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PUBLIC PERCEPTION AND ADAPTATION TOWARDS CLIMATE CHANGE POLICY IN MALAYSIA

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Abstract:

This study examined the relationship between public risk perception, public awareness, public knowledge and public adaptation towards climate change policies in Malaysia, with attitude towards climate change as the mediator. This study adopted selfadministered online questionnaires to collect inputs from Malaysians across all states. A total of 200 usable data was analysed in this study. The SPSS was used for the descriptive statistics analysis and SmartPLS was used for the measurement model and structural model analysis. Based on the findings, the results show that public risk perception has a significant effect on public adaptation towards climate change. Besides, public attitude mediates the relationship between public risk perception and adaptation towards climate change policy. These results will be useful for the government and industries in understanding public perceptions and attitudes towards climate change policies initiated by the government. Thus, it provides insights for the government in formulating climate change policy.

Keywords:

Climate Change, Public Risk Perception, Public Awareness, Public Knowledge, Public Attitude And Adaptation

Introduction

Climate change has been a rising issue for the world including Malaysia. Malaysia government has been supporting and solving the climate change issues based on the Sustainable Development Goals (SDGs) developed by the United Nations. According to Woroniecki et al. (2019), government is the most prevalent driver for climate change actions,

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this is then followed by communities and societies. Based on the report by Lindsey & Dahlman (2020), the combined land and ocean temperature has increased at an average rate of 0.07°C (0.13°F) per decade since 1880; it is projected that global surface temperature will be more than 0.5°C (0.9°F) warmer than the 1986-2005 average, regardless of which carbon dioxide emissions pathway the world follows. In Malaysia, the average temperature also has increased from 28°C to 30°C or 31°C since the past ten years.

Based on the impact and urgency of climate change, it has been of interest for scientists, social scientists, and academics to study public pro-environmental behaviours (Masud et al., 2015; Yu et al., 2020). However, in recent years, climate change communications and media coverage have increasingly stressed the importance of public adaptation towards climate change policies. Voluminous studies can be found in literature on adaptation towards climate change policies in Australia (Xie et al., 2019), Finland (Juhola, 2019), Taiwan (Lee et al., 2019; Sun & Han, 2018), the US (Sanchez Rodriguez et al., 2018), Spain (Olazabal et al., 2018), Portugal (Luís et al., 2018), and Turkey (Korkmaz, 2018). However, limited studies can be found about Malaysia.

Till-to-date, available research in Malaysia has shown that public attitude towards climate change has positive mediating effect between public risk perception, public knowledge, public awareness and pro-environmental behaviours among Malaysians (Masud et al., 2015). Choon et al. (2019) focused on risk perception and climate change mitigation behaviours in Klang Valley, whereas Akhtar et al. (2018) studied rice farmers' perceptions, awareness, attitudes and adaptive behaviour towards climate change.

Past studies also illustrates the importance of risk perception (Akhtar et al., 2018; Masud et al., 2015; Sun & Han, 2018; Valkengoed & Steg, 2019; Xie et al., 2019; Yu et al., 2020), awareness (Akhtar et al., 2018; Korkmaz, 2018; Lee et al., 2019; Luís et al., 2018; Masud et al., 2015, 2017; McNamara, 2013; Sun & Han, 2018), knowledge (Choon et al., 2019; Korkmaz, 2018; Masud et al., 2015, 2017; Valkengoed & Steg, 2019; Yu et al., 2020) and attitude (Akhtar et al., 2018; Lee et al., 2019; Masud et al., 2015, 2017; Yu et al., 2020) on climate change.

Understanding the public perception of climate change is vital to the implementation of appropriate and effective action, not only because public concern is a prerequisite for informing people effectively about climate change risks, but also because it has the enormous potential to increase public willingness to change behaviours and to adopt policy measures (Von Borgstede et al., 2013). In addition, while studies have been conducted between the relationship between environmental perception and environmental behaviour, there are few related attitudes to climate change, risk perceptions, and behavioural intentions in combination (De Dominicis et al., 2015). Thus, this research aims to explore the relationship between public risk perception, public awareness, public knowledge and public adaptation towards climate change policies in Malaysia, with attitude towards climate change as the mediator. This paper started with an introduction, then followed by literature review, hypotheses development and research methodology. Subsequently, results are presented, discussed and directions for further research are suggested.

