Approach Theory of Planned Behaviour with Habit as a Moderator:

Pro-Environmental Behaviour in Sorting Household Waste in Palembang City

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Abstract

The purpose of this study was to determine the influence of attitudes, subjective norms, and perceived behavioural control on pro-environmental behaviour in the city of Palembang, with habit serving as a moderator. This study employs attitudes, subjective norms, and PBC as exogenous variables, while pro-environmental behaviour and routines serve as endogenous and moderating variables, respectively. The population of this survey included all 379,435 households in the city of Palembang, with a sample size of 400 respondents. Survey methodologies were utilized for quantitative research. The data was analyzed using path analysis and PLS 3.0 software. This study concludes, based on the results of the present research analysis, that subjective norms have no moderating effect on behaviours. This result can be ascribed to the fact that each individual's values, beliefs, and experiences are unique. When an individual's values and beliefs do not align with the prevalent social norms, subjective norms may have a limited effect on refuse sorting behaviour. It demonstrates that assimilated behavioural control (PBC) has an effect on pro-environmental behaviour, but that this behaviour can be harmful. This phenomenon may be the result of a person's lack of control over their behaviour or lack of confidence in their capacity to engage in pro-environmental behaviour, thereby decreasing the likelihood that they will actually engage in that behaviour.

Keywords: Attitude, Subjective norm, Perceived behavior control, Pro environment behavior, Habit

1. Introduction

Palembang City faces an increase in waste piles every year. Based on waste management data conducted by sipsn.menlhk.go.id (2021), in 2019, the annual stockpile in Palembang City was 424,869.16 tons; in 2020, it was 426,390.66 tons, and in 2021, it was 430,791.65 tons. This indicates that every year there is a significant increase in landfill waste.

Garbage circulating in Palembang City comes from various sources. The most dominant source of waste generation is household waste. Waste management data conducted by SIPSN (2021) noted that as much as 68.47 per cent came from households, 12.64 per cent came from commerce, 8.45 per cent came from markets, 7.75 per cent came from public facilities, 1.28 per cent came from areas, 1.22 per cent came from offices, while 0.19 per cent came from other sources.

Based on prior research, most waste research can be explained by behavioral variables. It demonstrates that enhancing human behavior contributes to waste management program success. Therefore,

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increasing human behavior toward waste reduction via refuse segregation is crucial. In order to change human behavior, it is crucial to identify the major determinants of behavior, as they can be improved or changed if the precise determinants that form certain behaviors are identified (Wang, Zhang, Yin, & Zhang, 2011; Webb, Joseph, Yardley, & Michie, 2010; Low, 2012).

Reducing food waste is an essential pro-environmental action because it can help mitigate climate change and reduce waste production (USDA, 2019; Desilver, 2019). In addition, there is a positive correlation between pro-environmental attitudes and food waste reduction behavior (Asvatourian, Craig, Horgan, Kyle, & Macdiarmid, 2018). While much remains to be learned about promoting food waste-reduction behaviors, consumer-level interventions have shown promise (ncbi, 2020).Reducing food waste is a crucial measure individuals can take to safeguard the environment.

Several studies examining behaviour towards food waste were conducted by Stefan, van Herpen, Tudoran, & Lähteenmäki (2013), Graham-Rowe, Jessop, & Sparks (2015), Visschers, Wickli, & Siegrist (2016), Russell, Young, Unsworth, & Robinson (2017), Stoeva & Alriksson (2017), Shuangying, Tiezhan, Xuepeng, & Weisheng (2018), Gkargkavouzi, Halkos, & Matsiori, (2019) and Laura Sahetapy, Yunnni Kurnia, & Anne (2020). Some of these research discovered that Ajzen's theory of planned behaviour, which he created, may explain pro-environmental behaviour, specifically food waste. In particular, the areas of water conservation (Fielding et al. 2012 and Russell & Fielding, 2010) and recycling (Tonglet, Phillips, & Bates, 2004) have shown the effectiveness of the aforementioned theory as a theoretical foundation for scholarly investigation.

