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Consumer Perception, WOM, Purchase, and Green Behaviour in Response to the PM2.5 Phenomenon

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Abstract

A silent killer is an apt description of PM2.5 as this invisible tiny dust is very harmful for people's health. PM2.5 negatively affects the lives of people in many parts of the world including Thailand. This problem became the talk of the town in Thailand when Bangkok shot up to be among the worst three cities with the highest air pollution (world AQI ranking) in 2019. This study seeks to understand how Thai consumers perceive and respond to this challenging situation — including whether and how they purchase products such as masks and air purifiers to help protect them from PM2.5. Additionally, this research investigates what could encourage people to act together to save the environment. It was found that the PM2.5 topic has engaged Thai people. They spread word-of-mouth regarding this issue. Around 6 out of 10 Thai people wear masks to protect themselves from PM2.5. Thai people seem to adopt their behavior in ways that require little to no cost and minimal effort. For example, they close windows, but they do not refrain from doing what they are used to such as cooking methods that produce a lot of smoke, or lighting incense during Chinese New Year. When they buy PM2.5-related products i.e. masks, they make their purchase decisions primarily on the product's attributes and brand. People's negative attitude towards PM2.5 and its perceived danger are not sufficient to lead to green behavior; while environmental concern such as the belief that people are harming the balance of the nature does. Scholars can use these findings as a foundation to further study and extend the knowledge frontier of green consumer behaviour. Managers and policy makers can collaborate in facilitating the right environment to act green, as well as ingraining and reinforcing green behaviour in Thai society.

Keywords

Pollution, Consumer signaling, Green behaviour, Word-of-mouth, Environmental concern

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Introduction

PM2.5 is very damaging to peoples' health. The unseen property of PM2.5 makes the matter worse as many people are not aware of, or forget, or are not used to protecting themselves from this danger. With the detrimental effect of PM2.5, the Thai government announced this issue to be on the national agenda in quarter 1, 2019 (National News Bureau of Thailand, 2019). Despite that, Bangkok's air quality has continued deteriorating and the city was among the worst three city in the world Air Quality Index (AQI) rankings in quarter 3, 2019. In other words, Bangkok was among the top cities with the worst air quality in the world, after Lahore, Pakistan and Delhi, India (Bangkokbiznews, 2019; Thairathonline, 2019). This issue became the talk of the town among Thai consumers. News and information regarding PM2.5 was widespread in mass communication, social media, and in everyday conversation.

Many Thais, following the news, took steps regarding the PM2.5 issue. In terms of purchases, Thai consumers searched for products to prevent them from the harm of PM2.5 dust. PM2.5 masks and air purifiers were sold out at many retailers, both in online and offline channels.

While prior research conducted in Brazil and Iran found that consumers' concern for the environment does not lead to green behaviour (Filho et al., 2017; Nejati et al., 2011), there was recent research conducted in China which found that the PM2.5 situation stimulated green behaviour such as buying electric vehicles (Guo et al., 2020). It is interesting to see if the PM2.5 situation in Thailand could also be the catalyst to make Thai people—who are relatively novice to PM2.5 compared to Chinese—realize the negative impact of environmental problems on each individual, and behave in a way to reduce PM2.5. This situation possibly influences consumers towards green behaviour. That is to be consumers who care for the environment and behave in such a way that protects the environment or reduces the negative impact on the environment. One aspect of this behaviour is being a consumer who contributes to sustainability.

Despite the green attitude above, there are also some conflicting thoughts which could be an obstacle in becoming green consumers. That is, consumers may have to trade off some convenience. They may have to change their lifestyle, including some activities involving religious beliefs. For example, some Thais have gotten used to lighting incense in their homes. They now have to decide between not lighting incense or lighting incense. If they do not light incense, they are promoting good health for themselves and people around them. However, in doing so, they have to alter traditions and religious rituals as they have always been done.

With this situation happening, it is important to understand how Thai consumers perceive the situation, and how they respond to it. The consumer aspect is important

because how one consumes reflects how one actually lives one's life (Solomon et al., 2017). The term consumers and people will be used interchangeably in this paper.

Prior research mainly discusses the danger of PM2.5 and its causes (such as Apte et al., 2015; Dockery & Pope, 1994; Xing et al., 2016; Zhang et al., 2013). Research that studies how consumers are exposed to media (Puncreobutr et al., 2019) and how consumers spend during this situation (Jung, 2020) do not cover how consumers perceive the situation and how they live their lives, as well as how they buy—what marketing signals they rely on.

