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### Community Risk Perception and Social Response to Air Pollution in Industrial Zones of Peshawar, Pakistan

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Original Article

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#### Keywords

#### Abstract

Air Pollution, Community Risk Perception, Perceived Poor Air Quality, Behaviour/Policy Support, PM2.5, Peshawar

*This study examines community risk perception and social response to air pollution in industrial zones of Peshawar, Pakistan. Although reported PM2.5 evidence shows serious air-pollution exposure in Peshawar, less attention has been given to how residents socially interpret this environmental risk and whether such perception leads to behavioural or policy support. The study adopted quantitative cross-sectional survey design and collected data from two hundred respondents through a structured questionnaire. Awareness of air pollution, perceived poor air quality, community risk perception, and behaviour/policy support were measured with eighteen items on a five-point Likert scale. Secondary PM2.5 evidence was used to describe the environmental context of air-pollution exposure in Peshawar, while statistical analysis focused on respondent-level social constructs. Descriptive statistics, Cronbach's alpha, Pearson correlation and multiple regression were used for data analysis in SPSS. The findings showed that perceived poor air quality and awareness were significantly associated with community risk perception. Regression results further indicated that perceived poor air quality was the strongest predictor of risk perception, while awareness was the strongest predictor of behaviour and policy support. The study concludes that air pollution in industrial Peshawar is not only an environmental condition but also a socially interpreted risk shaped by lived experience, awareness, and perceived institutional response. The moderate level of behaviour/policy support suggests a perception-action gap that requires stronger public communication, community participation, and regulatory action.*

## Introduction

Air pollution is not only an environmental and public health problem, but a social one as well: It is the communities' lived experience, their perception, trust, and institutional support of the problems that defines their own exposure to it. Air pollution is now one of the biggest environmental health threats, responsible for millions of deaths each year and impacting most of the world's population, particularly in low- and middle-income countries (World Health Organization, 2024; IQAir, 2025). Fine particulate matter (PM<sub>2.5</sub>) is considered to be the most dangerous pollutant because of its ability to reach deep into the respiratory system and blood stream causing cardiovascular and respiratory diseases, cancer, and metabolic disorders (Bahrami et al., 2024). WHO (2024) reports that 99% of the world's population lives in areas where air-quality guideline levels are not met, showing that air pollution remains a major global public-health threat. WHO's global air-quality guidelines identify PM<sub>2.5</sub> as a key pollutant and set the annual guideline level at 5 µg/m<sup>3</sup>, which provides the benchmark for interpreting reported PM<sub>2.5</sub> exposure in Peshawar (WHO, 2021). The perception and interpretation of the risks in the daily life of communities is also a major component of environmental health risks besides the level of exposure (Slovic, 1995; Cori et al., 2020).

The air quality in Pakistan has become critical especially in industrial and urban areas. The SEED Programme and Peshawar Clean Air Alliance, (2022) reported that annual PM<sub>2.5</sub> concentrations in Peshawar are 61.40 – 80.09 µg/m<sup>3</sup> which is 12 to 16 times higher than the WHO guidelines. The city often sees hazardous air quality (AQI>300) during the winter smog seasons and transport and industrial emissions are considered as major sources of pollution. Likewise, Sustainable Development Policy Institute (SDPI, 2024) also ranks Pakistan as one of the most polluted countries in the world, and exposure to PM<sub>2.5</sub> is responsible for cardiovascular and respiratory diseases, especially in urban areas like Peshawar. However, public responses and behavioural adaptation to this serious environmental problem are not consistent, indicating a gap between the reported PM<sub>2.5</sub> context and the subjective estimation of risk.

Although reported air-quality evidence shows serious pollution exposure in Peshawar, less is known about how residents of industrially exposed areas socially interpret this risk and whether such perception leads to behaviour or policy support. Recent air-pollution perception research shows that communities often interpret pollution through sensory experience, local exposure, media information, and trust in institutions rather than through technical air-quality data alone (Cori et al., 2020; Bahrami et al., 2024; Pinakidou, 2025). Therefore, the present study examines air pollution as a socially perceived environmental risk by focusing on awareness, perceived poor air quality, community risk perception, and behaviour/policy support among residents of industrial zones of Peshawar.