Research shows a moderate relationship between attitudes and pro-environmental behavior (Miller, Rice, & Goldberg, 2022). However, when environmental consequences are more prominent, the relationship between attitudes and behavior may be stronger (Wyss, Knoch, & Berger, 2022). Individual factors such as self-control can also predict pro-environmental behavior (Wyss et al. 2022). Several studies on attitudes, including those conducted by Evans (2012) and Watson & Meah, (2012), discovered that negative attitudes reduce food waste. Furthermore, Abeliotis, Lasaridi, & Chroni (2014) and Graham-Rowe, Jessop, & Sparks (2014) performed study on respondents' emotions of shame and anxiety when they waste food.

Sapci & Considine (2014), Hasan et al. (2015), Lin, Nadlifatin, Amna, Persada, & Razif (2017), Lin et al. (2017), Chang & Chou (2018), Ali & Yusof (2018), Pamuk & Kahriman-Pamuk (2019) dan Chun T'ing et al. (2020) in some of these studies they found that attitudes influence pro-environmental behaviour. On the other hand, there have been no findings by researchers who found that there is no effect of attitudes towards behaviour in reducing food waste because pro-environmental behaviour in reducing waste is formed from a person's positive or negative attitude (Vesely & Klöckner, 2018). Therefore, attitude has an important role in reducing waste in society.

Subjective norms are variables that can influence behavior in addition to attitudes. (Ajzen & Fishbein, 2000)define subjective norms as perceptions of social pressure from others to perform or not perform the behavior. In other words, it is the individual's perception of how their significant others view the behavior (Solikhah, 2014). According to Armitage & Conner (2001), subjective norms are the least accurate predictor of behavior in TPB.

Ramayah, Lee, & Lim (2012), Lee & Tanusia (2016), Goh et al., (2018), and Chun T'ing et al. (2020) found that subjective norms influence pro-environmental behaviour. Contrary to research conducted by Loannov, karim, knussesn, tongley, Ayob & Sheau-Ting (2016) Ali & Yusof (2018) that subjective norms have no significant effect on waste sorting behaviour. This could happen because leftovers are invisible to others, so people cannot judge each other for this behaviour (Quested, Marsh, Stunell, & Parry, 2013).

Consequently, perceived behavioral control is a person's self-assurance that they can modulate internal conditions and actions, stimulate and react to certain attitudes, and achieve the intended results (Wallston, Wallston, Smith, & Dobbins, 1987). Al Mamun, Mohiuddin, Ahmad, Thurasamy, & Fazal, (2018) and

Strydom (2018) and Strydom (2018) assert that there is a positive relationship between perceived behavioral control and intention to recycle. In contrast, Karlina, Andriana, & Susetyo (2021) assert that there is no effect.

Research shows that habits can significantly influence pro-environmental behaviour (Linder, Giusti, Samuelsson, & Barthel, 2022)(Sarmento & Loureiro, 2021). Pro-environmental habits are defined as beneficial to the environment or as little harmful as possible (Linder et al. 2022). According to Wang, Guo, Wang, Zhang, & Wang (2018), past habits or behaviour are crucial in shaping routine behaviour. Research by Russell, Young, Unsworth, & Robinson (2017) found that past behaviour influences actual behaviour in reducing food waste. Other studies by Colesca, Ciocoui, & Popescu (2014), Russell et al. (2017), Wang et al. (2018), and Chun T'ing et al. (2020) support that 3R habits and behaviour have a positive relationship. Knussen et al., (2004), Cintya & Widati (2018), and Gkargkavouzi, Halkos, & Matsiori (2019) added the variables of Subjective Norms and Perceptual Behavior Control, where these variables influence habits. Habits will significantly influence the TPB explanation of behaviour (McEachan et al. 2016). Where habits play an important role in influencing behaviour (Colesca et al. 2014), Lo, van Breukelen, Peters, & Kok (2016) say that habits do not influence behaviour.

Habit can be a moderator variable, according to Amoroso & Lim (2017). Without the moderating influence of habits, consumer attitudes are a more accurate predictor of behavior, according to his research. Aarts, Verplanken, & Van Knippenberg (1998) contend that habit strength should be incorporated into the theory of planned behavior as an additional predictor of behavior and a moderator of environmental behavior. Agag & El-Masry (2016) conducted additional research on the habitual variable of moderating attitudes. Results indicate that consumers. The findings indicate that consumer attitudes are unrelated to their behaviors. The empirical conclusion is that no research using habits as a moderating variable has been found on SDGs and pro-environmental behavior.