Therefore, the current research seeks to understand the perception of Thai consumers towards the PM2.5 situation. Additionally, it is interesting to see how consumers shopped for appropriate products during that period. More importantly, does this PM2.5 situation lead Thai consumers to become green consumers, given that they now experience the impact of environmental issues firsthand.

The findings serve as a foundation for scholars to extend knowledge in this field. Managers can learn how consumers perceive, live, and buy, so that they can effectively communicate with consumers. Last, but not least, managers and policy makers can apply the findings to facilitate/regulate consumers to bring the best out of them regarding their green behaviour.

Literature Review

Bangkok's air pollution caused the city to move from being the twenty-eighth most polluted city in the world (2018 annual average number) (IQAir AirVisual, 2019) to number three on the Air Quality Index (AQI) in early 2019. (Air Visual, 2019). The AQI is used worldwide to communicate air pollution levels. This is among other incidences that make people aware of the danger of the deterioration of the environment (Chan, 1996). These incidences have drawn consumers, business sectors, and academia to pay attention to environmental issues (Junior et al., 2015).

Prior research mainly focuses on the cause (Querol et al., 2001; Querol et al., 2004; Zhang et al., 2013; Zheng et al., 2005), health impact (Apte et al., 2015; Dockery & Pope, 1994; Wang et al., 2020; Xing et al., 2016; Zhang et al., 2020), and economic loss as a result of the health effect (Wang et al., 2020) of PM2.5. Among the under-researched areas involving consumers, there is one paper that studied media exposure on Thai people. The researchers found that those who are in Bangkok and those who have a Bachelor's degree and higher have more media exposure than those residing outside the capital, as well as those with lower education (Puncreobutr et al., 2019). However, there is still a knowledge gap of how Thai consumers perceive and respond to PM2.5. Additionally, the prior research that focuses on consumer expenditure found that Korean consumers reduced spending on non-PM2.5 related categories, and increased spending on PM2.5 related categories in 2017 (Jung, 2020). However, there is still a gap in finding out how consumers make decisions

during this situation. For example, the marketing signals consumers rely on in making such purchases.

Given this changing and impactful situation, it would be helpful to understand the perception and behaviour of consumers, so that business people and policy makers can help make this world a better place to live. The business sector is a "meso-level" actor that is a powerful player in implementing sustainability in society (Kolk et al., 2010; Testa et al., 2018). In fact, the macro-level actor (i.e. legal system) and micro-level actor (i.e. consumer) alone cannot succeed in implementing environmental projects without involving the meso-level players (Testa et al., 2018).

Perception is a process that a consumer gives meaning to the stimuli based on each one's experience and background. The consumer perception process begins with consumer's selection, organization, and interpretation of the external sensory stimuli (e.g. sound) through the five senses (e.g. hearing) (Solomon, 2011). The perception of interest in the current study is the perceived danger of PM2.5.

Apart from the perception and response people have to PM2.5, the key variables marketers usually employ to understand the perception of consumers include affective response and attitude. Marketers and policy makers can predict consumer behaviour by understanding the consumer's attitude (Mostafa, 2007). Attitude is an important variable as it reflects the likes and dislikes of consumers. It is the brisk evaluation of an object (Ajzen 2001) such as like-dislike, positive-negative, good-bad, and favourable-unfavourable (Holbrook and Batra, 1987). With behavioural intention, attitude will affect behaviour (Bagozzi, 1981). For the PM2.5 context, the perceived danger also is included so that this research will better fit the context of the study.

Word-of-Mouth (WOM) is one behavior of interest in this research. WOM was first defined in 1967 as a spoken, interpersonal conversation about a brand or an offering between a message sender and a receiver in a noncommercial way (Arndt, 1967). WOM in the digital era is now termed electronic WOM (eWOM) and the definition has evolved to be "consumer-generated, consumption-related communication that employs digital tools and is directed primarily to other consumers" (Rosario, de Valck & Sotgiu, 2020, p.427).

WOM is important as people are motivated to both send and receive WOM messages. These messages influence how consumers live their lives and make purchases. People spread WOM for a variety of reasons including altruism (Hennig-Thurau et al., 2004) and gaining social value from their community members (Peters et al., 2013). At the same time, people are motivated to seek messages via WOM due to a variety of reasons including uncertainty reduction (Moe & Trusov, 2011) and decision making (Moore & Lafreniere, 2020).