## Problem Statement

Air pollution in the industrial areas of Peshawar has become a serious environmental and social concern. Reported PM<sub>2.5</sub> concentrations in Peshawar are far above WHO guideline levels, yet limited sociological evidence is available on how residents of industrially exposed areas understand, interpret, and respond to this risk. The problem is not only the presence of pollution but also the gap between environmental exposure, community-level awareness, and perceived poor air quality relates to community risk perception and support among residents of industrial zones of Peshawar.

### **Research Objective**

To examine how awareness of air pollution and perceived poor air quality influence community risk perception and behaviour/policy support among residents of industrially exposed areas of Peshawar.

### **Research Question**

How do residents of industrially exposed areas of Peshawar perceive air pollution as a social and environmental risk, and how are awareness, perceived poor air quality, and community risk perception related to behaviour/policy support?

### **Conceptual Framework**

The conceptual framework of this study is based on environmental sociology, risk perception theory, and the Theory of Planned Behaviour. Environmental sociology provides the broader lens for understanding why industrial exposure, inequality, institutional trust, and community vulnerability shape how pollution is experienced. According to a sociological view, environmental risk is not only a scientific reality but also a culturally and socially constructed issue, as each community constructs its own definition of risk, lists its priorities and reacts to the issue differently (Douglas and Wildavsky, 1982). In addition, Beck's perspective of risk society also helps uncover the danger and pollution created by the rapid industrialization which are socially embedded, politically contested, publically rendered and institutionalized in the form of public consciousness and trust (Beck, 1992). Risk perception theory provides the main explanation for community risk perception because it links perceived danger with lived experience, awareness, and social interpretation. (Slovic, 1987; Slovic, 1995). The Theory of Planned Behaviour supports the second part of the model by explaining how awareness and perceived risk may influence behaviour/policy support. Therefore, the framework links awareness and perceived poor air quality to community risk perception and then links awareness and community risk perception to behaviour/policy support.

### **Operationalisation of Variables**

The study used four survey-based constructs and one secondary contextual variable. Awareness of air pollution refers to respondents' understanding of air pollution sources, effects, and seriousness, measured through five items on a five-point Likert scale. Perceived poor air quality refers to respondents' personal judgement that the surrounding air is polluted, dusty, smoky, odorous, or harmful, measured through four Likert-scale items. Community risk perception refers to respondents' perception of the health and environmental risks caused by air pollution, measured through five Likert-scale items. Behaviour/policy support refers to respondents' support for protective behaviour, air-quality monitoring, and pollution-control policies, measured through four Likert-scale items. In addition, reported PM2.5 evidence was used as secondary environmental context to describe the seriousness of air pollution exposure in Peshawar. It was not treated as a respondent-level measured variable in the statistical analysis. Higher scores on perceived poor air quality indicate a stronger perception that local air quality is poor or polluted.

### **Literature Review**

In recent years, air pollution has emerged as a major environmental health threat worldwide, with particulate matter (PM2.5) being the most dangerous pollutants because of its high correlation with cardiovascular and respiratory diseases, cancer and premature death (IQAir, 2025). The evidence gathered globally recently reveals that almost the entire worldwide population is exposed to air pollution concentrations that are greater than the standard set by WHO (GBD 2021 Risk Factors Collaborators, 2024), and that the poorest people and the

poorest air quality conditions are the ones most affected. Ambient air pollution is responsible for millions of early deaths each year, and South Asia has been reported as one of the worst-hit regions in the world, given the high industrial emissions, poor regulation enforcement, and the rapid urbanization in the area (WHO, 2024). Recent studies in environmental health have, however, highlighted that perception, awareness, and social interpretation has a significant impact on the response of communities to environment hazards (Slovic, 1995).

Environmental risk perception literature emphasizes that people do not only assess environmental risks scientifically based on levels of exposure, but also emotionally based on their feelings of risk (Cori et al., 2020). Previous research has found that trust in institutions, the media, personal experiences, and visibility of pollution are factors that affect perceived risk more than secondary PM<sub>2.5</sub> context data. In addition, the Theory of Planned Behaviour (TPB) adds perspectives on attitude, subjective norm, and perceived behavioural control as determinants of behavioural responses to environmental risks, while also highlighting the importance of awareness and perception as mediating factors (Ajzen, 1991; Peng et al., 2025). Recent studies applying behavioural models to air-pollution responses show that knowledge, risk perception, attitudes, perceived barriers, and perceived benefits influence whether people adopt protective measures or support environmental action (Huang et al., 2024; Woo et al., 2023). Empirical studies have also demonstrated that knowledge does not always result in a correct perception of risk, particularly in urban areas of developing nations. In these regions, the degradation of the environment is common and the public response to it is limited despite the high exposure risk that people are facing (Bahrami et al., 2024). This suggests that awareness can lead to risk perception, but it does not necessarily lead to strong behaviours or policy support. This is especially likely when institutional trust in government performance and policy is low, and when practical policy options are limited (Cheng et al., 2022).

