.228	−0.016	−0.023	0.468	0.045	0.058	0.222	0.016	0.024	0.083
Sector of employment	−0.172	−0.053	0.358	0.045	0.016	0.609	−0.270	−0.103	0.002	−0.058	−0.044	0.082	−0.002	−0.001	0.983	0.016	0.015	0.767	0.063	0.047	0.001
Social class	0.091	0.056	0.373	0.119	0.108	0.005	0.232	0.177	0.000	0.106	0.083	0.000	0.031	0.024	0.546	0.026	0.019	0.579	0.128	0.100	0.000
Incomes	0.022	0.026	0.680	0.013	0.022	0.575	0.045	0.067	0.073	−0.045	−0.071	0.001	−0.034	−0.043	0.278	−0.072	−0.109	0.001	−0.019	−0.028	0.035
Environmental organisation membership	−0.869	−0.129	0.009	−0.173	−0.078	0.009	−0.300	−0.135	0.000	−0.386	−0.169	0.000	−0.484	−0.154	0.000	0.329	0.016	0.536	−0.332	−0.128	0.000
	R = 0.228			R = 0.189			R = 0.243			R = 0.280			R = 0.208			R = 0.230			R = 0.222		
	R ² = 0.052			R ² = 0.036			R ² = 0.059			R ² = 0.078			R ² = 0.048			R ² = 0.053			R ² = 0.049		
	Adjusted R ² = 0.028			Adjusted R ² = 0.027			Adjusted R ² = 0.051			Adjusted R ² = 0.076			Adjusted R ² = 0.034			Adjusted R ² = 0.046			Adjusted R ² = 0.048		
	F = 2.189			F = 4.157			F = 7.156			F = 26.635			F = 4.638			F = 8.411			F = 43.413		

Whereas these variables were all influential for determining the PEB of respondents in all countries, their scale of influence was not uniform, thus revealing some variations amongst them. For example, the results for Algeria showed the combined effect of R (0.adding 228) and R^2 (0.052), respectively, thus implying that the nine variables selected explained 52% of the variance in PEB. However, for Zimbabwe, this influence was comparatively lower, as it was found to be only 48% ($R^2 = 0.048$). Moreover, the influence of these variables was statistically significant ($F(10, 409) = 2.189, p < 0.005$) in Algeria. The relative contribution of the predictor variables to the variance in PEB in Algeria are as follows: social class, gender and environmental organisation membership.

In contrast, the results for both Nigeria and South Africa differed markedly from the findings pertaining to the PEB amongst Algerian and Zimbabwean respondents. More specifically, in the case of Nigeria, the nine predictor variables of PEB put together accounted for 59% of the total variance in PEB in that country ($R\text{-value} = 234, F(10, 1148) = 7.156, p \leq 0.05$). The relative contributions of the predictor variables to the variance of PEB were as follows: social class, sector of employment and environmental organisation membership.

The results for South Africa were even higher; the independent variables explained 78% of the variance in PEB. In this instance, the most parsimonious set of predictors of PEB came to be employment status, membership of environmental organisation, gender, educational qualifications and marital status.

4. Discussion

Our study is the first to conduct cross-national research on the determinants of PEB amongst six countries in Africa, namely, Algeria, Egypt, Ghana, Nigeria, South Africa and Zimbabwe. Of the few studies [54,55,57] that were conducted in African countries, the focus was predominantly on PEB within individual countries; thus, these studies failed to give a comprehensive overview. In an attempt to shed light on the determinants of PEB in the present study, five different hypotheses were formulated and tested. Both similarities and dissimilarities in PEB were found, and some of the factors responsible for the observed patterns are explained further in this section. In the present study, the selected determinants of PEB were socio-demographical and were comprised of gender, marital status, age, social class, income, education, employment status, employment sector and environmental organisation membership.

In testing our first hypothesis (Hypothesis 1), the results on Ghana revealed significant statistical differences between male and female respondents regarding their PEB, while for the other five countries (i.e., Algeria, Nigeria, South Africa, Zimbabwe and Egypt), no differences were found. However, when data for all countries were aggregated together, female respondents exhibited a higher PEB mean score of 7.930, greater than the mean score of 7.804 recorded for male respondents. The reason for the relatively higher PEB amongst women respondents may be ascribed to the point that in African cultural settings, women are culturally socialised at an early age to take responsibility for their household environments, including the maintenance of cleanliness and healthy surroundings [58,59]. To this extent, in recently reported research [55] conducted in South Africa, gender exerted a significant ($F(7, 2792) = 4.384; p < 0.001$) contribution towards the prediction of environmental awareness amongst respondents, a variable that has been shown to be an important predictor of PEB [60,61]. Similar gender-related differences have been documented by other researchers [62–64], who found that women displayed comparatively more positive environmental behaviour than men. Contrary to these findings, no significant statistical differences were found between male ($M = 7.491; SD = 1.526$) and female ($M = 7.606; SD = 1.331$), $t = -1.688, p = 0.092$) respondents in a certain Nigerian study [54]. Given such contrasting patterns, it can be seen that the role of gender towards PEB is not generally straightforward, thus suggesting the existence of underlying influences, varying contexts and even subtle discrepancies in the situational factors involved. For example, two previous studies both conducted in a university setting produced different results for the influence of gender on environmental behaviour. Meanwhile, research conducted by

Edumadze et al. [62] in Ghana revealed that male respondents exhibited relatively higher scores, and they were significantly different to women regarding environmentally responsible behaviour and sustainability orientations. Thondhlana and Hlatshwayo [65] found no significant variations in the PEB measured for student residences at Rhodes University in South Africa.