WOM is related to the knowledge people have as it determines the accuracy of the message people spread. Consumer knowledge can be classified into subjective knowledge

and objective knowledge. Subjective knowledge is the perceived knowledge one has about himself/herself (Carlson et al., 2009; Park et al., 1988); while objective knowledge is the measurable knowledge one actually possess (Leonhard et al., 2020). While subjective knowledge might not be accurate, it influences credibility (Lee & Koo, 2012). Prior research found that both types of knowledge have a positive effect on the purchase intention of green products (Khaleeli et al., 2021).

From the discussion above, marketers are interested in consumer attitude because it is a good predictor for consumer behaviour. Following the hierarchy of effects model, it is common that consumer behaviour will take place as a result of a person's cognitive and affective response (Heath & Feldwick, 2008). In the current study, the behaviour of interest lies in the behaviour as a response to the PM2.5 situation, as well as the purchasing behaviour and the green behaviour.

The purchasing behaviour in this research refers to how consumers make purchases, particularly during the PM2.5 situation. Most Thai consumers began to know the term PM2.5 roughly in 2018 (BBC News, 2020), so they could be novices in buying PM2.5-related product categories, and therefore look for quality signals as a shortcut. In terms of time availability, if consumers feel the urgent need to use a product, they should need the product as soon as possible. The time pressure could make consumers rely on quality signals rather than actively process information. Additionally, buying high-quality products is important. For example, if consumers accidentally buy fake PM2.5 masks, they could end up inhaling PM2.5 dust. Therefore, they are likely to rely on quality signals such as brand and price (Petty & Cacioppo, 1986). The focus on the purchasing behaviour in this paper is whether consumers rely on marketing signals; if yes, which signals consumers pay attention to before making their purchase decision. For example, some give priority to the brand. Others may pay attention to price, and believe that the higher the price, the higher the quality.

Consumers and sellers usually do not have the same level of information. When consumers are not certain about the actual quality of a product, they will look for signals that convey quality (Kassarjian, 1978; Nelson, 1970). According to cue utilization theory proposed by Cox in 1962, there are two elements in the cue perception process. The first element is cue predictive value, which is how much a cue can represent the quality. The second element is cue confidence value. This latter element refers to how much confidence consumers have with their cue judgement (Olson & Jacoby, 1972). In this research, the author seeks to understand whether and how consumers buy during the PM2.5 situation. That is, what cues they use in that situation. If marketers and policy makers understand what cues are important for consumers, they would be able to manage those cues accordingly. The term signal and cue will be used interchangeably in this paper.

Apart from the purchasing behaviour, this research seeks to understand consumers' green behaviour—including households' PM2.5-reduction behaviour (Shi et al., 2017) such as cooking (which may also emit PM2.5). This does not come naturally, as some consumers could be used to indulging and rewarding themselves. Self-indulgence and self-rewarding behaviour are not favourable in addressing environmental concerns (Follows & Jobber, 2000). This is because they may have to come out of their comfort zone, and adjust the way they live their lives in order to help the environment. For example, they may have to take public transportation instead of using their personal car. They may have to bring their reusable shopping bag to the supermarket, instead of just using the plastic bag provided by the retailer.

From the above discussion, apart from the exploratory objective of this research, five specific hypotheses were proposed. There are three main parts of the five hypotheses, covering thinking, speaking, and doing — around environmental and PM2.5 issues. The first three hypotheses focused on consumer's feeling and thinking that could lead to green behavior; followed by a hypothesis on consumer's knowledge which involved communicating/spreading word-of-mouth about PM2.5. The last hypothesis focused on consumer's action in purchasing products related to PM2.5.

The first three hypotheses investigated the anticipants of Green Consumer Behaviour (GCB). First, consumers who had a negative feeling towards the PM2.5 situation, and those who perceived the situation as dangerous, as well as those who cared for the environment, should be willing to act sustainably. Therefore:

H1: Negative Attitude towards PM2.5 situation will positively affect GCB.*

H2: Perceived danger of PM2.5 situation will positively affect GCB.

H3: Environmental Concern (EC) will positively affect GCB.

In order to spread the word about promoting green behavior, one has to have the correct information to share. Therefore, it is important to understand if people with high subjective knowledge who think they know a lot about PM2.5 (and are prone to share information) actually have the correct information or knowledge (objective knowledge). Regarding the hypothesis on consumer knowledge, since consumers have to expose themselves to the media or actively acquire knowledge to protect themselves and their loved ones from this harm, the subjective knowledge and objective knowledge of PM2.5 should be in the same direction. Therefore:

H4: Subjective and objective PM2.5 knowledge will correlate.

