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Pro-environmental Behaviours and Protection Motivation Theory: A Case of Two Universities in Bandung, Indonesia

Perilaku Pro-lingkungan dan Teori Proyeksi Motivasi: Studi Kasus Dua Universitas di Bandung, Indonesia

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Abstract: Maladaptive behavior towards the environment can threaten environmental conditions and this requires a more in-depth analysis. Students as part of the younger generation have the responsibility as educators, planners, and policy makers on environmental issues for a sustainable future so that research on university students' pro-environmental behavior is needed. This study adopted a developed causal model of pro-environmental behavior based on Protection Motivation Theory (PMT) in a sample of 363 Indonesian university students. This theory is expected to identify barriers and impulses in carrying out pro-environmental behavior. Based on the results, environmental attitude, self-efficacy, response costs, intrinsic and extrinsic rewards from maladaptive behavior to the environment, and perceived severity of respondents' have a direct and significant effect on pro-environmental behavior. In addition, perceived vulnerability has an indirect effect on pro-environmental behavior through the level of perceived severity. Improving pro-environmental behavior for students could be focused on environmental attitude and self-efficacy through environmental protection based on tested causal model.

Keywords: pro-environmental behavior, protection motivation theory, environmental attitude, self-efficacy, perceived severity.

Abstract: *Perilaku manusia dapat berpengaruh positif dan negatif terhadap lingkungan. Perilaku maladaptif terhadap lingkungan dapat mengancam kondisi lingkungan dan hal ini perlu dilakukan analisis yang lebih mendalam. Mahasiswa sebagai bagian dari generasi muda mempunyai tanggung jawab sebagai pendidik, perencana, dan pembuat kebijakan masalah lingkungan di masa depan yang berkelanjutan sehingga diperlukan penelitian mengenai perilaku pro-lingkungan pada mahasiswa. Penelitian ini menggunakan adopsi model kausal berdasarkan Protection Motivation Theory (PMT) pada sampel 363 mahasiswa Indonesia. Teori ini diharapkan dapat mengidentifikasi hambatan dan dorongan dalam melakukan perilaku pro-lingkungan. Berdasarkan hasil, sikap lingkungan, keyakinan diri, biaya respon, imbalan intrinsik dan ektrinsik dari perilaku maladaptif terhadap lingkungan, dan keparahan yang dirasakan responden memiliki pengaruh langsung dan signifikan terhadap perilaku pro-lingkungan. Selain itu, tingkat kerentanan memiliki pengaruh tidak langsung terhadap perilaku pro-lingkungan melalui tingkat keparahan. Peningkatan perilaku pro-lingkungan bagi mahasiswa dapat difokuskan pada sikap lingkungan dan keyakinan diri melalui perlindungan lingkungan berdasarkan model kausal yang sudah diuji.*

Kata kunci: *perilaku pro-lingkungan, protection motivation theory, sikap lingkungan, keyakinan diri, tingkat keparahan.*

INTRODUCTION

The industrial revolution is a historically significant event in increasing human prosperity. Humans experience rapid changes ranging from trends, lifestyles, behaviour, and social structures from time to time. These changes make humans more complex, unequal and more interconnected as people's living standards develop. Unfortunately, such a development also negatively impacts environmental quality as there has been a trend of over-exploitation and rising consumerism (Carvalho & Chaim, 2018). The decline in environmental quality can lead to various ecological crises, such as global warming, lack of water resources, air pollution, soil erosion, lack of natural resources, deforestation and loss of biodiversity. Such crises threaten sustainable survival and make humans vulnerable to disasters (Thondhlana & Hlatshwayo, 2018). Indonesia continues to experience many environmental problems and concerns as the value of the Environmental Quality Index (Indeks Kualitas Lingkungan Hidup; IKLH) continue to decline. IKLH is a national environmental management performance index that becomes a standard reference for all parties in measuring ecological protection and management performance. This index includes reducing land cover, water and air pollution and the amount of waste generated. The lower the three aspects, the lower the environmental quality index will also be. Over time, IKLH is predicted to decrease due to the pattern of human behaviour as the most critical factor (Moerdijat, 2020).