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Literature Review and Hypothesis Development

Adaptation towards Climate Change (ADT)

Adaptation towards climate change is vital to combat climate change (Carlton et al., 2016). In this study, we looked at climate change adaptation policies created by Malaysian government such as greater use of renewable energy, optimize usage of energy, encourage low carbon mobility, and promote green building. Adaptation towards climate change has been studied in many past literature to help government understand the opportunities and challenges of formulating politically possible and successful global climate change policies (Akhtar et al., 2018; Biesbroek et al., 2018; Choon et al., 2019; Juhola, 2019; Korkmaz, 2018; Lee et al., 2019; Luís et al., 2018; Masud et al., 2017; Sun & Han, 2018; Valkengoed & Steg, 2019; Woroniecki et al., 2019; Xie et al., 2019; Yu et al., 2020).

Public Risk Perception (PRP)

Risk perception is an intuitive risk judgment, commonly used by people to evaluate hazardous activities and technologies (Slovic, 1987). The initial risk perception of a person affects his or her subsequent attitude and behaviour (Yu et al., 2020). Public risk perception in this study examined public risk perception on the risk of climate on public health, agricultural production, shortage of fresh water and standard of living. Studies on samples of adults in Taiwan (Sun & Han, 2018) and Australia (Xie et al., 2019), and farmers in Malaysia (Akhtar et al., 2018), indicated a positive relationship between risk perception and adaptation towards climate change. Masud et al. (2015) and Yu et al. (2020) showed that higher risk perception leads to higher pro-environmental behaviours in Malaysia and Taiwan, respectively. Based on these findings, therefore, we hypothesized that public risk perception positively affects public adaptation towards climate change. We developed Hypothesis One (H1) as follows:
H1: Public risk perception positively affects public adaptation towards climate change

Public Awareness (PAW)

Awareness is defined as a person's capability of simulating future events, anticipating present events, and formulating appropriate actions (Yates, 1985). Public awareness in this study explored whether one is aware of climate change, its seriousness on human life and natural environment. Most of the past literature in climate change confirmed the importance of public awareness to improve public attitude, public adaptation and pro-environmental behaviours in climate change (Akhtar et al., 2018; Choon et al., 2019; Korkmaz, 2018; Lee et al., 2019; Masud et al., 2015, 2017; McNamara, 2013). However, Luís et al. (2018) found that higher public awareness could reduce public risk perception and thus, behavioural intention, this is caused by risk normalization. In addition, Masud et al. (2017) found that awareness of climate change in developing nations is far below developed nations, for examples, Japan has the highest level of awareness in Asia (99 percent), while the percentage of the people who have heard of climate change in Pakistan and Indonesia is only 12 percent and 25 percent, respectively. In view of this, Hypothesis Two (H2) was developed to confirm this statement again in our study.
H2: Public Awareness positively affects public adaptation towards climate change

Public Knowledge (PKW)

Knowledge is a highly valued state in which a person is in cognitive contact with reality (Zagzebski, 2017). In this study, we examined public knowledge whether they know about

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climate change is happening in our country, temperature is increasing, rainfall pattern is changing, and increase in emission of greenhouse gases and carbon dioxide. Some studies found positive associations between knowledge, and adaptation towards climate change (Korkmaz, 2018; Masud et al., 2015, 2017; Yu et al., 2020). However, other studies found a weak or negative relationship between knowledge, and adaptation towards climate change (Choon et al., 2019; Valkengoed & Steg, 2019). Therefore, we formed Hypothesis Three (H3) to test the relationship.

H3: Public knowledge positively affects public adaptation towards climate change

Attitude towards Climate Change (ATT)

Attitude towards behaviour refers to a personal judgement in favour of or opposed to performing a certain behaviour and it is a function of behavioural beliefs and the outcome of evolution (Ajzen, 1991). The study examined the public attitude environment in Malaysia and whether they are willing to pay a certain amount to reduce the impact of climate change. Voluminous research proved the positive relationship between attitude towards climate change, and adaptation and pro-environmental behaviour (Akhtar et al., 2018; Lee et al., 2019; Masud et al., 2015, 2017; Yu et al., 2020). Therefore, we hypothesized that attitude towards climate change positively affects adaptation towards climate change.

H4: Public attitude positively affects public adaptation towards climate change

Besides, the study also examined whether attitude towards climate change mediates the relationship between public risk perception, public awareness and public knowledge and public adaptation towards climate change. Yu et al. (2020) mentioned that public knowledge will increase attitude towards climate change, whereas Masud et al. (2015) confirmed that attitude towards climate change mediated the positive relationship between public risk perception, public awareness, public knowledge, and pro-environmental behaviour in Malaysia. Thus, the following hypotheses were developed.