On the other hand, habits can be considered obstacles in influencing behaviour and prevent people from engaging in environmentally friendly behaviour (Sopha & Klöckner, 2011; Kurz, Gardner, Verplanken, & Abraham, 2015; Wood & Rünger, 2016). According to many studies, habits should be considered a key explanatory construct (Fujii & Garling, 2003; Barr et al. 2005; Ajzen, 2005; Lavelle et al. 2015; Verplanken et al. 2016). Based on suggestions from previous research to incorporate measures of habit strength as additional variables into the TPB theory (Aarts & Verplanken, 1999; Klöckner & Matthies, 2004; Klöckner, 2013).

This research adopts a special way to analyze the factors influencing pro-environmental behaviour in sorting food waste by proposing and empirically testing a model with contributions from a strong theory, namely SDGs. TPB contributes to the current literature because it has yet to be done in other studies. Research by Agag & El-Masry (2016) only uses attitude as the dependent variable, and no other similar study examines all the variables from TPB on pro-environmental behaviour with habit moderation variables. Aarts, Verplanken, & Van Knippenberg (1998) dan Amoroso & Lim (2017) say that habits can be used as intermediary variables in increasing pro-environmental behaviour. Therefore, this study aims to contribute to the literature on environmental problems in solid waste. First, this study identifies the determinants influencing pro-environmental behaviour in sorting people into households. Second, this study examines the role of habitual moderation in the relationship between pro-environmental behaviour using TPB. These findings will help the community and related environmental services to develop strategies that increase pro-environmental community behaviour in sorting household food waste, especially in Palembang City.

2. Materials and Methods

This survey-based quantitative research is presented here. In this research, secondary and primary data were utilized. Institutions such as the Palembang City Environmental Service and SIPSN Menlhk (National et al. of Environment and Forestry) provided secondary data. In the meantime, questionnaires were used to collect

the primary data to address the study's problems. This study's respondents were the community, particularly households in Palembang City. This study's demographic consists of the inhabitants of the metropolis of Palembang. The number of households in Palembang City is 379,435, according to data from BPS Kota Palembang (2020), derived from the number of sub-districts in 2020. The Slovin formula with a 5% margin of error was used to obtain a sample of 400 respondents. This study employs a technique known as Proportional Stratified Random Sampling. The data analysis uses the path analysis method with PLS, as shown in Fig. 1 of the Bootstrapping Model.
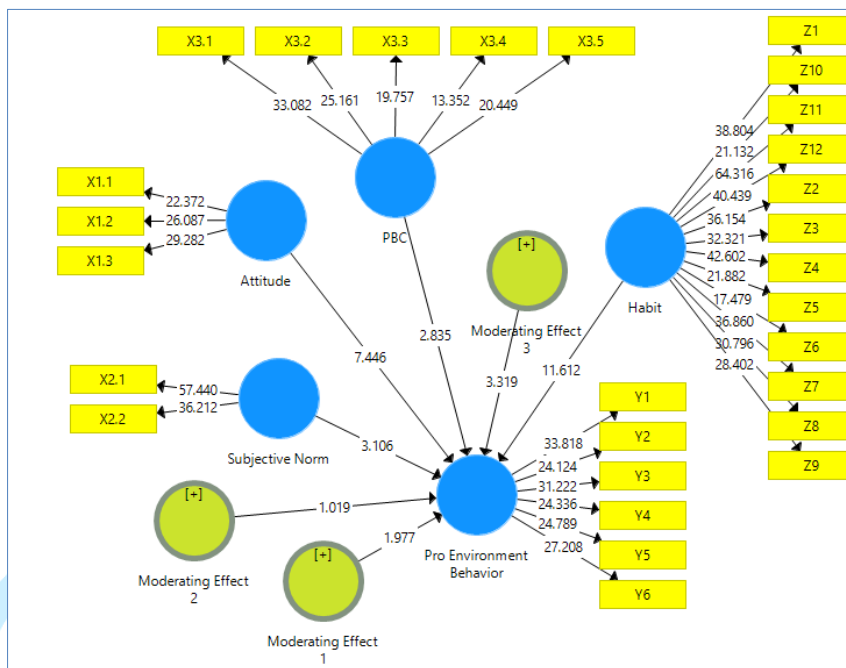
Fig. 1 Model Bootstrapping

3. Results

3.1 Convergent Validity

Convergent validity is evaluated based on the correlation between the item/compound score and the PLS-calculated construct score, as shown in Table 1. The reflective measure is deemed high if its correlation with the measured construct exceeds 0.70. According to the preceding results, all indicators with an outer value greater than 0.7 are valid.