The environmental crisis that threatens the welfare and survival on earth is rooted in the negative behaviour of humans towards the environment. Public policy experts and researchers state that increasing pro-environmental behaviour can reduce environmental crises (Dornhoff & Sothman, 2019; Thondhlana & Hlatshwayo, 2018). Pro-environmental behaviour is a person's or actions to minimize negative impacts on the environment or behaviour that pays more attention to and cares about the environment (Velk & Steg, 2007). There are six aspects of pro-environmental behaviour (Kaiser, Oerke, & Bogner, 2007): energy conservation, mobility and transportation, avoiding waste (actions that aim to prevent waste such as minimizing the use of single-use items, buying goods or products with refill types, using reusable items and others), recycling, green consumerism (actions that aim to choose and use environmentally friendly products), and conservation (actions that generally do not harm the environment and its surroundings).

The concept of pro-environmental behaviour first emerged around 1960-1970, which increased the interest of researchers in various fields, i.e. environment, psychology, agriculture, sociology, anthropology and others (Borden, 1977). Initially, research on environmental behaviour focused on public attention to environmental quality (Li, 2019). Over time, scholars' attention has increased in studying behaviour towards the environment in various social circles such as consumers, students and workers (Tian & Robesrtson, 2019; Meyer, 2016).

One theory that can explain pro-environmental behaviour is the Protection Motivation Theory (PMT). The use of PMT can describe individual motivations in carrying out pro-environmental behaviour. PMT also considers the current behavioural impulses that are assumed to be less pro-environmental and the barriers and impetus in implementing pro-environmental behaviours (Bockarjova & Steg, 2014). PMT combines individual and

social conceptions to understand cognitive decision-making processes (Rainear & Christensen, 2017). Research on PMT has been conducted on various social groups, such as students (Shafiei & Maleksaeidi, 2020; Rainear & Christensen, 2017) and office workers (Janmaimool, 2017). This study focuses on students since we think that the education sector is essential in achieving sustainability. Students are the agents of change to improve environmental quality (Vicente-Molina, 2018). Therefore, it is crucial to assess students' perceptions, attitudes, and behaviour and modify them to increase pro-environmental behaviour. This research is expected to be used as a reference for modelling pro-environmental behaviour among students to apply the concept of sustainability in the university environment. Meanwhile, the objectives of this research are (1) measuring the level of pro-environmental behaviour; (2) identifying the factors that influence pro-environmental behaviour; and (3) measuring the causal relationship between the factors that influence pro-environmental behaviour based on the Protection Motivation Theory among university students.

FRAMEWORK

Rogers (1975) first introduced the Protection Motivation Theory (PMT) as a model to explain the factors that predict risk-adaptive behaviour for effective risk-protection communication in changing attitudes and behaviour. The original model aimed to study behavioural change to address health risks (Rogers, 1975). In 1983, Rogers suggested that PMT could be widely applied. PMT explains that people consider different risks and benefits when making decisions. This theory proposes two types of individual cognitive processes from threats: threat appraisal and coping appraisal.

Threat appraisal (Bockarjova & Steg, 2014; Rogers, 1975) is an individual's primary cognitive process against threats. There are three factors covered, namely: (1) Perceived severity that reflects how seriously the risk is considered; (2) Perceived vulnerability that reflects the perception of how vulnerable is the threat at hand; and (3) Rewards that represent all the perceived benefits associated with the current behaviour or practice, which can be divided into intrinsic (inherent to self) and extrinsic benefits. Therefore, threat appraisal is based on the benefits of doing nothing (not engaging in risk protection behaviour) on the existing risks. Higher perceived severity and vulnerability tend to promote risk-protection behaviour, while higher perceived rewards of current practice will hinder the adoption of adaptive behaviour (Janmaimool, 2017).

Coping appraisal, which means an individual's assessment of his ability to respond to danger (Bockarjova & Steg, 2014; Rogers, 1975), consists of three elements, namely: (1) Self-efficacy that reflects whether a person believes that a person is capable of taking protective actions or actions; (2) Response-efficacy that relates to the protective efficacy of action or action to reduce or avoid an existing risk; and (3) Response costs of protective behaviour that represent all perceived costs associated with a protective measure or action, including monetary costs as well as non-monetary costs such as labour, time or inconvenience. In the coping appraisal stage, one weights the perceived ability to avoid or reduce risk against the perceived cost of protective action. Higher self-efficacy and response-efficacy will positively affect risk protective behaviour,

while the high perceived cost of risk will harm risk protective behaviour (Bockarjova & Steg, 2014).