The above hypotheses cover the feeling/thinking about the environment and spreading knowledge about PM2.5. The last hypothesis is about doing — how consumers purchase products related to PM2.5.

On top of the PM2.5 situation, there are also incidences of people who bought fake masks that did not protect them from PM2.5, and ended up in hospitals in February 2019 (K. Anutien, personal communication, November 2, 2020). With the news of fake product offerings in the market (Bangkok Post, 2019; Thai Residents, 2019), it is possible that consumers do not have trust in the products being sold. In such an uncertain situation, consumers usually rely on product brands in making decisions (Baek et al., 2010; Washburn et al., 2004).

Apart from the product brand, a retailer acts like a gatekeeper that sources the products and provides an assortment of offerings to consumers (Sternquist, 1994). A more reputable retailer—compared to a lesser-known retailer—increases the intention to purchase a product (Chu et al., 2005). This also applies with private brands (Bao et al., 2011). Additionally, when a warranty is offered with a product, consumers only consider the warranty when it is offered by a retailer with a good reputation (Purohit & Srivastava, 2001).

Therefore, in order for consumers to minimize their risk in buying fake products, it is hypothesised that they should rely on the product brand and store brand in deciding to make their purchase.

H5: In purchasing PM2.5-related products, consumers will rely on the product brand and store brand more than other signals.

**Note on H1:*

Regarding the attitude questionnaire item such as dislike – like. High attitude score refers to good attitude towards PM2.5. Therefore, the first hypothesis is "high/positive attitude towards PM2.5 situation negatively affects Green Consumer Behaviour (GCB)". Since this sentence is confusing. The hypothesis is rewritten as shown above.

Research Methodology

The objective of this study was to explore the attitude and behaviour of Thai consumers in response to PM2.5. Since we sought to study consumer decision making, our research participants were those who made purchase decisions for themselves. We focused on consumers aged 18 years old and above that lived in Bangkok, Thailand. There are 10.7 million people in Bangkok and metropolitan (World Population Review, 2021). According to the Thailand Board of Investment (2021), the proportion of those aged between 15 to 64 years old is 70% of the total population in Thailand. This percentage was used as a proxy for the age proportion of Bangkok and metropolitan's population, and resulted in the population number of 7,490 thousand people. This population number, 95% confidence level, and seven confidence interval are calculated (Creative Research Systems, n.d.). The number 196 was then obtained as the target sampling size.

From the above input, Thai consumers aged 18 and above were approached using convenience sampling. An online survey was used to collect data. The survey link was distributed to the target group via social media.

The scale measurements based on prior research are as follows.

Table 1 Variables and source of questionnaire item

Variable	**Source of questionnaire item**
Attitude*	Holbrook and Batra, 1987
Affective response	Stuart, Shimp, and Engle, 1987
Attitude towards green consumption	Zhao, Gao, Wu, Wang, and Zhu, 2014
Environmental concern*	Zhao, Gao, Wu, Wang, and Zhu, 2014
Green consumer behaviour*	Zhao, Gao, Wu, Wang, and Zhu, 2014

*Used for hypotheses testing

Apart from the scales above, a question on the perceived danger of PM2.5 was included. Additionally, consumer behaviour regarding information seeking (To what extent do you follow PM2.5 news?); information sharing (To what extent do you talk about the PM2.5 situation with others? To what extent do you educate others regarding PM2.5?); and their knowledge (How much knowledge do you have about PM2.5?) were measured. The responses to all these questions used a seven-point Likert scale from “not at all” to “very much”. The content of the objective knowledge questions was based on an official source from the Thailand Pollution Control Department.

Regarding purchasing behaviour, questions on general purchase situation and questions to assess what quality signals they use, as well as questions concerning the predictive value and confidence value (Olson and Jacoby, 1972) of each quality signal were utilized.

In order for the measurement to be suitable for the Thai context, additional relevant questions were included with the other questionnaire items. For example, a question about lighting incense sticks in the home was added. The Chinese New Year was in February 2019; it is common for Thai-Chinese consumers to light incense sticks indoors during the Chinese New Year period. However, it is known that such behaviour causes air pollution, which affects those who light the incense, their family, and society in general. This unique cultural-environmental conflict is worth exploring to better understand Thai consumers.

In terms of analysis, descriptive statistics, multiple regression and ANOVA were employed to analyse the results.

Results

There are three parts to the research findings. The first part is a brief description of the demographic characteristics of the respondents. The second part is an exploration in length of consumer attitudes and behaviour. The last part of this section reports the results of the five hypotheses.

