# Dinamika Pendidikan

# Students' Sustainable Waste Management Behaviors: Comparison Between Vocational and Public High School

**Sagitaningtyas Susanti Utami**[1], **Mohammad Nuh**[2], **I Gede Eko Putra Sri Sentanu**[2]✉

[1]Master Program of Public Administration, Faculty of Administrative Science, Universitas Brawijaya, Malang, Indonesia and Department of Frontier Sciences for Advanced Environment, Graduate School of Environmental Studies, Tohoku University, Miyagi, Japan
[2]Department of Public Administration, Faculty of Administrative Science, Universitas Brawijaya, Malang, Indonesia

## Abstract

This research aimed to comparing the behavior of high school students concerning sustainable waste management behavior between vocational and public school students. Management behaviors include waste prevention, reuse, recycling, green purchasing and waste disposal. The analysis uses a multivariate of covariance (MANCOVA) that the data collected by questionnaire involving 347 high school students in Tulungagung Regency. The findings presented here based on Protection Motivation Theory (PMT), from both types of schools it shows that threat appraisal has a significantly more influence on student's participation in Sustainable Waste Management Behaviors (SWMBs) than Coping appraisal in the level of significance 5%. Furthermore, it is also revealed that there are significant differentiation (p<0,05) SWMBs between the students of SMK 3 Boyolangu and SMA 1 Tulungagung. In order for students to understand the value of action and know which actions will mitigate waste effects, awareness must be provided to different forms of sustainable action strategies and the severity of waste disposal issues.

## How to Cite

Utami, S. S., Nuh, M., & Sentanu, I. G. E. P. S.(2020).Students' Sustainable Waste Management Behaviors: Comparison Between Vocational and Public High School. *Dinamika Pendidikan*, 15(2), 148-163.

✉ Correspondence Author:
Jalan MT. Haryono No. 163 Kota Malang, Jawa Timur, Indonesia, 65145
Email: sentanu@ub.ac.id

# INTRODUCTION

Tulungagung, one of the cities in East Java Indonesia, is facing waste problems with the increasing of waste in various places, which is caused by the behavior of society who still manage the waste improperly. The behavior of waste disposal in any place practiced by the residents of Tulungagung is very alarming (Basso & Fatah, 2017). Especially in villages that have not received a change and advances in information technology, village officials still rely on conservative government activities (Rimadani, Sarwono and Sentanu, 2019), that only apply a traditional waste management system. They do not have the initiative to carry out sustainable waste processing but only dumping it into landfills.

Many residents are littering in various locations, particularly rivers that transform into a sea of waste, including rivers that cross the Kalidawir sub-district, Bandung, Besuki, Boyolangu, but even residents throw trash into the Indonesian state forest company (Perhutani) area, such as the Telaga Buret area (Basso & Fatah, 2017; Yohanes & Prastika, 2019). Based on National Waste Management Information System, the volume of waste as an indicator of environmental quality in Tulungagung in 2017 - 2018 was 89.11 Ton per day in the urban areas and 157.50 Ton per day in the rural area. Moreover, the amount of waste that dumped in the landfill was 129.15 ton per day or equal to 34.224 ton per year and the unmanaged waste was 0.86 ton per day or equal to 220.16 ton per year (Environmental Agency, 2018).

The adverse impact has been felt. It proved that there was research in which it found one of the water-river in Tulungagung, Ngujang River, had pollution in a moderate stage. This condition is related to industrial and domestic activities in the upper watershed. Wastewater and solid waste from both domestic and industry have been known to give a burden on river water quality (Roosmini et al., 2018). Furthermore, the quality of the Ngrowo River has decreased due to the dense do-

mestic activity in the location, along with the Ngrowo River (Agistria, 2017). Waste-related problems frequently concentrate primarily on end-of - pipe solutions rather than on preventive strategies and holistic approaches, thus the waste management hierarchy shows the order of priority for action to minimize and manage waste, which changes the emphasis to 3Rs (reduce , reuse, recycle) – is important for sustainable growth (Hyman et al., 2013).

Environmental education is not only the responsibility of the entire school community but also more than a curriculum issue, involving schools in managing resources and land in a way that to protect the environment and addresses the needs of future generations (UNESCO, 2011b, 2011a). The Ministry of Environment selects schools and funds numerous local actors (state governments, local district education authorities, and NGOs), including Schools in Tulungagung (The ASEAN Secretariat, 2013).

Adiwiyata is an award given to schools that have successfully carried out environmental care and cultured movements in schools by the government, the provincial government, and the district / city government, schools movement is called the PBLHS Movement, one of which is waste management consisting of reduce, reuse and recycle (MENLHK, 2019; IPCC, 2013). The wastes-less-care culture, which is applied in Adiwiyata schools including the 6M concept, consisting of reducing, reusing, replacing, separating, recycling, and composting, which are considered as an excellent notion to overcome such behavior (Krisnawati et al., 2015). The waste management behaviors of students can play a significant role in tackling waste management problems by minimizing potential impacts on the environment (Matsui et al., 2007) furthermore for the future of this regency. So, it is necessary to instill thoughts that environmental interests to meet the needs of the present generation without sacrificing the interests of the future generations for their needs (Hadi et al, 2017).

Several researchers applied The Protection Motivation Theory (PMT) to explain pro-

environmental behaviors (Janmaimool, 2017; Kim et al., 2013; Marquit, 2008), one of them use the theory to analyse in education field (Almarshad, 2017). Rogers (1975) introduced PMT, propose a conceptual framework to explain factors predicting risk preventive behaviors. This theory assumes that an individual's decision to engage in risk preventive actions is taken on the basis of their desire or motivation to protect themselves from a threat that may affect an individual's environmental awareness and pro-environmental actions. (Prentice-Dunn & Rogers, 1986). This proves that PMT can be used in pro environmental behavior analysis including Sustainable Waste Management Behaviors (SWMBs).

Based on the PMT and implementation of SWMB, this study intends to investigate Vocationally and Public Highschool students' engagement in Tulungagung regarding sustainable waste management behaviors, consist of waste avoidance, green purchasing, waste disposal, reuse, and recycling behavior. Regarding the importance of these students' behaviors, this study will investigate the significance of SWMBs based on their coping and threat appraisal of the waste contamination in their environment.