Both cognitive processes are based on how individuals perceive the risks and benefits of adaptive-maladaptive behaviour, which may differ between individuals and deviate from objective risks and benefits. High threat level and high coping appraisal increase the chances that adaptive action will be applied and vice versa. PMT explains that individual decisions to carry out risk preventive behaviour are based on personal motivation to protect themselves from threats. PMT considers both adaptive and maladaptive behaviour of the individual, then considers the rewards and prices of various behaviours.

In recent decades increasing efforts have been directed towards motivating pro-environmental behaviour to reduce late-onset risks, such as environmental pollution, climate change, or security of energy availability. PMT is a suitable framework for understanding whether individuals will engage in pro-environmental behaviour to reduce environmental risks. PMT is beneficial for analyzing pro-environmental measures because it can show how several psychological processes and mechanisms interact and suggest effective multi-component programs in efforts to improve individual estimates of environmental threats and their actions against those threats (Rainear & Christensen, 2017; Bockarjova & Steg, 2014).

Shafiei & Maleksaeidi (2020) utilized PMT to explain pro-environmental behaviour in student social groups. The framework was formed using SPSS AMOS software to perform structural equation modelling (SEM) of the model and find the coefficient of determination between PMT factors on the pro-environmental behaviour of students in this study (Shafiei & Maleksaeidi, 2020). This research adopts the following framework (Figure 1).

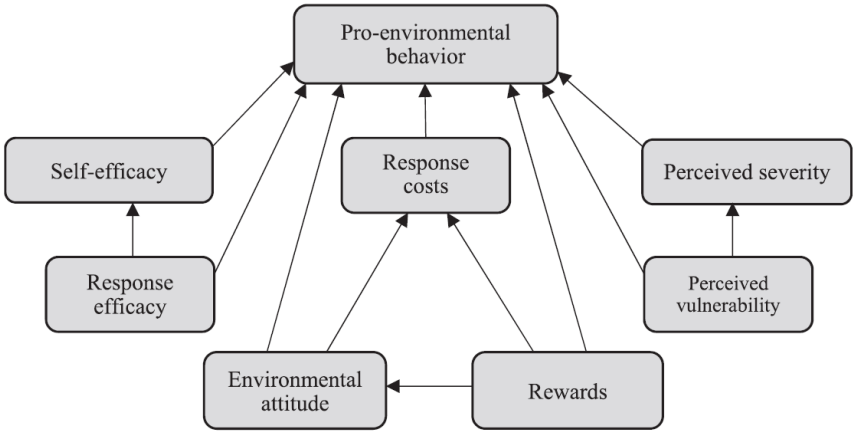

Figure 1. Pro-environmental Behaviours Framework (adapted from Shafiei & Maleksaeidi, 2020)

Our initial hypotheses for this study are: (1) Threat appraisal has a significant effect on pro-environmental behaviours; (2) Coping appraisal has a significant effect on pro-

environmental behaviours; and (3) Environmental attitude has a significant effect on pro-environmental behaviours in an adaptive (positive) way.

MATERIALS AND METHODS

Sample Determination and Recruitment

This research was conducted in Faculty of Civil and Environmental Engineering, Institut Teknologi Bandung (FCEE ITB) and Faculty of Civil Engineering and Planning, Institut Teknologi Nasional (FCEP ITENAS) in May 2021. ITB is a state university, while ITENAS is a private university. The total population of FCEE ITB is 3507 students in 2020, while the total population of FCEP ITENAS is 2857 students in 2020 (PDDikti, 2021). Cochran's (1963) formula was selected to determine the number of samples. Cochran's formula is used to calculate the number of samples with the desired margin of error (e), the level of confidence scale desired (α), and the estimation of the proportion of samples that meet the desired premise (p) (Biglari et al., 2019). With p=0.5, α=95% the number of samples in this study is 363 students (FCEE ITB n=194, FCEP ITENAS n=169). Table 1 shows the profile of respondents in this study.