Demographic characteristics

Two hundred and nine usable observations were analysed. The respondents' ages ranged from 18 to 61 years, with an average age of 30.15 years. One hundred and thirty-nine respondents (66.5%) were female. The majority of the respondents (87.6%) had a Bachelor's degree. Approximately one-third of the respondents had their own business. Another one-third worked for the private sector. One-fifth of the respondents were government officials. The rest (13.4%) either work for hire, were students, or did not work. The household income was well-distributed across different economic levels.

PM2.5 phenomenon exploration

This section first explores Thai people's attitude, WOM, as well as whether and how they protect themselves from harmful PM2.5. Secondly, this section explores the quality signals consumers use in their purchase of PM2.5-related products such as masks; as well as their purchase. The last part of this exploration involves the consumers' green attitude and behavior.

Attitude, WOM, and Protective Behavior

The respondents had a negative affective response and attitude towards PM2.5. From the Likert scale of 1 to 7, 1 being the most negative and 7 being the most positive, the mean (M) and standard deviation (SD) of affective response and attitude were 2.08 (.97) and 2.15 (.97). That is, the respondents did not like the PM2.5 situation. They found it negative, they felt bad, and were not satisfied with it. They thought that PM2.5 was dangerous. From the Likert scale of 1 to 7, 1 being not dangerous at all and 7 being extremely dangerous, the dangerous mean (standard deviation) was 5.57 (1.23).

PM2.5 has been the talk of the town. The results confirm that people tend to talk about this situation with others (M = 5.00; SD = 1.17); spread PM2.5 news to people around them (M = 4.91; SD = 1.35); follow news regarding PM2.5 (M = 4.72; SD = 1.27), and recommend preventive measurement (such as the correct way to wear a mask, closing doors

and windows) to others (M = 4.71; SD = 1.37). Note that all scales in this study employed a Likert scale of 1 to 7, 1 being the lowest and 7 being the highest.

Apart from receiving and spreading PM2.5 news, the respondents somewhat protected themselves from PM2.5. The top two activities were closing windows and doors (M = 4.73; SD = 1.97); and wearing a 3-ply mask (M = 4.40; SD = 2.05). While some common household activities added PM2.5 to the home and the environment, the results show that on average, the respondents do not refrain from lighting incense indoors during Chinese New Year festival (M = 4.52; SD = 1.74) as much as refraining from lighting incense indoors in their daily lives (M = 4.81; SD = 1.58). They seemed to be indifferent in refraining from having their car engine on while parking (M = 4.22; SD = 1.87); and refraining from cooking that involved lots of smoke (M = 3.77; SD = 2.08).

The researchers then asked what products consumers bought to protect themselves from PM2.5. Forty-three out of 209 consumers did not buy anything. The top purchase item was a 3-ply mask, in which 65.6% of the respondents bought them. Fourteen percent of them bought an air purifier for their bedroom. Other items such as an air purifier for the living room/ working room/ car and PM2.5 measurement device were purchased by less than 4% of the respondents.

Consumer signaling and purchase

The previous section covered what PM2.5-related products respondents bought to protect themselves from PM2.5. This section focuses on how and how much they purchased. That is, what signals they relied on in choosing PM2.5 related products; as well as the quantity and amount they bought. The following table displays the mean and standard deviation of the different signals used for buying a N95 mask, air purifier, and PM2.5 measurement device.

Table 2 Consumer signals in buying PM2.5 related products

Consumer signals	N95 mask		Air purifier		PM2.5 measurement device	
	Mean	Std. Devia-tion	Mean	Std. Devia-tion	Mean	Std. Devia-tion
Product brand	5.03	1.93	4.38	2.35	3.10	2.34
Price	4.72	1.59	4.29	2.08	3.03	2.24
Family and friends	4.29	1.96	3.88	1.96	3.03	2.20
Product review	4.24	1.92	3.83	2.09	3.03	2.25
Product attributes	5.37	1.61	4.38	2.14	3.27	2.32
Manufacturer brand	4.44	1.83	4.17	2.17	3.37	2.41
Channel brand (e.g. Lazada, Shopee)	3.53	1.92	3.44	2.16	2.63	2.04
Retailer brand (e.g. the shop in Lazada)	3.41	2.04	3.33	2.17	2.73	2.15

From Table 2, the top two signals consumers used when buying N95 masks and air purifiers were product attributes and product brand. The top two signals in buying a PM2.5 measurement device were product attributes and manufacturer brand. The bottom two signals in buying these three products were channel brand and retailer brand. The next paragraph explains these results.