There are some studies to assess the implementation of adiwiyata programs in Indonesia. Including research using descriptive quantitative and descriptive qualitative approaches, Warju & Soenarto (2017) focus on the importance of school management and programs, and Santosa (2018) focus on policies, curricula, parents' participatory and supportive facilities at Adiwiyata School. Their research underlines that the Adiwiyata system has been well implemented. While some studies use simple regression approaches and qualitative data analysis methods, Putri (2018) shows that adiwiyata school programs have a weak impact on students' environmental behaviors, including energy and water use, waste management, environmental care for surrounding conditions, while Darmayanti & Wibowo (2014) emphasizes that the management of Adiwiyata School is still not well implemented.

To date, however, no one has compared the implementation of the Adiwiyata program in vocational schools and public schools. This research filling the gap that shows a comparison of the two schools as there are two types of schools with different characteristics, and it needs to be noted that there are variations in the students' SWMB of the two schools. Where there is a difference, an adjustment must be made to the development of the implementation of the Adiwiyata program depending on the type of school. In comparison to the previous study, the originality of this study contrasts, apart from quantitative approaches, sustainable waste management behaviors between high school students and public schools. This was never done before.

The objectives of this research have been defined; first, to know how the student's sustainable waste management behaviors (SWMBs) are affected by their perceived severity as a result of waste pollution from disposal behavior and their perceived ability to cope; and, second, to show that there are differences in student participation in sustainable waste management between the vocational and public highschool students. Therefore, we can see if the Adiwiyata program's implementation in the two school types affects the differences among students in the SWMB.

PMT was introduced by Rogers (1975) as an instrument to understand how and why an individual response to potential threats to their health and safety. Thus, it described maladaptive and adaptive coping with a health threat as a combination of two appraisal processes (Boer & Seydel, 1996). The PMT suggests that the motivation to protect others relies on four factors: the perceived seriousness of a threatening incident, the perceived probability of occurrence or failure, the effectiveness of the suggested preventive action (perceived response effectiveness) and perceived self-efficacy. Threat assessment is estimating the risk of contracting a disease and estimating the seriousness of a disease. A coping appraisal consists of response efficacy and self-efficacy. Response efficacy is the person's expectancy

that carrying out recommendations can remove the threat. Self-efficacy is the assumption that one is capable of executing the recommended courses of action successfully.

PMT was applied by some researchers to explain pro-environmental behaviors. For example, Bockarjova argued that The Protection Motivation Theory offers a powerful mechanism for understanding pro-environmental decisions by using a wide variety of predictors such as the costs and benefits of current (maladaptive) behavior, and prospective adaptive behavior. Bockarjova found that Environmental risks are strong motivators of electric vehicle (EV) adoption (Bockarjova & Steg, 2014).

Kim et al. (2013) proposed that person's intention to engage in pro-environmental behaviors was significantly affected by substantial PMT attributes, including the perceived severity of the consequences related to climate change, perceived response efficacy, and self-efficacy. Marquit applied PMT to investigate how citizen's perception of air pollution problems and threats to human health influenced their engagement in pro-environmental behaviors that require minimal physical effort (Marquit, 2008). Keshavarz & Karami (2016) used PMT theory to find out farmer's pro-environmental behaviors during a drought

Waste management is seen as part of the generation, collection and disposal (Seadon, 2010), and waste management practices are mostly local, and much of the innovation that leads to improvements in waste management practices originates in local communities (Hyman et al., 2013). Waste management in Indonesia is governed by Law No. 18/2008 on waste management and Law No. 32/2009 on the protection and management of the environment. The Regulations emphasize on raising public awareness of the reduction and management of waste based on environmentally sound management of the three Rs (Reduce , Reuse, Recycle) implementation (Shawndefar & Marianne, 2017). Creating a lifestyle and mindset towards the environment such that living in accordance with the environment is not an easy job and can be achieved in a short time. Education is therefore the right tool for building a society that applies the principles of sustainability and environmental ethics.

Even though some scholars have already explored the application of PMT to investigate pro-environmental behaviors (Almarshad, 2017; Janmaimool, 2017), this study focuses on Sustainable Waste Management Behaviors (SWMBs) in Tulungagung Regency, which involves several types of waste management behaviors, these behaviors different levels and types of effort based on characteristics of student's behaviors. Hence, the potential of PMT to investigate each type of SWMB can be different. Because of the waste disposal process potentially induces environmental and health risk, an individual's threat appraisal and appraisal of how to cope, as denoted in PMT, will affect their engagement in waste behaviors. Thus, this research proposes the hypothesis as shown in Figure 1.
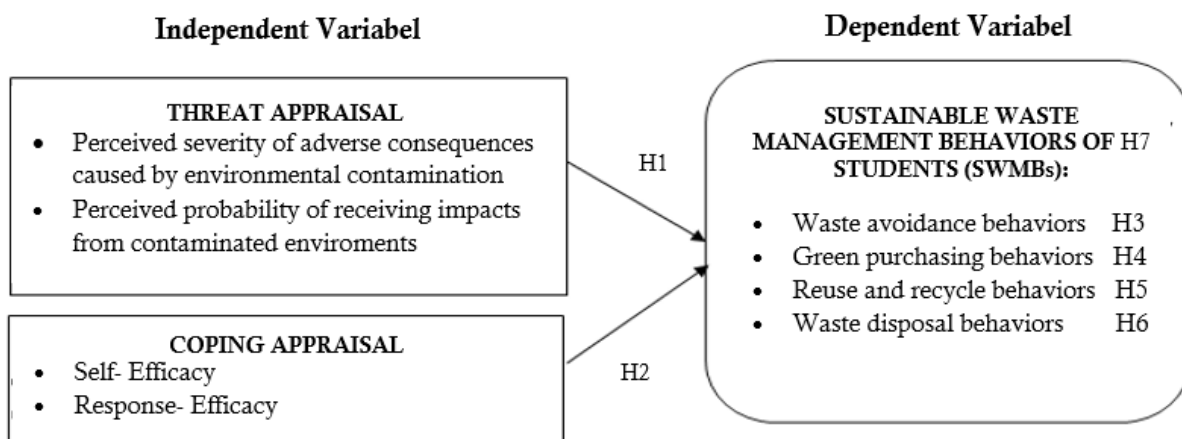


**Figure 1.** Conceptual framework of study adapted from (Janmaimool, 2017).
Source: Processed Secondary Data (2017)

Figure 1 explain hypotheses form this research are: (1) Threat Appraisal and Coping Appraisal influence the students' engagements in Waste Management Behaviors. The dynamic relationship beyond environmental awareness, self-regulation, and environmental competency will influence to protect the environment. The strategic effort to teach sustainable development education is to perform a green school (Adiwiyata) program through formal education (Warju & Soenarto, 2017). Some research revealed the Adiwayata impact of green behavior. The Adiwiyata programme is one way to practice and improve green behaviour. This program has successfully enhanced the green actions of vocational school students in Semarang (Hidayati, 2016).

