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Public Perception of Air Pollution Monitoring in Melaka

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Abstract

Air pollution has been a major environmental problem which has affected people's health and general quality of life. The Air Pollutant Index (API) is used by the Malaysian government to track and inform the public about the state of the air. Unfortunately, there are still problems with the effectiveness, reliability and the transparency of this monitoring system, particularly in states like Melaka where pollution incidents happen more commonly. This study examines public perceptions towards the government's air pollution monitoring efforts in Melaka which are focusing on community knowledge on air pollution, trust and participation. 200 respondents from both urban and suburban locations participated in a quantitative, cross-sectional survey. A systematic questionnaire was used to collect the data, and reliability test and descriptive statistics were used for analysis. With a mean score of 4.041 and Cronbach's alpha value 0.941, the findings showed that public awareness of the government's monitoring system was high indicating great internal consistency. Overall, the results have highlighted how crucial it is to gain public knowledge, enhance trust in environmental monitoring systems, and increase community engagement in order to enable more successful air quality management in Malaysia.

INTRODUCTION

Air pollution is one of the most significant environmental threats of the 21st century, with direct impacts on public health, ecosystem sustainability and sustainable urban development (Kementerian Kesihatan Malaysia, 2020). It refers to the presence of harmful pollutants in the atmosphere such as fine particles (PM2.5 and PM10), nitrogen dioxide, sulphur dioxide and volatile organic compounds, which are commonly caused by industrial emissions, vehicle exhaust, open burning and unsustainable land use activities (Murulitharan & Jayaprakash, 2025). According to the World Health Organization (WHO), ambient air pollution contributes to approximately 4.2 million premature deaths each year, with a greater impact on vulnerable groups in developing countries (WHO, 2023).

The air quality monitoring in Malaysia is regulated through the Environmental Quality Act 1974 and implemented through the Air Pollutant Index (API) system by the Department of Environment (DOE) (Jabatan Alam Sekitar Kementerian Sumber Asli dan Kelestarian Alam, 2025). Despite the existence of a legal framework, pollution incidents such as haze and localized pollution in urban and semi-urban areas continue to raise concerns about the

effectiveness of government monitoring and enforcement. An example in Malacca residents have reported repeated pollution in the Lereh River, which has turned the water black and foul-smelling, and has affected the health of local fishermen (AGENSI PENGURUSAN BENCANA NEGARA, 2025). The API reading in Alor Gajah also reached 157 in July 2025, indicating unhealthy air quality levels (National, 2025).

Public perception plays a key role in determining the effectiveness of environmental policies (Agensi Pengurusan Bencana Negara, 2025). Awareness of the causes of pollution, health risks and mitigation measures enables the public to demand transparency, practice self-protection and participate in local initiatives. Studies show that informed individuals are more likely to support green policies, participate in environmental activism and comply with pollution control measures (Sofia et al., 2021). Public trust in government monitoring systems is also important to build cooperation and ensure effective policy implementation.

Community engagement also strengthens the impact of air quality initiatives. Collaborative efforts such as citizen science programs, community-based air sensor installations, and educational campaigns can increase data collection, drive behavioral change, and build resilience to pollution-related health risks. Malacca, which is known for its tourism, fisheries, and heritage conservation sectors, community engagement is crucial (Mai Singgah, 2025).

Although air pollution issues are increasingly gaining attention on the national environmental agenda, empirical studies on public perceptions of government air pollution monitoring are still limited. Therefore, this study aims to assess the level of public awareness, trust, and engagement of air pollution monitoring in Melaka. Understanding the attitudes and expectations of local residents is essential to develop effective communication strategies and strengthen Malaysia's efforts towards environmental sustainability.

LITERATURE REVIEW

Air pollution is a major environmental problem that can affect every country and everyone in the world. To solve the problem of air pollution, local monitoring and practical assessment of pollution levels are needed. Based on a study Yang (2024), when higher pollution levels are announced, public perceptions of pollution show an online increase of 3.5% to 3.7%, corresponding to a response to an increase of more than 100 in the Air Quality Index (AQI). The study provides a detailed picture of how public perceptions respond to pollution level information announced under AQI standards. It can guide policymakers when developing AQI standards to maximize the welfare of air information (Yang, 2024). In addition, Chen et al. (2024) presented an in-depth analysis of the global burden of disease related to air pollution, offering a comparative perspective that explains the various effects across different regions. Although air pollution is an environmental issue, its impact on human health, economic conditions and quality of life is the biggest and most important challenge that hinders human progress.

