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A Study on the Contribution of Saudi Citizens Towards Sustainable Development Goals in the Attainment of Environmental Sustainability

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ABSTRACT

This research measures Saudis' environmental awareness. A survey questionnaire that was sent out electronically across the Kingdom has 21 Likert scale questions, ranging from "strongly disagree" to "strongly agree," and nine "yes" or "no" questions about activities that are good for the environment. The first part of the questionnaire used binary logistic regression, demographics, and component analysis to test possible hypotheses. All nine statements utilized for Structural Equation Modelling (SEM) in the last section were significant. The factor analysis found three. One of these characteristics revealed a significant gender response, showing that women are more open to and responsive to environmental awareness activities than men. Those who took an environmental course were 1.304 times more ecologically aware than those who did not (factor 2). Participating in campus activities makes 1.449 people more environmentally conscious. This study shows the importance of teaching males about the environment to make it more sustainable.

1. INTRODUCTION

One should look at a country or race's environmental excellence and awareness to determine its development [1]. Environmental education can instil sensible attitudes and behaviours toward nature and its resources while fostering environmental beliefs. Additionally, national policies should enhance regional cooperation to protect the environment, resource conservation, and awareness of global interdependence [2, 3].

Environmental problems are the core issues humanity faces, such as climate change associated with global warming, environmental contamination, deterioration of land, scarcity of potable water supply and loss of biodiversity. Given that human thought and behaviour are the most significant contributors to environmental issues [4, 5] these issues directly affect the health and sustainability of the ecosystems, necessitating the urgent need for environmental sustainability on Earth.

Researchers have assumed numerous terms to explain behaviours that conserve the environment, such as behaviour concerned about the environment, behaviour that describes the environment's importance, environmental care behaviours, and pro-environmental behaviours [6]. However, on the other hand, understanding environmental problems and solutions can be defined as environmental awareness [7]. Environmentally conscious behaviour is concealed. As a result, we are unable to observe it directly. We can only sense it from outward manifestations. Attitude takes into consideration the distinction between the definition of Psychological and Sociological. Hence, the Psychological definition of attitude classifies as behaviour. Though, the sociological definition of attitude implies a purpose to serve. Acknowledgements to prevent or reduce environmental problems with this awareness involve environmental attitude [8, 9]. The implicit attitude is more extensive than the observed behaviour. Environmental awareness is a vital component of our lives, even though psychological and sociological studies can debate the relationship between attitude and behaviour. Our natural habitat makes human life possible, while our lifestyles help define us. Therefore, it is high time for everybody to pledge to become more environmentally aware to guard the planet's sustainability.

According to Patchen [10] maintaining a healthy natural environment requires awareness of environmental issues. In addition, various research on environmental awareness has shown a substantial correlation between environmental awareness, environmental policy, and issues [10, 11]. Environmental awareness and attitude can be improved through environmental education. Thus, it is achievable from early childhood education through higher education [12]. Harvey [13] served as a metaphor for the importance of raising public awareness through educational initiatives for sustainable development. Raising people's knowledge of environmental issues is essential to developing workable solutions to sustainability-related environmental issues. Environmental education is urgently needed in such circumstances to raise this understanding among people in third-world nations. It has recently been discovered that environmental awareness alone cannot motivate environmentally responsible behaviour.

Environmentally conscious thinking results in sustainability practices [14-16]. So, according to Boiyo et al. [17] environmental attitudes positively influence university students' behaviour. Based on Lo-Iacono-Ferreira et al. [18] sure students' environmental attitudes significantly affect the

university's overall environmental performance. As Huang and Yore [19] the environmental attitude substantially impacts environmental concerns and ultimately leads to better environmental behaviour.

Another significant aspect that may encourage pro-environmental behaviour in people is an environmental concern [20]. It entails people being sensitive to current environmental situations and disasters [21, 22]. Additionally, it can be seen as people making proactive attempts to protect the environment by gaining a better awareness of nature and focusing on environmental issues [6, 23]. Age, gender, socioeconomic level, education, ethnicity, and religion are factors that underlie pro-environmental behaviours, according to some research [24-27].