In consumer signalling, people evaluate the cue predictive value and cue confidence value (Olson & Jacoby, 1972). The results of this study revealed that the top two signals that consumers felt that have predictive value were product brand and product attributes. The signals with the least predictive value were channel brand and retailer brand. Regarding the cue confidence value, the top ones were product brand, product attributes, and manufacturer brand. The signals that consumers had the least confidence value were channel brand and retailer brand. In other words, consumers used the signals that they thought could tell them about the product quality, and they felt confident in judging those signals.

Table 3 Consumer spending in PM2.5 related products

		Respondents[1]	**Respondents[2]**	**Maximum**	**Minimum**
3-ply mask	Quantity purchased	125	208	100	1
	Amount (baht) spent	122	208	2,500	5
N95 mask	Quantity purchased	112	208	400	1
	Amount (baht) spent	111	208	3,000	5
Air purifier for home	Quantity purchased	36	209	3	1
	Amount (baht) spent	33	207	70,000	3,500
Air purifier for car	Quantity purchased	8	209	2	1
	Amount (baht) spent	6	208	14,000	3,000
PM2.5 measurement device	Quantity purchased	4	209	1	1
	Amount (baht) spent	4	209	1,800	1,000

Table 3 Consumer spending in PM2.5 related products (Continued)

		Mean	Standard Deviation	Median	Mode
3-ply mask	Quantity purchased	21.29	26.57	10	10
	Amount (baht) spent	175.58	281.86	100	200
N95 mask	Quantity purchased	14.88	38.64	6	10
	Amount (baht) spent	485.86	455.13	370	300
Air purifier for home	Quantity purchased	1.31	0.57	1	1
	Amount (baht) spent	13,500.00	15,577.26	6,000	5,000
Air purifier for car	Quantity purchased	1.13	0.33	1	1
	Amount (baht) spent	7,333.33	3,804.24	6,250	4,500
PM2.5 measurement device	Quantity purchased	1.00	-	1	1
	Amount (baht) spent	1,325.00	341.87	1,250	1,000

[1]Number of respondents who reported that they bought the product (after cleaning the data)

[2]Total number of respondents who answered these questions

Regarding the consumer experience shopping for PM2.5-related products, 62.6% of the respondents rated 5 or above out of 7 in agreeing that they could not find these products when first encountering PM2.5. Most respondents could finally find these products as less than 5% of them strongly agreed with the statement that they still cannot find/buy these products. Although most people eventually found the products, some of them did not buy them (rated the top two boxes with the score of 6 and 7) due to their high price (20%), unsuitable product attributes (15%), and lack of confidence in the product quality (15%).

Green attitude and behaviour

The consumer signaling and purchase section above discusses how consumers buy. This section further explores consumer's green attitude and behaviour. The results reveal that the respondents wanted to help improve the PM2.5 situation (M = 5.87; SD = 1.21). The mode for this question was 7. They agreed with the policy in prohibiting people from burning activities; e.g. burning sugar cane or burning grass (M = 5.68; SD = 1.46). The mode for this question was also 7. They somewhat agreed with prohibiting people from burning joss paper during the Chinese New Year ceremony (M = 5.24; SD = 1.55). The mode for this question was 7. On average, they were indifferent/slightly agreed with using public transportation instead of a personal car (M = 4.68; SD = 1.61). The mode for this question was 4. Lastly, they were indifferent/slightly disagreed with the policy to allow cars with odd/even-number registration plates to drive on alternate days of the week (M = 3.83; SD = 1.98). The mode for this question was 5. The median scores for these five questions were the rounded-up number of the mean.

Regarding the attitude towards green consumption (Zhao et al 2014), the respondents were somewhat green (M = 4.73; SD = 0.84). These scores were derived from the questions concerning environment-friendly/non-polluting behaviour (M = 5.44; SD = 1.32); water and electricity conservation (M = 5.20; SD = 1.25); and paying for plastic bags when not bringing one's own reusable bag to the store (M = 5.05; SD = 1.57).

Next, the respondents were asked the environmental concern questions (M = 5.48; SD = 1.03), which comprised of three questions. The three questions were, "The balance of nature is very delicate and easily upset." (M = 5.61; SD = 1.15); "Mankind is severely abusing the environment." (M = 5.63; SD = 1.31); and "The whole pollution issue has upset me." (M = 5.19; SD = 1.27).