H5: Attitude towards climate change mediates the positive relationship between public risk perception and public adaptation towards climate change.
H6: Attitude towards climate change mediates the positive relationship between public awareness and public adaptation towards climate change.
H7: Attitude towards climate change mediates the positive relationship between public knowledge and public adaptation towards climate change.

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Based on the past literature review, Figure 1 show the conceptual framework of the study.

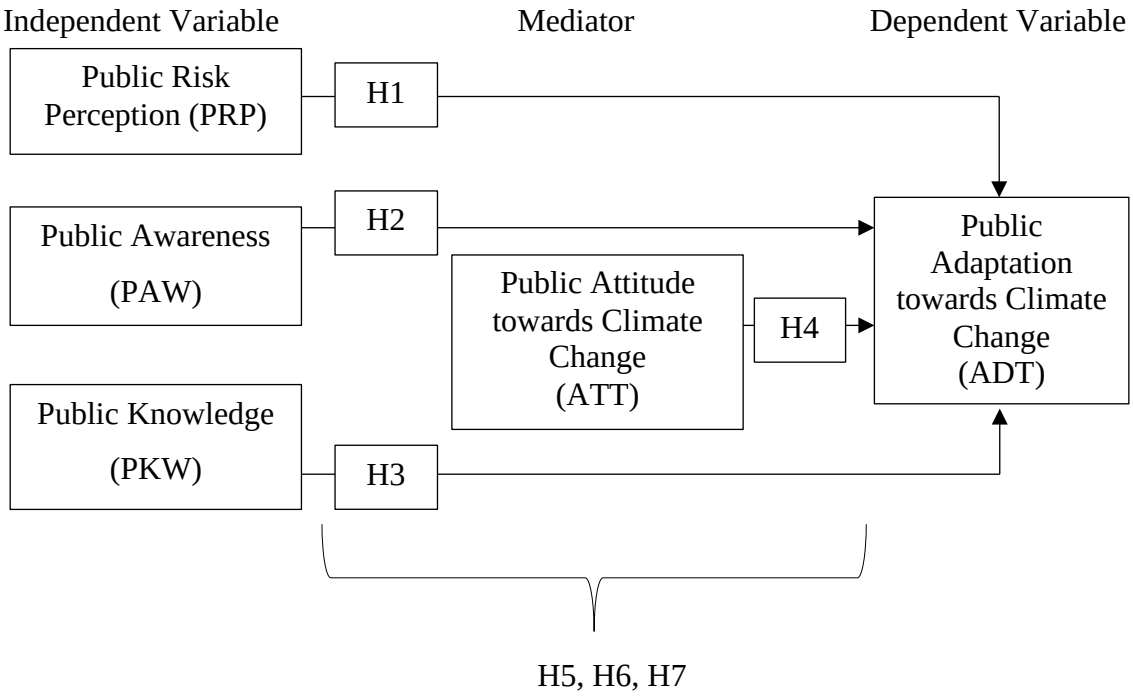

Figure 1. Conceptual Framework

Research Methodology

Sample and Data Collection

A self-administered online survey questionnaire was distributed to all Malaysians through email and social media. A random and snowball sampling technique was chosen since climate change is impacting the whole society and it was the most convenient way of collecting the necessary information and can cover the whole of Malaysia. This study conducted power analysis using G* Power version 3.1.9.2 software (Faul et al., 2007) to compute the sample size. Taking the effect size of 0.15, 5% of significant level and statistical power of 0.8, a minimum sample size of 80 was needed for the proposed framework.

The survey questionnaire consisted of two sections. First section collected respondents' demographic information and the second section collected information about respondents' risk perception, awareness, knowledge, attitude, and adaptation towards climate change.

Measurement of Constructs

Aspects measuring public risk perception, public awareness, knowledge and attitude towards climate change were adopted and adapted from Masud et al. (2015), whereas the questionnaire on adaptation towards climate change was adopted and adapted from Carlton et al. (2016). All respondents answered the survey questionnaire in a 5-point Likert scale, ranging from Strongly Disagree (1) to Strongly Agree (5).

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Data Analysis Method

Data collected was analysed using the SPSS version 22.0 and the SmartPLS version 3.0. The SPSS was used to carry out descriptive analysis as well as identifying missing values. The SmartPLS was adopted to assess the measurement model and the structural model of this study. The measurement model was used to confirm the internal consistency, indicator reliability, discriminant validity and convergent validity, whereas the structural model was used to test the research hypotheses.

