Indonesian Journal of Sustainability Accounting and Management
ISSN 2597–6214 | e–ISSN 2597–6222
DOI: 10.28992/ijsam.v8i1.853

# Environmental Sustainability: Mediating Effect of Environmental Knowledge for Pro-Environmental Behaviour

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**Abstract:** This study aims to examine the level of pro-environmental behaviour based on demographic profile and the interrelationship between environmental connectedness and pro-environmental behaviour via the mediating role of environmental knowledge. The quantitative and convenience sampling collected data from the Malaysian public. The collected data were analysed using the descriptive statistics and structural equation modelling (SEM) method. The findings show that there is a significant degree of pro-environmental conduct. Interestingly, though, there is very little variation in pro-environmental activity by age, gender, or educational attainment. Subsequently, the SEM findings demonstrated that environmental connectivity strongly impacted pro-environmental conduct. Additionally, environmental knowledge considerably and partially mediated the association between environmental connectedness and pro-environmental behaviour. This paper suggests that values and behavioural norms influence individual pro-environmental behaviour. This study suggests that people's backgrounds, such as family upbringing, parenting lessons and school syllabuses, are crucial in shaping the young generation and the adults towards pro-environmental behaviour. Therefore, the government and local authorities can encourage parents and peers to nurture their children's environmental values and perceived behaviour for better environmental sustainability. The value of the study shows that individuals' values, behaviour and attitudes towards the environment can be inculcated at home and need continuous practice anywhere.

**Keywords:** environmental connectedness, environmental knowledge, mediation effect, pro-environmental behaviour.

**Article info:** Received 5 September 2023 | revised 27 November 2023 | accepted 18 January 2024

**Recommended citation:** Noor, N. H. M., Zaini, M. D., Pudini, S., & Sidek, M. S. J. (2024). Environmental Sustainability: Mediating Effect of Environmental Knowledge for Pro-Environmental Behaviour. *Indonesian Journal of Sustainability Accounting and Management, 8*(1), 230–248. https://doi.org/10.28992/ijsam.v8i1.853

## INTRODUCTION

The issue of environmental sustainability has become the primary discussion of the present century. Current pollution and environmental damage are becoming significant threats to the world. Because environmental sustainability issues are significant, human behaviour towards their surroundings has been debated for their

severe consequences for the environmental system. This issue has been debated as one of the economic impacts towards protecting the environmental agenda in all countries. Human behaviours have been considered one of the critical elements in maintaining and reducing impacts on natural resources (Esfandiar et al., 2019). A substantial body of literature has been published in the social and behavioural sciences examining the human-environment relationship (e.g., Degenhardt, 2002; Schultz, 2001; Mayer & Frantz, 2004; Nisbet et al., 2009).

Environmentally friendly behaviours are often associated with protecting the environment and natural settings (Harbrow, 2019). For example, parks and protected areas are among the standard environmental settings that require personal responsibility and act to protect these settings. Empirical research on society's behaviour contended that personal responsibility and protection actions stem from an individual's internalised belief about the impact that their behaviour can have on the environment and are undertaken with the intent to minimise the impact (Landon et al., 2018; Li et al., 2019). This behaviour is also consistent with individual relationships between nature contact and pro-environmental behaviour (Martin et al., 2020). Nature connectedness is an individual's subjective sense of their relationship with the natural world (Martin & Czellar, 2016). Previous researchers highlighted that the levels of nature connectedness are positively associated with evaluation and well-being. Factors, including demographics, social, cultural, values, emotions, and personal norms, are found to be the determinants of environmental connectedness (Li et al., 2019, Hidayatullah & Ekasari, 2023). Given the current setting which people living in industrialised today, this implies a potential disconnect from the natural environment. Human pressures in modern society, along with technological changes, advancements, and urbanisation, could also affect people's ability to connect with nature in their daily lives. Thus, this circumstance can limit the impact of society's empathy towards the environment. This can lead to a decline in society's connectedness across generations and diminish people's experience in and with the natural world (Mackay & Schmitt, 2019).

People's relationship with nature can determine engagement in pro-environmental behaviours. Previous studies such as Clayton & Opotow (2003), Mayer & Frantz (2004), and Schultz et al. (2004) describe that people's sense of inclusion in nature is referred to as 'ecological identity or self'; and attachment to nature and place are thought to affect human identity or self-definition. In a similar view, Perkins (2010) describes the construct of love and care for nature as "a deep love and caring for nature which includes a clear recognition of nature's intrinsic value as well as a personal sense of responsibility to protect it from harm." Further, the connectedness to nature theory suggests that a relationship with the natural world directly affects people's physical, mental, and overall well-being due to benefits gained by increased exposure to nature and positive experiences in the natural world (Tauber, 2012). Wang et al. (2016) showed that an individual's natural connectedness remains a significant concern for potential solutions to environmental problems. Klassen (2010) emphasised that the differences in the level of interrelatedness or connectedness of individuals are because of the differences in people's ecological identity, sense of place, and ecological literacy.

According to Stern (2000), defining environmental intent-oriented behaviour and identifying people's environmental beliefs could be used to understand pro-environmental behaviour. Some social identity scholars have suggested that the individual's current personal or social goals also reflect a psychological significance, thus indicating the level of processes of individual participation in pro-environmental behaviour. Social identity forces would help explain the persistence of pro-environmental behaviours or patterns of change for pro-environmental behaviours over time. Environmental commitment is the individual's pursuit of environmental sustainability, willingness to sacrifice personal enjoyment, reducing waste of resources, using environmentally friendly new products, and supporting the government's adaptation strategies.