The respondents' green behaviour varied by different activities. On average, their green behaviour was in the middle of the scale (M = 4.38; SD = 1.34). The detailed activities are as follows: "I always use disposable tableware." (M = 4.62; SD = 1.89; range 1 to 7; Reversed Score); "I try to buy high-efficiency light bulbs to save energy." (M = 5.09; SD = 1.43; range 1 to 7); "I try to buy energy-efficient household appliances." (M = 5.46; SD = 1.37; range 1 to 7); "I always reuse paper bags and plastic bags." (M = 4.94; SD = 1.66; range 1 to 7); "I always reuse water." (M = 4.08; SD = 1.78; range 1 to 7); and "I always bring bottles to the recycling center." (M = 4.65; SD = 1.77; range 1 to 7). The full scale above had a Cronbach's Alpha score of .638. After excluding the first item, the Cronbach's Alpha score of the remaining five items was .701. The mean (standard deviation) of this reduced Green Consumer Behaviour scale was 4.84 (1.09) with the median 4.8 and mode 4.6. The score ranged from 2.2 to 7.0.

In supporting the green behaviour, especially in spreading the correct information to save others and the environment, people must have the right knowledge. It is a bad surprise to find that, while consumers talk about the situation (M = 5.00; SD 1.17) and recommend preventive measurement to others (M = 4.71; SD = 1.37); they actually have low objective knowledge. That is, on average, the respondents got the objective questions right a little less than half of the time. The mean score was 7.74 out of 15; median 8; and mode 10. The scores ranged from 0 to 14 out of 15 questions. This raw score out of 15 points was also converted to a score with a total of 7, in order to have the same scale as other questions. After converting the score, the mean score was 3.61 out of 7 with a standard deviation of 1.59. We will further confirm this point in testing hypothesis 4 in the next section.

This exploration part serves as a building block of the next part, which tested hypotheses involving the consumers' thinking/feeling, speaking, and green ttitude/behaviour.

Results of the hypotheses testing

Multiple regression was utilized to test Hypotheses 1 to 3. The results showed that only Environmental Concern positively affected Green Consumer Behaviour, while the effects of Attitude and Perceived Danger were not significant. That is, Hypotheses 1 and 2 were not supported. Hypothesis 3 was supported. Please see more detail in Table 3.

Table 3 Regression Analysis

Model		*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*
		B	Std. Error	Beta		
1	(Constant)	1.387	.659		2.106	.037
	Attitude	.037	.094	.033	.390	.697
	Perceived danger	.118	.075	.136	1.575	.117
	Environ-mental concern	.499	.071	.476	7.069	.000

In order to confirm the relationship between subjective knowledge and objective knowledge, the correlation results revealed that they were not related, r = .120, *p* = .083. When a respondent perceived that he/she had a high level of knowledge about PM2.5, the objective measures revealed otherwise. Hypothesis 4 was not supported. From the mean scores, people thought that they knew about PM2.5 more than they actually did. That is, the

mean score (standard deviation) of the subjective knowledge was 4.64 (1.09) versus 3.61 (1.59) for the objective knowledge.

The researcher further analysed the correlation of subjective/objective knowledge and communication behaviour. It was found that subjective knowledge was significantly related with all the communication behaviour. However, objective knowledge was either not significantly related with some communication behaviour, or was significantly related with some communication behaviour at a lesser degree than the subjective knowledge.

In order to test Hypothesis 5, whether consumers rely on product brand and store brand more than other signals, ANOVA was conducted to compare the mean difference among different signals consumers relied on when purchasing N95 masks, air purifiers, and PM2.5 measurement devices. The N95 mask results revealed that consumers significantly relied on product attributes (M = 5.36, SE = 0.14), product brand (M = 4.95, SE = 0.17), and price (M = 4.73, SE = 0.14); more than product reviews (M = 4.23, SE = 0.17), channel brand (e.g. Lazada, Shopee) (M = 3.56, SE = 0.17), and retailer brand (e.g. the shop in Lazada) (M = 3.44, SE = 0.18), $F(7, 1074) = 16.514$, $p = .000$. For the air purifier, although the main ANOVA results were significant, $F(7, 414) = 2.554$, $p = .014$, all the signals falls in the same subset in the post-hoc test. Lastly, the ANOVA results for PM2.5 measurement devices were not significantly different $F(7, 246) = .458$, $p = .864$. Despite the insignificant mean comparison for air purifiers and PM2.5 measurement devices, the direction of the result was in line with the significant result of the N95 masks. The mean level for product brand, product attribute, and price are higher than other signals for air purifiers. The mean level for product brand, product attributes, and manufacturer brand were slightly higher than other signals for a PM2.5 measurement device. Thus Hypothesis 5 was partially supported. Additionally, these results were in line with findings on cue predictive value and cue confidence value.