Result

Descriptive Analysis

The characteristics of respondents are provided in Table 1. A total of 200 usable data was collected. The majority of the respondents were female (54%). A total of 54 (27%) respondents were between 18 and 30 years old, 78 (39.0%) respondents were between 31 and 45 years, 50 (25%) respondents were between 46 and 60 years and 18 (9.0%) respondents were 61 years old and above. In terms of educational attainment of respondents, 0.5% had primary education, 25.0% had secondary education, 28.5% had diploma, 30.0% had bachelor's degree and 16.0% had master's degree. The majority of the respondents earn salaries less than RM2,000 to RM 5,999 (85%). This information shows that this study has respondents from different cultures and socio-economic backgrounds, which are suitable for the study. Besides, people with higher education are more concerned about global severity of climate change (Sun & Han, 2018).

Table 1. Characteristics of Respondents

Demographic	Item	Frequency	Percentage
Gender	Male	92	46
	Female	108	54
Age	18 – 30 years old	54	27
	31 – 45 years old	78	39
	46 – 60 years old	50	25
	61 years old and above	18	9
Race	Malay	27	13.5
	Chinese	66	33
	Indian	98	49
	Others	9	4.5
Education	Primary	1	25
	Secondary	50	31.1
	Diploma	57	28.5
	Undergraduate degree	60	30
	Postgraduate degree	32	16
Income	Less than RM 2,000	52	26
	RM 2,000 – RM 3,999	77	38.5
	RM 4,000 – RM 5,999	37	18.5
	RM 6,000 – RM 7,999	12	6
	RM 8,000 – RM 9,999	9	4.5
	Above RM 10,000	13	6.5

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Measurement Model

The assessment of the measurement model was to test the reliability and validity of variables in this study. Table 2 summarises the results of internal consistency reliability, discriminant validity and convergent validity. Table 3 shows the results of HTMT ratio. The test began with internal consistency reliability, which provides an estimate of the reliability based on intercorrelation of the observed variables. The threshold level of Composite reliability (CR) is above 0.6 for explanatory research (Gefen et al., 2000). The CR of the observed variables in this study are from 0.855 till 0.939 indicating the study meets the internal consistency reliability.

The indicator reliability denotes the proportion of indicator variance that is explained by the variable and its level of acceptance is greater than 0.708 (Hair. et al., 2017). All variables in this study are having outer loadings more than 0.708 indicating the variable is able to explain at least 50 percent of the indicator's variance. Thus, this study has met indicator reliability and convergent validity.

For convergent validity, the Average Variance Extract (AVE) was used to identify the degree to which a variable explains the variance of its indicators (Hair. et al., 2017; Hair et al., 2014). The level of acceptance of AVE is more than 0.50. The AVE values of all variables in this study are ranging from 0.664 to 0.794, indicating that this study has met convergent validity.

Discriminant validity refers to the degree to which indicators differentiate across variables by examining the correlation between potentially overlapping measures. This study ran the Heterotrait-Monotrait ratio of correlation (HTMT) to assess its validity (Henseler et al., 2015). The threshold level for HTMT is below 0.90 (Gold et al., 2001). All variables in this study have HTMT ratios of less than 0.90, indicating that there is no overlapping among the measures.

Table 2. Internal Consistency Reliability, Discriminant Validity and Convergent Validity

	Items	Factor Loadings	CR	AVE
Public Risk Perception	PRP2. Climate change impacts on agricultural production PRP3. Due to climate change fresh water shortages will occur	0.809 0.887	0.895	0.740
	PRP4. My standard of living will decrease	0.883		
Public Awareness	PAW1. I am aware of climate change PAW2. I am aware that climate change is a serious problem PAW3. I am aware that climate change affects human life PAW4. I am aware that climate change might affect the natural environment in Malaysia	0.822 0.933 0.906 0.899	0.939	0.794
Public Knowledge	PKW1. I know climate change is happening in the country PKW2. I feel the temperature is increasing	0.876 0.859	0.893	0.735
	PKW3. The rainfall pattern is unpredictable	0.837		

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Public Attitude towards Climate Change	ATT1. The environment in Malaysia is in danger because of global climate change ATT3.Climate change damages the natural environment and wildlife in Malaysia ATT4. I'm willing to pay a certain amount to reduce the impact of climate change	0.860 0.850 0.727	0.855	0.664
Public Adaptation towards Climate Change Policy	ADT1: I would like to provide advice based on the government's climate change mitigation policy (such as greater use of renewable energy, optimize usage of energy, encourage low-carbon mobility, and promote construction of green buildings). ADT2: I should take additional steps to protect Malaysia from increased weather variability. ADT3: In my role as Malaysian, I should help the government prepare for increased weather variability. ADT5: It is important for Malaysians to adapt to climate change to ensure the long term success of government climate change mitigation policy	0.831 0.918 0.894 0.836	0.926	0.758