In the adiwiyata evaluation, the assessment outcomes were focused on aspects of student performance and competency and public reaction and satisfaction that are rated as successful (Warju & Soenarto, 2017). Therefore, The Adiwiyata program should be continued as an attempt to support the paradigm of sustainable development. From all of the previous research, this study proposed hypotheses: (2) Students of vocational highschool have higher Engagement in Waste Disposal, Green Purchasing, Waste Avoidance Behaviors, recycle and reuse than the public highschool. The last is students of vocational highschool have higher participation in Sustainable Waste Management Behaviors (SWMBs) than the public highschool.

This study aimed to promote the development of environmental risk communication that can lead to behavioral changes and will follow the original PMT model, chosen only to explore variables relevant to threat and coping appraisal. These four independent variables will be analyzed to ensure that the degree of involvement in waste management behaviors can be predicted. (Janmaimool, 2017). Based on their environmental or energy benefits, the hierarchy classifies waste management practices,, therefore, the aims of hierarchy wastes should be managed following the following order of preference including waste avoidance, reuse, recycling, recovery of energy, treatment, containment, and disposal (Hyman et al., 2013). Regarding waste management behaviors, schools have made substantial efforts to promote their students to apply environmentally awareness. This research will investigate the participation of students in four forms of SWMBs, namely waste avoidance, green purchasing, reuse, and waste disposal and recycling behaviors. In this study the relationship between the independent variable and the dependent variable (Figure 1.) will be tested on two types of schools namely vocational and public school.

## METHODS

This study used a quantitative approach with a data collection method of field questionnaires and mancova analysis to answer research questions. This research was conducted in Tulungagung, East Java Regency, Indonesia, comparing two types of Vocational High Schools and General High Schools in Tulungagung District which were selected as a sample group because both schools were both awarded as Adiwiyata Schools. There were SMK 3 Boyolangu presented as a vocational high school, and SMA 1 Tulungagung presented as a Public High School.

Data collection conducted using a questionnaire for students at the study site. Questionnaires are distributed to students who use Indonesian so that a translation process is needed before and after the questionnaire has been completed. Data collected in the form of a Likert scale questionnaire. Based on data from (Direktorat Jenderal Pendidikan Anak Usia Dini, 2019), the total number of active student in SMK 3 and SMA 1 Tulungagung are 2.200 students. To calculate the number of sampel, this study used Slovin Setiawan (2007) an error margin is 5%, it calculated the minimum sample size are 328 students. However, in this study, 347 students had collected answers from respondents so that they had met the minimum requirements.

Sustainable Waste Management Beha-

**Table 1**. Factors, Variables, and Development Questionnaire

| Factors | Variables | Survey Questions | Response Categories |
|---|---|---|---|
| Level of engagement in hierarchy waste management behaviors | Waste disposal behaviors | How often do you separate waste into the proper categories before throwing it away in bins? | 1 = Never 5 = Regularly |
| | | Have you ever thrown the liquid from a container away before throwing the container away? | |
| | Green purchasing behaviors | Have you avoided buying food packaged in foam containers? | 1 = Never 5 = Regularly |
| | | During the past year, how often have you purchased environmentally friendly products, such as organic products, biodegradable detergents, and returnable containers? | |
| | Waste avoidance behaviors | How often do you use a cotton bag instead of plastic bags? | 1 = Never 5 = Regularly |
| | | Have you ever refused to receive a plastic bag when you buy a few items? | |
| | | Have you used a reusable instead of a single-use container? | |
| | Reuse and recycle behaviors | How often do you reuse or recycle things such as plastic bags and bottles? | 1 = Never 5 = Regularly |
| | | Have you ever done double-sided printing and used single-sided paper for writing notes? | |
| Threat Appraisal | Perceived severity of adverse consequences caused by environmental contamination | How severe can environmental pollutants caused by waste disposal affect humans? | 1 = Low 5 = Very high |
| | Perceived probability of receiving impacts from contaminated | What is the possibility that pollutants will impact you? | 1 = Low 5 = Very high |
| Coping Appraisal | Self-efficacy | Is it possible that you will be able to change your behaviors into sustainable waste management behaviors significantly? | 1 = Low 5 = Very high |
| | Response efficacy | Do you think a single person's actions can contribute to the improvement of environmental quality? | 1 = Low 5 = Very high |

Source: Janmaimool (2017)

viors (SWMBs) in waste management are activities that enforce an efficient intervention to reduce waste collection, storage and operational cost (Seadon, 2010). In this research, SWMBs including waste disposal behavior, green purchasing, waste avoidance, reduce and recycle behavior of students in their daily activity.Coping appraisal refers to the adaptive response and students' willingness to take preventive risk behaviors (Janmaimool, 2017). Self-efficacy in this research means a student's perception of their ability to implement the behaviors. Threat appraisal is an estimation of the level of danger by the students (Janmaimool, 2017). In this study, perceived appraisal of hazard means the degree of seriousness of the possible harms that a student knows.

In measuring the independent variables, students were asked to denote the degree of perceived severity of adverse effects triggered by the environmental impacts of waste disposal, the perceived risk of impacts from polluted habitats, the degree of self-capacity to conduct waste management activities, and the perceived capability of waste management behaviors to mitigate environmental impacts. The previous research showed that many scholars applied individual self-reports when developing questionnaire items that a self-report is a useful tool for measuring actual environmental behavior. This research used self-reports to collect data for the dependent variable measurement. Respondents were asked. To show the level of involvement in the behavior of waste management. A list of question was development by this study (Janmaimool, 2017).

