

RESEARCH

From Environmental Awareness to Sustainable Action and Social Impact in the Age of AI: A Mixed-Methods Study in Abu Dhabi

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ABSTRACT

OBJECTIVE: The study examines how environmental awareness relates to sustainable practices in Abu Dhabi and how age, income, and education shape this relationship.

DESIGN/METHODOLOGY/APPROACH: The design adopted was a mixed-methods, consisting of a survey of 350 people, ten in-depth interviews and the combination of the two strands to increase validity and provide social insight.

FINDINGS: The study showed high environmental awareness reflected in organic buying, water saving, reduced plastic use, and waste sorting, with weak links to demographics but a strong positive link between awareness and sustainable behaviour ($B = 0.669$, $p = 0.001$).

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PRACTICAL IMPLICATIONS: The study contributes to the development of a social policy related to sustainable environmental development by developing behavioural programmes and interventions based on artificial intelligence (AI).

ORIGINALITY/VALUE: The paper presents a new AI-powered-behavioural model and seals a significant knowledge gap in the region by empirically correlating environmental awareness with sustainable behaviour in the Arab Gulf.

KEYWORDS: *Environmental Awareness; Sustainability; Artificial Intelligence; Abu Dhabi.*

INTRODUCTION

One of the most urgent problems facing the world today is climate change (Atwoli *et al.*, 2022; Romm, 2022; Zurek *et al.*, 2022; Stern *et al.*, 2022). The environment is in a critical state because of the continuous rise in human activity in the domains of industry and technology (Ge *et al.*, 2021; Demrozi *et al.*, 2020). This enormous activity creates serious problems that affect human societies' stability as well as their social, economic, and health circumstances (Obidovna and Sulaymonovich, 2022; Chakraborty and Maity, 2020). According to studies, human activity is a contributing factor to several global issues, most notably the rise in sea levels and temperatures, which have seriously harmed biodiversity and living things all over the world. To stop additional depletion, international collaboration and coordinated action are required in this situation (Zhou and Gu 2024; Zubair, *et al.*, 2024).

The value of innovation in technology in current society cannot be denied. Artificial intelligence (AI) offers opportunities to improve sustainability and industrial areas (Animesh and Rahul, 2024; Alsayrayreh, 2025). This technology has enhanced human life and people's knowledge of environmental problems (Tan *et al.*, 2021; Al Qaidi, 2025). To safeguard and reinforce this knowledge, sustainable strategic governance can be affected through modern policies, developed resources, and a culture that remains essential (Burmans, 2022). In opposition to short planning requires intentional, strong efforts to mould and change people's behaviour (Rao *et al.*, 2024).

To foster environmental sustainability and address important environmental problems, governments, as well as the private and public sectors have a major role in the rise of industries and the debut of intelligent technology. This includes maintaining all the environmental issues. In addition, keeping track of pollution and the use of water and energy. Furthermore, many countries still need to adjust their sustainable strategies to incorporate new technology (Phuangsuwan *et al.*, 2024).



Pollution and carbon dioxide release is one of the major problems affecting human life, because of the huge amount of carbon, which leads to destroy the natural resources. To build sustainable countries, it is necessary to develop the industrial technology using AI methods (Pinho and Gomes, 2023).

Although mandatory and voluntary environmental policies have proven effective in many contexts, individual behaviour continues to present a major challenge. Studies highlight the need to transform traditional social practices to make them more sustainable—particularly regarding the use of plastic materials in daily life—and to strengthen recycling systems for plastic waste and other reusable materials. They also emphasise the vital role of environmental awareness (Chaigneau and Schill, 2022; Pinho and Gomes, 2023). Although the world is currently driving toward environmental sustainability, human activity is the major threat to the planet. To attain full sustainability, it is important to understand the need to use technology to the advantage of the entire humanity.