Recent policy discussions illustrate that air pollution is not just a measurement problem, but more of a governance, communication, and public-response problem in the context of Pakistan (Consortium for Development Policy Research [CDPR], 2025; SDPI, 2024). As per the report, Air Quality Index (AQI) generally remains in the zone above the hazardous category (>300) during the smog season. Such prolonged exposure to hazardous air quality shortens life expectancy and increases public-health risks. SDPI (2024) has reported that air pollution causes cardiovascular and respiratory diseases in Pakistan and thousands of premature deaths are caused by PM<sub>2.5</sub> in one year. But on the ground, there is still a lack of awareness and action in the urban industrial areas including Peshawar where the level of perceived pollution and actual pollution do not match consistently (CDPR, 2025).

Other analysis of the regional studies has shown that besides the factors, media framing, institutional trust and access to real-time environmental information play a role in perception gaps. Studies have also revealed that residents in high exposure areas overestimate the immediate senses (e.g. visibility of smog and smells) and underestimate the long-term health effects (Cori et al., 2020). Moreover, research in South Asia indicates that environmental awareness-raising programs do not consistently result in behaviour change, indicating that the process is influenced by a variety of socio-cultural and psychological factors (GBD 2021 Risk Factors Collaborators, 2024). Hence, the existing literature collectively indicates a significant lack of understanding regarding the relationship between reported PM<sub>2.5</sub> context and subjective risk perception, specifically in industrial areas of developing cities such as Peshawar, where the level of exposure is high, but the perceptions and responses have not been adequately studied (SEED Programme & Peshawar Clean Air Alliance, 2022). Recent

environmental and urban-vulnerability literature further suggests that air pollution should be understood not only as a technical environmental issue but also as a social-risk issue affecting exposed and vulnerable urban populations (Tavares et al., 2025). This strengthens the need to study community perception, awareness, and policy support in industrially exposed areas.

### **Research Methodology**

The study is quantitative in nature and uses a cross-sectional research design to investigate community risk perception and social response to air pollution and community in industrially exposed areas of Peshawar (Creswell & Creswell, 2023; Sekaran & Bougie, 2016). The study population consisted of residents and workers living or working near industrially exposed zones where daily exposure to dust, smoke, traffic emissions, and industrial pollution was likely. A sample of two hundred respondents was selected through purposive and convenience sampling because the study specifically targeted people with potential everyday exposure to industrial air pollution.

Respondents were included if they were 18 years or older, lived or worked in the selected industrially exposed areas of Peshawar, and were willing to participate voluntarily. A structured questionnaire was used to collect primary data, which consisted of 18 Likert-scale items to measure awareness of air pollution, perceived poor air quality, community risk perception, and behaviour/policy support. Responses were recorded on a five-point Likert scale ranging from low agreement to high agreement. Composite scores were calculated by averaging the Likert-scale items belonging to each construct (Pallant, 2020). Secondary reported PM<sub>2.5</sub> evidence from published reports was used only to describe the environmental context of Peshawar and was not treated as a respondent-level measured variable.

The data were analysed in SPSS using descriptive statistics, Cronbach's alpha, Pearson correlation, and multiple regression. Cronbach's alpha was used to assess internal consistency, Pearson correlation was used to examine relationships among the main constructs, and multiple regression was used to test whether awareness and perceived poor air quality predicted community risk perception and whether awareness and risk perception predicted behaviour/policy support. Age and education were included as control variables (Pallant, 2020). Participation was voluntary, and no personally identifying information was collected.

### **Data Analysis and Interpretation**

The demographic profile showed that the sample included respondents from different ages, gender, education, and occupational groups. The largest age group was 26–35 years, representing 29.0% of the sample, followed by respondents aged forty-six and above at 26.0%, 36–45 years at 25.5%, and 18–25 years at 19.5%. Females made up the 38.5% and males accounted for the 57.0% of respondents, and the remaining 4.5% belonged to another or unreported category in the current frequency summary. Education-wise, the highest percentage was secondary education (32.0%), followed by primary education (30.5%) and bachelor-level education (26.5%); the remaining 11.0% belonged to other educational categories such as master and above. The largest occupational group was workers, with 53.0% of the respondents. This is sociologically crucial because workers because workers may experience greater daily exposure to industrial and outdoor pollution.