Our results based on Hypothesis 2 showed that in terms of aggregated scores, the only determinant of PEB without significant differences between these countries was the age of respondents. In other words, there were no clear-cut variations in PEB amongst respondents in terms of how old they were, a finding also reported by various studies. For example, research conducted by Ifegbesan and Rampedi [54] in Nigeria revealed no statistically significant differences in PEB according to marital status and the age of respondents, which was similar to the findings of Miner et al. [66], who found no significant variations amongst respondents in terms of their willingness to participate in household electronic waste management in Jos (Nigeria). Likewise, the influence of age on the PEB of respondents in the Greater Accra Region of Ghana was marginally significant (i.e., 0.0007) based on the Logit model that was applied by Amoah and Addoah [57]. By contrast, age was found to be an important predictor of PEB in a recent South African study [55], thereby indicating some geographical discrepancies amongst the countries under consideration. That age can predict PEB seems plausible, and this is ascribed to lifelong learning and the increase in environmental knowledge that individuals acquire over time [57,67]. It is therefore not counterintuitive to find that in other studies, younger (<20 years old) respondents varied significantly in their green purchase behaviour than older respondents [27].

Other results associated with Hypothesis 2 have shown that South African respondents revealed significant differences in their PEB according to (1) scale of income, (2) social class, (3) employment status, (4) sector of employment and (5) education. In nearly the same manner, significant statistical differences in PEB according to the (1) scale of income, (2) social class, (3) employment status and (4) education were found in the data representing the respondents in Egypt. While these findings reveal some similarities, there are also dissimilarities between the countries being considered in the current study, in agreement with some of the results emanating from previous studies. However, it is imperative to recognise that there are subtle variations in these studies depending on both context and specific socio-economic circumstances in any given country [68–71]. For instance, the fact that income can have an ambiguous effect on PEB was effectively demonstrated in a Chilean study [67]. In the latter study, it was shown that income can positively affect certain kinds of PEB (for example, waste recycling) while negatively affecting others (such as using public transport and bicycles). Similarly, the moderating roles of factors such as education, employment and social class on PEB have been investigated in past studies. In terms of the influence of social class on PEB, Gifford and Nilsson [72] maintained that people are largely affected by the specific social contexts in which they experience their daily lives, and this may be short term or long term. As a result, while increased income or wealth can generate more recognition of environmental issues in Botswana than is the case amongst poorer inhabitants, the transition to a post-materialist lifestyle may also be at play when people begin to value environmental quality relatively more because their material conditions have been satisfied [72,73]. Lastly, the positive role of both employment and education on PEB are widely recognised, whether in developing countries [68,74,75] or in developed countries [23,72], lending credence to the results stemming from the present study.

In terms of the one-way ANOVA conducted to test Hypothesis 3, to a large extent, statistically significant variations in PEB were found between the six countries under consideration. This explained the influence of underlying geographical and domestic factors, such as, for example, their different development trajectories, educational and income levels, degree of environmental conservation as well as the extent of environmental activism amongst them. The observed variations in PEB may be ascribed to differences in their human development indices, a measure of average performance in the key elements of human development. For example, whereas both Zimbabwe and Nigeria had a human

development index of 0.509 and 0.540 in the year 2019, respectively, Algeria and South Africa had a human development index of 0.748 and 0.710 (respectively) for the same period [76]. Such national discrepancies in their development profiles may have a bearing on their individual PEB, although the exact nature of the statistical associations with these indices has not yet been determined.

In testing Hypothesis 4, bivariate correlations to determine the nature of the relationship between respondents' socio-demographic characteristics and PEB were calculated. Factors such as gender, employment status, sector of employment and social class were found to be positively correlated with PEB in certain countries, in agreement with the results stemming from previous studies [55,68,74,77]. On the other hand, for the data pertaining to South Africa, education, income and environmental organisation membership were negatively related to PEB. Such a finding is surprising and unexpected, as several researchers have indicated the positive role of these factors on PEB [78–81]. Even so, a previous study in South Africa has shown that being a member of an environmental organisation was one of the strongest predictors of PEB amongst their respondents [55]. Such a result is meaningful because being a member of an environmental organisation is expected to reflect some degree of environmental commitment amongst the relevant respondents by virtue of the inherent organisational affiliation and the different pro-environmental activities characteristic of such organisations. Similarly, a study conducted by Sembering et al. [75] in Indonesia has explained how environmental passion gained in the workplace may lead to positive influences on the PEB of employees, while Fatoki [82] indicated significantly positive association between organisational support for the adoption of environmental practices and PEB amongst South African employees.

