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The Effect of Selected Factors on Adaptive Behavioural Responses to Urban Air Pollution in Malaysia

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Urban air pollution is a primary concern throughout the world due to the upsurge of urban populations and high traffic volumes in urban regions. Urban air pollution is created by the failure of the public and the environment to respond to the amount of waste produced in relatively small areas throughout high population density and concentration. The intention of this study was to examine the effect of selected factors (perceived vulnerability, perceived severity, self-efficacy and response efficacy) on adaptive behaviour to urban air pollution. The respondents (N = 450) answered a face-to-face questionnaire survey. The results reveal support for the proposed model, with perceived vulnerability (H1) and self-efficacy (H3) positively predicting adaptive behavioural responses towards urban air quality. The findings specify that there is a significant relationship between perceived vulnerability ($ß = 0.246$, $t = 4.534$, $P=0.000$) and self-efficacy ($ß = 0.510$, $t = 9.653$, $P=0.000$) to adaptive behaviour of the urban community. As a conclusion, this study validates that vulnerability and self-efficacy have a major impact on the adaptive behaviour of the community on urban air pollution in Malaysia. The study makes a significant contribution to the literature by providing evidence of these selected factors as an ideal predictor for adaptive behaviour on air pollution.

Keywords: *Air pollution, Adaptive behaviour, Urban pollution, Environmental adaptation.*

Introduction

Air pollution is a harmful material in the air, possibly causing adverse effects to humans and affecting their well-being. These undesirable materials could harm human health (Battista & de Lieto Vollaro, 2017; Lan et al., 2016; Pant, Huynh, & Peltier, 2018) and the climate (Ogwu, Peters, Aliyu, & Abubakar, 2015; Tvinnereim, Liu, & Jamelske, 2017), along with natural and anthropogenic ecosystems (Azid, Juahir, Latif, Zain, & Osman, 2013; De Marco et al., 2019; Liao et al., 2015; Setälä, Viippola, Rantalainen, Pennanen, & Yli-Pelkonen, 2013), and impact towards the economy and society (De Marco et al., 2019). Numerous epidemiological studies have reported that air pollution poses a risk to public health, especially on the respiratory, cardiovascular, and pulmonary functionality in humans (Chen, Song, Kwan, Huang, & Xu, 2018; Huang, Rao, van der Kuijp, Bi, & Liu, 2017; Wakamatsu et al., 2017). People in high density areas are vulnerable towards the exposure of ambient air pollution in both the short and long term (Yuan, Ng, & Norford, 2014). In recent years, the atmospheric haze in South East Asia has become the main concern in Malaysia due to trans-boundary pollution (Fujii et al., 2016; Othman, Sahani, Mahmud, Khadzir, & Ahmad, 2014), the rapid growth of the industrial sector, urbanisation and a high volume of motorised traffic in cities (Gorai et al., 2015; Gulia, Shiva Nagendra, Khare, & Khanna, 2015; Shakir, Saudi, & Abu, 2017; Sue Wen, Fauzan Mohd Nor, Fazilan, & Sulaiman, 2016). Accordingly, urban air pollution is a major global problem in both developed and developing countries (Gorai et al., 2015; Gulia et al., 2015). As reported by the World Health Organization (WHO) (2019), 91 per cent of the world's population lives in areas beyond the WHO's air quality guideline limit. Urban areas with high population densities and people continually moving within the area can lead to an acquaintance of human receptors and ultimately, lead to illness. As such, the global environmental issue of air pollution in urban environments needs to be addressed effectively. Basically, the main sources of urban air pollution in Malaysia are vehicles, stationary and transboundary sources (Azid et al., 2013; Ee-Ling, Mustaffa, Amil, Khan, & Latif, 2015). Despite external factors, urban air pollution is also caused by public and environmental failure to respond to waste levels created by high population density and concentration in relatively small areas (Mabahwi, Leh, & Omar, 2015). Due to the vehicles, combustion process, and industries, a study by Sahrir, Abdullah, Ponrahono, and Sharaai (2019) identified that sulphur dioxide (SO_2), carbon dioxide (CO_2), nitrogen dioxide (NO_2), and particulate matter 10 micrometres (PM_{10}) were the major parameters contributing to the degrading air quality in urban areas in Malaysia. The severe impact of air pollution in urban areas has been known for years, but the behaviour of the community regarding them is vague (Ban, Zhou, Zhang, Anderson, & Li, 2017; Huang et al., 2017).

