Green value and sustainable transportation engagement: The mediating role of attitude

Nurliyana Nasuha Razali[a], Marhana Mohamed Anuar[a*] and Abdul Hafaz Ngah[a]

[a]Faculty of Business, Economics and Social Development, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia

CHRONICLE	ABSTRACT
	This study aims to investigate the effect of green value on attitude and sustainable transportation engagement and the mediating role of attitude on the relationship between green value and sustainable transportation engagement. A survey was carried out on students in a public university. A sample of 107 students was obtained for this study. The data was analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings show that green value and attitude had a significant influence on sustainable transportation engagement. In addition, attitude played a mediating role in the relationship between green value and sustainable transportation engagement. The study provides valuable contributions for both theory and practice in the area of eco-campus. Theoretically, the study extends the value-attitude-behavior model in the context of sustainable transportation and adds to the body of literature of eco-campus. This is among the first studies conducted in Malaysia that investigates factors that contribute towards sustainable transportation engagement among students. In terms of managerial significance, the results provide guidance to policymakers to help them plan for strategies to enhance students' engagement in sustainable transportation in the future.

1. Introduction

The key to a sustainable city is sustainable transportation (Wadhwa, 2000). This is due to excessive air pollution and noise from unsustainable transportation. Since 1960, emissions per kilometer have been decreased but in many urban areas, the percentage of traffic growth rise above that of improving emissions managements. Full recycling may be needed for solid waste, fluids, scrapped vehicles, and infrastructure. Many recognize the toll of deaths and injuries in accidents as a sustainability problem (Greene, 2015). It is widely acknowledged that trends in motorization on universities equate those experienced by the community at large. The carbon content of transportation fuels and the energy performance of transport systems influence the quantity of carbon dioxide emission produced by transportation. Greene (2015) points out that the combustion of fossil fuels is the prevalent cause of greenhouse gas emissions from human activities. Transportation is directed on an unsustainable lane. It is the rapid growing source of greenhouse gas emissions due to people action. Rises in the number of new vehicles, the average size of vehicle and the distance they are driven each year have been steadily increased in ground-level ozone and particulates in cities, regardless of compact vehicle emissions regulations (Wadhwa, 2000). Vasquez et al. (2015) report that few peer-reviewed studies analyze greenhouse gas emissions produced by universities for developing countries. It is estimated from their study that the GHG emission values at the campus expected to be increased in the future. This is because universities are developing and become more complicated. Besides, it is the regular path to move toward a higher economic level that is predicted in developing countries and middle-income countries which affects, among other things, greater access to automobiles for the students. during the last decade, campus planners have managed to provide access and

mobility without destroying campus qualities as distinct communities (Balsas, 2003). Any university working towards sustainability must compromise with the concern of transportation as students, staff and visitors commuting to and from campus represent one of the most crucial impacts a university has on the environment and society (Miralles-Guasch & Domene, 2010). Specifically, the current trends in transport activity volume and growth pose serious barriers for societies addressing to shift towards sustainable development (OECD, 1996). Towards sustainable development, generations must not compromise the ability of future generations to meet their needs (Greene, 2015). Hence, in terms of environmental issue in eco-campus for this paper, 'sustainable transport' has become the main goal for transport planning and policymaking around the world (Chowdhury & Ceder, 2016). Environmental issues on public transport and eco-campus for sustainability have been the preferences for Malaysian public universities, especially in assuring the efficiency and effectiveness of the bus service (Hashim, et al., 2013). This is because to become leaders in sustainable development, universities need to prepare students and "practice what they preach" (Gomez, et al., 2016). So, the aims of this study are

i) to examine the effect of green value on attitude,
ii) to examine the effect of attitude on sustainable transportation engagement,
iii) to examine the mediating role of attitude on the relationship between green value and sustainable transportation engagement.

2. Literature review

2.1 Sustainable transportation engagement

Sustainable transportation can be explained as satisfying present transport and mobility requirements without negotiating the ability of future generations to meet these needs (Black, 1996). In the context of this research, the Sustainable Transportation Engagement (STE) can be defined as the process whereby higher education makes deliberate attempts to involve and empower students in satisfying current transport and mobility needs without compromising the ability of future generations to meet such needs. Transportation at the university used by students can be categorized into: a) private vehicles, public transport, university transit bus, bicycles and walking. Black (1997) in his journal article stated that there are several reasons for unsustainable transportation such as the limited nature of petroleum supplies, the bad effects of petroleum-based emissions on air quality, the number of fatalities and injuries because of motor vehicles, traffic congestion, bordering on gridlock in many cities, and urban sprawl. The negative impacts of petroleum-based emissions on air quality is very dangerous not only for human health but also environment including animal life (Azam, et al., 2016). A sustainable transportation system has defined by The Transportation Association of Canada as a system that (Wadhwa, 2000) meets the access requirements of the current generation; giving chances for future generations to meet their own access needs (which will grow because of economic development and increasing populations); is powered by renewable (inexhaustible) energy resources; does not contaminate air, land or water beyond the planet's capability to ingest/purify (especially CO]); is technologically achievable; is economically and financially cost-effective; supports a craved quality of life; supports local, national and worldwide sustainable development goals.