This study applied a quantitative descriptive approach to assess and describe the characteristics of each assessed variables. Otherwise, categorical data explain the number or value of each group. The answer instruments scored and graded on a Likert scale. The Likert Scale indicates: Regularly/ Very High were scored 5, Sometimes/ High were scored 4, Every once in a while/ Middle were scored 3, Rarely/ Low were scored 2, and Never/ Very Low were scored 1. The frequency

distribution of scores obtained from the tabulation of respondents' answers. Mancova tests were conducted to test how PMT attributes affect each type of SWMBs for data analysis. MANCOVA is a covariance analysis in which at least two dependent variables are considered to be simultaneous, MANCOVA is an extension of Analysis of Covariance (ANCOVA), the difference is that ANCOVA uses scalar variables while MANCOVA uses vector variables (Raykov & Marcoulides, 2008). Analysis of Mancova was conducted using SPSS v23 and the internal consistency of the scales will be evaluated with Cronbach's alpha that is most widely used to determine the internal accuracy of a questionnaire (or survey) consisting of several Likert scales and objects (Tavakol & Dennick, 2011).

## RESULT AND DISCUSSION

This study involved 347 respondents consist of 227 students of SMK 3 Boyolangu and 120 students of SMA 1 Tulungagung, as shown in Figure 2. There was a more significant number of male respondents than that of female respondents, at 73,2% and 26,8%, respectively. It was because Vocational high school mostly consist of male students. The survey randomly spread to different grade levels, so the average age of respondents was 18 years old.
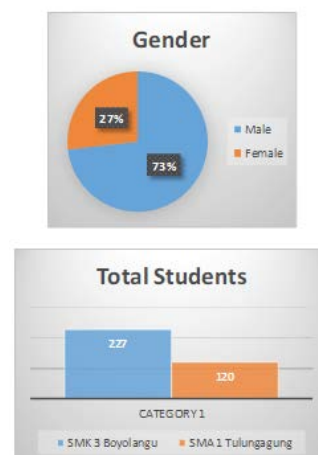


**Figure 2.** Descriptive Characteristic of Respondents
Source: Processed Primary Data (2020)

The descriptive statistic of the constructs is presented in Table 2. The average SWMBs of students is low, which the score was 2.53, with a standard deviation of 1.87 on a scale of 1-5. Regarding each type of SWMBs, students reported higher engagement in waste avoidance than other SWMBs with a 2.72 average score and a 2.26 standard deviation. Participation in green purchasing practices had the lowest score, with an average score of 2.27 and a standard deviation of 1.71, compared to the other SWMBs. Reuse and Recycling behaviors had an average score of 2.45 and a standard deviation of 1.86, which is slightly higher than waste disposal behaviors, which had an average score of 2.66 (SD = 1.64). Students reported a high perceived severity of negative impact caused by environmental pollution, with an average score of 4.04 and a standard deviation of 0.74, based on threat and coping appraisals.

Perceived probability had an average score of 3.49 and a standard deviation of 0.95. Students reported slightly different levels of self-efficacy and response-efficacy, namely 3.65 (SD = 0.83) and 3.87 (SD = 0.92) respectively. In Table 2 also shows the reliability of scales presented as Cronbach's alpha values.

From those reliability tests, Green Purchasing and Reuse and Recycle behaviors variables demonstrate good reliability with Cronbach alpha as above 0,6. These findings suggest that all corrected data are valid and can be used for inferential statistical analysis, such as multivariate covariance analysis (MANCOVA). The following rule of thumb is given in Cronbach's alpha (George & Mallery, 2003): > .9 is excellent and > .5 is bad. As a result, some values in the waste disposal and threat assessment variable behavior are less than 0.5 but still close to 0.5, so that researchers still consider it acceptable to use them in the MANCOVA analysis.

Testing whether perceived severity, perceived vulnerability, perceived self-efficacy, or perceived response efficacy could predict participants' engagement in SWMBs, Multivariate Analysis of Covariance analyses were performed. The research first examined the predictors of overall SWMBs before investigating the predictors of each type of SWMB. Therefore, as the criterion variable, an average SWMB score was calculated and established. The selected predictors were the four indices, and the results are reported in Table 3.

**Table 2**. The Descriptive Statistic of Potential Predictors and Cronbach's Alpha (N = 347) and Average SWMBs Score

|  | Item | Mean | SD | Cronbach's α |
|---|---|---|---|---|
| Waste Management Behaviors | Waste disposal behaviors | 2,660 | 1,63549 | 0,433 |
|  | Green Purchasing behaviors | 2,274 | 1,70774 | 0,627 |
|  | Waste avoidance behaviors | 2,719 | 2,25896 | 0,555 |
|  | Reuse and Recycle behaviors | 2,454 | 1,86002 | 0,654 |
| Threat Appraisal | Perceived severity of the negative impact caused by environmental contamination | 4,0375 | 0,74203 | 0,490 |
|  | The perceived probability of receiving impacts from contaminated environments | 3,4899 | 0,95068 | 0,490 |
| Coping Appraisal | Self-Efficacy | 3,6513 | 0,83425 | 0,532 |
|  | Response Efficacy | 3,8703 | 0,91734 | 0,532 |

Source: Processed Primary Data (2020)

**Table 3.** Influence of Threat Appraisal and Coping Appraisal in SWMBs for Students

| No | Independent Variable | Dependent Variable | F | Sig. |
|---|---|---|---|---|
| 1 | Threat Appraisal | Waste avoidance behaviors | 17.434 | 0.000 |
| | | Green purchasing behaviors | 1.547 | 0.214 |
| | | Reuse and recycle behaviors | 77.011 | 0.000 |
| | | Waste disposal behaviors | 7.304 | 0.007 |
| 2 | Coping Appraisal | Waste avoidance behaviors | 0.32 | 0.858 |
| | | Green purchasing behaviors | 6.451 | 0.12 |
| | | Reuse and recycle behaviors | 0.181 | 0.671 |
| | | Waste disposal behaviors | 0.141 | 0.708 |

Source: Processed Primary Data (2020)

Hypothesis 1: The influence of Threat Appraisal on students' engagement in Sustainable Waste Management Behaviors. From the data of the influence of Threat Appraisal to the Sustainable Waste Management resulted in F value 19.714 and significance (p) 0.000. We can conclude that there is a significant influence (p<0.05) between Threat appraisal and Sustainable Waste management among students at the level of significance 5%.