In a broader perspective, Klassen (2010) contended that an individual's connectedness to the environment depends on various precursors: 'prior knowledge,' 'lived experience,' 'cultural background,' and peer influence. To create environmentally literate people about the environment, environmental education and awareness of the ecosystem and the consequence of peoples' actions can, in return, enhance individual's experience and encourage them to sustainable behaviours (Siow et al., 2014; Priyashantha & Priyangaa, 2022). Several scholars also stressed the importance of environmental education as knowledge can profoundly impact the relationship between nature and connectedness with psychological well-being and thus mediate spiritual connectedness (Aini & Laily, 2010; Otto & Pensini, 2017).

Despite the importance of environmental effects on people's lives, we face a dramatic environmental crisis due to chemicals, waste, and others. Interestingly, some people still do not see the connection to any negative impacts on their health, quality of life, and physical environment. As mentioned, many studies have analysed how intangible motivations (such as environmental identity, place attachment, connectedness to nature, and environmental concern) are important drivers of environmental action or behaviour. Recognising and understanding the diversity of people's motivations, values, and commitment to engage in sustainability behaviours and the developmental pattern among these different approaches supports knowledge, skill, and capacity development for sustainability with careful management across these differences. According to Schultz's (2002) connectedness model, the connectedness scale can measure the extent to which people view themselves as a part of nature. In this context, the types of connectedness can be described in two ways: explicit, in which the individual acknowledges and is able to express the connection, and implicit, which is a non-conscious connectedness inexpressible to others (Schultz & Tabanico, 2007).

Concern for the environment is one factor that describes people's connection with nature and is considered a determinant of pro-environmental behaviours. A study by Verplanken et al. (2020) found that global warming worry affected individuals' amount of concern. The global warming worry pattern reported in the study was positively associated with pro-environmental behaviour. However, the study highlighted that the individual's worrying pattern concerning global warming can vary because of the level of coping with the individual interpretation. This finding showed that although the individuals viewed global consequences as the most concerning, they did not feel responsible for them. Self-related responses to the threat may be part of the self-regulation process leading to behaviour (Hagger et al., 2017).

Further, it is believed that values contribute to the connection to nature. Klassen (2010) suggests a strong interrelatedness between ecological identity, sense of place, and ecological literacy and establishes the extent to which these three concepts influence individuals and vary. Further, the author concludes that an individual's environmental connectedness depends on various antecedents, including prior knowledge, lived experiences, and cultural background. Additionally, according to Schultz (2002), "values" serve as a unifying factor for all the notions and forerunners outlined by Klassen since they serve as the foundation for people's interactions with nature and their emotional, psychological, and physiological reactions to it. Ina similar view, Kaiser et al. (2008), suggest that an individual's ecological behaviour is influenced by their integration of environmental knowledge and sense of connection to the natural world. Given the interdependence of these variables, learning about how the natural world works may expose people to the interconnectivity of all life, which may affect their connection to nature. According to research, increasing environmental knowledge, awareness, or concern are effective ways of facilitating pro-environmental behaviour. Although people's environmental concern is not always positively displayed in their behaviour, pro-environmental behaviour can be facilitated by increasing environmental knowledge, awareness, or concern (Kement et al., 2020; Schultz, 2001; Schultz et al., 2004; Yu et al., 2019).

In general, individuals can be influenced by external (such as social, cultural, economic, and institutional factors), and internal factors (include motivations, environmental knowledge, awareness, and attitudes) when choosing their involvement with environmental commitment (Gifford & Nilsson, 2014). Nevertheless, Ertz et al. (2016) posited that individuals may not adopt pro-environmental behaviour due to time, cost, and effort. Individuals' behaviour to be connected to the environment may be influenced by their beliefs, motives, and environmental commitment. Additionally, this responsible behaviour is likely to be engaged by educated individuals with a profound sense of environmental knowledge and motivation. Some individuals may be inspired to be involved with environmental behaviour by distinctive factors, including environmental commitment (Han & Hyun, 2017), green lifestyle or pro-environmental lifestyle (Mohd Suki, 2017), environmental consciousness (Mishal et al., 2017; Nazir & Pedretti, 2016), and goal-framing differences (Chakraborty et al., 2017). Individuals' demographic backgrounds are crucial for comprehending behaviour related to environmental connectivity. Policymakers are also interested in pro-environmental changes in the context of education because of its implications for environmental preservation and sustainability goals. Studies have looked at how people behave in favour of the environment in a variety of contexts, including waste (Wut et al., 2021), electronic environmental knowledge (Zareie & Navimipour, 2016), gender differences in pro-environmental behaviour (Vicente-Molina et al., 2018), and even the use of message notes to encourage recycling (Georgescu & Herman, 2020).

Since behaviour is challenging to observe and precisely measure, attitude, and commitment as proxy variables have grown in popularity as practical tools for examining interpersonal and environmental conflicts. This is because of the variables brought on by disparate identities and values about environmental objectives, quality of life, economic development, and resource allocation held by members of contemporary society. Understanding complex adaptive systems is interesting; whereas the foundation of the sustainability field naturally emerges more from individual behaviour, environmental commitment to pro-environmental work can be presented in any of the action logics, including the connections between social, ecological, and economic systems.

In general, those who have made an environmental commitment are not anymore (or, in some situations, even less) likely to change their pro-environmental behaviour than people who have never done so. It can be difficult to change human behaviour as this is associated with an individual's identity. Hence, to foster society for continuous environment connectedness, there is a need to understand the status of such behaviour. Society needs to engage in positive environmental behaviour since they will be exposed to the impacts of environmental problems in the future and can stimulate environmental efforts. In this respect, this current study occurred in one of the coastal areas in Peninsular Malaysia. The objective of this study is to evaluate the level of environmental connectedness based on the demographic analysis of the visitors. This study analysed the level of environmental connectedness behaviour among seaside and recreational park visitors. It is worth noting that studies related to environmental connectedness in Malaysia, particularly on demographic analysis, still need to be completed. Although previous studies on pro-environmental behaviour have been conducted concerning environmental commitment (Afsar & Umrani, 2020), environmental consciousness (Cheema et al., 2020), lifestyle practice (Shamsi & Siddiqui, 2017; Axsen et al., 2012), and others, these studies were conducted in different contexts.