Value-Attitude-Behavior Model

This study used value-attitude-behavior model as an underlying theory. Values are mostly expressed in terms of good or bad, better or worse, desirability or avoidance. Values define or direct us to goals, frame our attitudes, and provide standards against which the behavior of individuals and societies can be judged. Consumers' environmental consciousness (value) strongly influenced their attitude towards environmental issues and towards eco-social benefits (attitude), which in turn exerted positive effects on their green purchase behavior (behavior) (Cheung & To, 2019). In the context of transportation, human behavior on the road is determined by the attitude to driving, the psychological condition at the moment of driving, the cognitive processes, and the personality (Muzikante & Reņģe, 2011).

Green value

Values are related to the beliefs and concepts that govern a specific desirable state and, in turn, can affect behavior (Bardi & Schwartz, 2003). The previous study by Karna, Hansen and Juslin (2003) reported that green values, environmental marketing strategies, structures and functions are logically connected. Based on the concept of green or ecological marketing, businesses should refer to ethical and green practices while dealing with customers, suppliers, dealers, and employees (Rehman, 2017). Values convey what is significant to us in our lives. Every individual has various values (e.g., achievement, benevolence) with changeable degrees of importance (Bardi & Schwartz, 2003). In this study, student as the largest stakeholder in higher education should practice green value for sustainable transportation to achieve sustainable development. Environmental or "green" marketing has been seen as a tool towards sustainable development and satisfaction of different stakeholders (Karna, et al., 2003).

Attitude

Attitudes refer to the evaluation of a specific object, quality, or behavior as good or bad, positive or negative (Leiserowitz, et al., 2006). It is usually extracted from and reflect abstract values (Maio et al., 2013). Attitude, as well as behaviors, are leaded,

commonly by the beliefs that are reachable in the context in which attitudes are expressed and in the context in which behavior is performed (Ajzen I. , 2012). In line with VAB model, attitude is expected to mediate the relationship between green value and STE. This study is therefore among the first few studies that this relationship.
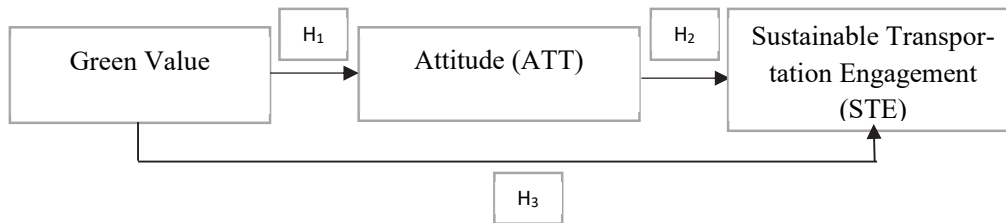

Fig. 1. Research model

Based on the literature review conducted the following hypotheses are proposed.

H1: Green value positively influences attitude.
H2: Attitude positively influences sustainable transportation engagement.
H3: Attitude mediates the relationship between green value and sustainable transportation engagement.

3. Methodology

Sample and data collection

Quantitative research using convenience sampling method was used in this study. Survey data was collected through the personal delivery of self-administered survey forms on March 2019 to random students who were around the main library of University Malaysia of Terengganu. This study utilized Gpower software to reach the minimum sample size needed. The sample size necessary for two independent variables and two dependent variables using effect size (f2) of 0.15 (medium) is 68 respondents. However, a total of 130 questionnaires were distributed to University Malaysia of Terengganu's students as one of the top eco-campus in the UI Green Metric for east of Malaysia (Anon., 2018). One Hundred and seven were returned which were considered suitable for the analysis, yielding a response rate of 82.31 per cent. 23 of these were rejected due to errors in completing sections of the questionnaire.

Measurement Items

The distributed questionnaire consists of three sections. The instruments involving 14 items related to the research model were adapted from existing literature and refined based on the context of this study.