Hypothesis 2: The influence of Coping Appraisal on students' engagement in Sustainable Waste Management Behaviors. From the data of the influence of Coping App-raisal to the Sustainable Waste Management resulted in F value 1.916 and significance (p) 0.107. We may assume there is no important influence (p>0.05) between the coping appraisal and Sustainable Waste management among students at the level of significance 5%.

In order to test whether perceived severity, perceived vulnerability, perceived self-efficacy, or perceived response efficacy may predict the participation of students in SWMBs, multiple regression analysis was also performed. With $F_{(4, 342)}= 0.098$, p= 0.000, the overall model was relevant. The multiple coefficient of correlation (R) was 0.314, and

**Table 4.** Summary of Regression Analysis for Variables Predicting SWMBs

| Variable | Sustainable Waste Management Behaviors | | | |
|---|---|---|---|---|
| | B | SE B | β | VIF |
| Perceived severity | 0,086 | 0,044 | 0,109 | 1,177 |
| Perceived Probability | 0,167 | 0,035 | 0,271** | 1,199 |
| Self-Efficacy | - 0,001 | 0,040 | - 0,001 | 1,244 |
| Response Efficacy | - 0,039 | 0,036 | - 0,062 | 1,186 |
| R2 | 0,098 | | | |
| Adjusted R2 | 0,088 | | | |
| F for change in R2 | 9,331 | | | |

Notes : N = 347; **p< 0,01

Source: Processed Primary Data (2020)

0.098 was the square of R. However, this model shows that only 9.8 percent of the variance in SWMBs can be accounted for by the linear combination of the four predictors. The variance inflation factor ( VIF) ranged from 1.177 to 1.244, which is lower than the 10 threshold value (Field,2009). The result indicated that there was no multicollinearity. The result is reported in Table 4.

Regarding the influence of each variable on SWMBs, The findings indicate that one variable could predict the participation of respondents in SWMBs. Perceived probability was the most significant variable at 0.1%; its beta-value is 0.271. Perceived probability variables had a positive impact on SWMBs. Respondents reported high scores on this variable and tended to engage in SWMBs actively. The perceived severity of one variable had no effect on SWMBs. However, the variables of Self-efficacy and Response-efficacy had a negative impact on SWMBs. Students reported low scores on these variables had high activity in SWMBs engagement. However, this implies that the Protection Motivation Theory can be applied to explore people's decision to participate in SWMBS, and that encourages students' perceived probability potentially supports the practice of SWMBs. Four multiple regression models that showed in Table 4. for predicting each type of SWMB. Simultaneously, PMT-related variables may predict the involvement of respondents in waste disposal. and waste avoidance, whereas green purchasing and reuse and recycle behaviors were not significantly influenced by the variables. In the partial influence, it can be seen that:

First, the multiple regression model for predicting waste disposal behavior is significant, with $F (4, 342) = 9.091$, $p = 0.000$. The multiple correlation coefficient (R) was 0.310, and R square was 0.096. Those indicate that approximately 9.6 % of a linear combination of those selected predictors may account for the variance in waste disposal behaviors. There was no multicollinearity as a result of the VIF; the VIF values were in the range of

1.17–1.224. They were all below the threshold value of 10. It was found that perceived severity was significant at 5 percent with regard to the effect of each factor on behavior. Perceived probability and self-efficacy did not show a significant influence on waste disposal behavior. Furthermore, response efficacy had a negative impact on to waste disposal of students.

Second, the model for predicting green purchasing behavior was not significantly influenced by each factor. With $F (4, 342) = 2.220$, $p = 0.066$. The multiple correlation coefficient (R) was 0.159, and R square was 0.025. Whether simultaneously or partially, the PMT factors did not influence the SWMBs of students. The third model is the model for predicting waste avoidance behaviors. The results show that, with $F (4, 342) = 5.11$, $p = 0.000$, the overall model was substantial. The multiple coefficients of correlation (R) were 0.497 and square R was 0.247. Multicollinearity was not a concern in this regression, as all VIF values were below the threshold value of 10. Moreover, the only perceived probability was a significant factor in explaining respondents' engagement in waste reduction behaviors.

The model for forecasting reuse and recycling practices was the last model. The overall model, with $F (4, 342) = 1.795$, p= 0.129, was not relevant. The multiple correlation coefficient (R) was 0.143, and R square was 0.021. The VIF index was also below the threshold value of the VIF index of 10. Whether simultaneously or partially, the PMT factors did not influence the SWMBs of students. Overall, the results of the multiple regression analysis showed that variables linked to PMT well predicted the waste disposal behaviors and waste avoidance behaviors of the student, as these two models were significant than those of the models for predicting reusing, reducing and green purchasing behaviors. Also, variable PMT of Perceived severity could predict waste disposal behaviors, and waste avoidance behaviors could only predict by Perceived probability, whereas the reduction and reuse behaviors in this study did not significantly

influence by PMT factors. Furthermore, the PMT factors have a negative impact on Green Purchasing behaviors. To investigate the difference of students' behaviors between SMK 3 Boyolangu and SMA 1 Tulungagung were also used Multivariate Analysis of Covariance (MANCOVA) analyses. The result was presented in Table 5.

**Table 5.** The Difference Behaviors Between Students of SMK 3 Boyolangu and SMA 1 Tulungagung in Parameter of Level Engagement in Hierarchy Waste Management Behaviors

| Dependent Variables | F-value | Sig. |
|---|---|---|
| Waste Disposal Behaviors | 21,333 | 0,000 |
| Green Purchasing Behaviors | 45,900 | 0,000 |
| Waste Avoidance Behaviors | 7,620 | 0,001 |
| Reuse and Recycle Behaviors | 16,425 | 0,000 |
| Waste Management Behaviors | 16,171 | 0,000 |

Source: Processed Primary Data (2020)

Hypothesis 3: The difference in Students' engagement in Waste Disposal Behaviors between SMK 3 and SMA 1 Tulungagung. The analysis of students' waste disposal behaviors between SMK 3 and SMA 1 Tulungagung resulted in F value 21.333 and significance (p) 0.000. Therefore, there is a significant differentiation (p<0,05) between the students of SMK 3 and SMA 1 Tulungagung in the Waste Disposal Behaviors in the level of significance 5%.