Therefore, this study offers an empirical perspective on the level of environmental connectedness behaviour based on demographic aspects. Hence, the current study fills the gap in the literature on environmental sustainability in Malaysia. This study aimed to answer whether individuals' environmental knowledge significantly mediates people's environmental connectedness for pro-environmental behaviour.

## METHODS

A quantitative research method was chosen for this study. The approach used to collect data is a questionnaire using a convenience sampling technique. This study covers a group of Malaysian citizens. Three hundred respondents were selected for this study. The researchers considered distributing the questionnaire among 500 participants, and this size is assumed adequate as a sample size between 30 and 500 is already acceptable for most research studies (Sekaran & Bougie, 2019).

Figure 1 shows the research model for the three constructs and their theoretical relationships, as discussed above.

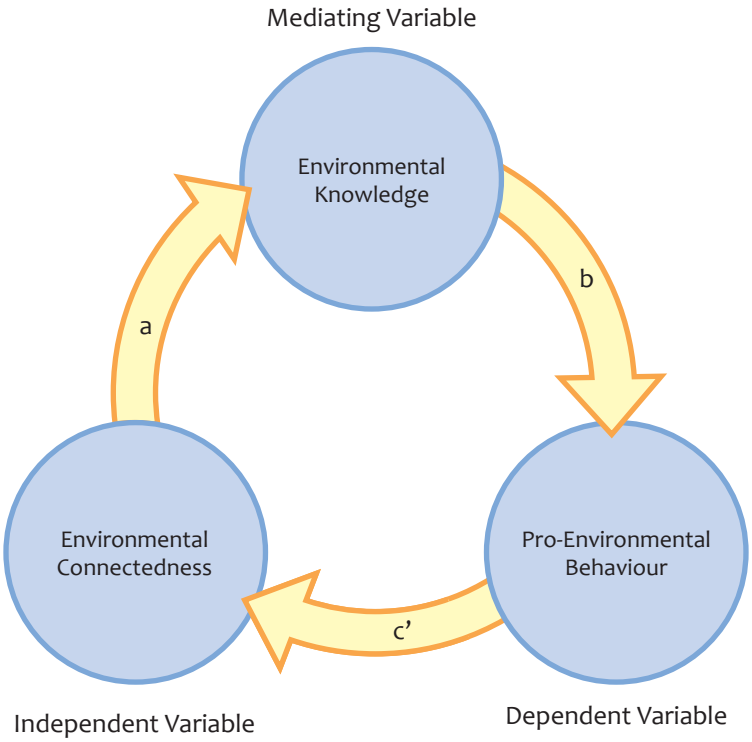



**Figure 1 Conceptual model**

Based on the above discussion, this study proposed the following hypotheses:

H1: There is a significant difference in the level of pro-environmental behaviour across gender group.
H2: There is a significant difference in the level of pro-environmental behaviour across age group.
H3: There is a significant difference in the level of pro-environmental behaviour across the education level.
H4: Environmental connectedness significantly predicts pro-environmental behaviour.
H5: Environmental knowledge significantly predicts pro-environmental behaviour.
H6: Environmental knowledge mediates the relationship between environmental and pro-environmental behaviour.

The ten-item questionnaire survey to measure environmental connectedness was adapted from Pearce et al. (2022) study. Environmental knowledge was measured using four items adapted from Jaiswal & Kant (2018). Then, pro-environmental behaviour was measured by seven items adapted from Blok et al. (2015). Table 1 summarises the measurement of the variables.

**Table 1 Measurement of the variable**

| Variable | Items | M | SD | Cronbach's Alpha |
|---|---|---|---|---|
| Environmental Connectedness | 1. When I undertake outdoor activities, I feel like I am unified with nature.<br>2. The more I am in touch with nature, the more I understand myself.<br>3. I am very attached to the natural surroundings of my living environment.<br>4. I care about the impact of environmental problems on me caused by emerging contaminants.<br>5. I care about the impact of environmental problems on society caused by emerging contaminants.<br>6. I donate money to environmental conservation groups to prevent emerging contaminants from causing environmental problems.<br>7. I work as an environmental volunteer for environmental conservation to prevent the occurrence of emerging contaminants.<br>8. I actively search for environmental conservation information on preventing emerging contaminants.<br>9. I read all types of publications about preventing emerging contaminants.<br>10. I attend or watch environmental conservation seminars or videos. | 4.127 | 0.667 | 0.840 |
| Environmental Knowledge | 1. I have better knowledge and information about environmental issues.<br>2. I know more about recycling than the average person.<br>3. I know how to select products and packages that reduce the amount of landfill waste.<br>4. I know that I buy products and packages that are environmentally safe | 4.017 | 0.711 | 0.806 |
| Pro-Environmental Behaviour | 1. We must make sure that air conditioning is off before leaving.<br>2. We must get as much as possible to print on both pages on one A4 sheet.<br>3. We must use stainless steel straws when drinking.<br>4. We should reduce the use of straws when drinking.<br>5. We must bring my shopping/plastic bag when I shop.<br>6. We must switch on the lights and switch them off before leaving.<br>7. We must recycle waste items and products (e.g., glass, plastic bottles, batteries, chemical office waste, paper, and others) | 4.140 | 0.753 | 0.830 |