In section A, the respondents were asked about mode of transportation on campus, frequency of use and sustainable transportation engagement with eight items specifically in environmental sustainability using five-point Likert-scale (1= strongly disagree and 5= strongly agree). In section B, the green value and attitude were measured through a five-point Likert-scale (1= very seldom and 5= very often) with three items for green value adopted from Choi, Jang, & Kandampully (2015) and three items for attitude adopted from Taufique & Vaithianathan (2018). In section C, the respondents were asked about their gender, age, nationality, year of study, the program of study, courses on environment taken, car ownership, purchased parking pass, residence, student status, religion and race. A pre-test allowed for the quotation of comments and recommendations regarding potential defect including the questionnaire format, design, and wording.

Data Analysis

Data does not have the normality requirement when it is analyzed with Smart PLS. However, as suggested by Hair et al. (2017), the study was tested for the multivariate normality by looking at the skewness and kurtosis using the software available at:
https://webpower.psychstat.org/models/kurtosis/results.php?url=54750fdd23ccb0c263171592f2a06b89.

If the distribution is normal, the values of skewness and kurtosis are zero. Kurtosis values above zero indicate a distribution that is too peaked with short, thick tails, and kurtosis values below zero indicate a distribution that is too flat (also with too many cases in the tails). Non-normal kurtosis produces an underestimate of the variance of a variable (Tabachnick & Fidell, 2007). The findings displayed the research data was multivariate, not normal, Mardia's multivariate skewness ($\beta = 0.000$, p>0.01) and Mardia's multivariate kurtosis ($\beta = 1.780$, p>0.01), which is a non-parametric analysis software. The Partial Least Squares (PLS) analysis (using the SmartPLS 3.2.8 software) was used to analyze the measurement model (Ringle, et al., 2015). There are two recommended stage analytical procedures. First is the measurement model (validity and reliability of

the measures) (Anderson & Gerbing, 1988). Second, the examination of the structural model (testing the hypothesized relationship) (Hair Jr, Sarstedt, Hopkins, & Kuppelwieser, 2014).

4. Findings

Respondents profile

Among the respondents, 23.4% of students were male and 76.6% were female. Respondents mostly had an age range from below 24 years old (88.8%), 9.3% were 24-26 years old, 0.9% for 27-29 years old and also 0.9% for over 29 years old. The most mode of transportation used by the respondents in this study is a walk (51.4%), followed by motorcycle (23.4%), drove alone (10.3%), carpool (9.3%), public transportation (2.8%) and others (2.8%).

Table 1
Demographic Profiles of the Respondents

Variables	Category	Frequency	Per cent (%)
Gender	Male	25	23.4
	Female	82	76.6
Age	Below 24 years old	95	88.8
	24-26	10	9.3
	27-29 years old	1	.9
	Over 29	1	.9
Nationality	Malaysian	104	97.2
	Non-Malaysian	3	2.8
Study year	1 year	39	36.4
	2 years	24	22.4
	3 years	34	31.8
	More than 3 years	10	9.3
Program of study	Bachelors	102	95.3
	Masters	2	1.9
	PhD	3	2.8
Environment course has taken	Yes	54	50.5
	No	53	49.5
Car ownership	Yes	24	22.4
	No	83	77.6
Purchased parking pass	Yes	18	16.8
	No	89	83.2
Residence	On-campus	60	56.1
	Off-campus	47	43.9
Student status	Full-time	105	98.1
	Part-time	2	1.9
Religion	Islam	80	74.8
	Buddhism	16	15.0
	Hinduism	7	6.5
	Christian	4	3.7
Race	Malay	77	72.0
	Indian	19	17.8
	Chinese	7	6.5
	Other	4	3.7

Types of transportation mode

Table 2 demonstrates types of transportations that students used on campus. Majority of the students (51.4%) preferred to walk within campus, followed by using own transport such as motorcycles (23.4%) and car (10.3%). A few students (9.3 %) using a share vehicle-carpool and the least popular mode of transport was using a public transportation. Perhaps, the high cost of using a public transport contributed to the low popularity of this transportation mode among students at the university.

Table 2
Transportation mode in campus

		Frequency	Per cent
Valid	Walk	55	51.4
	Motorcycle	25	23.4
	Public transportation	3	2.8
	Carpool	10	9.3
	Drove alone	11	10.3
	Other	3	2.8

Measurement Model Assessment

To determine the measurement model two types of validity have been examined which are convergent validity and discriminant validity. The convergent validity of the measurement is commonly decided by examining the loadings, average variance extracted (AVE) and also the composite reliability (CR) at their threshold value. According to Ramayah et al. (2018), the loadings of 0.708 or higher is suggested but loadings higher than 0.5 is adequate if other items have the highest scores of loadings to complement AVE and CR. For AVE, it is suggested that AVE should be higher than 0.5 and CR should be higher than 0.70-0.90 (definitely 0.95) to be considered as satisfactory (Hair J. F., Hult, Ringle, & Sarstedt, 2017).