Hypothesis 4: The difference in Students' engagement in Green Purchasing Behaviors between SMK 3 and SMA 1 Tulungagung. The analysis of students' green purchasing behaviors between SMK 3 and SMA 1 Tulungagung resulted in F value 45.900 and significance (p) 0.000. We can conclude, there is a significant differentiation (p<0,05) between the students of SMK 3 and SMA 1 Tulunga-

gung in the Waste Disposal Behaviors in the level of significance 5%.

Hypothesis 5: The difference in Students' engagement in Waste Avoidance Behaviors between SMK 3 and SMA 1 Tulungagung. The analysis of students' waste avoidance behaviors between SMK 3 and SMA 1 Tulungagung resulted in an F value of 7.620 and significance (p) 0.001. So, there is a significant differentiation (p<0,05) between the students of SMK 3 and SMA 1 Tulungagung in the Waste Disposal Behaviors in the level of significance 5%.

Hypothesis 6: The difference in Students' engagement in Reuse and Recycle Behaviors between SMK 3 and SMA 1 Tulungagung. The analysis of students' reuse and recycle behaviors between SMK 3 and SMA 1 Tulungagung resulted in F value 16.425 and significance (p) 0.000. We can say that there is a significant differentiation (p<0,05) between the students of SMK 3 and SMA 1 Tulungagung in the Waste Disposal Behaviors in the level of significance 5%.

Hypothesis 7: The difference in Students' engagement in Overall Sustainable Waste Management Behaviors between SMK 3 and SMA 1 Tulungagung. The analysis of students' in Sustainable Waste Management behaviors between SMK 3 and SMA 1 Tulungagung resulted in F value 16.171 and significance (p) 0.000. We can say that there is a significant differentiation (p<0,05) between the students of SMK 3 and SMA 1 Tulungagung in the Waste Disposal Behaviors in the level of significance 5%. Based on the total value, Sustainable Waste Management Behaviors of Vocational High School's students are higher than the public school in Waste Disposal Behaviors and Waste avoidance behaviors. However, Public High School's students, they have higher engagement in Green Purchasing behaviors and Reuse and recycling behaviors.

This study's assumption that student's behavioral change is essential to lessen waste management in Tulungagung Regency. Protection Motivation Theory (PMT) was applied to investigate whether threat appraisal and co-

ping appraisal could explain people's decision to engage in each type of Sustainable Waste Management Behaviors, Including Waste disposal behaviors, Green Purchasing behaviors, waste avoidance behaviors and Reuse and Recycle behaviors.

According to the results of multiple regression analyses, PMT was able to predict some types of SWMBs, particularly behaviors that do not require students to pay anything, such as waste disposal and waste avoidance. However, the PMT did not have a significant effect on the potentially provide the student with the economic benefit of reuse and recycle behaviors. This behavior, including reusing and recycling plastic bags and bottles and also using single-sided paper for writing notes. In Indonesia, students are not well introduced in those two kinds of behavior in their daily life. The assignment of their school also did not allow them to use the single side paper for an assignment. Therefore, they used not to apply this reuse and recycled behaviors in their ordinary.

There was also no major influence of PMT on SWMBs associated with such added costs, such as the procurement of green goods. In Indonesia, the cost of a green product is generally expensive than that of a chemical containing product. It was also found that PMT attributes were less capable of explaining SWMBs that involve significant effort and disturb the comfortable lifestyles of people. Customers usually obtain a plastic bag when purchasing products , for example, or a bottle when purchasing food or beverages. According to the result of multiple regression analyses, such behaviors (such as refusing to receive a plastic bag when purchasing some items, using a reusable instead of a single-use container, and using a cotton bag instead of plastic bags) have a negative impact explained by attributes of PMT. Even though they have a good knowledge of SWMBs but students still depend on their parents to decide what the product that they will buy and the way they have convenient shopping and also their surroundings that did not give them persuasion

to implement those behaviors.

Furthermore, they still do not care about the impact of using too much plastic bag because they still choose the convenient way. The students need figures that give real examples and influences from their environment as a trigger to shape their habit of considering in purchase green products and other SWMBS. The proof of this hypothesis supports the Protection Motivation Theory theory, where when a person feels threatened by negative environmental influences and does what is recommended in their coping assessment efforts, their sustainable waste management behavior will increase. The difference in activities and teaching from schools regarding the behavior of sustainable waste management gives different results between SMK and public schools even though they both have the title of Adiwiyata school.

Considering the factors affecting each type of SWMB, the perceived response effectiveness of students did not affect all types of SWMBs. While the respondents agreed that the waste management behaviors of individuals could solve problems of waste management and the effects of waste disposal, many still do not commit to changing their behaviors. Other factors must be involved to change student's behaviors. This finding contradicts the results of an investigation conducted by Keshavarz & Karami (2016), who found that Perceived reaction efficacy deeply affected the participation of farmers in pro-environmental behaviors during a drought. These findings indicate that various forms of pro-environmental activities may be clarified differently by different PMT attributes.

Furthermore, perceived self-efficacy did not have a significant and positive influence on all SWMB forms. Thus, If they think it is possible to perform them, students will decide to perform SWMBs. However, in this situation, they still feel in a harmless situation. So, they are not influenced to engage in SWMBs. This finding is contrary to the results of prior studies (Hernández et al., 2010), found that high participation in recycling activities was

identified by individuals with high perceived self-efficacy. In several research that applied the theory of planned behaviors, self-efficacy was also found to be a strong predictor of pro-environmental behaviors (Sutton, 2014).

The outcome showed that not all forms of SWMBS were influenced by perceived severity and perceived probability, based on the impact of threat assessments on SWMBs. Green buying and reduction and reuse practices were also not substantially affected by either perceived severity or perceived probability. Therefore, individual green purchasing and reuse and recycling decisions can be based on other variables, such as environmental perceptions, awareness, and level of income. The explanation is that green buying practices often produce extra spending and rely more on the general environmental consciousness of individuals than the desire to protect themselves from environmental threats caused by waste disposal. Waste avoidance behaviors were also only affected by expected chance, similar to green buying behaviors, although variables relevant to coping evaluation did not influence those behaviors at all. It can be inferred that PMT attributes might not be well-suited for exploring both green purchasing and waste reduction, reuse and recycling behaviors. Furthermore, Other types of causes should be further explored to help these habits.