The data analysis technique used in this research includes (1) testing preliminary requirements, (2) testing the significant differences, and (3) structural equation modeling (SEM). A reliability test is performed first to show whether an instrument used to obtain information can be trusted as a data collection tool. The Cronbach alpha value > 0.80 is perfect and acceptable reliable (Gliner & Morgan, 2000). The normality test was then performed to ensure the data collected was distributed normally. One of the popular methods for testing normal distribution is to determine skewness and kurtosis. Kline (2005) suggests a kurtosis value of ± 1 is excellent for most psychometric uses, but ± 2 is usually sufficient. This study uses a deviation value of ± 2. Kline (2005) suggests the kurtosis range value is ± 10 for normal data. Next, the independent samples t-test was conducted to compare the difference between the male and female groups in environmental connectedness. In addition, the ANOVA test was used to determine whether there is a statistically significant difference in the level of environmental connectedness across age groups and educational levels.

Structural equation modeling (SEM) was then adopted to analyse data and test hypothesised relationship. The first stage involves testing confirmatory factor analysis (CFA) to inspect how and the extent to which the observed variables are related to their underlying latent factors based on a sound theoretical underpinning

(Hair et al., 2010). CFA was espoused to test for convergent/discriminant validity between the manifest and latent variables. CFA is a way of testing how well the measured variables represent a smaller number of constructs. From CFA, the fit value of the Goodness-of-fit Index (GFI), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Normed Fit Index (NFI) need to meet the fit values as suggested by the literature, which is 0.90 and above (Hair et al., 2010). While the index value of the Root Mean Square Error of Approximation (RMSEA) must be less than 0.08, and the Chi-Square/degree of freedom ratio ($\chi^2$/df) needs to be less than 5.0 (Hair et al., 2010).

This study next further assessed convergent and discriminant validity. Convergent validity shows whether a test designed to assess a particular construct correlates with other tests that assess the same construct. According to Hair et al. (2010), convergent validity is established when composite reliability (CR) and average variance extracted (AVE) are more significant than 0.70 and 0.50, respectively. Next, the Fornell-Larcker (1981) criterion and cross-loading examination were referred to in determining the discriminant validity. Discriminant validity is established when the square root of AVE is greater than the correlation and the correlation value between the constructs is more than 0.50 and below 0.85 (Fornell & Larcker, 1981). The discriminant validity assessment ensures that the constructs have the most robust relationships with their indicators (Hair et al., 2010). In the final step, structural model analysis was used to test the mediation effect of environmental knowledge. PROCESS macro confirmed the mediational model (Hayes, 2009).

## RESULTS AND DISCUSSION

The researchers attempted to achieve valid data and distributed the questionnaire among 300 respondents of diversified attributes. We received 262 responses; of them, only 247 were used for analysis due to missing data. Table 2 shows the background information of the respondents. Most respondents are female, with 38 respondents (76.0%) and 12 male respondents (24.0%). Most respondents were 21–30 (n = 30, 60.0%). As for the highest education level, most respondents obtained bachelor's degree level qualification (n = 30, 60.0%).

**Table 2 Demographic profile**

| No. | Profile | Frequency (n) | Percentage (%) |
|---|---|---|---|
| 1 | Gender | | |
| | Male | 71 | 28.7 |
| | Female | 176 | 71.3 |
| 2 | Age Group | | |
| | 18–20 years old | 64 | 25.9 |
| | 21–30 years old | 137 | 55.5 |
| | 31–40 years old | 34 | 13.8 |
| | 41–50 years old | 10 | 4.0 |
| | 51–60 years old | 2 | 0.8 |
| 3 | Highest Education Level | | |
| | Secondary level (SPM) | 0 | 0.0 |
| | Diploma level | 170 | 68.8 |
| | Bachelor degree level | 67 | 27.1 |
| | Master degree level | 5 | 2.0 |
| | Ph.D. or DBA level | 5 | 2.0 |

Based on Table 3, the reliability results show that the Cronbach alpha values for environmental connectedness (0.840), environmental knowledge (0.806), and pro-environmental behaviour (0.830) were above 0.80. These indicate that the variable instruments were reliable. The normality results found that all Skewness (≤±2) and Kurtosis (≤±10) values for the variables were in a normal distribution (see Table 3).

**Table 3 Normality & reliability results**

| Variable | Mean | SD | Skewness | Kurtosis | Cronbach's Alpha | No. of Items |
|---|---|---|---|---|---|---|
| Environmental Connectedness | 4.127 | 0.667 | –1.554 | 2.987 | 0.840 | 10 |
| Environmental Knowledge | 4.017 | 0.711 | –1.779 | 1.980 | 0.806 | 4 |
| Pro-Environmental Behaviour | 4.140 | 0.753 | –1.583 | 3.114 | 0.830 | 7 |

Producing valid and reliable research findings is the responsibility of every researcher. Research findings should significantly contribute to the knowledge group from a theoretical, practical, and empirical perspective. Common Method Variance (CMV) is causing a problem of internal consistency. CMV usually occurs due to the self-reported questionnaire. This study conducted Harman's single-factor test using exploratory factor analysis to assess the CMV. The outcome of the principal component analysis revealed that the first factor did not explain more than 50% of the variance; it only explained 34.57% of the variance (Podsakoff et al., 2003).

In interpreting the level of items, the range of mean between 1.00–2.50 is considered a low level, 2.51–3.50 is a medium level, and 3.51–5.00 is considered a high level. Table 4 shows that the respondent's level of pro-environmental behaviour is high, with mean values ranging from 3.70 to 4.65.