It can also be noted that solutions to environmental problems depend on perceiving the environment, which undoubtedly depends upon the behaviour; thus, behaviour analysis plays a vital role in providing environmental awareness. Thus, it is unquestionably true that environmental awareness, which is brought about by education, is crucial if we wish to have a favourable attitude toward the environment and environmentally friendly behaviours. Additionally, promoting environmentally friendly behaviour is essential for sustainability and reducing adverse environmental effects. Given that the idea of education is implicitly based on the idea that people's religious beliefs about the environment are what causes environmental problems, it is accurate to say that education has a magical effect on changing a person's positive attitude and behaviour [28]. Also, Thiengkamol and Thiengkamol [29] noted that environmental education might impact behaviour, fostering cooperative attitudes and environmental conservation.

Environmental education also increases people's expectations for environmental awareness issues and offers the opportunity to acquire the skills, information, and attitudes necessary to protect the environment [30]. On the same topic, Khan et al. [31] researched to gauge Saudi Arabian citizens' understanding of environmental sustainability. Although every survey participant believed that environmental protection is crucial, there are notable differences across the groups regarding the acceptance of and engagement in eco-friendly behaviour. Additionally, it showed that raising environmental sustainability through awareness-raising activities on sustainability concerns in a university setting.

Some environmental concerns Saudi Arabia faces today include water scarcity, desertification, sand and dust storms, and pollution-related health issues. Environmental stress is getting worse everywhere because of industrial pollution, the aftermath of violent wars, wasting energy, and a general lack of awareness about environmental issues. Climate change will continue to make the environment in this fragile region worse because of things like less rain, dust storms, and rising sea levels. Further, competition over scarcer resources could amplify and extend the critical environmental concern of water shortage, which is aggravated by climate change, mismanagement of water resources, and pollution. Since 1980, Saudi Arabia's water supply has dropped by almost two-thirds. This is partly because Saudi Arabia's irrigation methods could be better. Therefore, desalination plays a crucial role in this country.

Economic expansion, perpetual population growth, speedy urbanization, and progressing demand for water and energy build environmental hurdles in Saudi Arabia. Thus, it became one of the primary targets of Saudi Arabia's fundamental environmental strategy: preserving biodiversity and ensuring wildlife maintains ecological equilibrium, especially concerning rare, vulnerable and endangered animal and plant species [32]. Hence, managing environmental sustainability is one of the crucial goals of the Saudi Vision 2030 reform plans. On the one hand, Saudi Arabia has made numerous efforts to protect its environmental resources while, on the other hand, also promoting environmental awareness. For example, the Hejaz Bloggers group has initiated an environmental awareness campaign, "jogging while picking up a litter", and their campaign attracted the Youth of Saudi Arabia as an association of sport and environment [33].

Based on the reasonable strategy specified in the previous paragraphs, it is essential to analyse humankind's perception of environmental sustainability as it can present significant decisions while considering environmental cognition. The present study aims to assess the environmental grasp in Saudi Arabia by examining the link between citizen's attitude, behaviour, environmental wisdom, and understanding the sustainable development goals in the Kingdom. This study used a survey questionnaire on the surveyed respondents' demographic profile and environmental knowledge, evaluated by twenty-one questions, and tested the hypotheses as delineated below in Table 1. Although, this research's outcomes should be considered necessary steps towards environmental education if the participants' awareness needs to meet the desired sustainability norms. The current study outline can incorporate the first part as the introduction and existing literature that exposes the study's content. In contrast, the part 2 methodology incorporates the various techniques used to explore the study, followed by part 3 interpreting the study's outcomes. Finally, part 4 encompasses the entire work.

Table 1. Summary of research hypotheses to be tested

H1	There is no discernible gender difference in attitudes toward environmental awareness and sustainability.
H2	If they've taken an environmental awareness or sustainability course, gender act differently.
H3	Gender act differently with respect to environmental awareness and sustainability if they've led an environmental activity or seminar.

Source: Authors Computation

2. METHODOLOGY

When implementing structural equation modelling, the appropriate sample size is the primary concern (SEM). According to Joseph et al. [34], sample size can be crucial in obtaining consistent, noticeable estimates and interpretations of results. There are no specific rules regarding the sample size that should be considered. However, a general rule of thumb was put forth by Joseph et al. [34] a minimum suggested ratio is less than five observations for each parameter. Therefore, the conclusion's analytical robustness may be complex if the observation or parameter proportion is less than 5:1 [35]. This presumption suggests that models with a more prominent parameter call for a larger sample size [36].