In order to resolve these issues, a series of behaviours and actions must be taken seriously by the community, as it affects all parts of the community, directly or indirectly. The main objective of this study is to evaluate the effect of selected factors (perceived vulnerability, perceived severity, self-efficacy and response efficacy) on adaptive behaviour to urban air pollution. Several studies show that it is important to not only address the spatiotemporal variability and patterns of air pollutants but also to retain other behavioural characteristics of the community themselves (Ban et al., 2017; Lan et al., 2016; Oltra & Sala, 2014; Oltra et al., 2017). There is a rising concession that environmental behaviour relies upon on the way people consider the environment (Keshavarz & Karami, 2016). Interpreting human behaviour in all its complexity is a difficult task. To date, there are numerous models that try to interpret and predict behaviour (Jansen & Van Schaik, 2016). As concluded by Rainear and Christensen (2017), pro-environmental behaviours are difficult to upsurge as people often do not feel motivated to deal with a matter that seems to be secluded psychologically. In the importance of encouraging peoples to decrease the exposure to air pollution and lessen the health risks and impacts, this study addresses the deficiency in the understanding of community adaptation towards air pollution. Adaptive behaviour can be defined as the capability to care for oneself and function in the community, which includes skills such as self-direction, sustaining health, safety and involvement in social activities (Crawford, 2013). Adaptation not only aims to prevent the effects of pollution, but the victims must be prepared to accept substantial changes in their lives for the ascertainable future (Nagle, 2011). There are several studies indicating that the concept of adaptive behaviour is still emerging, and the definition even then has been a source of disagreement among researchers. Previous study on behaviour to air pollution deliberated on travel behaviour and the pattern of community (Sá et al., 2017), avoidance behaviour by using a filtering mask (Sun, Kahn, & Zheng, 2017), protective behaviour on smog episodes (Jiuchang Wei, Zhu, Marinova, & Wang, 2017), concern behaviour towards air pollution (Ban et al., 2017), and consumer's green purchase behaviour (Joshi & Rahman, 2016). However, there were a limited number of studies on adaptive behaviour on air pollution and how the urban community adapts to the negative impacts of these issues. Through a better understanding of the behaviour response of the urban community towards the poor-quality of air, the negative impacts of air pollution can be reduced.