**Table 4 Level of pro-environmental behaviour**

| Items | N | Mean | SD | Min | Max | Level |
|---|---|---|---|---|---|---|
| 1. We must ensure the air conditioning is off before leaving. | 247 | 4.45 | 0.82 | 1.00 | 5.00 | High |
| 2. We must get as much as possible to print on both pages one A4 sheet | 247 | 4.23 | 0.86 | 1.00 | 5.00 | High |
| 3. We must use stainless steel straws when drinking. | 247 | 4.14 | 0.86 | 3.00 | 5.00 | High |
| 4. We must try to reduce the use of straws when drinking. | 247 | 4.55 | 0.77 | 1.00 | 5.00 | High |
| 5. We must bring my shopping/plastic bag when we shop. | 247 | 4.65 | 0.75 | 2.00 | 5.00 | High |
| 6. We must switch on the lights and switch them off before leaving. | 247 | 3.85 | 1.22 | 1.00 | 5.00 | High |
| 7. We must recycle waste items and products (e.g., glass, plastic bottles, batteries, chemical office waste, paper, and others) | 247 | 3.70 | 1.57 | 1.00 | 5.00 | High |

Note: 1.00–2.50, low; 2.51–3.50, medium; 3.51–5.00, high.

Based on Table 5, the result found that there was an insignificant difference in Pro-Environmental Behaviour between the male group (M = 4.001, SD = 0.471) and female (M = 3.751, SD = 0.913); t (38) = 4.229, $p$ = 0.170. Thus, H1 was rejected. Second, there were no significant differences in Pro-Environmental Behaviour across age groups (F (2,27) = 4.037, $p$ = 0.256) and educational level (F (4,20) = 4.037, $p$ = 0.115). Hence, the findings

indicated that regardless of the respondent's gender, age, and educational level, Pro-Environmental Behaviour is a significant value for Malaysians. Thus, H2 and H3 were rejected.

**Table 5 T-test & ANOVA results**

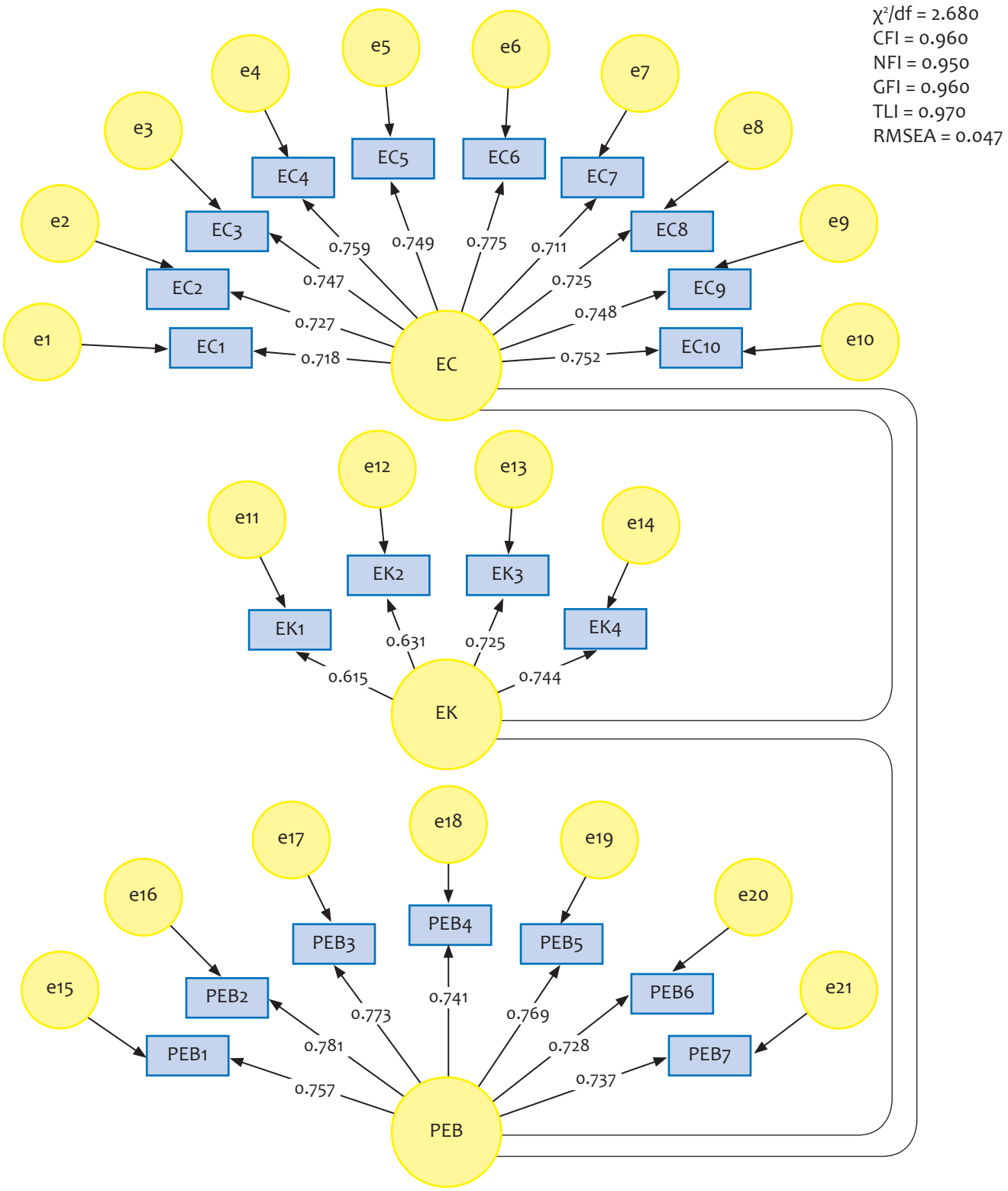
| | | N | Mean | SD | Levene's Test | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | F | Sig. | t | df1 | df2 | Sig. (2-tailed) |
| t-test | | | | | | | | | | |
| Gender | Male | 71 | 4.001 | 0.471 | 4.600 | 0.077 | 4.229 | 38 | NA | 0.170 |
| | Female | 176 | 3.751 | 0.913 | | | | | | |
| Age Group | 18–20 years old | 64 | 4.233 | 0.750 | 4.622 | 0.063 | NA | 2 | 27 | 0.256 |
| | 21–30 years old | 137 | 4.060 | 0.875 | | | | | | |
| | 31–40 years old | 34 | 4.050 | 0.811 | | | | | | |
| | 41–50 years old | 10 | 3.500 | 0.708 | | | | | | |
| | 51–60 years old | 2 | 4.100 | 1.023 | | | | | | |
| Highest Education Level | Secondary level (SPM) | 0 | 3.300 | 0.787 | 4.037 | 0.057 | NA | 4 | 20 | 0.115 |
| | Diploma level | 170 | 4.204 | 0.722 | | | | | | |
| | Bachelor's degree level | 67 | 4.765 | 0.763 | | | | | | |
| | Master's degree level | 5 | 4.322 | 0.674 | | | | | | |
| | Ph.D. or DBA level | 5 | 3.900 | 0.740 | | | | | | |