Table 1 Convergent Validity Test

Variable	Indicator	Outer Loading
Attitude (X1)	X1.1	0.782
	X1.2	0.828
	X1.3	0.830
Subjective Norm (X2)	X2.1	0.927
	X2.2	0.899
PBC (X3)	X3.1	0.854
	X3.2	0.813
	X3.3	0.816
	X3.4	0.766
	X3.5	0.812
Pro Environment Behavior (Y)	Y1	0.791
	Y2	0.728
	Y3	0.804
	Y4	0.787
	Y5	0.779
	Y6	0.776

Variable	Indicator	Outer Loading
Habit (M)	Z1	0.817
	Z2	0.807
	Z3	0.828
	Z4	0.847
	Z5	0.765
	Z6	0.708
	Z7	0.807
	Z8	0.810
	Z9	0.791
	Z10	0.739
	Z11	0.863
	Z12	0.838

Source: Data Processing Results With PLS 3.0, 2023

3.2 Average Variant Extracted (AVE)

Table 2 demonstrates that the AVE is greater than 0.5, indicating that all latent variables utilized in this study are valid because they exceed the recommended AVE value (> 0.5).

Table 2 AVE Test

Variable	AVE
Attitude (X1)	0.662
Subjective Norm (X2)	0.833
PBC (X3)	0.660
Pro Environment Behavior (Y)	0.605
Habit (M)	0.645
Moderating Effect 1	1.000
Moderating Effect 2	1.000
Moderating Effect 3	1.000

Source: Data Processing Results With PLS 3.0, 2023

3.3 Composite Reliability Test

According to Table 3, a construct is considered reliable when its composite reliability score exceeds 0.70, and its Cronbach alpha exceeds 0.70. The table above shows the SmartPLS output results showing that all constructs have composite reliability and Cronbach alpha scores greater than 0.70. Therefore, the structure is reliable.

Table 3 Composite Reliability Test

Variable	Composite Reliability
Attitude (X1)	0.854
Subjective Norm (X2)	0.909
PBC (X3)	0.907
Pro Environment Behavior (Y)	0.902
Habit (M)	0.956
Moderating Effect 1	1.000
Moderating Effect 2	1.000
Moderating Effect 3	1.000

Source: Data Processing Results With PLS 3.0, 2023

3.4 Path Coefficient Test

Table 4, the R square value for each equation is above 30 per cent (0.3). The r square value of 0.615 means that the independent variables (Attitude, Subjective norms, PBC) and their moderation (Habit) can explain the dependent variable (Pro Environment Behavior) of 61.5 per cent, the remainder by other variables outside the model.

Table 4 Test of R Square Pro Environment Behavior (Y)

Variable	Composite Reliability
Pro Environment Behavior (Y)	0.615

Source: Data Processing Results With PLS 3.0, 2023

3.5 Hypothesis Testing

Based on the results of Table 5, the regression equation:

Pro Environment Behavior =0.370 Attitude+0.462 Habit + 0.124 PBC+0.142 Subjective Norm+0.077

X1*M--0.055X2*M-0.169X3*M

Table 5 Hypothesis Testing

Hypothesis	Influence	Original Sample	T-Statistics	P-Value
H1	Attitude -> Pro Environment Behavior	0.370	0.000	Received
H2	Subjective Norm -> Pro Environment Behavior	0.462	0.002	Received
H3	PBC -> Pro Environment Behavior	0.077	0.005	Received
H4	Habit -> Pro Environment Behavior	-0.055	0.000	Received
H5	Moderating Effect 1 -> Pro Environment Behavior	-0.169	0.049	Received
H6	Moderating Effect 2 -> Pro Environment Behavior	0.124	0.309	Received
H7	Moderating Effect 3 -> Pro Environment Behavior	0.142	0.001	Received

Source: Data Processing Results With PLS 3.0, 2023

Interpretation:

1. With a coefficient of 0.370, t statistic=7.446>t_table=1.64, and a probability value of 0.0000alpha=0.05, the attitude directly and statistically significantly influences pro environmental behavior. All other variables being equal, a one-point increase in attitude results in a 0.370-point increase in environmental behavior.

