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ECO REALITIES ON THE EAST COAST OF MALAYSIA: WHO KNOWS MORE, WHO DOES MORE?

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ABSTRACT

Background and Purpose: Malaysia's remarkable natural landscapes face increasing threats from the worsening global climate crisis, further exacerbated by local human activities such as improper waste management, deforestation, and pollution of air and waterways. This study assesses the current awareness, knowledge, and attitudes toward environmental practices among communities on the East Coast of Malaysia – Kelantan, Terengganu, and Pahang.

Methodology: This study employed a cross-sectional research design and a non-probability purposive sampling technique. Primary data were collected using self-administered questionnaires which were distributed to 267 adults in the communities of Kelantan, Terengganu and Pahang between September and October 2024. This study utilised SPSS and SmartPLS 3.0 for data analysis.

Findings: The findings reveal a positive influence of environmental awareness, knowledge, and attitude on environmental practices within these communities. Additionally, multigroup analysis shows that urban communities exhibit a stronger positive attitude toward environmental practices than rural communities. The results from this study extend the environmental literacy model by incorporating residential area (rural vs. urban) as a moderating variable, highlighting the need for differentiated approaches in environmental sustainability programs.

Contributions: It contributes a valuable insight to policymakers and agencies to design any policies or programmes in addressing the unique challenges of rural and urban areas on Malaysia's East Coast, thereby supporting the nation's broader sustainability agenda.

Keywords: Awareness, knowledge, attitude, environmental practices, multi-group analysis.

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1.0 INTRODUCTION

Environmental degradation has become a pressing global concern, transcending borders and socioeconomic divides. Climate change, pollution, biodiversity loss and ecosystem disruption are no longer isolated issues; rather, they constitute a shared crisis that threatens human health, livelihoods, and long-term sustainability across nations (Fletcher et al., 2024). While governments and institutions continue to develop policies and technologies to these address their challenges, public awareness and behavioural change remain central to advancing effective environmental solutions.

In the Southeast Asian region, Malaysia is recognised for its rich natural heritage and biodiversity, due to its broad range of natural features. Nevertheless, the country is becoming increasingly vulnerable to a range of dangerous environmental problems, some of which are made it worse by the dawning global climate crisis and others caused by human activities. The destruction of the environment in Malaysia, such as pollution, soil erosion, deforestation, and pesticide pollution of water, is wreaking havoc on society and has a direct impact on the health of the public and community welfare.

Environmental awareness, knowledge, and attitude to environmental practices among communities become an important factor in dealing with these environmental issues. These factors differ across the populations, especially between rural and urban communities. Urban communities are generally are more knowledgeable about the environmental issues and more actively engaged in conservation efforts because they have better access to environmental education, media, infrastructure, and government-led campaigns than rural communities (Fadhullah et al., 2022; He et al., 2022). In contrast, rural communities often depend more directly on nature for their daily lives, and they may have less exposure to formal environmental programs. This deficiency has made it difficult for them to stay informed or make wise decisions in protecting the environment (Kan et al., 2025; Owojori et al., 2022). Therefore, the urban-rural gap raises important questions about how differences in location and access to resources shape individuals' understanding and practices related to the environment.

While numerous studies on awareness, knowledge, attitude, and practices in Malaysia have focus on specific environmental issues, such as pollution, solid waste management control, and recycling, relatively few have taken a holistic approach to examining overall environmental practices. Moreover, most environmental research conducted in Malaysia in Malaysia has focused primarily on students in schools and universities (Abdul-Halim et al., 2021; Azhar et al., 2022; Yaacob et al., 2025), thereby neglecting the other influential groups, especially adult members of local communities, who play important roles in day-to-day environmental practices at the grassroots level.

Some studies involving adult populations have revealed important insight. For example, while 95.9% of households in Kelantan are aware that improper waste disposal causes pollution and disease, only 50.3% actively practice waste separation (Fadhullah et al., 2022). Additionally, Kelantan and Terengganu showed low engagement in recycling programs and continued issues with domestic waste pollution (Saat et al., 2024). Similarly, a study on coral reef conservation in Terengganu found that while 55.3% of villagers were aware of coral reef ecosystems, and only 29% actively participated in conservation efforts (Marzo et al., 2023). The data above clearly indicates a gap between attitude and behaviour, where knowledge alone does not guarantee an action (Kan et al., 2025; Li et al., 2023).