Conclusion and discussion

This research is among the first few to explore how consumers perceive and respond to the PM2.5 situation. Approaching this topic from the consumer decision making perspective is important because these are people in the society who could make this world a better place to live. The findings serve as building blocks to better understand the environmental issue and sustainable behaviour, particularly in the context of Thailand.

The findings in this research reveal that consumers found PM2.5 dangerous and that they clearly do not like this harmful situation. Despite this, their negative attitude itself could not lead consumers to have green behaviour. When it comes to protecting themselves and their loved ones from PM2.5, convenience, familiarity, and tradition superseded green behaviour. The green behaviours adopted by those surveyed in this study were mainly, familiar, convenient and no/low cost activities. PM2.5 generating activities such as lighting incense continue especially during Chinese New Year. This is compared to the daily lighting

of incense, which people tend to refrain from. Preventive activities such as refraining from cooking food that generates lots of smoke, and eating antioxidant food is often ignored.

PM2.5 is the talk of the town, especially during the time of year when the PM2.5 is high. Sadly, a negative discovery is that subjective knowledge (consumer perception of their knowledge) is not significantly correlated with objective knowledge (their real knowledge of PM2.5). That is, those who think that they have knowledge about PM2.5 actually have misunderstandings about it. Even worse is that the subjective knowledge significantly relates with their communication with others, including suggesting to others how to be safe from PM2.5 and how to reduce their PM2.5 emissions. This is not good news because it is possible for these people to spread incorrect information.

As buying is a significant part of consumer's having, using, and being, this paper also explored consumer purchasing behavior and found that the top-two quality signals in buying PM2.5-related products such as masks are product brand and the attributes of the product. Those surveyed found these two signals predictive of the intrinsic product quality; and were confident in themselves that they could judge these two signals well.

From the above findings, policy makers, educators and managers should coordinate in educating and facilitating convenient environmental actions for going green. As simply feeling bad and not liking the situation does not make people act green. Ingraining and encouraging environmental concern among Thai people including the youth is important. It could also be useful to segment the Thai people according to how they could influence the PM2.5 situation. For example, there could be tailored messages for those who cook, drive, and farm.

Influencing consumers at the macro level—tradition, culture, and society—could also shape consumers' green behaviour. For example, using opinion leaders that consumers trust — both at the national level and community level — to demonstrate environment-friendly ways to cook, drive, and celebrate Chinese New Year, would assist in inducing green behaviour.

In marketing PM2.5-related products, managers should focus on communicating product attributes, product brand, and price on the packaging, point-of-purchase, and other media. Channels/retailers should advertise that the store has trusted brands with the right attributes and reasonable prices. Marketers from manufacturers and channels/retailers can consider PM2.5 as an area for their corporate social responsibility projects as more initiatives are needed to facilitate an atmosphere and culture towards a greener society.

This research employed quantitative methods to explore the issue. Future research could further explore qualitatively to better understand why consumers act the way they do. For example, researchers could use laddering techniques to dive into why consumers buy and do not buy certain products; as well as to understand the triggers and barriers in buying

products. Since choosing the channel/retailer is the first step before choosing the product, future search should investigate how consumers choose the channel/retailer.Future research should also look for ways to encourage those with high objective knowledge to spread correct word-of-mouth information about PM2.5; and those with low objective knowledge to seek out more accurate facts before spreading information. Additionally, future research should quantitatively investigate how to encourage people to become more concerned with environmental issues; and whether there are any moderators and/or mediators between environmental concerns and green consumer behaviour.

This study was conducted among novice respondents who are relatively new to PM2.5. Future research should investigate if novice versus expert consumers in the PM2.5 context think and act similarly or differently. Would the same or different message/campaign be required to encourage consumers to act sustainably?

In conclusion, the findings of this research will assist academics, practitioners, and policy makers to understand Thai consumer behaviour during the PM2.5 situation. This knowledge is important so that both business and policy makers can work together to facilitate an atmosphere where consumers cooperate in caring and acting for the environment. Currently, many parties express their concern and have begun to help the environment. Better understanding of attitude and behaviour regarding PM2.5 situation will equip academics, practitioners, and policy makers to help make our society a greener society.

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