These principles are strengthened by the United Nations (UN) 2030 Agenda on Sustainable Development that consists of seventeen global goals. Recent research highlights the significance of taking responsible and rational actions and building cultural transformation processes in terms of environmental awareness (Buerke *et al.*, 2017; Kollmuss and Agyeman, 2022; Luo *et al.*, 2020). Nevertheless, a critical gap in existing knowledge exists in the relationship between environmental awareness and sustainable action that requires further investigation (Farjam *et al.*, 2019; Mubarak and Albayouk, 2024). This paper focuses on analysing the correlation between environmental awareness and sustainable behaviour as well as testing the effects of artificial intelligence on environmental awareness and sustainable behaviour. Although various studies have been conducted on sustainability and environmental development at the world level, not many studies have concentrated on Emirati and Gulf societies. Despite the success that the United Arab Emirates (UAE) has recorded in the quest to meet the Sustainable Development Goals, there is still a need to conduct research to learn more about the social aspects of sustainability.

Through quantitative and qualitative approaches, the study contributes to the field of environmental sociology, in which the gap between action and awareness is studied in the technologically advanced setting of the Gulf, and in which artificial intelligence can be viewed as a driver of sustainable social change.

Research Problem

It is obvious that there is still a huge gap between environmental consciousness and sustainable action, even with the fast development of technologies and the introduction of Artificial Intelligence (AI)-related solutions. The residents of Abu Dhabi, which is characterised by urban growth and keen sustainability efforts, are worried about the environment, which does not necessarily translate into their behaviour. The literature seldom looks at this awareness-action gap in the sociocultural context of Abu Dhabi. This paper examines environmental awareness as a predictor of sustainable behaviour and outlines the key obstacles that preclude the residents from translating environmental awareness into real practice.

Questions and Hypotheses (H)

How well do Abu Dhabi residents know about different environmental practices?

To what extent are Abu Dhabi residents interested in engaging in sustainable practices?

H1. The association between the levels of environmental awareness and adherence to sustainable behaviour among individuals is statistically significant and positive.

H2. The relationship between environmental awareness and sustainable behaviour depends on demographic factors (age, education level, and income) with the association being stronger among groups having higher levels of education and income.

LITERATURE REVIEW

The purpose of this section is to present past research that has been conducted concerning environmental awareness and sustainable behaviour. Numerous sources of literature confirm that the environmental awareness is a key prerequisite leading for promoting meaningful behavioural change. The connection between behavioural patterns and their effects on the environment and climate has become a topic of growing academic interest, with the importance of behavioural change in environmental conservation taking centre stage (Celik, 2020; Almansoori, 2024).

An example is a qualitative focus group study on environmental awareness and sustainable behaviour conducted by Boermans *et al.* (2024) across respondents in Germany, the Netherlands, and Poland. Their results shed light on how cultural and social situations affect the environmental perception of people and condition their behaviour in relation to sustainability. This indicates that environmental consciousness is not only cognitive but has a strong sociocultural experience.

It is always found that environmental awareness serves as a major motivation for pro-environmental behaviour. Handayani *et al.*, (2021) also highlight that cognitive knowledge of environmental values encourages sustainable behaviour, whereas Bulkeley, (2021) reminds that ignorance leads to inactivity and reliance on government intervention. AI technologies may assist in filling the gap by improving environmental education and activities. Yilmaz and Can (2020) investigated the impact of climate change information on university students. They suggested that the formation of early environmental awareness based on cultural socialisation leads to the sustainable behavioural patterns.

The literature has identified an association between sustainability practices with increased environmental literacy and awareness, especially in urban contexts (Ningrum and Herdiansyah, 2018).

RESEARCH METHODOLOGY

Research Design

The research was based on a mixed method. This was because it could produce adequate information and make the results rich in qualitative data that would add value to the entire outcome of the quantitative work and add to the overall comprehension of the linkage between environmental awareness and sustainable behaviour.