Note: PRP1, PKW4, PKW5, ATT2 and ADT4 were removed due to factor loading < 0.708.
CR= Composite Reliability; AVE= Average Variance Extracted

Table 3. Heterotrait-Monotrait ratio (HTMT ratio)

	Public Adaptation	Public Attitude	Public Awareness	Public Knowledge	Public Risk Perception
Public Adaptation					
Public Attitude	0.898				
Public Awareness	0.680	0.796			
Public Knowledge	0.700	0.843	0.887		
Public Risk Perception	0.678	0.822	0.892	0.875	

Structural Model

The proportion of variance explained was used to determine the accuracy of the model's predictions. In the present study, the R^2 values of public attitude towards climate and public adaptation to climate change policy are 0.525 and 0.56 respectively. The PLS-SEM model shows that public risk perception of climate change (T = 6.315, p<0.01) have positive and significant influence on public attitudes towards climate change and public attitude mediates the relationship between public risk perception and public adaptation to climate change policy (T = 2.273, p<0.01). Thus, H1 and H5 are supported. The study finds that all the other hypotheses are not supported as *p*-value more than 0.05 significance level. Table 4 shows the hypotheses results of this study.

Table 4. Hypothesis Testing Results

Hypothesis	Std Beta (b)	T Values	P Values	Decision
H1: Public Risk Perception à Public Adaptation	0.237	6.315	0.000	Supported***

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H2: Public Awareness à Public Adaptation	0.251	1.414	0.158	Not Supported
H3: Public Knowledge à Public Adaptation	0.305	1.699	0.089	Not Supported
H4: Public Attitude à Public Adaptation	0.528	0.950	0.342	Not Supported
H5: Public Risk Perception à Public Attitude à Public Adaptation	0.063	2.273	0.023	Supported**
H6: Public Awareness à Public Attitude à Public Adaptation	0.140	0.631	0.528	Not supported
H7: Public Knowledge à Public Attitude à Public Adaptation	0.098	1.851	0.064	Not Supported

Note: **p<0.01, ***P<0.001 (One tail)

Discussion and Conclusion

This study aims to explore the relationship between public risk perception, awareness, knowledge, and adaptation towards climate change, with an attitude towards climate change as a mediator. This study was adopted from Masud et al. (2015). However, Masud et al. (2015) studied the relationship between public risk perception, awareness, knowledge, and proenvironmental behaviours, and the venue of study was only Kuala Lumpur, one of the states in Malaysia. This study focused across Malaysia, , and focused on adaptation towards climate change that is vital in current literature.

Based on the results, this study finds consistent results with past literature (Akhtar et al., 2018; Masud et al., 2015; Valkengoed & Steg, 2019; Xie et al., 2019; Yu et al., 2020) that public risk perception has positive relationship with adaptation towards climate change. When the public has higher risk perception on the impacts of climate change on agricultural production, fresh water shortage and their standard of living are worsening due to climate change, they are more willing to provide advice, help the government, and take additional steps to protect Malaysia from increased weather variability. Besides, they feel that it is imperative for them to adapt to climate change to ensure the long term success of government climate change mitigation policy.

This study finds insignificant results between public knowledge, public awareness, public attitude and public adaptation towards climate change. Although the results are varied from most literatures (Akhtar et al., 2018; Choon et al., 2019; Korkmaz, 2018; Lee et al., 2019; Masud et al., 2015; McNamara, 2013; Yu et al., 2020), they are consistent with Luís et al. (2018) and Valkengoed & Steg (2019). We find that even if the public are aware and have knowledge about climate change, it does not really increase their attitude and adaptation towards government climate change mitigation policy.

The findings from this study hope to provide insights to the government on the determinants in improving public adaptation towards climate change. This study implies that the public will only adapt to climate change policy if they can feel the risk of climate change and their quality of life are affected. Rumore et al. (2016) confirmed that role-play simulation can be an effective method to improve adaptation behaviours than just teaching and disseminating climate change knowledge and information to the public. This is rather reflected in the findings of our study.

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Besides, future research can further explore the normative norms (Biesbroek et al., 2018; Juhola, 2019; Valkengoed & Steg, 2019) and human values (Corner et al., 2014) on adaptation towards climate change, which might help to explain why public awareness, knowledge and attitude are not significant in affecting public adaptation towards climate change.

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