However, the SEM statistical analysis may be too sensitive if the sample size is too large (for example, greater than 400), and creating a goodness-of-fit value would suggest a poor fit [34]. Consequently, a sample size of roughly 414 was deemed sufficient. Therefore, it was chosen to choose 414 as the goal sample size for this study under the recommendations

mentioned above.

A structured survey questionnaire was developed under two main categories to gather the essential data on Saudi people's attitudes toward environmental sustainability awareness to meet the goals for sustainable development.

Demographic profile-as gender profile of respondents

Environmental Knowledge-incorporate two criteria. First, environmental education Second, environmental activities. Both are based on 21 statements depicting people's perceptions of environmental sustainability awareness.

Pro-environmental Behaviour-includes nine statements from the respondent based on Yes or No and further tested using SEM technique.

A Google Docs survey was done in Al-Kharj, Riyadh, and the country's central area to find out what Saudi Arabia's young people think. With a digital version of the "snowball" method, 414 statistically valid samples were taken. On a Likert scale from 1 to 5, respondents could choose "strongly disagree" or "strongly agree." The study starts with basic statistical methods, such as Bartlett's test of sphericity and the descriptive evaluation and analysis of the mean among the variables generated by component analysis.

The independent-sample t-test was used to compare the differences between the selected demographic variables and the acquired factors. Finally, the logistic regression model used in the study is as follows.

$$ln\left[\frac{\pi}{1-\pi}\right] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3$$

where, π is the probability of behavioural attitude towards environmental sustainability awareness, α represents intercepts, $x_1, x_2,$ *and* x_3 are independent variables, which are likely to affect the perception towards environmental sustainability awareness, and $\beta_1, \beta_2,$ *and* β_3 are coefficients of regression.

3. RESULTS AND INTERPRETATIONS

This research demonstrates that more than 400 participants were collected via an electronic survey using snowball sampling procedures (Figure 1). There are more men (54%) than women (46%). Perceptions of the surrounding environment are the primary focus of survey questions. When asked to rate how much weight they gave to environmental issues, students were split down the middle on whether they had taken an environmental studies course or participated in campus environmental groups. Comparatively, 46% claimed they had never taken such a class. 63% of students also reported not attending an environmental-themed workshop or event on campus. The remaining 37% were involved in environmental awareness events.

With an approximate estimate of 85%, Table 2 defines the KMO measure of sample adequacy, and Bartlett's test of sphericity is crucial. A survey question asks about the perception of the behavioural attitude of environmental sustainability awareness in a professional sector and is separated from the segment questions by roughly 21 articulations. Eight of these 21 hypotheses were discarded due to their poor assessments of communalities (less than 50%).

Table 3 represents the statements' retrieved from the rotation component matrix and reveals that three factors can be retained, and their possible name is mentioned along with the statements. The first factor comprises four statements named "Behavioural attitude towards environmental awareness", having a Cronbach alpha value of 0.886; factor two incorporates six statements and is named "environmental protection awareness", with a Cronbach alpha value of 0.807. The third factor has "Environmental sustainability challenges" with a 0.636 Cronbach alpha coefficient. Thus, factor one possesses 35% of the distinction. Factor 2 is 13.89% of the variance; for Factor 3, it is 12.6 %, with 61.73 % in aggregate.

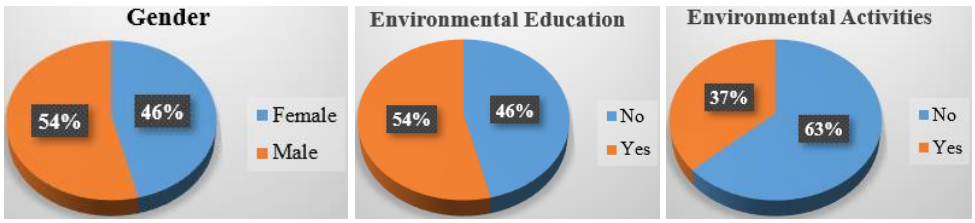

Figure 1. Describes the demographic profile and environmental knowledge

Table 2. KMO and bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.848
Bartlett's Test of Sphericity	Approx. Chi-Square	2067.19
	df	78(0.000)
Statements	Initial	Extraction
1. I educate myself and spread awareness about the importance of saving our environment	1.000	.553
2. I save energy as I am aware of the energy conservation role in saving the environment	1.000	.511
3. I use environmentally friendly products	1.000	.513
7. I know environmental issues and how to solve it	1.000	.613
8. I have the time and resources required to save the environment	1.000	.505
9. I have the will and ability to save the environment	1.000	.572
12. When I see others taking steps to save the environment, it motivates me	1.000	.724
16. I feel happy when I do a pro-environment conservation work	1.000	.739
17. I like people who save the environment	1.000	.781
18. I support people who work towards saving the environment	1.000	.710
19. I do not have the time to engage in environmentally friendly activities	1.000	.549
20. I do not know what to do to save the environment	1.000	.649
21. Just my efforts alone are not going to save the environment	1.000	.605
Extraction Method: Principal Component Analysis.		