2. With a coefficient of 0.142, t statistic=3.106>t_table=1.64, and a probability value of 0.002alpha=0.05, the subjective norm and statistically significantly influences pro environmental behavior. All other variables being equal, a one-point increase in subjective norm results in a 0.142-point increase in pro environmental behavior.

3. With a coefficient of 0.124, t statistic=2.835>t_table=1.64, and a probability value of 0.005alpha=0.05, the PBC directly and statistically significantly influences pro environmental behavior. All other variables being equal, a one-point increase in PBC results in a 0.124-point increase in pro environmental behavior.

4. With a coefficient of 0.462, t statistic=11.612>t_table=1.64, and a probability value of 0.0000alpha=0.05, the habit directly and statistically significantly influences pro environmental behavior. All other variables being equal, a one-point increase in habit results in a 0.462-point increase in pro environmental behavior.

5. The relationship between attitude and habit as moderating variable is found to have a notable and positive impact on pro-environment behaviour, as indicated by a coefficient of 0.077. This effect is statistically significant, as evidenced by a t statistic value of 1.977, which exceeds the critical value of 1.64. Additionally, the probability value further supports the significance of this relationship. Value=0.005<alpa=0.05. This implies that the variable of Habit will have a positive impact on the relationship between Attitude and Pro Environment Behaviour, resulting in an increase of 0.077 points. This assumption is made under the condition that all other variables remain unchanged.

6. The relationship between subjective norm and habit as moderating variable in influencing pro-environment behaviour is found to be statistically insignificant, as indicated by a coefficient of -0.055 with a t statistic value of 1.019, which is less than the critical t value of 1.64. Additionally, the associated probability value further supports this conclusion. Value=0.309>alpa=0.05. This implies that, under the

assumption of other variables remaining constant, the influence of Habit on Pro Environment Behaviour will not be augmented by 0.055 points in the presence of Subjective Norm.

7. The relationship between pbc and habit as moderating variable is found to have a notable and negative impact on pro-environment behaviour, as indicated by a coefficient of -0.169. This effect is statistically significant, as evidenced by a t statistic value of 3.319, which exceeds the critical value of 1.64. Additionally, the probability value further supports the significance of this relationship. Value=0.001<alpa=0.05. This implies that the variable of Habit will have a positive impact on the relationship between Attitude and Pro Environment Behaviour, resulting in an increase of 0.001 points. This assumption is made under the condition that all other variables remain unchanged.

4. Discussion

With a coefficient of 0.370, t statistic=7.446>t_table=1.64, and a probability value of 0.0000alpha=0.05, the attitude directly and statistically significantly influences pro environmental behavior. All other variables being equal, a one-point increase in attitude results in a 0.370-point increase in environmental behavior. This is in line with the research of Sapci & Considine (2014), Hasan et al., (2015), Lin, Nadlifatin, Amna, Persada, & Razif (2017), Lin et al., (2017), Chang & Chou (2018), Ali & Yusof (2018), Pamuk & Kahriman-Pamuk (2019) and Chun T'ing et al., (2020). A pro-environmental attitude reflects a sense of care and awareness of the importance of protecting the natural environment. When a person has a strong pro-environment attitude, motivation will be formed internally so that in carrying out pro-environmental behaviour, these actions will have positive values and benefits.

With a coefficient of 0.142, t statistic=3.106>t_table=1.64, and a probability value of 0.002alpha=0.05, the subjective norm and statistically significantly influences pro environmental behavior. All other variables being equal, a one-point increase in subjective norm results in a 0.142-point increase in pro environmental behavior. In line with the research of Ramayah, Lee, & Lim (2012), Lee & Tanusia (2016), Goh et al., (2018),and Chun T'ing et al., (2020), but these results contradict Loannov's research by Loannov, karim, knussesn, tongley, Ayob & Sheau-Ting (2016) Ali & Yusof (2018). Social norms have an important role in shaping individual behaviour. So, when individuals feel that the surrounding environment has strong norms, it encourages them to follow the prevailing norms and apply pro-environmental behaviour.