Table 1. Profile of participants

Participants Profile
Male:289 (80%); Female:74 (20%)
Age: average=21 years old; min=17 years old; max=41 years old.
Undergraduate: 336 (92.6%); Master: 25 (6.9%); Doctoral:2 (0.6%)
Participation in non-profit environmental organizations: Yes=57 (16%); No=306 (84%)

Questionnaire

The final questionnaire was composed of 52 items and divided into four sections. The first section comprised 12 questions regarding respondents' attributes, including gender, age, education, parent's education, involvement in environmental organizations, and types of media where information related to the environment is sourced. Section two is comprised of 10 questions related with existing pro-environmental behaviors (PEB). Section three included 15 questions regarding threat appraisals, such as perceived severity, perceived vulnerability, and intrinsic and extrinsic rewards. Meanwhile, section four comprised of 15 questions regarding coping appraisal, including questions surrounding self-efficacy, response efficacy, and response costs. A five-point Likert scale with possible answers varying from strongly disagree (= 1) to strongly agree (= 5) was used to test these variables. The key questions (adapted from Shafiei & Maleksaeidi, 2020) is shown in Appendix. A preliminary survey was conducted to test the validity and reliability of the instrument.

Data Analysis

Firstly, data on pro-environmental behaviours were classified as very high, high, medium, low, very low (Table 2). The data used for measurement is a questionnaire

consisting of 40 questions with a scale of 1-5. Therefore, a maximum value of 200, a minimum value of 40, and SDi (standard deviation) of 26.67 can be obtained.

Table 2. Categories of pro-environmental behaviours

No	Formula	Score	Category
1	$X \geq Mi + 1{,}5\ SDi$	$X \geq 160$	Very high
2	$Mi + 0{,}5\ SDi \leq X < Mi + 1{,}5\ SDi$	$134 \leq X < 160$	High
3	$Mi - 0{,}5\ SDi \leq X < Mi + 0{,}5\ SDi$	$106 \leq X < 134$	Medium
4	$Mi - 1{,}5\ SDi \leq X < Mi - 0{,}5\ SDi$	$80 \leq X < 106$	Low
5	$X < Mi - 1{,}5\ SDi$	$X < 80$	Very low

Mi = ½ (Max + Nilai)
SDi = 1/6 (Max + Min)
X = Pro-environmental Behaviour Score

Secondly, a Structural Equation Modelling (SEM) was conducted using IBM SPSS Statistics 24 and IBM SPSS AMOS 24 software to describe the visualization of the coefficient of determination framework value based on PMT. This approach was adopted from Shafiei & Maleksaeidi (2020).

RESULTS

Students' pro-environmental behaviour based on the Protection Motivation Theory (PMT) is in the "Very High" category of 6% or 22 respondents. More than half of the respondents (60%) fall into the "High" category, which 219 respondents represent and the remaining third is in the "Medium" category of 32% with 114 respondents. Eight respondents is in the "Low" category (2%) and none of the respondents is in the "Very Low" category (Figure 2). As the average score is 138.84, it can be concluded that the respondents have "High" pro-environmental behaviour.