Recycle and reuse behaviors are big campaign in this city, even in Adiwiyata programs. Reuse and recycle emphasized because it easy to practice, such as using double-sided printing and using single-sided paper for writing notes, and some economic advantages may also be provided using a cotton bag rather than getting a plastic bag from the seller. Nevertheless, in practice, people need to be pushed into their act. Such as they have to buy a plastic bag if they want to buy something. When people feel that there are environmental risks associated with raising solid waste, they will first decide to perform activities that can be done easily and without expense, but PMT may not fully explain SWMBs that involve financial and mental effort.

Communication campaigns to promote waste management practices can be built based on this research. Especially in Adiwiyata programs, it needs more than a curriculum but the practices that could enhance students' perceived self-efficacy and response efficacy to make positively influence students' engagement in all types of SWMBs. Which contains guidance on how to perform the separation of waste or how to reuse and recycle solid waste. Knowledge related to the magnitude of the negative effects of waste disposal environmental pollution also theoretically increases the motivation to participate in reuse and recycle and waste disposal behaviors, as the results showed that the perceived severity of students significantly impacted waste disposal behaviors. The results also showed that the degree of participation in waste avoidance activities was also significantly affected by differences in the level of perceived probability. Therefore, sharing information relevant to the report that includes of environmental pollution, such as the kinds of health problems caused by contaminated air or water, may also enhance this kind of SWMBs. In conclusion, encouraging students to participate in and form of SWMB seems to require strategies for communication and practice.

Based on these studies' results, the average of students' engagement in two kinds of school tends to low. However, the difference between adiwiyata and non-adiwiyata school have some different behaviors in SWMBs. Not all of the SWMBs behavior in Adiwiyata school students have higher engagement in SWMBs than in Non-Adiwiyata School. In vocational schools represented as adiwiyata school, it mostly consists of male students. They are high in waste disposal and waste avoidance behaviors engagement.

In the public school, represented non-adiwiyata schools, they have high engagement in green purchasing and reuse and recycle behaviors. In vocational school, there are punishments and fines if their student found littering. Therefore, the discipline of waste disposal and waste avoidance is higher in

this kind of school. In the public school, that consists of a female and male student, and the female student is more care about the way of purchasing behavior. It was easier to encourage female students because they practice them when they are shopping. In the public school also has an art class that emphasizes the student to make reuse and recycle craft. So that the public school's students were more familiar with the practice of reuse and recycled, but Both of school they did not have the policy to use double-sided printing paper in their assignment so those not too familiar in those both schools.

## CONCLUSION

This research applied the principle of safety motivation (PMT) to investigate the participation of students in sustainable waste management behaviors (SWMBs). Four factors were examined on the basis of PMT, including the perceived severity of negative impacts of environmental pollution caused by waste disposal processes, the perceived probability of impacts, perceived response effectiveness, and self-efficacy, on their effect on the participation of students in SWMBs, including waste avoidance, green purchasing practices, reuse and recycling, and waste disposal. Multiple linear regression analyses and Mancova analyses were conducted, and the findings showed that not all forms of SWMBs were influenced by perceived response efficacy and self-efficacy. The perceived severity had a significant impact on the disposal of waste, while the perceived probability of receiving consequences or vulnerability had a significant impact on the behavior of waste avoidance. In terms of the role of coping appraisal, the study shows that the perceived self-efficacy and response effectiveness of students did not have a major impact on their willingness to participate in all types of SWMBs. Students apparently believe that their participation in SWMBs may not increase the quality of the community. Consequently, they do not think about transforming the acts into SWMBs significantly. Information on different types of environmental action strategies and the severity of waste management issues should be given to students so that students can understand the value of taking action and understand which actions can mitigate the effects of waste. Students should particularly be encouraged to reuse and recycle the waste bank at Adiwiyata School with the students participating, as well as to carry out creative activities to recycle waste so as to enhance student conduct in reuse and recycling waste.

## REFERENCES

Agistria, R. (2017). *The Study of Waterways Environment Ngrowo River Due to the Domestic Waste Disease in Tulungagung.* Gadjahmada University.

Almarshad, S. O. (2017). Adopting Sustainable Behavior In Institutions Of Higher Education: A Study On Intentions Of Decision Makers In The Mena Region. *European Journal of Sustainable Development*, 6(2). https://doi.org/10.14207/ejsd.2017.v6n2p89

Basso, A., & Fatah, M. A. (2017). *Prihatin Sampah, PPLH Desak Bupati Terbitkan Perbup Sungai.* https://jatimtimes.com/baca/155311/20170712/092159/prihatin-sampah-pplh-desak-bupati-terbitkan-perbup-sungai

Bockarjova, M., & Steg, L. (2014). Can Protection Motivation Theory predict pro-environmental behavior? Explaining the adoption of electric vehicles in the Netherlands. *Global Environmental Change, 28*, 276–288. https://doi.org/10.1016/j.gloenvcha.2014.06.010

Boer, H., & Seydel, E. (1996). *Protection motivation theory.* In P. Connor & M. Norman (Eds.), Predicting Health Behavior: Research and Practice with Social Cognition Models (pp. 95–120). Open University Press.

Darmayanti, S. E., & Wibowo, U. B. (2014). Evaluasi Program Pendidikan Karakter Di Sekolah Dasar Kabupaten Kulon Progo. *Jurnal Prima Edukasia*, 2(2), 223. https://doi.org/10.21831/jpe.v2i2.2721

Direktorat Jenderal Pendidikan Anak Usia Dini.

(2019). *Data Peserta Didik.* Kementerian Pendidikan Dan Kebudayaan.

Environmental Agency. (2018). Form Non Fisik 2018.

George, D., & Mallery, P. (2003). *Using SPSS for windows step by step: A simple study guide and reference (4th ed.).* Pearson Education.