Literature Review and Hypotheses Development

Adaptative Behaviour on Air Pollution

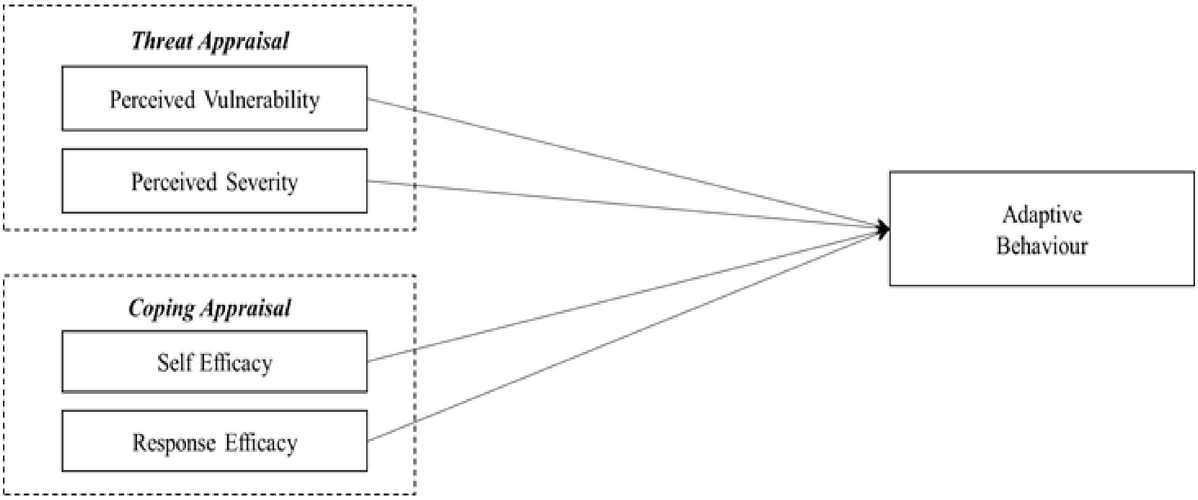
From an adaptive viewpoint, it is justifiable for individuals to adjust their behaviour depending on the current and local conditions, which may result in differences on behaviour between an individual (Ban et al., 2017; Junni Wei et al., 2014). Some scholars further explained that adaptation can also be referred to as an individual that participates in self-care, manages their social situations and applies skills to meet their own needs, primarily based on their degree of development (Perfect, Archbold, Goodwin, Levine-Donnerstein, & Quan, 2013). It is important to consider adaptive behaviour to determine how well an individual functions in daily life; vocationally, socially and educationally. Adaptive behaviour in an air pollution context can be defined as the additional protective behaviour, concern behaviour (Oltra & Sala, 2014) and daily normal behaviour (Ban et al., 2017). In addition, when dealing with environmental risks such as air pollution, individuals may have numerous views about how these problems have originated, impacts they have and how to better manage the hazard to reduce the impacts. An impact-oriented description must be adopted to identify and prioritise activities that can make a significant environmental difference (Oltra et al., 2017). Previous studies on adaptive behaviour focussed on employee adaptive behaviour in service enactments (Leischnig & Kasper-Brauer, 2015), pedestrian adaptive behaviour in the hot outdoors (Melnikov et al., 2017), thermal adaptive behaviour (Melnikov et al., 2017), adaptation to coastal flooding (Koerth et al., 2013), and adaptation to climate change (Osberghaus, Finkel, Pohl, et al., 2010), but there is a lack of study in adaptive behaviour to air pollution. Individuals with chronic cardiovascular or respiratory disease, the elderly, and foetuses are generally considered to be more vulnerable to major air contaminants (Ban et al., 2017; Laumbach, Meng, & Kipen, 2015). Additionally, the adaptive behaviour in response to air pollution can be derived by using risk perception (Huang et al., 2017) and behavioural change (Zhou et al., 2016). These concepts cite environmental, personal, and individual characteristics as the major factors in behavioural determination towards the risk and behaviour change.

One of the key issues with the concept of adaptive behaviour is the lack of fundamental theory and framework that has never been fully resolved (Price, Morris, & Costello, 2018). Attempts were made by previous studies to determine which theory best explains adaptive behaviour. These studies revealed inconsistent and inconclusive results as they mostly used variables from an existing or modified theoretical source that focusses on one aspect of behaviour (Price et al., 2018). One of the preferred theories to explain human behaviour towards environmental risk, such as air pollution, is the Protection Motivation Theory (PMT) by Rogers (1975). This theory is an ideal example of a framework that can be applied by scholars for describing the adoption of adaptive behavioural responses on air quality. It is used to explain risk-reduction behaviours or intentions to perform protective behaviours. In 1983, Rogers' revised this theory that interprets the cognitive mediation progression of behavioural modification in relation to threat and coping appraisal (Plotnikoff & Higginbotham, 2002). We argue that PMT is a suitable framework for explaining the adaptive behavioural responses of the community. Even though the theory originates from health protection and psychological range, numerous studies from the field of environmental behaviour affirm the association of cognitive variables in adaptation behavioural responses (Koerth et al., 2013). This theory presents a systematic way of understanding behaviours or fears and appeals to how people cope with them. PMT not only emphases on the individual costs of adaptive behaviour (Keshavarz & Karami, 2016), but also considers the aspects of collective action consisting of two cognitive processes, namely coping appraisal and threat appraisal (Hatamzadeh, Morowatisharifabad, Zamani-alavijeh, Fallahzadeh, & Mosaddegh, 2016; Thrul, Stemmler, Bühler, & Kuntsche, 2013) that linked with maladaptive responses and adaptive behaviour (Hassani et al., 2014). In general, if individuals feel more threatened regarding the consequences of not executing an action and, at the same time, adapt to this threat, there is a reason for changing their behaviour.