Participants

The research was done in Abu Dhabi, United Arab Emirates, in July 2024 and in January 2025. The questionnaire was given to a random cluster sample of 350 respondents, with purposive interviews carried out with 10 respondents, making the total sample size 360 people.

Table 1: Participants' Demographic Characteristics

Variable	Category	Frequency	Percentage
Gender	Male	113	32.5%
	Female	237	67.5%
Age	20–29	195	55.6%
	30–39	118	33.6%
	40–49	37	10.5%
Education Level	High School	165	47.0%
	Diploma	165	47.3%

Variable	Category	Frequency	Percentage
	Bachelor's Degree	20	5.7%
Monthly Income (AED)	< 5,000	173	49.6%
	5,000–9,999	24	6.8%
	10,000–14,999	104	29.6%
	20,000 or more	49	14.0%

Source: Prepared by the authors based on study data (2025)

Table 1 data shows that female subjects were the most dominant (67.5%), with male participants being at 32.5%. Regarding age distribution, the highest percentage (55.6) was in the age group of 20-29 years, with 33.6% being in the age group of 30-39 years. In terms of education, 47.0% of the respondents had a secondary education certificate, which is the same as those with a diploma. The percentage of those who had received a bachelor's degree was 5.7%. Concerning monthly earnings, close to fifty percent of respondents (49.6) made under AED 5,000, with 29.6% making between AED 10,000 and 14,999.

Research Tools

Questionnaire: A valid questionnaire was created to examine the relationship between environmental awareness and sustainable behaviour. Expert review and pilot test using 13 participants revealed a high level of reliability as confirmed by Cronbach's alpha.

Interviews: Ten purposefully chosen participants in Abu Dhabi were interviewed to find out motivations and obstacles to sustainable behaviour. All the interviews were recorded and kept in private.

Table 2: Reliability Coefficients of the Study Instrument

No.	Scale	No. of Items	Cronbach's Alpha
1	Environmental Awareness	5	0.86
2	Sustainable Environmental Behaviour	5	0.77
3	Social and Economic Challenges	3	0.74

Source: Prepared by the authors based on study data (2025)

Procedures

To safeguard research ethics, the participants were first required to be informed because they needed to consent freely in order to engage in the study. They were informed

about the importance and purpose of the research and were guaranteed the privacy of their personal data. Data were then collected during the period between July 2024 and January 2025.

Measures

Data were analysed in IBM SPSS version 23 using descriptive statistics, correlation, regression, t-tests, and ANOVA to examine links and group differences in environmental awareness, sustainable behaviour, and demographics.

RESULTS

Descriptive Results

First question Response: How familiar are Abu Dhabi residents with different environmental practices?

To answer the first research question regarding the level of environmental awareness, Table 3 displays the descriptive statistics for awareness-related items.

Table 3: Descriptive Statistics for Residents' Awareness of Environmental Practices in Abu Dhabi

Item	N	Minimum	Maximum	Mean	Standard (Std.) Deviation
Recycling	351	1	5	4.2137	0.9304
Water Conservation	351	1	5	4.1709	0.91299
Use of Sustainable Transportation	351	1	5	3.7949	1.32366
Reducing Plastic Use	351	1	5	3.7322	1.26584
Purchasing Eco-Friendly Products	351	1	5	3.8063	0.95443

Source: Prepared by the authors based on study data (2025)

The results presented in Table 3 indicate that the residents of Abu Dhabi are highly aware of the environment. The greatest awareness was related to waste recycling (Mean = 4.21, Std. = 0.93) and water conservation (Mean= 4.17, Std. = 0.91) with moderate awareness related to sustainable transport (Mean = 3.79, Std. = 1.32), plastic reduction (Mean = 3.73, Std. = 1.27), and eco-friendly products (Mean = 3.81, Std. = 0.95).

The findings of the survey were supported by the interviews; most of the participants confirmed the importance of conserving water and reducing the use of plastic as measures to protect the environment.

“I am aware that water is a valuable resource and I always endeavour to minimise my consumption at the house.”