Therefore, this study aims to explore the environmental awareness, knowledge, and attitude towards environmental practices, focusing on comparing urban and rural communities on the East Coast of Malaysia. The study will provide findings on how geographical factors influence environmental practices. Furthermore, it will inform community-based policy recommendations and outreach strategies tailored to the unique needs and abilities of urban

and rural populations. This approach supports a more inclusive and practical framework for promoting environmental sustainability practices at the grassroots level.

2.0 LITERATURE REVIEW

Understanding the differences in environmental behaviour among communities requires a structured lens through which knowledge, attitudes, and actions can be examined. The Environmental Literacy Model introduced by Roth (1992) offers such a lens and serves as the theoretical foundation for this study. It comprises four core dimensions:

- Environmental Knowledge – comprehension of ecosystems and how human actions affect them.
- Environmental Attitudes – underlying values and emotional investment in environmental concerns.
- Skills and Competencies – abilities to turn understanding into practical actions.
- Environmental Behaviour – actual implementation of conservation activities like recycling or energy conservation

The Environmental Literacy Model is widely used in environmental education and behaviour research to conceptualize the dynamic relationship between individuals and environmental issues. This model emphasizes that knowledge alone is not enough to shape pro-environmental behaviour. Instead, behaviour results from complex interactions between knowledge, attitudes, and an enabling environment. As Kollmuss and Agyeman (2002) highlighted, there is often a gap between environmental awareness and action, which is influenced by other factors such as social norms, infrastructure, and perceived behavioural control. While knowledge equips people with essential facts, awareness heightens their concern, and attitudes shape their motivation to act (Stern, 2000). This section explores the existing literature on how awareness, knowledge and attitudes are interrelated and motivated environmental practices.

2.1 Awareness (AWR) and Environmental Sustainability Practices (ESP)

Environmental awareness refers to an individual's recognition and understanding of environmental problems and their potential consequences. It represents a crucial early step in encouraging sustainable behaviour (Otto & Pensini, 2017). Numerous studies have shown a clear connection between environmental awareness and environmental practices. For example, Otto and Pensini (2017) discovered that students with stronger emotional connections to nature exhibited more consistent pro-environmental actions. Similarly, Garay et al. (2022) reported that awareness significantly influences individuals' willingness to engage in environmental initiatives.

For instance, Daoud et al. (2025) found that higher awareness significantly boosts the chances of individuals engaging in eco-friendly behaviours, such as recycling and energy conservation. Similarly, Syarifuddin et al. (2024) also highlighted that those campaigns and social media enhance community awareness and lead to participation in environmental activities. Furthermore, Seow et al. (2020) conducted a study among tourists in Perak and found positive influences of environmental awareness on attitudes. The result that higher levels of awareness will contribute to more positive environmental attitudes. Thus, their findings suggest that awareness is not merely informational but also builds concern, which may lead to behavioural change. Accordingly, this study proposes the following hypothesis.

H_1: Awareness (AWR) has a significant positive influence on environment sustainability practice (ESP).

2.2 Knowledge (KNW) and Environment Sustainability Practices (ESP)

Environmental knowledge encompasses an individual's understanding of how ecosystems function, including awareness of environmental issues, their underlying causes, and potential solutions (Frick et al., 2004). While knowledge alone may not automatically result in pro-environmental behaviour, it forms the cognitive foundation upon which awareness and attitudes are connected (Kollmuss & Agyeman, 2002). Knowing environmental practices enables individuals to make informed decisions that minimize negative environmental impacts and contribute positively to sustainability efforts.

Several studies suggest that knowledge is a prerequisite for behaviour, as individuals well-equipped with knowledge are more likely to react (Kaiser & Fuhrer, 2003). Knowledge alone is unable to predict behaviour directly; however, it supports the development of awareness and attitude, which are stronger determinants of action (Abdul-Halim et al., 2021; Bartik et al., 2020; Kollmuss & Agyeman, 2002; Liu et al., 2020). Bamberg and Möser (2007) conducted a meta-analysis; it revealed that knowledge indirectly influences behaviour through its impact on awareness and attitudes. This finding is further supported by Firmanshah et al. (2023) in their research, which found that positive attitudes and behaviour towards sustainability among students are driven by environmental education and knowledge.