Table 4 describes the descriptive statistics for the factors retrieved from the factor analysis among these factors, i.e., behavioural attitude towards environment awareness ranked first with the mean value about the four, indicating that the respondent strongly agreed with these factors' parameters. Furthermore, environmental protection awareness ranked second with a mean value above three, indicating that the respondent agrees with these parameters and has the lowest standard deviation. While the last with the highest standard deviation and lowest mean value reflects that the factor challenges of environmental sustainability parameters come under the undecided category.

The outcomes of Levene's test applied to the demographic profile of respondents and environmental knowledge revealed the following, as delineated in the below Table 5. They depicted a significant difference among gender for factor one, i.e., behavioural attitude towards environmental awareness, where the male is in the disagreement zone while the female is in the agreement zone. Reflecting that female shows an influential behavioural attitude towards environmental awareness. Further, Levene's test exhibited whether they had studied the environment as a course and found that factor two, i.e., environmental protection awareness has a significant difference between those who had studied the environmental course and those who did not study any such course. The one who studied the course is well aware of environmental protection and possesses knowledge about conserving the environment. Additionally, Levene's test on environmental activities conducted by the college showed a significant difference among them (between participated and non-participated respondents) for factor two, i.e., environmental protection awareness.

Table 3. Rotated component matrix[a]

Factor No	Statements	Factor Loading	Factor Title	Cronbach's Alpha
Factor 1	17. I like people who save the environment	0.875	Behavioural attitude towards environmental awareness	0.886
	16. I feel happy when I do a pro-environment conservation work	0.837		
	18. I support people who work towards saving the environment	0.822		
	12. When I see others taking steps to save the environment, it motivates me	0.813		
	7. I know environmental issues and how to solve it	0.772		
Factor 2	8. I have the time and resources required to save the environment	0.709	Environmental protection awareness	0.807
	3. I use environmentally friendly products	0.695		
	1. I educate myself and spread awareness about the importance of saving our environment	0.671		
	2. I save energy as I am aware of the energy conservation role in saving the environment	0.646		
	9. I have the will and ability to save the environment	0.555		
Factor 3	20. I do not know what to do to save the environment	0.801	Environmental sustainability challenges	0.636
	21. Just my efforts alone are not going to save the environment	0.759		
	19. I do not have the time to engage in environmentally friendly activities	0.71		

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization[a]
a. Rotation converged in 5 iterations

Table 4. Descriptive statistics

Factors	N	Minimum	Maximum	Mean	Std. Deviation
Factor 1	414	1.00	5.00	4.3593	.87228
Factor 2	414	1.00	5.00	3.1401	.79251
Factor 3	414	1.00	5.00	2.9106	.88743
Valid N (listwise)	414				

Table 5. Group statistics on gender and Levene's test for equality of variance

	Factors		N	Mean	Std. Deviation	Std. Error Mean	F	Sig	t	df	Sig. (2-tailed)
Gender	Factor 1	M	223	-0.11	1.05	0.07	9.47	0.002	-2.38	412	0.018
		F	191	0.13	0.924	0.07			-2.4	411.7	0.017
Environmental Education	Factor 2	No	191	-0.14	0.94	0.07	0.836	0.361	-2.66	412	0.008
		Yes	223	0.12	1.04	0.07			-2.68	410.6	0.008
Environmental Activities	Factor 3	No	262	-0.13	0.97	0.06	0.196	0.658	-3.56	412	0.00
		Yes	152	0.23	1.01	0.08			-3.52	304.95	0.001

Based on the variables used in this study, the regression equation is as follows:

$$ln\left[\frac{\pi}{1-\pi}\right] = \alpha + \beta_1 fac_1 + \beta_2 fac_2 + \beta_3 fac_3$$

fac_1 represents a behavioural attitude towards environmental awareness, fac_2 represents environmental protection awareness, and fac_3 represents environmental sustainability challenges.