In the meantime, a second participant contributed to the study.

“I am aware that plastic substances are bad for the environment and harmful to our health and therefore we always attempt to avoid consuming products that are packed in plastic bottles.”

Second Question Result: To what extent are Abu Dhabi residents committed to practising sustainable behaviours in their day-to-day activities?

Table 4 shows the descriptive statistics of the items related to sustainable behaviour to answer the second research question about the extent of commitment to sustainable practices.

Table 4: Shows how the Participants themselves had committed to living Sustainable Lifestyles

Item	N	Minimum	Maximum	Mean	Std. Deviation
Waste Sorting and Recycling	351	1	5	3.6809	1.10617
Reducing Energy Consumption	351	1	5	2.6011	1.54009
Use of Public Transportation	351	1	5	3.3875	1.33663
Use of Reusable Bags	351	1	5	3.5983	1.10371
Purchasing Organic Products	351	1	5	3.735	1.10111

Source: Prepared by the authors based on study data (2025)

The results in Table 4 indicate that the inhabitants of Abu Dhabi are very loyal to sustainable practices. The largest means were buying organic products (Mean = 3.74, Std. = 1.10) and sorting/recycling of waste (Mean = 3.68, Std. = 1.11), then followed by using reusable bags (Mean = 3.60, Std. = 1.10). There was reduced involvement in energy reduction behaviours (Mean = 3.39, Std. = 1.34; Mean = 2.60, Std. = 1.54).

Interviews showed that most participants sorted waste and used reusable bags.

According to one participant: *“I sort garbage at home and go shopping with eco-friendly bags that are made of linen or other durable materials.”* (Person 2)

“I would always make an effort to put in the household waste recycling or put it in the specially set-up recycling containers, but in the absence of such containers around my home, I would put it in the general waste bin instead.” (Person 6)

Results of Inferential Statistics

H1: Result: The awareness of environmental practices by individuals and their adherence to sustainable behaviour have a statistically significant positive relationship.

Since the sample size ($N = 351$) was large, formal tests of normality were not necessary. According to the Central Limit Theorem, the samples larger than 30-50 are normally distributed and the strength of the Pearson correlation is guaranteed.

Table 5: Pearson Correlation between Environmental Awareness and Sustainable Behaviour

	Awareness	Commitment
Awareness	1	.777**
Commitment	.777**	1
N	351	351

Source: Prepared by the authors based on study data (2025)

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

Table 5 reveals that the value of the correlation coefficient is $r = 0.777$ which implies a strong positive correlation whereas the level of significance $p = 0.01$ is indicative of a statistically significant relationship and is unlikely to have occurred by chance. This statistically significant outcome agrees with the initial hypothesis that the greater the environmental awareness, the greater the involvement in sustainable practices and is in line with other studies that have been able to relate environmental knowledge to responsible behaviour.

The same result was indicated in the interview findings. For example, *“I sort out waste at home and I use environmentally friendly bags.”* (Person 2)

Others said, *“we are aware that there are bad materials in the market like plastics that destroy the environment and influence our health, therefore we are not using them”.* (Person 7)

H2: Findings: There is a correlation between environmental awareness and sustainable behaviour depending on the demographic factors (age, educational level, and income) and the strength of this connection is higher between more educated and higher-income groups.

The hypothesis is separated into two sections: Are sustainable behaviour values directly influenced by education, income, and age?

Are demographic factors (e.g., education, income, and age) influencing or mediated by environmental awareness in the case of sustainable behaviour?

Part I outcome asks the question: Do education, income and age directly influence sustainable behaviour?

In order to test the first hypothesis, a regression analysis was conducted on the impact of education, income, and age on sustainable behaviour. The overall significance of these predictors has been confirmed by the results of ANOVA and is presented in Table 6.