In this study, the loadings were all higher than 0.5. The CR was all higher than 0.7 and the AVE was also higher than 0.5 as suggested in the literature (see Table 3).

The discriminant validity using the new suggested method by Henseler et al. (2015) through the Heterotrait-Monotrait ratio of correlations and the results are shown in Table 4.

Convergent Validity

Table 3
Validation of measurement scales

Construct	Item		Loadings	CR	AVE
Green value	Using sustainable transportation when travelling would enable me to protect the environment	GV1	0.900	0.929	0.813
	Using sustainable transportation when travelling would enable me to prevent pollution	GV2	0.891		
	Using sustainable transportation when travelling would enable me to respect the earth	GV3	0.913		
Attitude	It is very important to raise sustainable transportation concern among campus communities	ATT1	0.856	0.875	0.702
	More sustainable transportation initiatives are needed at my campus.	ATT2	0.894		
	It is crucial to promote sustainable transportation among campus communities.	ATT3	0.758		
Sustainable transportation engagement	I use sustainable transportation to:			0.948	0.698
	Reduce Carbon Dioxide (CO2) emissions	STEV1	0.824		
	Reduce ozone emissions	STEV2	0.919		
	Reduce Volatile Organic Compound (VOC) emissions	STEV3	0.896		
	Reduce Carbon Monoxide (CO) emissions	STEV4	0.874		
	Reduce Nitrogen Oxides (NOx) emissions	STEV5	0.868		
	Reduce traffic noise level.	STEV6	0.662		
	Reduce energy consumption.	STEV7	0.836		
	Reduce land consumption.	STEV8	0.778		

Notes: CR, composite reliability; AVE, average variance extracted

Discriminant Validity

In a well-fitting model, Heterotrait correlations should be smaller than Monotrait correlations, meaning that the HTMT ratio should be below 1.0 (Garson, 2016). Henseler, Ringle and Sarstedt (2015) suggested that if the HTMT value is below 0.90, discriminant validity has been established between a given pair of reflective constructs.

Table 4
Heterotrait-Monotrait (HTMT)

	Attitude	Green value	Sustainable transportation engagement
Attitude			
Green value	0.355		
Sustainable transportation engagement	0.408	0.344	

It is important to confirm that there is no collinearity issue in the structural model before testing the structural model. Diamantapoulus and Sigauw, (2006) reported that the VIF must be lower than 3.3. Table 5 below shows the VIF value for each construct is lower than the conservative value of 3.3. Thus, it indicates that collinearity is not a concern (see Table 5).

Table 5
Lateral collinearity

	Attitude	Green value	Sustainable transportation engagement
Attitude			1.096
Green Value	1.000		1.096
Sustainable transportation engagement			

Structural Model Assessment

After the measurement model and the collinearity issue were clarified, the assessment of the structural model should be done. To estimate the structural model, a bootstrapping procedure with 500 resamples was run to generate the t-values. Fig. 2 presents the structural model.
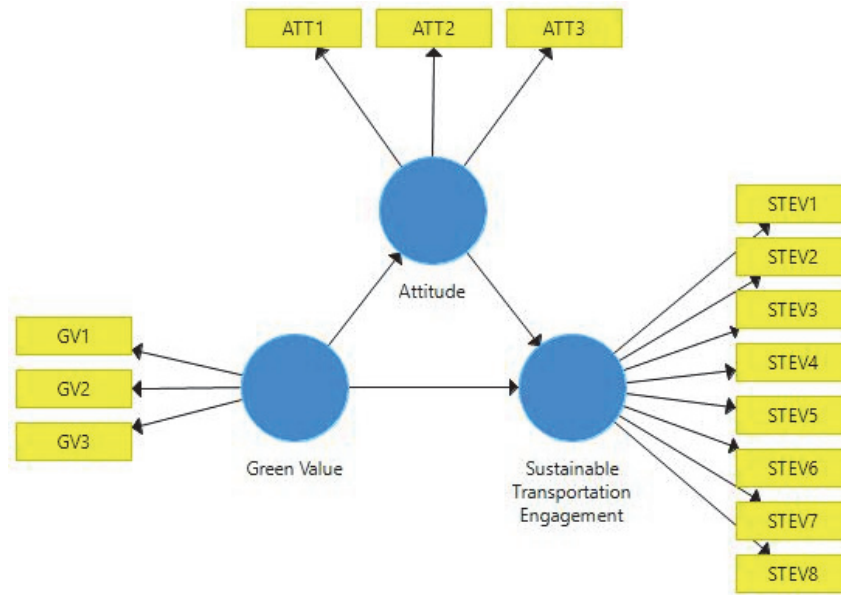