Four hundred fourteen respondents' demographic information and environmental knowledge were used as predictors in a logistic regression analysis of their impression of environmental sustainability awareness. The parameters of the logistic regression model's coefficient estimate results, standard errors, Wald statistics, significance levels, and odds ratio served as markers of perception toward environmental sustainability awareness. The predictors as a whole were statistically significant in distinguishing between males and females when tested against a constant-only model (Chi-square = 6.766, p 0.08 with df = 3). A modest correlation between prediction and grouping was shown by Nagelkerke's R2, which was 0.022. The 2 log-likelihood was 564.684, and Cox and Snell R2 was 0.016. 55.1% of predictions were accurate (73.1% for men and 34% for women). The whole model test also revealed that the predictors consistently discriminated between the environmental courses investigated (Chi-square = 7.616, p 0.055 with df = 3). Nagelkerke's R2 of 0.024 showed little correlation between categorization and prediction. The 2 log-likelihood was 563.834, and the Cox and Snell R2 was 0.018. 56.3% of predictions were accurate overall (31.9% for no and 77.1% for yes). Additionally, according to the results of the complete model test (Chi-square = 13.157, p 0.004 with df = 3), the predictors as a group consistently discriminated between the environmental actions carried out by the college. Nagelkerke's R2 of 0.043 showed little correlation between categorization and prediction. The 2 log-likelihood was 531.188, and the Cox and Snell R2 was 0.031. 64.5% of predictions were accurate overall (95.8% for no predictions and 10.5% for yes).

Table 6. Results of logistic regression

Exogenous	Endogenous variable	B	S.E.	Wald	df	Sig.	Exp(B)	Inference
Gender	Factor 1	0.243	0.104	5.489	1	0.019	1.275	Significant
	Factor 2	0.054	0.1	0.298	1	0.585	1.056	Insignificant
	Factor 3	-0.086	0.1	0.747	1	0.387	0.917	Insignificant
	Constant	-0.159	0.099	2.558	1	0.11	0.853	
Environmental Education	Factor 1	-0.76	0.1	0.583	1	0.445	0.927	Insignificant
	Factor 2	0.265	0.101	6.858	1	0.009	1.304	Significant
	Factor 3	0.002	0.1	0	1	0.985	1.002	Insignificant
	Constant	0.158	0.1	2.511	1	0.113	1.171	
Environmental Activities	Factor 1	-0.75	0.104	0.516	1	0.473	0.928	Insignificant
	Factor 2	0.371	0.107	12.0024	1	0.001	1.449	Significant
	Factor 3	-0.036	0.104	0.123	1	0.726	0.964	Insignificant
	Constant	-0.563	0.104	29.274	1	0	0.569	

Table 7. Results of SEM (standardized) on PEB

Indicator	Statements on Pro-environmental Behaviour (PEB)	Coefficient	P-value	error
P1	I close the water tap while brushing	0.193	0.001	0.96
P2	I switch off the lights when I go out	0.28	0.00	0.92
P3	I print papers on both sides	0.397	0.00	0.84
P4	I use organic products	0.39	0.00	0.85
P5	I practice carpooling	0.279	0.00	0.92
P6	I use pro-environmental brands	0.64	0.00	0.59
P7	I take a short shower	0.284	0.00	0.92
P8	I use my bag while doing shopping	0.457	0.00	0.79
P9	I use energy-efficient lighting	0.3186	0.00	0.84
Probability of Chi-Square is 0.0817; CFI is 0.951; & TLI is 0.934				