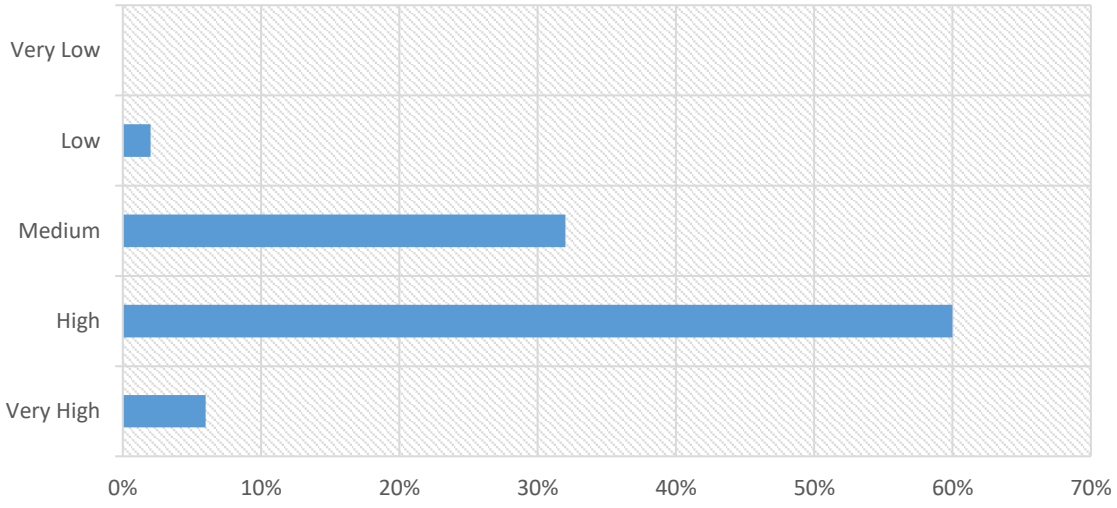

Figure 2. Pro-environmental behaviours among university students

Table 3 shows the t-test result to compare the pro-environmental behaviour of respondents based on gender, university and education level. The information in the table shows that the average pro-environmental behaviour of men and women is 141.45 and 138.17, respectively. This indicates that the average behaviour for men is higher than for women. However, the results of the t-test showed that the difference was not statistically significant, as seen from the almost similar t-value.

Table 3. t-test results to compare pro-environmental behaviours based on gender, university, and education level

Category		**Average**	**Standard Deviation**	**t-Value**	**p-Value**
Gender	Female	138.17	14.631	1.745	.084
	Male	141.45	14.331	1.724	.086
Undergraduate/Graduate	Undergraduate	138.65	14.870	-.920	.358
	Postgraduate	141.44	11.210	-1.172	.250
University	ITB	139.35	14.249	-.710	.478
	ITENAS	138.25	15.035	-.712	.477

In the case of universities, the pro-environmental behaviour of students at FTSL ITB and FTSP ITENAS were 139.35 and 138.25, respectively. This shows that the average pro-environmental behaviour of students in ITB is higher than in ITENAS. However, the results of the t-test indicate that the difference is not statistically significant because the difference in the t-value tends to be small. The average pro-environmental behaviour of students based on strata is divided as undergraduate, postgraduate and doctoral. However, those analyzed were only undergraduate and postgraduate, considering that not all faculties tested had doctoral degrees. The mean is 138.65 and 141.44, respectively. This shows that the average pro-environmental behaviour of graduate students is higher than at the undergraduate level. The results of the t-test also support this statement and reveal that the difference between the two strata is statistically significant.

Figure 4 shows the analysis framework (SEM) and the determinants of students' pro-environmental behaviour. As shown in the diagram, the attitude towards the environment (environmental attitude) has a determinant value of = 0.24; $p < 0.01$, which means that the parameter has a positive and significant effect on the pro-environmental behaviour of students in the scope of the study. Self-efficacy has a determination value of = 0.21 with a p-value of <0.01, which means it has a positive and significant effect on the pro-environmental behaviour of students within the scope of the study. However, response costs ($\beta = -0.17$, $p < 0.01$) and rewards ($\beta = -0.11$, $p < 0.01$) had a significant but negative effect on pro behavior. -environment.

Intrinsic and extrinsic rewards (rewards) indirectly affect students' pro-environmental behaviour through environmental attitudes with a determination of -0.57, which means

that they affect negatively and significantly. Rewards also affect the cost response positively, with a determination value of 0.16 ($p < 0.01$). In addition, based on the framework, it can be seen that response efficacy indirectly has a positive and significant effect on students' pro-environmental behaviour through self-confidence ($\beta = 0.46$, $p < 0.01$). There are different findings compared to previous research by Shafiei & Maleksaeidi (2020). This framework identifies a positive and significant effect of perceived severity with a determination value of 0.15 ($p<0.01$). The highest value of the causal relationship is also seen from the impact of perceived vulnerability on severity (perceived severity) of 0.70, which means vulnerability affects severity positively and significantly. In addition, there is also an identified but insignificant causal relationship, such as between response efficacy and perceived vulnerability. Overall, the adopted model can explain most of the variance in pro-environmental behaviour with a multiple regression coefficients of 0.63 ($R^2 = 0.63$).