Globally, 63% of university students in Indonesia are exposed to environmental issues through formal education (Erwinsyah, 2022). Meanwhile, Daoud et al. (2025) found that university students with higher environmental knowledge demonstrated greater pro-environmental behaviour. A study in Turkey among hotel employees highlights that knowledgeable employees are more likely to engage in effective environmental practices (Keles et al., 2023). However, a gap between knowledge and behaviour, often called the "knowledge–action gap", remains a challenge, underscoring the need for integrated approaches that combine education with motivational factors (Tiew et al., 2019). Therefore, we propose the following hypothesis.

H_2: Knowledge (KNW) has a significant positive influence on environment sustainability practice (ESP).

2.3 Attitude and Environmental Practices

Environmental attitudes, which consist of beliefs, feelings, and behavioural intentions, are widely recognized as a predictor of environmental practices. According to the Environmental Literacy Model, environmental behaviour is driven by the knowledge and attitude of an individual, as well as factors that encourage or inhibit that practice (Roth, 1992). Several studies from other countries have confirmed that individuals with positive environmental attitudes tend to engage in environmental practices such as recycling, energy conservation, and green purchasing (Bamberg & Möser, 2007; Daoud et al., 2025; Song et al., 2024; Zhao et al., 2021). Similarly, Miller et al. (2022) emphasized that attitude is a strong predictor of environmental practices.

Supporting this, Mokhtar et al. (2025) conducting research in Malaysia identified a similar trend among university students, highlighting that cultivating favourable attitudes encourages greater adoption of eco-friendly behaviours. Not only that, attitude has also been tested as a mediator in the relationship between knowledge and awareness of practices (Liu et al., 2020). Nonetheless, attitude is usually found to have a moderate to weak relationship with practice, as validated by Ahmad et al. (2015). Meanwhile, in some studies, attitude was found not to correlate with practices (Erwinsyah, 2022). Drawing from these insights, the study proposes the following hypothesize:

H3: Attitude (ATT) has a significant positive influence on environment sustainability practice (ESP).

2.4 Role of Residential Area

In the context of a residential area, whether urban or rural, it could significantly influence environmental literacy, which consists of awareness, knowledge, attitudes, and practices**.** Generally, urban residents have better surrounding with good access to formal environmental education, modern infrastructure like waste management systems and sustainability campaigns (Abdul-Halim et al., 2021). These opportunities help them to increase their environmental knowledge and encourage their engagement in environmental practices. Still, a fast-paced urban lifestyle and reliance on convenience may limit direct interaction with nature and reduce direct conservation behaviours.

On the other hand, rural communities often face challenges such as limited educational resources and inadequate environmental infrastructure (Kan et al., 2025; Owojori et al., 2022). However, they have a stronger connection and practical understanding of nature as they had daily interaction with the natural environment. (Bashan et al., 2021). This was evidenced in a study by Liu et al. (2020), which found that rural communities in China showed stronger environmental knowledge, environmental attitudes and pro-environmental behaviour than urban respondents, despite having fewer formal resources.

Empirical findings demonstrate a pattern in which urban communities perform better in environmental education and structured sustainability programs. At the same time, rural populations are more oriented towards eco-centric values and deeper intrinsic motivations (Kollmuss & Agyeman, 2002). This difference highlights the different pathways through which environmental literacy develops in each context—formal education in urban versus experiential education in rural settings. UNESCO (2021) supports this contextual sensitivity by recommending educational approaches tailored to communities' specific cultural, social, economic, and environmental realities. Thus, residential areas are a meaningful moderating factor in understanding how awareness, knowledge, and attitudes shape environmental practices.

While prior studies (Liu et al., 2020; Sheasby & Smith, 2023) have examined urban-rural differences in other countries, limited research has contrasted these settings in Malaysia. Given these, it is important to investigate how residential area moderates the relationships between awareness, knowledge, and attitudes with environmental practices. Therefore, the following hypotheses are proposed:

H4a: There is a significant difference in the relationship between awareness (AWR) and environment sustainability practice (ESP) for urban and rural communities.
H4b: There is a significant difference in the relationship between knowledge (KNW) and environment sustainability practice (ESP) for urban and rural communities.
H4c: There is a significant difference in the relationship between attitude (ATT) and environment sustainability practice (ESP) for urban and rural communities.

2.5 Research Framework

Figure 1 shows the research framework for this study, where the independent variables are awareness, knowledge, and attitude, while the dependent variable is environmental practices. This study also tests a moderating variable, which is residential area.