**Table 1: Sample Demographics of Respondents**

<b>Variable</b>	<b>Category</b>	<b>Frequency</b>	<b>Percent</b>
<b>Age group</b>	18-25	39	19.5
	26-35	58	29.0
	36-45	51	25.5
	46 and above	52	26.0
<b>Gender</b>	Male	114	57.0
	Female	77	38.5
	Other	9	4.5
<b>Education</b>	Primary	61	30.5
	Secondary	64	32.0
	Bachelor	53	26.5
	Master and above	22	11.0
<b>Occupation</b>	Student	12	6.0
	Worker	106	53.0
	Business	60	30.0
	Other	22	11.0

The descriptive statistics revealed that the highest means ( $M = 4.05$ ,  $SD = 0.68$ ) was that of perceived poor air quality. This is a clear indication that the respondents are aware of the smoky, dusty, odorous and harmful nature of the air in their area. The level of community risk perception was also high ( $M = 3.81$ ,  $SD = 0.63$ ). It highlights the general association of air pollution with health problems and environmental danger. Awareness of air pollution was moderate ( $M = 3.36$ ,  $SD = 0.80$ ) as well as behaviour/policy support ( $M = 3.68$ ,  $SD = 0.73$ ). The pattern indicates the perception-action gap. It means that the residents perceive and recognise the poor air quality, but their awareness and social response remain less developed than their perception of pollution.

The constructs were internally consistent as confirmed through reliability test (Cronbach's alpha) and also suitable for further analysis. Awareness of air pollution demonstrated excellent reliability ( $\alpha = .916$ ), and perceived poor air quality ( $\alpha = .871$ ), community risk perception ( $\alpha = .862$ ) and behaviour/policy support ( $\alpha = .868$ ) showed good reliability. These values suggest that the items included in each construct measured the same concept and were appropriate for composite-score analysis.

**Table 2: Descriptive Statistics and Reliability of Study Constructs**

<b>Construct</b>	<b>M</b>	<b>SD</b>	<b>Cronbach's <math>\alpha</math></b>
Awareness of Air Pollution	3.36	0.80	.916
Perceived Poor Air Quality	4.05	0.68	.871
Community Risk Perception	3.81	0.63	.862
Behaviour/Policy Support	3.68	0.73	.868

Note. All constructs were measured on a five-point Likert scale. Higher scores indicate stronger agreement.

Basic assumptions were tested prior to regression analysis. There was no violation of the approximating assumptions as the values of residual skewness and kurtosis were within acceptable limits, Durbin-Watson values close to two and VIF values close to one. This indicated that the assumptions of normality, independence of errors, and multicollinearity were fairly met. Thus, the regression models were deemed to be suitable for interpretation.

Pearson correlation analysis was conducted to examine the relationships among the main study constructs. Community risk perception was positively and significantly related to awareness of air pollution ( $r = .231, p < .01$ ), indicating that respondents with higher awareness were more likely to perceive air pollution as a serious risk. Perceived poor air quality was also positively and significantly related to community risk perception ( $r = .336, p < .01$ ), showing that lived experience of polluted air was associated with stronger risk perception. Community risk perception was positively related to behaviour/policy support ( $r = .381, p < .01$ ). Awareness also had a strong positive relationship with behaviour/policy support ( $r = .403, p < .01$ ), suggesting that awareness is an important factor in shaping support for protective behaviour and pollution-control policies. Awareness and perceived poor air quality were not significantly correlated ( $r = -.026, p > .05$ ), suggesting that informational awareness and lived sensory experience may operate as largely independent channels in shaping residents' overall response to air pollution.

**Table 3: Pearson Correlation Matrix**

<b>Construct</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
1. Awareness of Air Pollution	—	-.026	.231**	.403**
2. Perceived Poor Air Quality	-.026	—	.336**	.160*
3. Community Risk Perception	.231**	.336**	—	.381**
4. Behaviour/Policy Support	.403**	.160*	.381**	—

Note. N = 200. \* $p < .05$ , \*\* $p < .01$ . Composite scores were calculated by averaging the items of each construct.