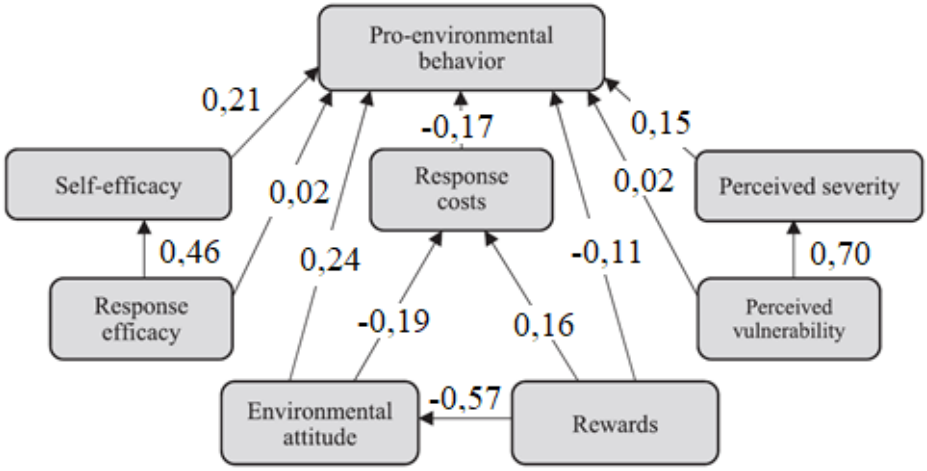

Figure 4. Framework analysis of pro-environmental behaviours among students

DISCUSSION

Human behaviour towards the environment can have positive and negative effects on the environment. Behaviour that is not pro-environmental can threaten environmental conditions, which needs a more in-depth analysis (Shafiei & Maleksaeidi, 2020). In realizing the reduction of threats from the ecological crisis, studying pro-environmental behaviour needs to be done in various social groups. One of them is university students. This group is considered necessary because students are guardians, planners, policymakers, and educators of future environmental issues. The university or institutional environment can provide a climate for students to learn and discuss environmental issues to encourage good environmental behaviour among themselves and in the future in society (Vicente-Molina, 2018). Therefore, this research was carried out for the reasons described earlier on a sample of students at two universities. The framework or causal model was developed based on the Protection Motivation Theory (PMT), which has not been widely used in Indonesia to analyze pro-environmental behaviour. PMT is used to understand what drives and inhibits students from behaving

pro-environmentally. PMT is suitable as an ideal theoretical framework for understanding what governs individual behaviour change (Bockarjova and Steg, 2014).\

First, we will look at the average value of the questions used to measure environmental behaviour. Overall, the results show that pro-environmental behaviour among students is already high and in a relatively good level. These findings confirm the results of studies by Shafiei & Maleksaeidi (2020) and Rainear & Christensen (2017), which revealed in their research that students had relatively favourable environmental behaviour, while their energy consumption behaviour was the highest among others.

Furthermore, the pro-environmental behaviour of students were compared concerning gender, educational strata, and faculty. The results showed no significant difference between the scores of pro-environmental behavior scores in men and women. This finding is in line with the results of research by Pazokinejad and Salehi (2014). On the other hand, the pro-environmental behaviour of students based on their educational level has a significant effect, where the pro-environmental behaviour of graduate students is higher than undergraduate students.

The findings in the framework that have been adopted from Shafiei & Maleksaeidi's research (2020) regarding the determinants of student pro-environmental behaviour show that there is a significant influence, both adaptive (positive) and maladaptive (negative), on pro-environmental behaviour. Threat appraisal consisting of perceived severity, vulnerability, and rewards significantly influences both adaptively and maladaptively on pro-environmental behaviour. Coping appraisal, which consists of self-efficacy, response efficacy, and cost (response costs), also significantly affects pro-environmental behaviour. This follows the first and second hypotheses. In addition, the findings show that environmental attitudes have a positive and significant effect on students' pro-environmental behaviour. Based on these findings, it can be stated that by increasing students' attitudes towards the environment, the likelihood of more positive pro-environmental behaviour or adaptive behaviour will increase. The positive and significant influence of attitudes towards the environment in this study confirms the results of the study of Shafiei & Maleksaeidi (2020) and Ertz et al. (2016). This follows the third hypothesis, which shows that attitudes towards the environment have a significant and positive influence on pro-environmental behaviour.