With a coefficient of 0.124, t statistic=2.835>t_table=1.64, and a probability value of 0.005alpha=0.05, the PBC directly and statistically significantly influences pro environmental behavior. All other variables being equal, a one-point increase in PBC results in a 0.124-point increase in pro environmental behavior. This research refers to Al Mamun, Mohiuddin, Ahmad, Thurasamy, & Fazal, (2018)., dan Strydom (2018), which say a positive relationship exists between perceived PBS and pro-environmental behaviour. Meanwhile, Karlina, Andriana, & Susetyo (2021) said it had no effect. In pro-environmental behaviour, PBC reflects the extent to which a person believes they can and control to take actions that support the environment. PBC increases an individual's sense of control and autonomy over their behaviour. If they feel that they can control and manage pro-environmental actions, their motivation can increase.

With a coefficient of 0.462, t statistic=11.612>t_table=1.64, and a probability value of 0.0000alpha=0.05, the habit directly and statistically significantly influences pro environmental behavior. All other variables being equal, a one-point increase in habit results in a 0.462-point increase in pro environmental behavior. This aligns with research (Linder et al., 2022; Sarmento & Loureiro, 2021). Habits lead to consistency in behaviour. When pro-environmental behaviour becomes a habit, individuals tend to automatically carry out these.

The relationship between attitude and habit as moderating variable is found to have a notable and positive impact on pro-environment behaviour, as indicated by a coefficient of 0.077. This effect is statistically significant, as evidenced by a t statistic value of 1.977, which exceeds the critical value of 1.64. Additionally,

the probability value further supports the significance of this relationship. Value=0.005<alpa=0.05. This implies that the variable of Habit will have a positive impact on the relationship between Attitude and Pro Environment Behaviour, resulting in an increase of 0.077 points. This assumption is made under the condition that all other variables remain unchanged. This is in line with the research of Colesca, Ciocoui, & Popescu (2014), Russell et al. (2017), Wang et al. (2018), and Chun T'ing et al. (2020).

The relationship between subjective norm and habit as moderating variable in influencing pro-environment behaviour is found to be statistically insignificant, as indicated by a coefficient of -0.055 with a t statistic value of 1.019, which is less than the critical t value of 1.64. Additionally, the associated probability value further supports this conclusion. Value=0.309>alpa=0.05. This implies that, under the assumption of other variables remaining constant, the influence of Habit on Pro Environment Behaviour will not be augmented by 0.055 points in the presence of Subjective Norm. This is inversely proportional to the results of research by Knussen et al., (2004), Cintya & Widati (2018), and Gkargkavouzi, Halkos, & Matsiori (2019). This can happen because of the lack of strong habits and social norms that apply in their environment. If pro-environmental behaviour has become a strong habit for individuals, this can reflect strong social norms in their environment. Besides that, If individual values and beliefs are not in line with prevailing social norms, then subjective norms may not have a major effect on the behaviour of selecting waste.

The relationship between PBC and habit as moderating variable is found to have a notable and negative impact on pro-environment behaviour, as indicated by a coefficient of -0.169. This effect is statistically significant, as evidenced by a t statistic value of 3.319, which exceeds the critical value of 1.64. Additionally, the probability value further supports the significance of this relationship. Value=0.001<alpa=0.05. This implies that the variable of Habit will have a positive impact on the relationship between Attitude and Pro Environment Behaviour, resulting in an increase of 0.001 points. This assumption is made under the condition that all other variables remain unchanged.

This is in line with the results of research by Knussen et al., (2004), Cintya & Widati (2018), dan Gkargkavouzi, Halkos, & Matsiori (2019). Increasing PBC can help increase individual motivation and confidence in pro-environmental behaviour. In contrast, strong habits in carrying out pro-environmental behaviour can ensure the consistency of this behaviour.

5. Conclusions

Based on the calculation results, it was found that habits do not moderate subjective norms towards pro-environment behaviour. If pro-environmental behaviour has become a strong habit for individuals, this can reflect strong social norms in their environment. In this case, habits cannot strengthen the influence of subjective norms on pro-environmental behaviour because individuals feel they do not have support from their surroundings which have recognized and encouraged this behaviour. In addition, Habits reflect behaviour that is carried out consistently in certain situations. In this study, pro-environmental habits have yet to be formed properly. Hence, the result is that individuals cannot maintain these behaviours even though there are pressures from social norms that may be different.

Declaration of Conflict
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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