For the last hypothesis (Hypothesis 5), a multiple regression test was applied to indicate the socio-demographic variables that best predicted PEB in each country. As stated before, the most parsimonious sets of predictors of PEB were factors such as social class, age, gender, membership of environmental organisation, employment status, highest education, marital status, income and employment sector. Considered collectively, these variables explained 49% of the variance in PEB which was found to be statistically significant ($F(10, 8382) = 43.413, p < 0.005$). Moreover, such a predictive power on PEB was relatively higher for both Nigeria (59%) and South Africa (78%), although it was relatively lower for Algeria (52%) and Zimbabwe (48%). These findings resemble some of the studies conducted in some of the African countries. In conducting a stepwise multiple regression analysis on certain demographical variables in Nigeria to determine whether they can predict the PEB of respondents, Ifegbesan and Rampedi [54] found that social class and membership of environmental organisations were significant predictors of PEB. Both Gifford and Nilsson [72] have indicated that PEB may be seen amongst middle or upper-middle class individuals, thus implying that it is influenced by social class, an outcome that was reported in the USA by Laidley [83] and other related studies [84,85]. As far as membership of environmental organisations is concerned, it is the nature of the activities (for example, waste recycling, energy conservation, wetland protection, etc.) that are performed by such organisations that generate positive environmental attitudes amongst their members [74].

5. Conclusions and Recommendations

In this paper, the determinants of PEB amongst the inhabitants of six African countries were investigated. Whereas many of these studies [28,64,70,85,86] were conducted in developed countries, there is paucity of such knowledge in developing countries, particularly those in Africa. This study used the World Value Survey Wave 6 data from six African countries (Algeria, Egypt, Ghana, Nigeria, South Africa and Zimbabwe) to examine the statistical relationships between PEB and its determinants. The study identified key determinants of PEB amongst respondents within and across the six African countries, thereby providing useful insights that may inform environmental policy interventions in the selected countries.

In terms of Hypotheses 1–2, the following conclusions are summarised. Although no statistically significant associations were found between gender and PEB when five of these countries were considered individually, when their data sets were aggregated together, female respondents revealed a higher PEB mean score than male respondents. This implies significant statistical differences between the two groups, therefore necessitating the need for environmental awareness interventions that must be directed to all citizens, including men, as they appear to lack the relevant knowledge of environmentally responsible practices. Such interventions must disseminate critical information on environmental sustainability practices, thus contributing towards positive behavioural change, especially in the case of Ghana, where statistically significant differences in PEB were driven by the gender gap.

Amongst the countries examined in the current study, the only demographical determinant of PEB without significant differences was the age of respondents, similar to the outcome of some of the studies conducted in Nigeria and Ghana [62,63]. However, empirical evidence from other studies has shown that age has a significant moderating influence on PEB, therefore suggesting its positive predictive power. Although there are contrary findings in certain research contexts, older people are more likely to engage in pro-environmental activities than younger individuals due to the effect of lifelong learning, availability of time if they are retired from formal employment, and sometimes for the economic benefits realised from such practices [66,87,88].

Furthermore, the current study found that, with the exception of Zimbabwe, many of the socio-demographical factors displayed statistically significant relationships with PEB, thus pointing out the importance of these factors if their environmental behaviour is to be increased for the better. Such factors included scale of income, educational achievements, social class and employment sector. There is, therefore, a need to broaden opportunities for environmental education and general information dissemination regarding the value of sustainable lifestyles in all organisations, including households, schools, community-based organisations, non-governmental organisations, universities and workplaces, amongst others.

The specific finding associated with Hypothesis 3 is that there are statistically significant differences in PEB between the various countries examined in the present study. Such differences reflect the existence of underlying geographical factors and their national characteristics, which lie outside the scope of this paper. It is therefore worthwhile for future research to examine how national characteristics, including their socio-economic challenges and human development profiles, affect the development of PEB.

With respect to Hypothesis 4, when the data for all countries were aggregated together, the majority of independent variables such as gender, employment status, sector of employment and social class were all positively correlated with the PEB of respondents, although there were few exceptions. Such positive correlations indicate the direction that future policy recommendations at different levels can take to improve PEB in these countries. More pertinently, the role of employment status has featured prominently as a determinant of PEB in countries such as Algeria, Nigeria, South Africa and Egypt, while the specific sector of employment was predictive among the respondents who represented Egypt, Ghana and South Africa. Therefore, employment organisations must be encouraged to adopt environmental policies and sustainable practices, as such interventions have been found in previous studies to generate a positive message amongst employees while increasing environmental commitment throughout their organisations [74,89].

With respect to Hypothesis 5, variables such as social class, age, gender, environmental organisation membership, employment status, highest education, marital status, income and employment sector explained 49% of the variance in PEB. For certain countries such an influence was low; meanwhile, for others, it was high. If governments, regional planners and policy makers in the countries examined in this study are to bring about increased PEB amongst their citizens, there is a need to recognize the characteristics, as well as the

opportunities and constraints associated with these factors, thus maximising the chances of success of planned interventions.

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