Hadi, S., & Mulyono, K. B. (2017). Internalization of Conservation Values in Forming Green Consumption Attitude. *Dinamika Pendidikan*, 12(1), 43-52.

Hidayati, N. (2016). Perilaku Warga Sekolah Dalam Implementasi Adiwiyata Di SMK Negeri 2 Semarang. *Jurnal Geografi Gea,* 14(1). https://doi.org/10.17509/gea.v14i1.3362

Hyman, M., Turner, B., & Carpintero, A. (2013). *Guidelines for National Waste Management Strategies: Moving from Challenges to Opportunities.* In Tess Cieux (Ed.), The Inter-Organisation Programme for the Sound Management of Chemicals (IOMC). United Nations Environment Programme [UNEP].

IPCC. (2013). *Summary for Policymakers. In Intergovernmental Panel on Climate Change (Ed.),* Climate Change 2013 - The Physical Science Basis (pp. 1–30). Cambridge University Press. https://doi.org/10.1017/CBO9781107415324.004

Janmaimool, P. (2017). Application of Protection Motivation Theory to Investigate Sustainable Waste Management Behaviors. *Sustainability*, 9(7), 1079. https://doi.org/10.3390/su9071079

Keshavarz, M., & Karami, E. (2016). Farmers' pro-environmental behavior under drought: Application of protection motivation theory. *Journal of Arid Environments,* 127, 128–136. https://doi.org/10.1016/j.jaridenv.2015.11.010

Kim, S., Jeong, S.-H., & Hwang, Y. (2013). Predictors of Pro-Environmental Behaviors of American and Korean Students. *Science Communication,* 35(2), 168–188. https://doi.org/10.1177/1075547012441692

Krisnawati, Y. K., Susilowati, S. S., Irawati Al Muhdhar, M. H., Rochman, F. R., & Budiasih, E. B. (2015). The Implementation of 6M Based Waste Management Module to Support Adiwiyata School Program. *Journal of Studies in Education,* 5(1), 92. https://doi.org/10.5296/jse.v5i1.6725

Marquit, J. D. (2008). *Threat Perception as a Determinant of Pro- Environmental Behaviors : Public Involvement in Air Pollution Abatement in Cache Valley ,* Utah. Perception.

Matsui, Y., Tanaka, M., & Ohsako, M. (2007). Study of the effect of political measures on the citizen participation rate in recycling and on the environmental load reduction. *Waste Management,* 27(8), S9–S20. https://doi.org/10.1016/j.wasman.2007.02.014

Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia Nomor P.52/MENLHK/SETJEN/KUM.1/9/2019 Tentang Gerakan Peduli dan Berbudaya Lingkungan Hidup di Sekolah, (2019).

Prentice-Dunn, S., & Rogers, R. W. (1986). Protection Motivation Theory and preventive health: beyond the Health Belief Model. *Health Education Research,* 1(3), 153–161. https://doi.org/10.1093/her/1.3.153

Putri, L. A. K. (2018). *Pengaruh program Sekolah Adiwiyata terhadap perilaku peduli lingkungan siswa di SMA Negeri 2 Pringsewu. Fakultas Ilmu Sosial dan Ilmu Politi*k. Universitas Lampung. Bandar Lampung

Raykov, T., & Marcoulides, G. A. (2008). *An Introduction to Applied Multivariate Analysis.* Routledge. https://doi.org/10.4324/9780203809532

Rimadani, R., Sarwono, & Sentanu, I. G. E. P. S. (2019). Kualifikasi Pendidikan Nonformal Aparatur Pemerintah Desa: Strategi Dan Tantangan. *Jurnal Administrasi Pendidikan*, 26(2), 152–160. https://doi.org/10.17509/jap.v26i2.21332

Rogers, R. W. (1975). A Protection Motivation Theory of Fear Appeals and Attitude Change1. *The Journal of Psychology*, 91(1), 93–114. https://doi.org/10.1080/00223980.1975.9915803

Roosmini, D., Septiono, M. A., Putri, N. E., Shabrina, H. M., Salami, I. R. S., & Ariesyady, H. D. (2018). River water pollution condition in upper part of Brantas River and

Bengawan Solo River. *IOP Conference Series: Earth and Environmental Science*, 106, 012059. https://doi.org/10.1088/1755-1315/106/1/012059

Santosa, A. (2018). Evaluation of Adiwiyata Programs in Realizing School Of Care and Environmental Culture. *Proceeding International Seminar*.

Seadon, J. K. (2010). Sustainable waste management systems. *Journal of Cleaner Production,* 18(16–17), 1639–1651. https://doi.org/10.1016/j.jclepro.2010.07.009

Setiawan, N. (2007). P*enentuan ukuran sampel memakai rumus slovin dan tabel krejcie-morgan: telaah konsep dan aplikasinya.* Universitas Padjadjaran. Bandung.

Shawndefar, M., & Marianne, P. (2017). *Understanding Waste Management in Indonesia.* https://undpindonesia.exposure.co/understanding-waste-management-in-indonesias-urban-areas

Sutton, S. (2014). *Theory of planned behaviour. In Cambridge Handbook of Psychology, Health and Medicine* (pp. 223–228). Cambridge University Press. https://doi.org/10.1017/CBO9780511543579.049

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education,* 2, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

The ASEAN Secretariat. (2013). Ase*an Guidlines on Eco-Schools.* www.asean.org

UNESCO. (2011a). *Country Programming Indonesia-Unesco Country Programming.* Science And Technology.

UNESCO. (2011b). *National Journeys United Nations Decade of Education for Sustainable Development 2011.* the United Nations Educational, Scientifi c and Cultural Organization. https://sustainabledevelopment.un.org/content/documents/924unesco7.pdf

Warju, S. P. H., & Soenarto, M. D. H. (2017). Evaluating the Implementation of Green School (Adiwiyata) Program: Evidence from Indonesia. I*nternational Journal of Environmental and Science Education.*

Yohanes, D., & Prastika, D. (2019). *Cegah Perilaku Buang Sampah Sembarangan, Pemkab Tulungagung Menginisiasi Satu Desa Satu Bak Sampah.* https://jatim.tribunnews.com/2019/11/18/cegah-perilaku-buang-sampah-sembarangan-pemkab-tulungagung-menginisiasi-satu-desa-satu-bak-sampah?page=3