Figure 2 shows the measurement model constructed through confirmatory factor analysis (CFA). The analysis results show that the model measurement has met the required index fit value. Furthermore, the factor loadings found for all items are in the range of 0.70 to 0.83, which indicates that the criterion of the unidimensionality measuring scale for the constructs have met (Hair et al., 2010). The fit index of the model also fits well ($\chi^2$/df = 2.680, $p$ < 0.001, NFI = 0.950, GFI = 0.960, TLI = 0.970, CFI = 0.960, and RMSEA = 0.047).

From Table 6, the Average Variance Extracted (AVE) value for environmental connectedness (0.709), environmental knowledge (0.717), and pro-environmental behaviour (0.637) meet the criteria of AVE ≥ 0.50. From the results in Table 6, the composite reliability values for the environmental connectedness (0.951), environmental knowledge (0.938), and pro-environmental behaviour (0.913) constructs where exceed 0.70. Hence, all the items consistently measure their corresponding construct. The AVE and CR results show convergent validity (Hair et al., 2010).

The correlation value between the constructs is more than 0.50, below the level of 0.85, proving that the discriminant validity has been fulfilled (Fornell & Larcker, 1981). Discriminant validity is also established when the square root of AVE is greater than the correlation (Fornell & Larcker, 1981). Based on Table 7, this study has met the prescribed criteria. Thus, the variables are unrelated to each other.

As shown in Table 8, it was discovered that environmental connectedness ($\beta$ = 0.211, $p$ < 0.001) significantly influences pro-environmental behaviour. Similarly, the association between environmental knowledge and pro-environmental behaviour was significant ($\beta$ = 0.438, $p$ < 0.001). This means that when environmental connectedness and environmental knowledge increase by one standard deviation, pro-environmental behaviour increases by 0.211 and 0.438, respectively. Hence, H4 and H5 were accepted.




Note: N = 247; EC = Environmental Connectedness;
EK = Environmental Knowledge; PEB = Pro-Environmental Behaviour

**Figure 2 CFA Model**

**Table 6 Value of factor loading, average variance extracted (AVE), & composite reliability (CR)**

| Variable | Items | Factor Loading | AVE | CR |
|---|---|---|---|---|
| Environmental Connectedness | EC1 | 0.718 | 0.709 | 0.951 |
| | EC2 | 0.727 | | |
| | EC3 | 0.747 | | |
| | EC4 | 0.759 | | |
| | EC5 | 0.749 | | |
| | EC6 | 0.775 | | |
| | EC7 | 0.711 | | |
| | EC8 | 0.725 | | |
| | EC9 | 0.748 | | |
| | EC10 | 0.752 | | |
| Environmental Knowledge | EK1 | 0.615 | 0.717 | 0.938 |
| | EK2 | 0.631 | | |
| | EK3 | 0.725 | | |
| | EK4 | 0.744 | | |
| Pro-Environmental Behaviour | PEB1 | 0.757 | 0.637 | 0.913 |
| | PEB2 | 0.781 | | |
| | PEB3 | 0.773 | | |
| | PEB4 | 0.741 | | |
| | PEB5 | 0.769 | | |
| | PEB6 | 0.728 | | |
| | PEB7 | 0.737 | | |

Note: Average Variance Extracted, AVE; Composite Reliability, CR

**Table 7 Discriminant validity of the construct**

| No. | Variable | 1 | 2 | 3 |
|---|---|---|---|---|
| 1 | Environmental Connectedness | **0.842** | | |
| 2 | Environmental Knowledge | 0.612** | **0.846** | |
| 3 | Pro-Environmental Behaviour | 0.722** | 0.686** | **0.798** |

Note: Squared root of AVE is shown in bold on a diagonal.

Next, the mediation effect was tested. The goodness-fit indices results indicated an improved and perfect model fit, as indicated in Figure 3. The results confirm that the relationship between environmental connectedness and pro-environmental behaviour is partially mediated by environmental knowledge ($\beta = 0.241$, $p < 0.001$). Hence, H6 was accepted. The mediation model could be confirmed and tested using the bootstrapping method. The present study obtained a 95% confidence interval of the indirect effects with 5,000 bootstraps resamples (Hayes, 2009). The mediation analysis results confirmed that environmental knowledge mediates the relationship between environmental connectedness and pro-environmental behaviour. The upper and lower bound standardized indirect effect coefficients were more than zero (see Table 8), indicating the presence of the indirect effect of environmental knowledge. The final tested research model is summarised in Figure 3.