Threat and Coping Appraisal

Threat appraisal can be defined as a cognitive process used to assess the level of threat, which comprises of two important aspects: (1) the person's evaluation of the severity of the risk (perceived severity); and (2) the person's evaluation of the probability of reducing the risk (perceived vulnerability) (Janmaimool, 2017). Fundamentally, a higher expectation of severity and vulnerability is probably enhancing individual motivation to execute risk preventative behaviour (Janmaimool, 2017). A study by Koerth et al. (2013) indicated that the cognitive variables such as risk perception, severity and vulnerability were initiated to be more significant than socioeconomic variables for predicting adaptive behaviour. In addition, coping appraisal comprises of (1) the individual's expectation that executes their actions that can eliminate the risk (response efficacy), and (2) belief in one's competence to perform the advised course of action effectively (self-efficacy) (Keshavarz & Karami, 2016). One of the best predictors for adaptive behaviour is self-efficacy, on how individuals evaluate their own capability of undertaking adaptation measures (Koerth et al., 2013). The previous study reported that self and response efficacy correspondingly have a significant impact on household green behaviours (Zhao, Cavusgil, & Zhao, 2016). As mentioned by Rainear and Christensen (2017), self-efficacy, response efficacy, and severity are the strongest predictors of intentions to behave consciously to reduce the negative impact of one's practices on the natural and built environment. Moreover, response efficacy, self-efficacy, perceived vulnerability and severity had a positive relationship with the intention to cope with the health risk (Mohammad Ali Morowatisharifabad, Mahdi Abdolkarimi, Mohammad Asadpour, Mahmood Sheikh Fathollahi, & Parisa Balaee, 2018). Basically, if threat appraisal is high but the coping appraisal is low, the feedback will be to indulge in some analytical way or as non-adaptive behaviours such as avoidance and renunciation of the threat (Osberghaus, Finkel, & Pohl, 2010). As most studies focussed on health-related behaviour, the generalisation of these findings in the context of environmental behaviour must be performed thoroughly. It is acknowledged that individuals who show a high level of perceived risks and perceived self-capability would be further dynamic in their adaptive behavioural responses on air pollution and the risks behind it. In summary, the four main components of our proposed model are perceptions of vulnerability, severity, self-efficacy, and response efficacy. Nevertheless, it is significant to study the community adaptive behaviour towards urban air pollution as a lack of thought has been specified to the role of psychological barriers in behaviour to air pollution. This conceptual idea has been derived from related concepts and the existing theory of PMT by Rogers (1975). The conceptual framework of this study (refer to Figure 1) has been adapted from the study by Woon, Tan, and Low (2005), and Plotnikoff and Higginbotham (2002), which discussed the PMT as the predictors that explain the model on recommended behaviour.

Figure 1. The conceptual framework of the study



In accordance with the above discussions, this study hypothesised that perceived vulnerability, perceived severity, self-efficacy and response efficacy can positively predict adaptive behaviour on urban air pollution among the community. The hypotheses thus formulated are as follows:

H1: There is a positive relationship between perceived vulnerability and adaptive behaviour.
H2: There is a positive relationship between perceived severity and adaptive behaviour.
H3: There is a positive relationship between self-efficacy and adaptive behaviour.
H4: There is a positive relationship between response efficacy and adaptive behaviour.

Methodology

Population, Sample Size and Sampling Procedure

This descriptive-analytical study was conducted to test the model. The face-to-face questionnaire survey was performed on a random sample of 450 individuals in Klang Valley, Malaysia. Over the years, the cities of Klang Valley have seen substantial growth, leading to a good economy. This also leads to the worsening air pollution in Klang Valley and was related to the increased rate of respiratory diseases, which are among the ten primary sources of death in Malaysia (Rahman et al., 2015). Thus, this area is well suited to represent the urban air quality and community responses towards it. Initially, the multi-stage cluster sampling method was implemented for narrowing down the large pieces of the study area into smaller portions and systematically in stages until the sampling units were reached. The samples were randomly selected from three clusters of ten planning local authorities, and formerly, using random numbers, they were chosen to reach the sample size. The inclusion criteria included those aged 18 years and over and being a resident in the study area for at least one year. A set of the survey questionnaire was deliberately constructed to ensure most of the issues concerning air pollution and community adaption towards the risk were included.