The first regression model examined predictors of community risk perception. The model was statistically significant,  $F(4,195) = 12.429$ ,  $p < .001$ , and explained 20.3% of the variance in community risk perception ( $R = .451$ ,  $R^2 = .203$ , Adjusted  $R^2 = .187$ ). Perceived poor air quality was the strongest predictor ( $\beta = .355$ ,  $p < .001$ ), followed by awareness of air pollution ( $\beta = .252$ ,  $p < .001$ ). Age also had a small but significant positive effect ( $\beta = .165$ ,  $p = .011$ ), while education was not statistically significant ( $\beta = .075$ ,  $p = .245$ ). These results suggest that community risk perception is shaped more by lived experience and awareness than by age or formal education alone.

**Table 4: Multiple Regression Predicting Community Risk Perception**

Predictor	$\beta$	p
Perceived Poor Air Quality	.355	< .001
Awareness of Air Pollution	.252	< .001
Age	.165	.011
Education	.075	.245

Model summary:  $R = .451$ ,  $R^2 = .203$ , Adjusted  $R^2 = .187$ ,  $F(4,195) = 12.429$ ,  $p < .001$ .  
 Dependent variable: Community Risk Perception.

A second regression model examined predictors of behaviour/policy support, using awareness of air pollution, community risk perception, and education as predictors. Age was not included as a direct predictor in the final model because the model focused on awareness, perceived risk, and education as theoretically relevant predictors of behavioural and policy support. The model was statistically significant,  $F(3,196) = 23.643$ ,  $p < .001$ , and explained 26.6% of the variance in behaviour/policy support ( $R = .515$ ,  $R^2 = .266$ , Adjusted  $R^2 = .254$ ). Awareness of air pollution was the strongest predictor ( $\beta = .333$ ,  $p < .001$ ), followed by community risk perception ( $\beta = .314$ ,  $p < .001$ ). Education had a small but statistically significant negative effect ( $\beta = -.125$ ,  $p = .043$ ). This suggests that support for protective behaviour and pollution-control policy depends mainly on awareness and perceived risk. The negative effect of education should be interpreted cautiously because the effect size is small and may reflect differences in expectations, institutional trust, or perceived effectiveness of policy action rather than lower environmental concern among educated respondents.

**Table 5: Multiple Regression Predicting Behaviour/Policy Support**

<b>Predictor</b>	<b><math>\beta</math></b>	<b>p</b>
Awareness of Air Pollution	.333	< .001
Community Risk Perception	.314	< .001
Education	-.125	.043

Model summary:  $R = .515$ ,  $R^2 = .266$ , Adjusted  $R^2 = .254$ ,  $F(3,196) = 23.643$ ,  $p < .001$ .  
 Age was not included in this final model.

## Discussion

The results indicate that air pollution in industrial Peshawar is not a mere condition for the environment but also a risk that is socially construed. This interpretation is in line with the perception of risk and risk society perspective, which assert that social experience, public awareness, trust in the institution, and cultural meaning are used to interpret environmental hazards but not by technical measurement (Douglas and Wildavsky, 1982; Beck, 1992; Slovic, 1995). Secondary PM2.5 evidence uncovers that Peshawar is heavily exposed to air-pollution. Yet the primary contribution of the study is sociological: how the residents perceive, comprehend, and react to the pollution in their daily life. The perceived poor air quality has a high mean score, which indicates that the residents are directly exposed to the pollution in the form of smoke, dust, odour, poor visibility, and discomfort. This confirms recent evidence that lived experience, local exposure, perceived health risk, and awareness of information about actual or perceived pollution dominate public perception of air pollution (Cori et al., 2020; Bahrami et al., 2024; Pinakidou, 2025). These real experiences seem to influence their perception of air pollution as a health and environmental hazard.

This interpretation is supported by the regression results. Perceived poor air quality turned out to be the best predictor of community risk perception, i.e., the lived experience of pollution had a larger impact on community risk perception than formal education. This aligns with the sociological perspective that environmental risk is not merely grasped in terms of scientific information but also through sensory experience, social knowledge, community discourse, as well as trust in institutions. Awareness was also a significant predictor of community risk perception, indicating that information about pollution sources and health effects helps residents recognise air pollution as a serious issue.