Furthermore, in Malaysia the picture of how residents perceive air pollution and monitoring is complex and shaped by both their lived experience and institutional cues. The Iskandar Puteri study (Goodson et al., 2024) found strong concern among university students who reported symptoms and took preventive measures (mask-wearing or avoiding outdoor time) even though official monitoring data indicated many pollutants were within local standards (with the exception of NO_2 exceeding WHO values). Meanwhile, the larger survey by Krishnan et al. (2025) found that after the MCO, public opinion about air pollution improved, yet awareness and trust did not significantly vary by demographic factors such as gender, occupation or race suggesting that macroscale events (like lockdowns) altered perception more than individual traits. Together these studies suggest that in Malaysia the mere presence of monitoring systems or official data is not sufficient: what matters is how the public experiences the air (for example visible haze, smell, health symptoms), how timely and transparent the authorities' communication is, and how personal sense matches the official narrative. For a locale such as Melaka, this means that increasing monitoring stations or publishing numbers needs to be paired with accessible interpretation and community-level engagement to build trust and stimulate protective behaviours.

Moreover, the actual conditions of air pollution and its causes have also been the focus of numerous research conducted in Malaysia, Rahman et al. (2022) examined the distribution of fine dust particles in the air from 65 monitoring sites and showed that urban and industrial regions had worse air quality, particularly in Johor Bahru and the Klang Valley, where open burning and haze were common. Based on their research, weather patterns and human activities were directly affected by pollution issues in Malaysia. In contrast, when Al-Battawi et al, (2024) examined the chemical composition of air pollutants in both urban and rural locations where they found that harmful substances that can lead to heart disease and breathing issues were more frequent in urban traffic zones. In comparison for both studies, it has revealed that open burning activity and also transportation has contributed to the significant causes of air pollution in Malaysia, which has led to impact on both the environment and human health. Because of this, Malaysia must take the initiative to enhance its air quality management, focusing on both monitoring systems and also lowering the primary source of the pollution.

Other than that, recent Malaysian research supports the idea that public awareness of air pollution is shaped by knowledge, attitudes, and practices (KAP). Haliza Abdul Rahman and Nur Hazami Shamsul Bahari (2020) examined KAP related to haze pollution among secondary-school students in Hulu Langat, Selangor, revealing that those with higher environmental awareness exhibited greater concern and were more inclined to engage in preventive behaviors. It also shows here that high environmental awareness can lead an individual to take action against air pollution. Further supporting the argument above, Zainordin et al., (2018) have assessed how pedestrians perceive environmental issues and their readiness for commuting behavior change to reduce exposure to ozone gases (O_3) in Penang. The study revealed that women and educationists have higher awareness and a stronger willingness to walk instead of using their cars, which infers that demographic and social factors bear great impact on public perception of pollution. All the evidence hereby support the belief that Malaysians' perception about air pollution is not only affected by exposure but also by environmental awareness and the subjective intention of the person involved in behavior.

To add more, air pollution monitoring plays an important role in trying to control air pollution as and the approach on the monitoring is a crucial process to create an effective and efficient flow for the air pollution study and the monitoring approach is a crucial component in ensuring effective environmental management. In China, unequal access to information between the central and local governments results in local authorities taking strategic actions in environmental enforcement. (Wang et al., 2024). This study explains how the strategy of monitoring pollution in China to decentralize the monitoring system changes the way of enforcement to control the pollution. The 2005 Target-based Performance Evaluation System (TPES) reform encouraged and regulated local governments to improve their environmental enforcement, significantly strengthening the effectiveness of non-centralized SO_2 reduction efforts. (Guan, 2022). The study indicated that implementing the TPES strategy has increased the effectiveness to control the air pollution for each local government as they have improved their monitoring system and enforcement method. Hence, in order to have effective environmental management to reduce air pollution, the government on every level needs an effective strategy on their air pollution to have different and notable results..

METHODOLOGY

This study utilizes a quantitative cross-sectional research design to survey public perception towards air pollution monitoring by the government in Melaka, focusing on residents of Melaka. A total of 200 respondents representing diverse demographic backgrounds from an urban area and sub-urban area were selected using a convenience sampling method. Data were collected through a structured questionnaire administered both face-to-face and online, involving four sections: socio-demographic characteristics, community knowledge on air pollution, and public perception on government monitoring efforts. Responses were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Descriptive statistics, including means and standard deviations, were implemented to analyze the data, while Cronbach's alpha coefficient was used to assess the internal consistency of the instrument, with values exceeding 0.70 considered acceptable for reliability. Ethical considerations were meticulously observed throughout the study, ensuring participants' anonymity, informed consent, voluntary participation, and the confidentiality of all collected data.