**Table 8 Direct, indirect & total effects in the structural model**

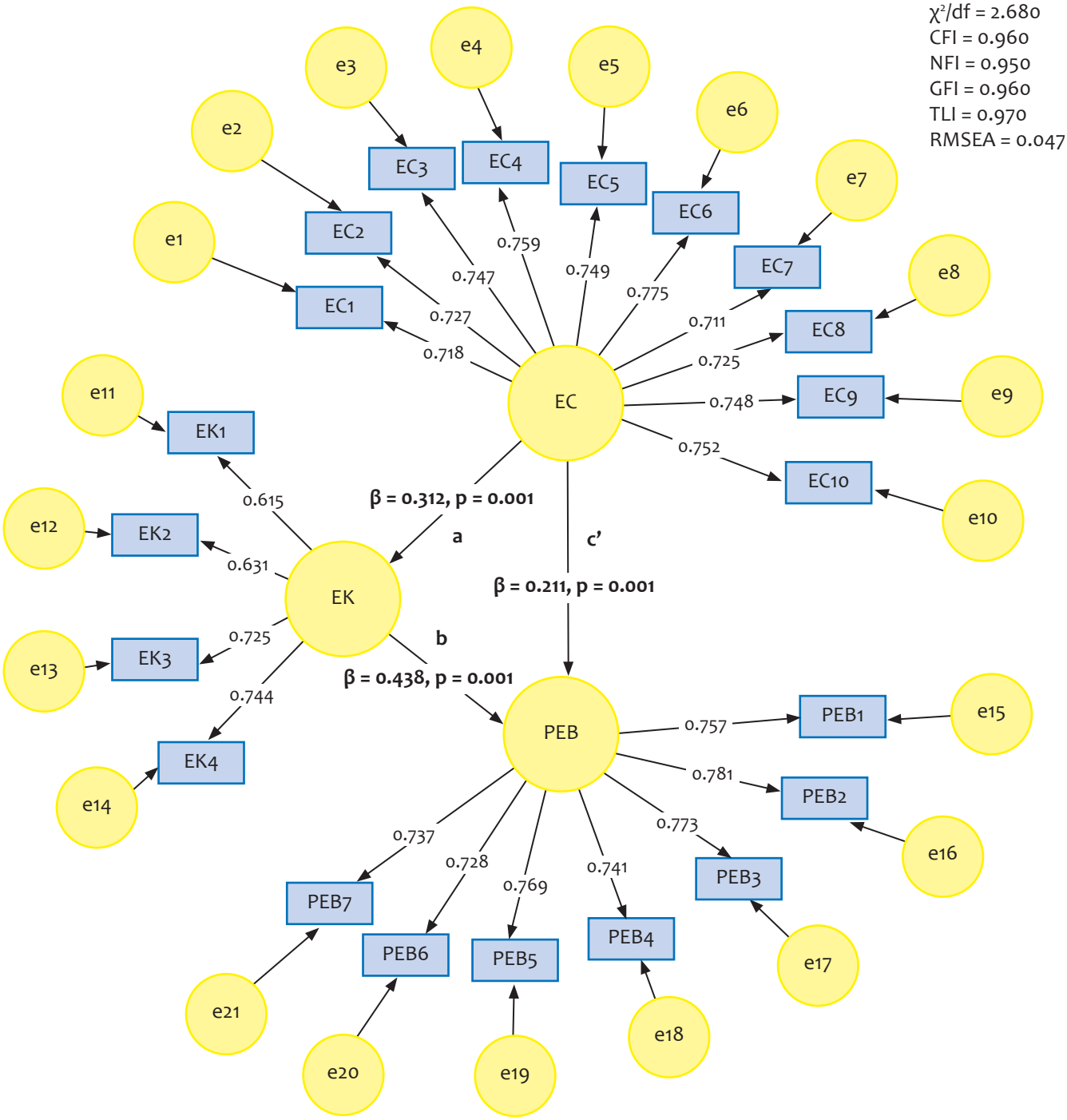
| Dependent Variable | | Independent Variable | Std. Estimate β | | |
|---|---|---|---|---|---|
| **Standardized Direct Effects** | | | | | |
| PEB | ← | EC (path c') | 0.211*** | | |
| PEB | ← | EK (path b) | 0.438*** | | |
| EK | ← | EC (path a) | 0.312*** | | |
| **Standardized Indirect Effects (Mediation Effect via Self-Efficacy)** | | | | | |
| PEB | ← | EC | 0.137*** | | |
| **Standardized Total Effects (Direct Effect + Indirect Effect) (path c = c' + ab)** | | | | **95% lower bound** | **95% upper bound** |
| PEB | ← | EC | 0.348*** | 0.124 | 0.511 |

Note: ***Paths are significant at the 1% level ($p < 0.01$). ***Indirect effects are significant at the 1% level with bootstrap at 5000 and bias-corrected percentile method; Environmental Connectedness, EC; Environmental Knowledge, EK; Pro-Environmental Behaviour, PEB

The main objective of this study is to examine the level of pro-environmental behaviour and significant differences in the level of pro-environmental behaviour across gender, age, and educational level. The study examines the interrelationship between environmental connectedness and pro-environmental behaviour via the mediating role of environmental knowledge. The first finding has indicated that the level of pro-environmental behaviour is high. The second finding found an insignificant difference in pro-environmental behaviour across gender, age, and educational level. The findings reflect positive insight that most Malaysian care and are concerned with the environment regardless of their demographic group. Li et al. (2022) for example, has found that gender does affect green behaviours. Then, Wang et al. (2021) has revealed that elderly have higher green attitudes and behaviours, yet this is only applicable in the country with aging society. On other hand, Mikuła et al. (2021) also has identified that educational level does not has significantly influence the level of human pro-environmental behaviour. These findings also indicate the need for extensive or generic segmentation of the pro-environmental behaviour activities and programs. For example, developing targeted campaigns or advocacy programs designed to encourage pro-environmental behaviours for Malaysian.