Instrument and Data Analysis

Consistent with PMT theory, protection motivation was operationalised as selected factors on adaptive behavioural responses on urban air pollution as the main risk. These items were adopted and adapted from a review of measures by Ban et al. (2017) on a seven-point scale ranging from one (strongly disagree) to seven (strongly agree) for all predictor variables, with all items averaged to create a composite variable of adaptive behavioural responses. As for the adaptive behaviour variable, a seven-point scale ranging from one (never) to seven (always) that represented the frequencies of the respondents' behaviour were inquired. As stated by Finstad (2010), it was found that the seven-point item scale emerged as the best overall for psychometric study. As for this study, the four PMT constructs were adapted from the previous environmental study, such as predictors of pro-environmental behaviours (Kim et al., 2012), household adaptation on risk (Koerth et al., 2013), protection motivation explanation based on consumers' environmental sustainability (Zhao, Cavusgil, & Zhao, 2016) and protection motivation analysis of green consumption choices (Hellen, 2017). Several factors (perceived vulnerability, perceived severity, self-efficacy and response efficacy) were measured. The data were analysed by using the IBM SPSS software. In order to assess mean values, mode and standard deviations, a descriptive statistical analysis was derived. For inferential analysis, data were analysed using SmartPLS software.

Validity and Reliability of the Instrument

Any instrument is alleged to be valid when it measures what it is likely to be measured (Pandey & Pandey, 2015). Convergent and discriminant techniques are two types of construct validity in the SEM method (Samani, 2016). Based on Henseler, Hubona, and Ray (2016) and Hair, Hult, Ringle, and Sarstedt (2017), an instrument attained its validity convergence if it attained three rules; all individual item values exceeding 0.7, composite reliability values of not less than 0.8, and Average Variance Extracted (AVE) values exceeding 0.5. However, loading values equal to or greater than 0.5 are acceptable, if other items have high scores of loading to complement AVE scores greater than 0.5 (Byrne, 2016). Several indicators with loadings lower than 0.7 have been kept as the minimum if an AVE result of 0.5 was achieved.

Based on the findings, it displayed that all the conditions have achieved the requirement of convergent validity (refer to Table 1). Additionally, the results exhibit that composite reliability values range from 0.632 to 0.946, and average variances extracted range from 0.513 to 0.746. These values exceed the standards of 0.6 and 0.5, respectively. An examination of discriminant validity reveals that the square root of each predictor's average variance is higher than the correlation of that factor with all other factors in the model. Hence, the result discloses substantial discriminant validity.

Cronbach's alpha is the most popular technique and the recommended method of examining the internal consistency and reliability of the variables to confirm consistent measurement across time and various items in the instrument (Taber, 2017). The values range of Cronbach's alpha is from zero to one, where the higher value represents a better reliability (Al-Osail et al., 2015). It is the most popular technique and recommended method of examining the internal consistency and reliability of the variables to ensure consistent measurement across time and various items in the instrument. A value of 0.7 and above is considered to be accepted and meet the requirement of the internal consistency. Based on the results, the Cronbach's alpha value of all constructs is greater than 0.8, and thus exceeds the recommended threshold of 0.7. Therefore, it can be concluded that the constructs meet reliability and convergent validity requirements (refer to Table 2).

Table 1: Measurement Model

Variables	Item	Cross loading	Composite value	AVE value
Adaptive Behaviour (AB)	ABR1	0.588	0.866	0.520
	ABR2	0.769		
	ABR3	0.779		
	ABR4	0.782		
	ABR5	0.687		
	ABR6	0.703		
Perceived Vulnerability (PV)	PVL1	0.788	0.900	0.643
	PVL2	0.837		
	PVL3	0.779		
	PVL4	0.822		
	PVL5	0.783		
Perceived Severity (PS)	PSV1	0.938	0.896	0.746
	PSV2	0.946		
	PSV3	0.681		
Self-efficacy (SE)	SEF1	0.805	0.927	0.645
	SEF2	0.765		
	SEF3	0.766		
	SEF4	0.773		
	SEF5	0.861		
	SEF6	0.836		
	SEF7	0.810		
Response Efficacy (RE)	REF1	0.785	0.880	0.513
	REF2	0.833		
	REF3	0.714		
	REF4	0.688		
	REF5	0.637		
	REF6	0.632		
	REF7	0.701		

Table 2: The value of Cronbach's alpha coefficient by constructs

Construct	Cronbach's Alpha Coefficients
Adaptive Behaviour	0.814
Perceived Vulnerability	0.873
Perceived Severity	0.832
Self-efficacy	0.908
Response Efficacy	0.866

Results and Findings

Descriptive Analysis

The findings indicated that the mean value of the five constructs is within the range of 4.343 to 5.443, with the standard deviation at 0.924 to 1.025, using the seven-point Likert Scale. As reported in Table 3, the urban community were moderately trying to adapt to air pollution as the mean for every construct is also in the moderate level.