RESULT AND DISCUSSION

Profile of Respondents

The table profile of the respondent (Table 1.0) provides important information regarding the characteristics of respondents stated in Melaka that have participated in this study which is the study of public perception of air pollution monitoring in Melaka. Total participation in this study is 200 individuals. The gender distribution shows that most of the respondents are female 54.5% and the count of male representatives is 45.5%. The districts they come from are distributed accordingly. The highest is Melaka Tengah (36.0%), followed by Alor Gajah (28.0%) and Jasin (21.0%), while the lowest count of representatives is Masjid Tanah (15.0%). In terms of level of education, the largest group of respondents are those with a bachelor's degree, making up 40.0% of the total. This is followed by those with a diploma, which account for (20.5%). SPM holders represent 18.5% of the respondents. Respondents with STPM/Matriculation or equivalent make up 9.5% of the total. Those with a master's degree account for 10.5% of the respondents. A very small percentage of respondents have PhD (1.0%). As for Employment Categories the largest group of respondents are non-working, representing 33.5% of the total. Respondents working in the private sector make up 29.0% of the sample. Those employed in the public sector account for 23.5% of respondents. People involved in business/entrepreneurship represent 9.5% of the total. Smaller proportions are made up of students (1.5%) respondents. Overall, the demographic statistics show that the respondents reflect a wide slice of the Melaka community, with a significant proportion of young and well-

educated individuals. The response distribution across districts and employment categories reflects a balanced mix of viewpoints on both working and non-working populations.

TABLE 1.0
PROFILE OF RESPONDENTS (N=200)

Profile	Category	Frequency	Percentage (%)
Gender	Male	91	45.5
	Female	109	54.5
District	Alor Gajah	56	28.0
	Melaka Tengah	72	36.0
	Jasin	42	21.0
	Masjid Tanah	30	15.0
Level of Education	SPM	37	18.5
	STPM, Matriculation and Equivalent	19	9.5
	Diploma	41	20.5
	Bachelor's degree	80	40.0
	Master's degree	21	10.5
	PhD	2	1.0
Employment Category	Public Sector	47	23.5
	Private Sector	58	29.0
	Business	19	9.5
	Retired	6	3.0
	Non-working	67	33.5
	Student	3	1.5

Table 1.2 presents the reliability results; the instrument used in this study. The reliability analysis was conducted using Cronbach's alpha to evaluate the internal consistency of the measurement items used in this study. According to Pallant (2016), a Cronbach's alpha value of 0.70 and above indicates acceptable reliability, while values exceeding 0.80 reflect excellent internal consistency. Moreove, the variable "Perception Towards Air Pollution Monitoring in Melaka" recorded a Cronbach's alpha coefficient of 0.941, demonstrating an excellent level of reliability. This result confirms that the items used to measure public perception are highly consistent and dependable for further statistical analysis.

Table 1.1
RELIABILITY TEST

Variable	Number of Items	Cronbach's Alpha	Reliability Assumed
Public Perception of Air Pollution Monitoring In Melaka	10	0.941	Excellent

Mean and Standard Deviation

The mean and standard deviation analysis offer valuable data into the respondents' overall perception towards air pollution monitoring in Malacca. Participants assessed their perception views using a five-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). As shown in the results, the overall mean score was 4.041, which falls within the high range (3.58–5.00), with a standard deviation of 1.062. These findings imply that respondents generally demonstrate a strong and positive perception of air pollution

monitoring efforts in Malacca, while the moderate spread of responses indicates some variation in individual opinions. With a sample size of 200, the results reflect a dependable representation of the level of knowledge and the perception towards air pollution monitoring among the residents of Malacca while underscoring the needed government efforts to engage more with the community and community initiative to be more involved with government effort in air pollution monitoring.

The findings from this study conducted in Malacca indicate an apparently positive perception towards air pollution monitoring among respondents. However, the results also reveal a noticeable gap between awareness and actionable behavior, suggesting that although the respondents trust monitoring by the government, it does not guarantee that they will act accordingly. To bridge this gap, policy interventions should emphasize comprehensive public education on air quality issues, the establishment of accessible community-based monitoring platforms, and the implementation of localized strategies that empower residents to actively contribute to and sustain air control practices..

Table 1.3
LEVEL OF MEAN SCORE RANGE

Mean Score Range	Level
1.00 – 2.33	Low
2.34 – 3.67	Medium
3.58 – 5.00	High

Table 1.4

MEAN AND STANDARD DEVIATION

Variable	Mean	Standard Deviation	N
Public Perception of Air Pollution Monitoring In Melaka	4.041	1.062	200

CONCLUSION

This study underscores the pivotal role of public knowledge, trust, and community engagement in the effective management of air quality in Malaysia, particularly in Melaka. The findings demonstrate that public perception towards government air pollution monitoring efforts in Melaka is generally strong and positive, supported by a high overall mean score of 4.041 and high public awareness. However, sustainable and impactful air quality management can only be realized when communities are not only aware but also adequately supported, motivated, and equipped to act. Beyond awareness, the research highlights a noticeable gap between awareness and actionable behavior, suggesting that public trust does not guarantee necessary protective measures. Policies informed by this research should therefore prioritize comprehensive public education, accessible community-based monitoring platforms, and localized strategies that empower residents to actively contribute to and sustain air control practices. Strengthening collaboration among government bodies, communities, and stakeholders is essential to building national climate resilience and achieving inclusive growth. Ultimately, this study reinforces that combating air pollution is a collective responsibility, one that demands empowered communities, informed policymaking, and coordinated efforts to ensure a sustainable and resilient future for Malaysia in alignment with environmental quality goals.

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