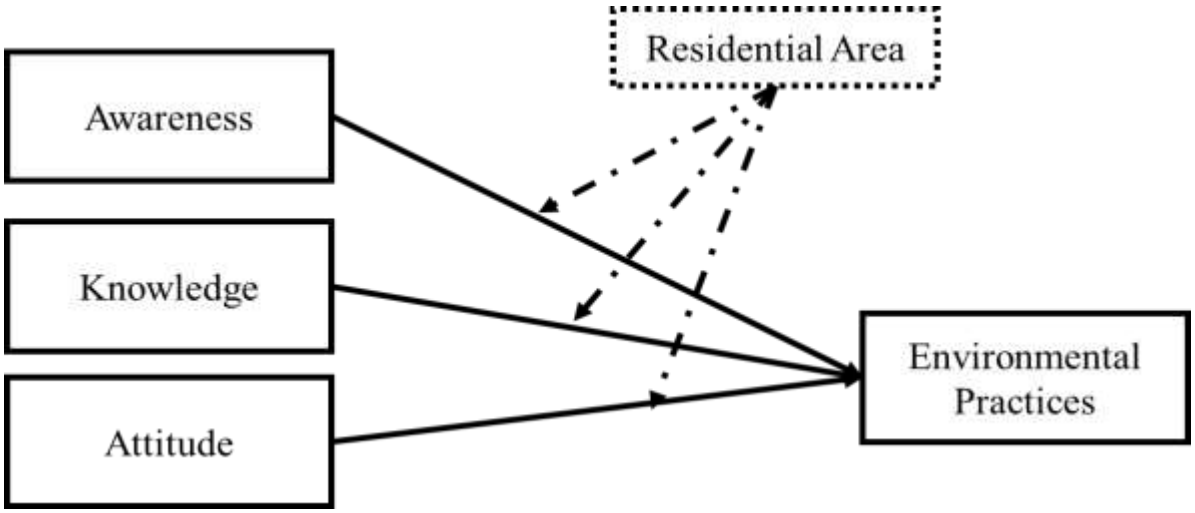

Figure 1: Research framework

3.0 RESEARCH DESIGN

3.1 Sampling and Data Collection

This study employed a cross-sectional research design using primary data collected through self-administered questionnaires. The questionnaire consisted of demographic items and variables measured using a ten-point Likert scale ranging from 1 (strongly disagree) to 10 (strongly agree). This study employed a sample of 370 respondents, identified and selected using purposive non-probability sampling techniques. This technique is used to ensure the selection of participants who meet the study's inclusion criteria, which are adults aged 18 and above from urban and rural communities in Kelantan, Terengganu, and Pahang. While this technique limits the generalisability of findings to the broader population, it allows for a focused investigation of the theoretical construct within the Environmental Literacy Model, especially in underrepresented populations. Data were collected from August 2024 until October 2024. After data screening and cleaning, out of 370 questionnaires distributed, only 267 were valid for further analysis. The other 93 questionnaires were excluded due to incomplete answers and straight lining. All the respondents were informed of the purpose of the study and assured of the confidentiality of participants' information, other than for research purposes.

3.2 Variable Development

This study adapted measurement items from an earlier study specific to the research area. The AWR (3-items), KNW (11-items) and ATT (9-items) measurements were adapted from (Abdul-Halim et al., 2021). Meanwhile, items measuring ESP (14-items) were adapted from (Abdul-Halim et al., 2021; Hashim et al., 2023). All thirty-seven items demonstrated strong validity and reliability, with a Cronbach's alpha coefficient exceeding 0.70. Although the items were adapted from a previous study; this study still implements content validity from experts (academics and industry professionals) to minimize potential bias and ensure the items adequately addressed the research objectives (Podsakoff et al., 2012). A pilot study with 30 respondents further confirmed the instrument's reliability and validity, with all measures meeting the minimum reliability standard of 0.7 as recommended by Hair et al. (2010).

3.3 Analysis Method

This study employed SPSS for data cleaning, checking for missing values, and assessing for normality. Subsequently, Partial Least Squares-Structural Equation Modelling (PLS-SEM) with SmartPLS version 3 was used to assess the structural model (Ringle et al., 2015). SmartPLS, a second-generation multivariate analysis tool, is widely used to analyse complex models with latent constructs. It is especially suitable for non-normal data and moderate sample sizes (n = 267) (Afthanorhan et al., 2020; Hair et al., 2017). Data analysis followed a two-step approach where the measurement model was examined for validity and reliability. Then, the structural model was evaluated using a 95% confidence level and a one-tailed bootstrapping method, applying a t-value threshold of 1.96.