Fig. 2. Structural Model

Table 6 presents the assessment of the coefficient of determination (R2), the effect size (f2) and the predictive relevance (Q2) of the independent variable on dependent variables in this study. The value for the coefficient of determination (R2) for Attitude and Sustainable Transportation Engagement were 0.088 and 0.180 respectively. Overall, the Q2 value of 0.045 and 0.111 for Attitude and Sustainable Transportation Engagement respectively which are larger than 0 (Hair et al., 2014) indicates that exogenous variable has predictive ability over the endogenous variable. For the effect sizes, the endogenous has a small effect size. All the details are shown in Table 6.

Table 6
Assessment of coefficient

Construct	R2	Q2	Effect size		
			GV	ATT	STE
GV				0.096 Small	0.061 Small
ATT	0.088	0.045			0.095 Small
STE	0.180	0.111			

Notes: GV, Green value; ATT, Attitude; STE, Sustainable transportation engagement

Table 7 illustrates the hypothesis testing results of this study. while Table 7 presents the results of the hypothesis testing. (Green value → Attitude), β=0.296, t=3.317, LL=0.134, UL=0.442; (Attitude → Sustainable Transportation Engagement), β=0.292, t=3.206, LL=0.097, UL=0.463. Hence, it confirmed that Green value has a positive relationship with Attitude and Attitude has a positive relationship with Sustainable Transportation Engagement. Thus, H1 and H2 were supported.

To test the third hypothesis the Preacher and Hayes (2008) method of bootstrapping the indirect effect was applied. The bootstrapping analysis results for H3, (Green value → Attitude → Sustainable Transportation Engagement) β=0.234, t=2.150, LL=0.024, UL=0.176, shows that the relationship were supported. As indicated by Preacher and Hayes (2008), LL and the UL do not straddle a 0 in between indicating there is a mediation effect between the independent variable and the dependent variable. Hence, we can conclude that Attitude (ATT) was mediated a positive relationship between Green value (GV) and Sustainable Transportation Engagement (STE).

Table 7
Hypotheses testing

Hypothesis	Relationship	Beat	Std. Error	t-value	P-value	LL	UL	Decision
H1	GV→ATT	0.296	0.089	3.317	0.001	0.134	0.442	Supported
H2	ATT→STE	0.292	0.091	3.206	0.001	0.097	0.463	Supported
H3	GV→ATT→STE	0.234	0.040	2.150	0.032	0.024	0.176	Supported

Notes: GV: Green value, ATT: Attitude, STE: Sustainable transportation engagement

5. Discussion and Conclusion

The results of this empirical study have confirmed that the direct effects of green value on sustainable transportation engagement, the direct effect of attitude on sustainable transportation engagement and the mediation effects of attitude between green value and sustainable transportation engagement exist. The findings gained from the current study are persistent with past studies (Bardi & Schwartz, 2003; Cheung & To, 2019), thus affirming that this VAB theory model is potent in predicting sustainable transportation engagement (behavior) among the students in eco-campus.

This study contributes significant understanding as well as theoretical and practical guidance for the forthcoming practice of sustainable transportation in Higher Educations Institutions globally. Theoretically, this paper extends the value-attitude-behavior model in the context of sustainable transportation and adds to the body of literature of eco-campus. It enriched the study of Cheung and To (2019) by confirming that the positive relationship between attitude towards green purchase behavior in terms of environmental sustainability specifically in sustainable transportation on eco-campus. This is among the first studies conducted in Malaysia that examine factors that contribute towards sustainable transportation engagement among students. In terms of policy-making significance, the results accommodate guidance to policymakers to help them plan for strategies to enhance students' engagement in sustainable transportation in the future.

In contempt of the positive findings, the present study was limited in some ways. The sample is selected among students from eco-campus which the result may do not apply to the universities that were not listed as eco-campus in UI Green Metric 2018. However, as time passed by, this surely will develop the understanding among eco-campus students and can increase more universities to participate by implementing sustainable transportation practice towards sustainable development goals 2030.

Acknowledgement

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