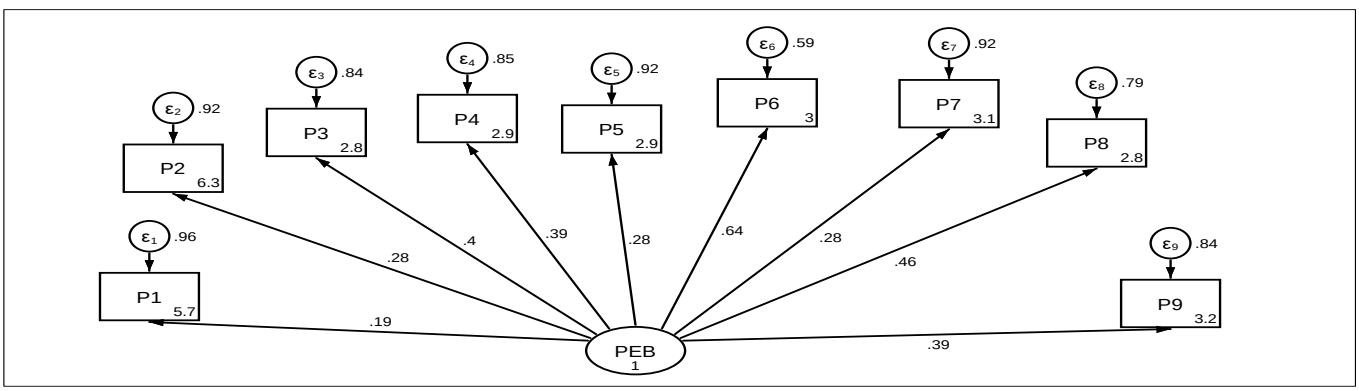

Figure 2. Outline of SEM (standardised) outcomes

Table 6 delineated the logistic regression result for the perception of environmental sustainability awareness in Saudi Arabia on Gender and environmental knowledge. The associate p-value of Wald's test indicated that out of these three factors retrieved from factor analysis, only one factor was significant for Gender and that one is the first factor. Regarding environmental knowledge (environmental education, environmental activities), factor two was significant for both.

Table 7 represents the nine statements asked in the questionnaire about the pro-environmental behaviour of an individual respondent and their assigned indicator code used in the SEM based on the Yes or No (No is assigned as 1, while Yes is assigned as 2). Also, the SEM outcomes endorsed propose that all the statements were statistically significant (Figure 2). The model provides an excellent fit with the comparative fit index (CFI = 0.951) and Tucker-Lewis index (TLI = 0.934), both above 90 per cent. Lastly, the Chi-square is also above the 5 per cent level.

4. CONCLUSION

The study compiles the thought of Saudi citizens and their perception of environmental sustainability awareness-a structural questionnaire designed to cover respondents' opinions on environmental awareness and its sustainability-the sample of 414 respondents sufficient to analyse the factor analysis technique. The questionnaire was subdivided into two-part. Firstly, it comprises twenty-one statements in the questionnaire to measure environmental knowledge based on 5 points Likert scale, out of which thirteen were best suited based on KMO and Bartlett's Test of Sphericity. The KMO value is approximately 0.85 and statistically significant at a 1% significance level. Three factors were derived from the rotation component matrix of these thirteen statements. Factor one has the highest mean value, while factor three has the lowest mean value and the highest standard deviation. The second part comprises nine statements based on Yes and No to evaluate the pro-environmental behaviour using the SEM and found that all the statements are significant; hence the model is best fitted.

Levene's test further tested the first part of the questionnaire to explicitly evaluate the hypothesis design to predict the mean difference among the tested endogenous and exogenous variables. Levene's test outcomes revealed a mean difference among the gender for factor one, suggesting that females are more sensitive towards behavioural attitudes regarding environmental awareness than males. Hence, accepting alternative hypothesis 1 in the case of gender. However, Levene's test also revealed environmental knowledge and found a significant difference among those who studied the environmental course and participated in environmental activities conducted by their college regarding environmental protection awareness. So, factor two is significant for both of these, and thus, we can conclude that alternative hypotheses 5 and 8 are significant.

Besides, this part tested for binary logistic regression and depicted that out of three factors. The only factor one has an odd value of 1.275 for the gender, which means that females have an advantage of 1.275 over males towards the behavioural attitude of environmental sustainability awareness at a 1 per cent statistically significant level. Likewise, factor two has an odd value of 1.304 for those with environmental education, which means that those who studied the environmental course have an advantage of 1.304 over those who did not study such a course. Additionally, factor two had an advantage over those who participated in any environmental activities conducted by their college, with an odd value of 1.449 compared to respondents who did not participate.

The fact that many of the people who took part in our study in Al-Kharj, Riyadh, and the central region of Saudi Arabia are themselves students presents some challenges. Because of this, a large proportion of the young people in our sample may be relatively well-educated despite having limited financial resources. Another problem is that the study's results must be applied to countries with very different cultural norms, institutional policies, economic situations, and environmental problems. Several factors were discovered in this investigation. Statistics, ecology, and schooling were the most common topics. It is also essential to find out how good and bad life experiences (like the loss of a beloved landmark, for example) shape environmental activism. Better, more long-lasting environmental practices may emerge from investigations into these topics.

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