A Multi-Group Analysis (PLS-MGA) was conducted in SmartPLS to compare environmental practices between rural and urban communities. This helped find significant differences in path coefficients between the two groups, offering insights into how geographic location influences environmental behaviour. Following Cheah et al. (2023) and Henseler et al. (2016) applied measurement invariance testing to ensure that any observed differences were not due to measurement bias.

4.0 ANALYSIS RESULT AND DISCUSSION

4.1 Profile of The Respondents

This study involved 267 respondents from the East Coast states of Peninsular Malaysia—Kelantan, Terengganu, and Pahang. The majority were female (76.0%) (n=202). Most (59.6%) of respondents were between 18 to 39 years old, while 40.4% were aged 40 years and above. In terms of education, 46% of respondents held degrees and above, while 27.7% held diploma, 12.7% held certificates and 13.5% had basic education. Most participants were married (71.9%), with the rest being single (24.7%), divorced (2.2%), or widowed (1.1%). Ethnically, the sample was Malay (97.8%). Residentially, respondents were evenly split, with 51.7% living in rural areas and 48.3% living in urban settings.

4.2 Assessment of Measurement Model

A convergent validity test was performed to examine how well a particular measurement measures what it was designed to measure and correlate favourably with other alternative measures of the same construct. As suggested by Hair et al. (2013), the factor loadings, composite reliability (CR) and average variance extracted (AVE) were used as indicators to assess the convergent validity. The loadings for all items must be more than 0.5 as recommended by Chin (1998) and Barclay et al. (1995). Likewise, according to Hair et al. (2017), the threshold value for loading is 0.7, AVE; 0.5, and CR is 0.7. For this study, items with loading less than 0.6 were dropped from the model. All the values shown in Table 1 are greater than the minimum value, showing that the measurement model is achieved in this study. Items A6, A7, K3, K7, ESP4, ESP6, ESP7, ESP10 and ESP14 were dropped from the model because of low loading (<0.6).

Then, a discriminant validity test was performed using the Heterotrait–Monotrait (HTMT) ratio, to ensure that the measures do not reflect other variables. It is shown by low correlations between the measure of interest and the measures of the other constructs (Cheung & Lee, 2010). The HTMT values for ATT, AWR, KNW, and ESP are all below the threshold of 0.90 recommended by (Gold et al., 2001); therefore, discriminant validity is established in this study.

This study used a single source of data, in which obtaining data for independent and dependent variables from the same person at the same time; thus, Common Method Variance

(CMV) could be an issue in this study (Podsakoff et al., 2012). To avoid CMV in this study, the questionnaire was pre-tested prior to the field study. One of the famous methods to identify CMV is using Harman's single-factor analysis, as recommended by various researchers (Hair et al., 2017; Irani & Kilic, 2022). The results of the unrotated factor analysis show that the first factor accounts for 31.33% of the total variance, which is below the commonly accepted threshold of 50%, thus confirming that CMV was not a serious concern in this study.

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Table 1: Measurement model

Constructs	Items	Complete (n=267)				Rural (n=138)				Urban (n=129)			
		Loadings	**CA**	**CR**	**AVE**	**Loadings**	**CA**	**CR**	**AVE**	**Loadings**	**CA**	**CR**	**AVE**
ATT	A1	0.808	0.859	0.892	0.556	0.791	0.858	0.891	0.541	0.811	0.874	0.902	0.569
	A2	0.734				0.635				0.815			
	A3	0.803				0.785				0.813			
	A4	0.727				0.762				0.693			
	A5	0.759				0.831				0.692			
	A8	0.724				0.714				0.750			
	A9	0.651				0.601				0.694			
AWR	AW1	0.788	0.825	0.896	0.743	0.681	0.776	0.871	0.696	0.860	0.865	0.918	0.788
	AW2	0.897				0.896				0.911			
	AW3	0.896				0.906				0.892			
KNW	K1	0.712	0.903	0.920	0.536	0.745	0.895	0.914	0.543	0.686	0.922	0.935	0.617
	K2	0.782				0.767				0.793			
	K4	0.742				0.663				0.826			
	K5	0.726				0.710				0.770			
	K6	0.802				0.782				0.835			
	K8	0.783				0.722				0.843			
	K9	0.706				0.739				0.678			
	K10	0.814				0.797				0.838			
	K11	0.743				0.700				0.783			
ESP	ESP1	0.754	0.909	0.925	0.531	0.729	0.883	0.906	0.519	0.785	0.922	0.935	0.616
	ESP2	0.784				0.778				0.795			
	ESP3	0.760				0.756				0.770			
	ESP5	0.706				0.696				0.724			
	ESP8	0.744				0.663				0.824			
	ESP9	0.720				0.660				0.777			
	ESP11	0.735				0.692				0.771			
	ESP12	0.786				0.783				0.789			
	ESP13	0.770				0.712				0.821			