The SEM result first showed that both environmental connectedness and environmental knowledge were significantly influencing pro-environmental behaviour. These findings were consistent with the previous findings such as Esfandiar et al. (2019), Harbrow (2019), Li et al. (2019), and Mackay & Schmitt (2019). Second, the findings also showed that environmental knowledge partially mediates the relationship between environmental connectedness and pro-environmental behaviour. This means the influence of environmental connectedness towards pro-environmental behaviour could be strengthened with the emergence of environmental knowledge. The role of environmental knowledge has received increasing attention from previous empirical studies (e.g., Al Zaidi et al., 2023; Varadarajan, 2017). Pro-environmental behaviours involve a behaviour change related to the internal and external environment, such as value, cognition, knowledge, personality, self-efficacy, and others. The mediating result of environmental knowledge has been supported by empirical studies such as Hamzah et al. (2021) and Liu et al. (2020). Environmental knowledge can be achieved via environmental education. Environmental education refers to planned efforts made to educate the community and is closely

related to the national goal to build a society that is sensitive and has accurate knowledge, skills, and values about environmental issues and can contribute to the solution of environmental problems.




Note: N = 247; EC = Environmental Connectedness;
EK = Environmental Knowledge; PEB = Pro-Environmental Behaviour

**Figure 3 Structural Path Analysis Results**

In addition, the government can also encourage pro-environmental behaviour through legislation and policies. For instance, they are introducing more relevant schemes or incentives in promoting pro-environmental behaviour, such as oil waste recycling and e-waste recycling. In Japan, neighbours are responsible for sorting, treating, and segregating their household waste, governed under a strict and scheduled collection calendar. Next, in Switzerland, garbage bags are sold at a higher price, while recycling is free of charge. Then, both public and private organisations also should promote more corporate social responsibility (CSR) and sponsorship of social activities that improve social and environmental well-being. For example, in Maybank, the employees are given a paid leave of up to one month to encourage their staff to join the CSR program. Similarly, Universiti Teknologi MARA (UiTM) has encouraged their staff to implement social work activities, which is part of their performance indicator. This indicator has been aligned with their performance appraisal system, the MyATP system. Introducing these procedures and systems would encourage Malaysian adults to continue executing pro-environmental behaviour.

This paper makes contributions by firstly showing that pro-environmental behaviour is becoming more receptive to society in Malaysia. Secondly, the study's findings provide policymakers and practitioners with valuable recommendations to help in improving pro-environmental behaviour. Various parties, including the government, private sector, learning institutions, and non-governmental organisations, must play a role in improving environmental knowledge and awareness among Malaysians. Early education is an initial stage for shaping individual behaviour. Educators are essential in guiding and encouraging the younger generation to practice a sustainable way of life. For example, the university could collaborate with the private sector in executing programs such as beach cleaning, urban farming, or pitching competitions. The government also needs to step up more campaigns to educate the public on the importance of environmental sustainability through various channels such as news, social media, television, radio, and exhibitions.

Third, the analysis reveals that environmental knowledge is a mediating factor in enhancing connectedness with the environment, which drives people to self-practice pro-environmental behaviour. Fourth, as the analysis reveals, the findings demonstrate that environmental values and connectedness can be manifested through environmental education. It is worth noting that individuals can cultivate environmental connectedness and environmental personal values.

As discussed beforehand, the results are consistent with the connectedness theory, where the findings show that environment connectedness is motivated by personal identity and values, individual knowledge, and experiences. The influence of individuals' identity, values, and experience is associated with individual sentiment that signifies affective attachment to the environment. Previous studies show that individuals' identities, values, and experiences influence pro-environmental behaviour. Also, the enhancement of environmental knowledge is shown to encourage and elevate pro-environmental behaviour among those individuals who have committed environmental to themselves. Findings from this study have meaningful theoretical implications as they shed some lights on the importance of environmental knowledge in driving people, particularly in Malaysia, towards pro-environmental behaviour.

## CONCLUSION

This study investigated the level of environmental connectedness based on the demographic analysis of visitors at the seaside and recreational parks in Malaysia. This study emphasises the level of pro-environmental behaviour of the Malaysian public and examines its significant differences across demographic groups. Findings from this study highlighted the mediating role of environmental knowledge by implying that pro-environmental

behaviour could be promoted through both environmental connectedness and environmental knowledge. This demonstrates that in order to guarantee that public awareness is growing, knowledge must be shared and distributed widely. As a result, the message's delivery method and tools are essential. This might be explained by society's growing consciousness of and openness to the discourse surrounding global warming. Many stakeholders, including parents, employees, governmental agencies, and others, are expected to support and engage in environmental behaviour. Based on the empirical findings, this study proposes several theoretical and practical implications for the literature. The study has limitations. Firstly, it only focuses on two constructs to predict pro-environmental behaviour. Future studies might want to determine other constructs that may determine pro-environmental behaviour. For example, culture and norm, institutional support, regulative structure, and others. Secondly, this study focuses only on Peninsular Malaysia. Some past studies suggest that geographical factors play an essential role in determining the level of environmental practice. Therefore, replicating this study at a different geographical location may result in new findings in different contexts.

## ACKNOWLEDGEMENT

The Authors would like to thank the Faculty of Accountancy, Universiti Teknologi MARA (UiTM), Malaysia, for funding and facilitating this research project.

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