Table 3: Descriptive Analysis

Construct	Mean	Standard Deviation
Adaptive Behaviour	4.670	0.978
Perceived Vulnerability	4.544	1.025
Perceived Severity	4.343	0.924
Self-efficacy	4.636	1.016
Response Efficacy	5.443	0.802

Analysis of Research Hypotheses

Figure 2 exhibits the presence of four independent variables into the SmartPLS route model where it has contributed 47 per cent to the change of the dependent variable, which is adaptive behaviour. The statistical significance of all structural parameter estimates was tested to determine the validity of the proposed paths. The estimates of the structural parameters and the results of the hypothesis test are shown in Table 4.

Figure 2. Analysis of the SmartPLS route model

Table 4: Hypothesis Testing

Hypothesis	**Relationship**	**Beta,ß**	**t Value**	**P-Value**	**Decision**
H1	Perceived Vulnerability > Adaptive Behaviour	0.246	4.534	0.000	Supported
H2	Perceived Severity > Adaptive Behaviour	0.022	0.437	0.331	Not supported
H3	Self-efficacy > Adaptive Behaviour	0.510	9.653	0.000	Supported
H4	Response Efficacy > Adaptive Behaviour	0.011	0.240	0.405	Not supported

$p < 0.05$

The hypotheses tested using the SmartPLS route model analysis were derived in two significant findings. Firstly, the perceived vulnerability has a positive and significant relationship towards adaptive behaviour (ß = 0.246, t = 4.534). Secondly, self-efficacy has a positive and significant relationship towards adaptive behaviour (ß = 0.510, t = 9.653). However, contrary to prior studies, the two assumed predictors of perceived severity and response efficacy are not significant in this context of the study. In previous studies, it was stated that perceived vulnerability, severity, self-efficacy and response efficacy (Cismaru, Cismaru, Ono, & Nelson, 2011; Koerth et al., 2013) had a significant impact on adaptive behaviour. Hypothesis H1, which asserts that perceived vulnerability has a positive effect on adaptive behaviour, was statistically significant. People who believed that the risk is severe and vulnerable might adapt more and take extra measures to reduce the risk (Koerth et al., 2013). However, the study by Janmaimool (2017) stated that perceived vulnerability was not significantly affected by pro-environmental behaviour to reduce the impact of the environmental threat. Research hypothesis H2, which suggests that perceived severity has a positive effect on adaptive behaviour, was also verified and the relationship between these two variables is not statistically significant (ß = 0.022, t = 0.437). This is in line with the study by Janmaimool (2017) which reported that not all types of sustainable behaviour to reduce the impact of environmental pollutants were affected by perceived severity. It was also not associated with adaptive behaviour, as some people might not take any initiative to avoid polluted areas (Oltra & Sala, 2018). Some studies found that perceived severity significantly influences pro-environmental behaviour and they will behave accordingly to reduce the impact of the risk (Keshavarz & Karami, 2016; Zhao et al., 2016).

Hypothesis H3 claims that self-efficacy has a positive impact on adaptive behaviour and was accepted statistically. Self-efficacy contributes to the shaping of the community to adapt to the environmental risk and create their ability or the potential to respond successfully to any change (Cowie et al., 2015; Lepori, 2016; Wolf, Allice, & Bell, 2013). Both high and low self-efficacy can lead to counterproductive outcomes for adaptation. In contrast, the relationship between self-efficacy and pro-environmental behaviours was found to not be significant (Wai Yoong, Bojei, Osman, & Hashim, 2019). Research hypothesis H4, that implicit variable of response efficacy (ß = 0.510, t = 9.653) has an impact on adaptive behaviour, was statistically rejected (ß = 0.011, t = 0.240). Osberghaus, Finkel, Pohl, et al. (2010) and Kim et al. (2012) verified that providing behavioural advice on certain adaptation may upsurge coping appraisal and thus, perceived adaptive capacity by raising the response efficacy. Nevertheless, some studies identified that response efficacy did not influence people's behaviour towards reducing environmental threat (Janmaimool, 2016). The findings have confirmed that perceived vulnerability and self-efficacy acted as a predictor of variables which are significant to the adaptive behaviour of the urban community on air pollution. In addition, the findings also indicate that the self-efficacy variable is the most powerful predictor that influences the adaptive behaviour, in comparison to other predictors.