Notes: ATT: Attitude; AWR: Awareness; KNW: Knowledge; ESP: Environmental Practices

4.3 Assessment of Structural Model

Before assessing the structural model, it is important to ensure no multicollinearity issue in this data. Table 3 shows the results of the collinearity test. The VIF value for this study is less than 5 for each construct, as suggested by (Hair et al., 2017) indicates that there is no potential multicollinearity issue in the model. After satisfying the validity and reliability of the measurement model, we continue to hypothesis testing. Nonparametric bootstrapping was applied with five thousand replications and one-tailed t-statistics to evaluate the structural model. The significance of direct effects specified by the research model was evaluated (see Table 3). The result revealed that the impact of ATT (β=0.289, ρ<0.05) on ESP, AWR (β=0.350, ρ<0.05), and KNW (β=0.191, ρ<0.05) on ESP is positive and significant. Therefore, H_1, H_2 and H_3 are supported.

4.4 Evaluating the Structural Model

Table 3 presents the coefficient of determination (R^2), the effect size (f^2) and the predictive relevance (Q^2) of the independent variable on the dependent variable in this study. The value R^2 is the amount of variance in the dependent variable explained by the independent variable in the model. The R^2 of this study is 0.514, indicating that the model accounts for 51.4% of the variation in the dependent variable. The R^2 values can be described as substantial (Hair et al., 2013) and large according to Cohen (1988).

Next, we examine the effect size (f^2) following (Cohen, 1988) Table 3 shows that AWR, KNW and ATT have produce a small effect size on the R^2 for ESP. Subsequently, Q^2 was examined through a blindfolding procedure. Based on Hair et al. (2013) Q^2 represents how well the model and its parameter estimates can reconstruct well-observed values. If $Q^2 > 0$, it shows that the model has predictive relevance. The Q^2 value of 0.359 for the ESP construct shows medium predictive relevance of the model, as it exceeds the threshold of 0.25 but is below 0.50.

According to Hair et al. (2013) Q^2 values above 0.25 signify moderate predictive accuracy, while Shmueli et al. (2019) note that a positive Q^2 confirms the model's meaningful predictive power beyond mere explanatory capability. This suggests that the model not only explains the variance in ESP but also has a satisfactory ability to predict its indicators in new data.

Table 2: Assessment of discriminant validity using HTMT

Constructs	**1**	**2**	**3**	**4**
Complete (n=267)				
ESP				
ATT	0.688			
AWR	0.707	0.639		
KNW	0.684	0.824	0.748	
Rural (n=138)				
ESP				
ATT	0.526			
AWR	0.620	0.564		
KNW	0.576	0.838	0.680	
Urban (n=129)				
ESP				
ATT	0.839			
AWR	0.797	0.714		
KNW	0.787	0.807	0.831	

Notes: Discriminant validity achieved at $HTMT_{0.90}$; ATT: Attitude; AWR: Awareness; KNW: Knowledge; ESP: Environmental Practices

Table 3: Direct hypothesis

Hypotheses	**Beta**	**t-stats**	***P-value***	**VIF**	**F^2**	**Decision**
Complete						
H_1: ATT -> ESP	0.289	3.290	0.001*	2.223	0.076	Supported
H_2: AWR-> ESP	0.350	3.039	0.001*	1.775	0.120	Supported
H_3: KNW-> ESP	0.191	1.843	0.033*	2.730	0.035	Supported
	R^2	**Q^2**				
ESP	0.514	0.288				

*Notes: *Relationships are significant at P < 0.05. ATT: Attitude; AWR: Awareness; KNW: Knowledge; ESP: Environmental Practices*

4.5 Multigroup Analysis

Before performing the multigroup analysis (MGA), it is necessary to examine the compositional invariance. Table 4 presents the summary of the results. Since the *c* value in Table 4 is not significantly different from one, the *p*-value significantly exceeds 0.05, thus, compositional invariance is considered established (Cheah et al., 2020). At the same time, the composites' equality of variances and mean values across the different groups indicated that full measurement invariance has been achieved, confirming that the model is suitable for MGA.