Table 6: Coefficients from Multiple Regression Analysis

Predictor	Beta (B)	Std. Error	Beta	Test Statistics (T)	Significance (Sig.)
(Constant)	3.330	0.798		4.171	0.000
Environmental Awareness	0.669	0.027	0.780	24.719	0.000
Age	-0.498	0.171	-0.090	-2.917	0.004
Education Level	-0.065	0.125	-0.017	-0.517	0.605
Monthly Income (AED)	0.899	0.103	0.276	8.722	0.000

Source: Prepared by the authors based on study data (2025)

Dependent Variable: Commitment to Sustainable Behaviour.

Table 6 shows that sustainable behaviour is significantly influenced by environmental awareness, age ($B = -0.498$, $p < 0.01$), and income ($B = -0.899$, $p < 0.01$), but not by education ($B = -0.065$, $p = 0.605$). The joint significance of all the independent variables was confirmed by an ANOVA test (Table 7).

Table 7: ANOVA Table for the Effect of Environmental Awareness and Demographic Factors on Sustainable Behaviour

Source	Sum of Squares	Degrees of Freedom (Df)	Mean Square	Fisher's Statistic (F)	Sig.
Regression	3444.315	4	861.079	191.390	0.000
Residual	1556.682	346	4.499		
Total	5000.997	350			

Source: Prepared by the authors based on study data (2025)

Dependent Variable: Commitment to Sustainable Behaviour.

Predictors: Environmental Awareness, Age, Education Level, Monthly Income in United Arab Emirates Dirham (AED).

Table 7 suggests that the overall effect of the independent variables on sustainable behaviour is significant ($F = 191.39, p < 0.01$). This proves the point that the variables jointly explain a significant part of the sustainable behaviour variance.

Outcome of second section of the second hypothesis: Does environmental awareness serve as a mediating variable in the relationship between the demographic variables) education, income and age) on the one hand and sustainable behaviour?

The mediation hypothesis was tested by Baron–Kenny regression: demographics → behaviour, demographics → awareness, then awareness predicting behaviour while controlling demographics.

Table 8: Multiple Regression Analysis of the effect of Demographic Variables on Environmental Awareness

Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	21.060	1.108	—	19.013	0.000
Age	-1.408	0.330	-0.218	-4.266	0.000
Education Level	1.047	0.241	0.234	4.344	0.000
Monthly Income (AED)	0.063	0.204	0.017	0.307	0.759

Source: Prepared by the authors based on study data (2025)

Dependent Variable: Environmental Awareness.

A set of regression analyses were performed to test the relationship between the independent variables (education, income, and age) and the sustainable behaviour through the mediating effect of environmental awareness using the Baron and Kenny (1986) method. As shown by the results in Table 7 in the first step (Path c), only age and income had a statistically significant direct effect on sustainable behaviour ($B = -0.498, \text{Sig.} = 0.004$ and $B = 0.899, \text{Sig.} = 0.000$ respectively) but education did not. Table 8 in step two (Path a) showed that age had a negative effect on the environmental awareness ($B = -1.408, \text{Sig.} = 0.000$), whereas education had a significant positive impact ($B = 1.047, \text{Sig.} = 0.000$); income did not have a significant effect ($B = 0.063, \text{Sig.} = 0.759$). The third step (Path b + c 7) involved the inclusion of environmental awareness as a predictor of the demographic variables.

As indicated in Table 7, environmental awareness was found to positively influence sustainable behaviour ($B = 0.669, p < 0.001$), whereas age and income had

a significant but lesser effect. This means that age and education influence sustainable behaviour partially via environmental awareness, which substantiates the hypothesis.

The findings of the interview proved these preliminary results, as participants with greater income stated that they could afford to buy eco-friendly products.

“I will ensure that I purchase organic food and employ greener bags, although they would be pricier.” (Person 6).

In the meantime, the older respondents recognised their environmental awareness but admitted that they did not modify their habits. *“I am aware of the need for recycling, but it is tiresome, and I still dispose of my rubbish in the common bin.”* (Person 4).