Personal experiences of air pollution exposure have been described as a significant factor in changing people's usual behavioural responses in order to reduce the harmful effect of air pollution (Ban et al., 2017). When people have been adversely affected by hazardous air pollution, they may perceive the risk as risky and their efficacy towards air pollution is much higher than others. However, people that always cope with air pollution, such as people who are working in a construction area or staying near factories, may perceive the risk differently. Gradually, they will accept the pollution as normal and not take extra measures to reduce the impact as stated by Egondi et al. (2013). Air pollution seems to have a greater negative impact on chronically ill patients, the elderly, pregnant women, and infants (Lin, Li, & Bautista, 2017). For the young and healthy generation, they tend to ignore the news information obtained from the press as it is less likely to create a perception towards the risk beliefs about themselves. Consequently, if health authorities attempt to motivate the public to adopt self-protective and concern behaviours (e.g., reducing outdoor activities or wearing masks during haze), their health campaigns should emphasise on increasing people's risk perceptions about air pollution.

Discussion and Conclusion

The overall objective of this study was to provide a credible analysis of adaptive behavioural responses to air pollution and the factors driving these responses among the urban Malaysian community. Based on literature and configuration theory, this study confirmed that community perceived vulnerability and self-efficacy combine to form configuration for predicting adaptive behaviour of an urban community on air pollution. Ambiguous theory on adaptive behaviour (Ban et al., 2017; Price et al., 2018) has led to using PMT to predict the behaviour of the community towards the risk of air pollution. Furthermore, the lack of material and literature on individual adaptive practice and behaviour, especially towards air pollution, makes related analyses challenging. The present study showed that although there was a correlation between all the constructs of the PMT with the adaptive behaviour on air pollution, only perceived vulnerability and self-efficacy were able to predict the behaviour. Thus, it seems that intervention based on the constructs of this theory emphasising these factors can increase the incentive to initiate adaptive behaviour towards the impact of air pollution, especially in the urban area. The findings of this study contribute great implications, especially to the literature in several ways. First, this study expands the literature by unravelling factors of adaptive behaviour towards the risk of air pollution. By having high perceived vulnerability and self-efficacy in the individual community, these will create a strong adaptation level of the community in urban air pollution. Through understanding the urban air pollution risk and issue by focussing on how people behave and take preventive measures, the impact of air pollution can be lessened. As air pollution is a global issue, whether in developing or developed countries, these findings of the relationships among identified factors can be applied to study similar problems in other contexts.

In the context of policy and air pollution management, the observations about governments' interventions were largely media influenced and can affect the behaviour of the public (Tvinnereim, Liu, & Jamelske, 2017). Stimulating behavioural change and community engagement is deliberated as a serious issue in air pollution management. In addition, actions intended at influencing individuals' attitudes and behaviours generally consist of public information campaigns and warning systems which aim at reducing exposure to pollution, especially towards the most vulnerable in the community (Oltra et al., 2017). A study discovered by Chen et al. (2018), for example, observed the efficiency of an air quality alert programme covering Toronto. The result identified that interventions depend on warning systems and information campaigns alone to reassure exposure avoidance and intended emission control could produce little benefit if not attended by mandatory actions by the government. Our results and findings will assist policymakers to better comprehend community responses and adaptations to air pollution. In addition, they may as well recognise the possible ways to accomplish the implementation of effective mitigation measures which will reduce the risk of air pollution towards the community. The level of validity and reliability of the instrument is demonstrated to be outstanding, through decent literature review and data collection procedures. This has enabled reliable and effective work by the researchers. This model's proposed factors can explain a 47 per cent variance in adaptive behaviour, indicating a certainty to examine other possible variables such as prior experience with air pollution (e.g., risk perception (Egondi et al., 2013; Huang et al., 2017; Oltra et al., 2017; Tvinnereim et al., 2017), attitudes (European Commission, 2013; Smallbone, 2010) and socio-demographic factors in future studies to better explain adaptive behaviour towards air pollution, especially in the community. In addition, the use of urban community samples can restrict the generalisability of the outcome to other social groups, other than the urban community. Future research can conduct a nationwide survey to give an overview and findings in their context. The air quality policy needs to illustrate that the clear majorities of the public, experts and national authorities all reinforce policies, such as stricter caps on air pollutant emissions.

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