Table 5 revealed the Multigroup Analysis (PLS-MGA) results. The path from attitude (ATT) to environmental practices (ESP) differs significantly across the two groups (path difference= –0.283, p=0.037), indicating that the influence of attitude on ESP is higher in the urban community compared to the rural community. This suggests that the effect of attitude on environmental practices is not uniform across residential contexts, potentially reflecting contextual or demographic variations. In contrast, the paths from Awareness (AWR) to ESP

(p=0.416) and Knowledge (KNW) to ESP (p=0.372) did not show significant differences, indicating that these relationships are stable across both groups. Overall, the findings partially support the presence of group-specific structural differences, emphasizing the role of attitude as a differentiating factor between rural and urban residents in shaping environmental practices. Thus, H_{4c} is supported, while the rest of the hypotheses are not.

Table 4: Summary of the MICOM result

Composite	**C value (=1)**	**95% confidence interval**	**p-value**	**Compositional invariance**
ESP	0.999	[0.997;1.000]	0.282	Yes
AWR	0.997	[0.993; 1.000]	0.203	Yes
KNW	0.997	[0.995; 1.000]	0.213	Yes
ATT	0.985	[0.985; 1.000]	0.054	Yes
Composite	**Difference of the composite mean value**	**95% confidence interval**	**p-value**	**Equal mean values**
ESP	-0.162	[-0.197; 0.199]	0.076	Yes
AWR	0.123	[-0.190; 0.203]	0.158	Yes
KNW	-0.074	[-0.189; 0.194]	0.238	Yes
ATT	-0.071	[-0.204; 0.191]	0.273	Yes
Composite	**Difference of the composite variance ratio**	**95% confidence interval**	**p-value**	**Equal variances**
ESP	-0.147	[-0.522; 0.546]	0.318	Yes
AWR	-0.282	[-0.453; 0.408]	0.134	Yes
KNW	0.009	[-0.546; 0.509]	0.496	Yes
ATT	-0.063	[-0.584; 0.576]	0.440	Yes

Notes: ATT: Attitude; AWR: Awareness; KNW: Knowledge; ESP: Environmental Practices

Table 5: Multi-group analysis results for urban and rural communities

Hypotheses		Path Coefficients-diff (Rural-urban)	p-Value new (Rural vs urban)	Decision
H_{4a}	AWR -> ESP	0.024	0.416	Not Supported
H_{4b}	KNW-> ESP	0.058	0.372	Not Supported
H_{4c}	ATT -> ESP	-0.283	0.037	Supported

Notes: ATT: Attitude; AWR: Awareness; KNW: Knowledge; ESP: Environmental Practices

5.0 DISCUSSION

This study aimed to provide empirical evidence the influence of AWR, ATT and KNW on ESP among communities in East Coast of Malaysia. It is also investigate whether these three factors differ between rural and urban communities. Although previous research has widely explored environment literacy, much of it has focused on students or formal education setting. Community level studies remain limited, despite communities being the primary agents of environmental action and policy adoption. By shifting the focus to local communities, this study contributes new insights to the body of research on environment sustainability practices in the East Coast of Malaysia.

The finding from this study revealed that environment sustainability practices (ESP) among the communities on the East Coast of Malaysia are shaped by awareness (AWR), knowledge (KNW), and attitude (ATT) in the communities. Specifically, AWR appear to exert

a more immediate influence on practice than knowledge, indicating that theoretical models may need to recalibrate the assumed symmetry among literacy components when applied beyond formal education setting. East Coast communities may already possess a baseline understanding of environmental issues, however, without sufficient environmental awareness, such understanding is unlikely to be translated into meaningful and sustainable actions at the community level. The finding is consistent with previous studies that revealed a significant positive relationship between AWR, ATT, KNW, and ESP (Abdul-Halim et al., 2021; Bamberg & Möser, 2007; Daoud et al., 2025; Kaiser & Fuhrer, 2003; Seow et al., 2020; Yaacob et al., 2025; Zhao et al., 2021).