RESEARCH DISCUSSION

The discussion of the key findings based on the results of the analysis was conducted in the context of the past research and theory. The people of Abu Dhabi were highly environmentally conscious, particularly regarding water saving, plastic minimisation, and conscious consumption.

Sustainable practices, like waste sorting, recycling, purchasing organic goods, and using reusable bags were also found to be strongly adhered by the residents, which is indicative of government intervention in offering recycling facilities and awareness campaigns.

The high level of infrastructure, affluence, and wellness programmes have enhanced the eco-friendly attitude in Abu Dhabi, with a large number of its residents being committed to organic food to stay healthy. Nevertheless, energy rationalisation was rated slightly lower than the average, which may be explained by the fact that the city depends on clean energy, which includes solar power.

This observation supports the findings of the study carried out by Handayani *et al.*, (2021), as the authors undertook to highlight the significance of cognitive awareness as a driver of environmental behaviour. When people realise the worth and vulnerability of the surrounding environment, then they are more prone to adopt protection and sustainability behaviour.

This result echoes the warning that Bulkeley (2021) puts forward: that awareness without actual action breeds behavioural inertia, increasing the gap between concern and practice.

This result also stands in opposition to the results of Yilmaz and Can (2020), who suggested that the formation of the early environmental awareness based on cultural socialisation leads to the formation of sustainable behavioural patterns.

Regression analyses based on the Baron and Kenny method showed a strong positive correlation between environmental awareness and sustainable behaviour (Yayla *et al.*, 2021).

Age and monthly income among the independent variables had direct influences on sustainable behaviour of a significant magnitude ($B = -0.498$, $\text{Sig.} = 0.004$ age and $B = 0.899$, $\text{Sig.} = 0.000$ income), which indicates that older age has a negative impact on sustainable behaviour and high income influences sustainable behaviour positively. Education, on the other hand, was not statistically significant ($B = -0.065$, $\text{Sig.} = 0.605$). The path analysis also revealed that age and education were significantly predicted by environmental awareness as a mediating variable in predicting sustainable behaviour ($B = 0.669$, $\text{Sig.} = 0.000$). All these findings confirm the hypothesis of the study that demographic variables, especially age, education, and income influence the relation in environmental consciousness and sustainable behaviour, with the association being stronger in individuals with higher income and education.

IMPLICATIONS

This work expands the environmental sociological field through proving that environmental awareness plays a mediation role between demographic parameters and sustainable behaviour in the Gulf setting and the need to remove financial, infrastructural, and cultural barriers and reinforce social norms and institutional functions in line with the UAE Vision 2030 and the United Nations Sustainable Development Goals.

LIMITATIONS AND RECOMMENDATIONS

The study has some limitations: it focuses only on urban Abu Dhabi, relies on 350 responses, and uses a cross-sectional design that cannot show change over time. Future work should include longitudinal and comparative studies in other regions (especially rural areas and focus groups), along with stronger policies and cooperation between government, civil society, and universities to remove barriers and make sustainability a shared social value in the UAE.

CONCLUSIONS

In an extensive study of the linkage between awareness and behaviour in the region of Abu Dhabi, the research identified a strong environmental concern, but limited sustainable practice, a situation that can be explained by the influence of income, social norms, and related costs. The researchers recommend further investigations of the processes of sustainability in the Gulf societies. Though the study utilised a powerful mixed-methods design, the study is limited by being confined to an Abu Dhabi sample, limiting the extrapolation of the results of the study. Therefore, the authors suggest further longitudinal research with rural orientation, and the strengthening of university-government partnerships, to deepen the environmental sustainability education and praxis throughout the United Arab Emirates. The study calls for stronger social and socio-economic policies, more diverse sustainability initiatives, and wider involvement of state, private sector, and local communities to mainstream sustainability, close the gap between awareness and practice, and support the UAE's sustainable development vision.

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BIOGRAPHY



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