Perceived severity has a positive and significant effect on pro-environmental behaviour. This is in accordance with the second hypothesis of the study. Based on these findings, the higher the severity perceived by the students, the higher their awareness of doing adaptive (positive) environmental behaviour that is more responsible for the environment. This finding confirms the results of the studies of Shafiei & Maleksaeidi (2020), and Rainear & Christensen (2017). Another finding from the threat appraisal factor is perceived vulnerability, where vulnerability has an indirect but positive and significant effect on pro-environmental behaviour. This is in accordance with the second hypothesis of the study. Based on these findings, the higher the perceived vulnerability of students, the higher the level of perceived vulnerability and will affect adaptive (positive) environmental behaviour that is more responsible for the environment. This finding confirms the results of the studies of Shafiei & Maleksaeidi (2020) and Rainear & Christensen (2017). The next finding from the threat appraisal factor is perceived

vulnerability, where vulnerability has an indirect but positive and significant effect on pro-environmental behaviour. This is per the second hypothesis of the study. Based on these findings, the higher the perceived vulnerability of students, the higher the level of perceived vulnerability and will affect adaptive (positive) environmental behaviour that is more responsible for the environment. This finding confirms the results of the studies of Shafiei & Maleksaeidi (2020) and Rainear & Christensen (2017). Findings from one of the coping appraisal factors, namely self-efficacy, have a positive and significant effect on pro-environmental behaviour. This is in accordance with the second hypothesis. Based on these findings, the higher the level of students' self-confidence in carrying out adaptive (positive) environmental behaviour, the more likely they will lead to more environmentally responsible behaviour. These findings confirm the results of studies by Shafiei & Maleksaeidi (2020) and Rainear & Christensen (2017).

In addition, the response efficacy parameter also affects pro-environmental behaviour indirectly, significantly and positively. This is also in accordance with the findings of Shafiei & Maleksaeidi (2020). Another result shows that the perceived costs of current environmentally unfriendly behaviour have a significant negative effect on students' pro-environmental behaviour. This is in accordance with the second hypothesis. Based on these findings, the higher the costs that students can feel, the more adaptive (positive) environmental behaviour will turn out to be maladaptive. These findings confirm the results of the Shafiei & Maleksaeidi (2020) study. In addition, the research findings indicate that rewards indirectly influence students' pro-environmental behaviour through environmental attitudes and response costs. The findings are congruent with the PMT framework indicating that increasing the costs of pro-environmental behaviour and the perceived intrinsic and extrinsic rewards of non-pro-environmental behaviour are currently likely to decrease pro-environmental behavior. This negative effect of rewards also strengthens the research results by Shafiei & Maleksaeidi (2020) and Bockarjova and Steg (2014).

In this study, the perceived costs of engaging in environmentally friendly behaviour include time and money consuming to engage in pro-environmental behaviour, difficulty in complying with environmental protection policies, and social resistance to environmental behaviour among some social groups. The negative effect of this parameter on pro-environmental behaviour is in line with the results of research by Shafiei & Maleksaeidi (2020), Bockarjova & Steg (2014), and Rainear & Christensen (2017).

CONCLUSIONS

This study examines the Protection Motivation Theory (PMT) as a rationale or framework to explain pro-environmental behaviour among students. Factors that influence pro-environmental behaviour among students based on PMT are Threat Appraisal which consists of vulnerability, severity, and reward and Coping Appraisal, which consists of self-confidence, response efficacy and response cost. In addition, based on previous research, there are factors of attitude towards the environment that affect pro-environmental behaviour. The pro-environmental behaviour of students already has a "High" predicate. In addition, postgraduate students had higher pro-environmental behaviour than undergraduate students. Moreover, self-efficacy,

environmental attitude, and perceived severity positively and significantly affect pro-environmental behaviour. Meanwhile, response costs and rewards have a negative and significant influence on pro-environmental behaviour. The findings also reveal that rewards indirectly influence pro-environmental behaviour through attitudes towards the environment and response costs.