Meanwhile, based on the literature review, there is a difference in terms of AWR, KNW, and ATT between urban and rural communities due to the advantages received in urban communities compared to rural areas. Interestingly, in this study, the results of Multigroup Analysis (PLS-MGA) showed different findings where residential area only moderates the relationship between ATT and ESP, but not on the relationship between AWR and KNW towards ESP. This result explains that there are significant differences in ATT, whereby the influence of ATT on ESP is more substantial among urban communities than those living in rural areas. This finding may be explained that attitude is inherently shaped by lived experience, exposure and daily interactions with environment infrastructure. Additionally, urban communities have better access to infrastructure (e.g., recycling, public transport, green spaces) that facilitates environmentally friendly actions aligned with their attitudes (Barr, 2007; Kollmuss & Agyeman, 2002). Nevertheless, AWR and KNW show that there is no difference between rural and urban communities. This finding may be attributed to the fact that these rural communities have more balanced access to information, such as through community education programs or social media. Furthermore, many rural communities engage in daily interaction with natural surroundings, which may contribute to a high level of knowledge and awareness, even if not through formal channels.

Environmental sustainability practices are often driven more by awareness than knowledge, highlighting the importance of affective and perceptual dimensions in shaping community-level behaviour (Johan & Kamaruddin, 2025). In Malaysia's East Coast, where floods, erosion, and waste accumulation are recurrent, communities develop experiential awareness through firsthand encounters rather than formal education. Recent studies demonstrate that environmental consciousness shaped by experiential awareness significantly strengthens moral responsibility and pro-environmental intentions, indicating that interventions which emphasize visibility, salience, and personal relevance are more effective than those relying solely on knowledge dissemination (Laheri et al., 2024).

Environmental knowledge is essential but insufficient for sustainable action. The knowledge–action gap shows that people may understand environmental issues yet fail to act due to habits, convenience, or structural barriers (Kollmuss & Agyeman, 2002). In Malaysia's East Coast, semi-urban and rural communities access waste systems and green technologies, but limited infrastructure constrains behaviour. Thus, environmental literacy must integrate cognition, motivation, and opportunity (Stern, 2000).

Residential context further shapes the attitude–practice link. Urban residents benefit from institutional support and enforcement, while rural communities face service gaps that weaken the impact of positive attitudes (Cheng & Mao, 2024). Yet rural–urban disparities in awareness are narrowing through digital connectivity and proximity to ecosystems, positioning rural communities as key sustainability stakeholders (Johan & Kamaruddin, 2025). This convergence calls for inclusive, multilevel policies that combine ecological knowledge, experiential awareness, and structural support to foster sustainable practices in sensitive regions like Malaysia's East Coast (Stern, 2000).

This study offers theoretical contributions towards advancing the body of knowledge by extending the application of the environmental literacy model within the context of urban and rural community settings in Malaysia. While the model traditionally emphasizes the interconnectedness of knowledge, attitude, and behaviour in shaping environmental literacy, this research enhances its explanatory power by incorporating residential context (urban vs rural) as a moderating factor influencing how these components interact. Furthermore, by empirically assessing the differences in awareness, knowledge, attitude and practices across residential areas, the study supports a more differentiated and contextual approach to environmental literacy. It suggests that theoretical models must consider geographical and socio-economic variations to remain robust and applicable across diverse populations.

The results will also help policymakers and relevant agencies by guiding the development and enhancement of environmental sustainability efforts across Malaysia, particularly the East Coast region. These findings imply that awareness-based interventions may yield broader and more uniform impacts across residential area, whereas attitude-driven initiatives require infrastructure support to be effective. Therefore, tailored programs are needed to address the distinct gaps in awareness, knowledge, attitude, and practices between rural and urban communities. Furthermore, strengthening environmental facilities in rural areas is necessary to simplify alignment between attitudes and behaviours. Nonetheless, this study also has limitations. This study is limited to selected communities on the East Coast of Malaysia, which may affect the generalizability of the findings. In addition, the reliance on self-reported data may introduce social desirability bias.

6.0 CONCLUSION

This study examined the factors influencing the environment sustainability practices among communities in East Coast of Malaysia, drawing on data from 267 respondents representing the Bumiputra, Chinese and Indian ethnic group. The findings show that awareness, knowledge and attitude are direct positive influences on environment sustainability practices in East Coast of Malaysia. Additionally, residential area was found to significantly moderate the relationship between attitude and environment sustainability practices. Despite its regional focus, reliance on self-reports, and cross-sectional design, the findings provide practical guidance for policymakers to enhance environmental sustainability initiatives in Malaysia, especially on the East Coast. Future research should include a broader area, incorporate additional demographic and contextual variables and consider mixed method approaches to deepen understanding of community-level environmental behaviour.

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