Overall, this study can be used as a new reference in the literature related to pro-environmental behaviour and by proving the previous research framework on a sample of social groups in Indonesia and offers further evidence of the effectiveness of PMT in predicting pro-environmental behaviour. In addition, the findings of this study provide insight for policymakers and planners to take effective decisions regarding the development of pro-environmental behaviour among students. The results show that environmental attitudes and self-confidence are the most important determinants of pro-environmental behaviour and are in accordance with the adoption of the previous research framework. This means that this framework can be used as a reference in adopting measures to increase public understanding of the need for environmental protection, the right to life for plants and animals, the impact of environmental damage on individual health and social welfare as well as increasing the responsibilities of different industries and businesses.

Finally, given the vital role of various social groups in protecting the environment on the one hand, as well as the evidence showing the importance and effectiveness of PMT, it is recommended that future researchers use this theory as a framework to study the pro-environmental behavior of different social groups and the understanding factors that influence it.

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APPENDIX

The authors would like to express gratitude to Luthfika Ghassani for her assistance in formatting the paper. This study receives no funding.

Table A1. Key Questions

Variables	Definitions	Parameters
Pro-environmental behaviour	Environmentally friendly behaviour that has been applied by respondents	I'm trying to save energy I prefer to use public transportation, cycling or walking instead of private vehicles I don't use disposable cutlery I choose to use environmentally friendly products I participate in environmental activities such as waste sorting and recycling, environmental sanitation, and tree planting I participate in efforts to disseminate environmental information around me
Attitude to the environment	What respondents feel about environmental	The government should require industrial businesses to prioritize environmental protection before making products with the highest efficiency and profitability

Variables	Definitions	Parameters
	conditions and protection	One of the causes of the spread of disease and poverty is environmental destruction The flora and fauna on this earth have the same right as humans to live Humans must be able to lower their standard of living in order to protect the environment The government must be able to balance economic interests and environmental protection in each sector
Perceived severity	Respondents' perceptions of the severity of the environmental crisis	Environmental pollution has become a serious threat to humans The negative impact of the lack of human resources is very severe Climate change is a scary thing for me Human survival is threatened because not being able to take care of the environment is a terrifying thing for me
Perceived vulnerability	Respondents' confidence in their vulnerability to environmental damage	I can experience the negative impact of environmental pollution I will experience the negative impact of resource reduction in the near future I am vulnerable to the negative effects of climate change My life is threatened because of the negative effects of not being able to take care of the environment
Rewards	Intrinsic and extrinsic rewards that respondents get from current non-pro-environmental behavior	Using private vehicles is more convenient than public transportation with the aim of saving energy Buying ordinary products is cheaper than eco-friendly products Doing personal activities that I like is easier than pro-environmental activities Continuing to do things according to my previous standard of living is more profitable than an eco-friendly standard of living I don't want to be ostracized from my social group because I'm too worried about the environmental crisis There are still many things like price and work that I have to worry about compared to environmental sustainability I am indifferent to activities that can protect the environment because the future is not my problem
Self confidence	Respondents' confidence in their ability to overcome the environmental crisis	I understand the precautions that must be taken to protect the environment in daily life I feel better if I have done activities that can protect the environment I believe whatever happens to the environment, I can handle it I am not too worried about the difficulties of the global environmental crisis that I will face because I am confident in my ability to overcome it
Response efficacy rate	Respondents' estimates of the benefits of pro-environmental behavior	Good environmental ethics contribute to reducing environmental risks The activities I do to protect the environment can definitely reduce the negative effects of the environment My contribution to environmental programs definitely has a positive effect in increasing the interest and participation of others If I increase my attention to environmental conditions, then I can reduce the environmental crisis for myself and others

Variables	Definitions	Parameters
Response Cost	Respondents' estimates of financial and structural constraints in carrying out pro-environmental behavior	Strive to reduce the environmental risk of spending too much money Participating in environmental programs takes up too much of my free time It is very difficult for me to comply with environmental protection regulations I can't match the current standard of living for an eco-friendlier one Finding information regarding actions that can protect the environment is very difficult for me There's no point if I'm the only one doing activities that protect the environment without other people's involvement too There are no facilities that support me to participate in environmental protection activities

The options for the questions are "strongly agree", "agree", "neutral", "disagree", and "strongly disagree".

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