The second regression model demonstrated that awareness was the most significant predictor of the behaviour and policy support. This is consistent with behavioural and TPB-based studies that demonstrate that awareness, attitudes, perceived risk, perceived barriers, and perceived benefits are involved in influencing protective behaviour and environmental action support (Ajzen, 1991; Peng et al., 2025; Huang et al., 2024; Woo et al., 2023). This finding holds significance as it suggests that social awareness could be one of the major avenues by which environmental concern can turn into public response. The more the residents are aware of the dangers of air pollution, the more inclined they will be to endorse monitoring, protective behaviour, and rigid policies that regulate pollution. Nevertheless, the level of behaviour/policy support was moderate, but not high. It means that there is a perception-action gap. Residents might be aware of the harm caused by pollution, but might have no resources, trust in institutions, or other effective opportunities to act. According to similar studies, environmental

risk perception does not directly translate into action since the reaction of the population might be determined by the availability of information, perceived government performance, institutional trust, and the practical ability to respond (Cheng et al., 2022).

This is the key gap in terms of environmental sociology. Not every community is impaired by pollution equally, and individuals living or working near industrial areas may face greater exposure while having limited power to reduce it. Recent literature on environmental justice and urban vulnerability also demonstrates that affected communities can experience disproportional environmental impacts and they have less access to decision-making and institutional protection (Organisation for Economic Co-operation and Development, 2024; Tavares et al., 2025). Hence, air pollution cannot be regarded as a technical environmental problem, but as a matter of community vulnerability, environmental justice, community consciousness, and institutional accountability. The findings imply that to work on the air quality response in Peshawar, it is essential not only to work on technical monitoring but also to provide socially available information, involvement of people, and a better regulation of industrial activity.

### **Limitations**

This study has several limitations. First, the cross-sectional design does not allow causal claims, although it helps identify significant associations among awareness, perceived poor air quality, community risk perception, and behaviour/policy support. Second, purposive and convenience sampling limit the generalisability of the findings beyond the selected industrially exposed areas of Peshawar. Third, the study relied on self-reported Likert-scale responses, which may be affected by social desirability bias or individual differences in interpretation. Fourth, secondary PM<sub>2.5</sub> evidence was used only as environmental context and was not linked to respondent-level exposure measurements. Future studies should use longitudinal designs, larger probability-based samples, and direct air-quality measurements to examine how environmental exposure and social perception interact over time.

### **Conclusion**

This research investigated social response and perception of community of air pollution in the industrial area of Peshawar. The results show that residents generally perceived local air quality as poor and associated it with health and environmental risks. The perceived poor air quality and the awareness were important predictors of the community risk perception, while awareness and risk perception were important predictors of the behaviour and policy support. These findings demonstrate that air pollution is not merely a physical environmental state, but also a socially perceived and subjective risk.

Consequently, community-based education, real-time air-quality measurements, public reporting mechanisms, school and workplace education, and increased regulation of industrial emissions should be strengthened to enhance public response to air pollution. The policy should consider air pollution as a social justice and a community health concern, in addition to an environmental-management concern of the future. These guidelines are in line with the recent policy debates on environmental justice and air-quality that focus on public information, monitoring, participation, and protection of vulnerable urban communities (Organisation for Economic Co-operation and Development, 2024; CDPR, 2025; Tavares et al., 2025).

### **References**

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)

- Bahrami, Z., Sato, S., Yang, Z., Maiti, M., Kanawat, P., Umemura, T., Onishi, K., Terasaki, H., Nakayama, T., Matsumi, Y., & Ueda, K. (2024). The perception of air pollution and its health risk: A scoping review of measures and methods. *Global Health Action*, 17(1), Article 2370100. <https://doi.org/10.1080/16549716.2024.2370100>
- Beck, U. (1992). *Risk society: Towards a new modernity*. SAGE Publications.
- Cheng, H., Bian, Q., & Mao, Q. (2022). How can internet use and environmental risk perception encourage pro-environmental behavior? The mediating role of government performance perception. *Polish Journal of Environmental Studies*, 31(6), 5621–5631. <https://doi.org/10.15244/pjoes/152225>
- Consortium for Development Policy Research. (2025, May). *Pakistan's air pollution: Research, policy & practice*. CDPR. <https://www.cdpr.org.pk/wp-content/uploads/2025/05/Policy-Note-Pakistans-Air-Pollution.pdf>
- Cori, L., Donzelli, G., Gorini, F., Bianchi, F., & Curzio, O. (2020). Risk perception of air pollution: A systematic review focused on particulate matter exposure. *International Journal of Environmental Research and Public Health*, 17(17), Article 6424. <https://doi.org/10.3390/ijerph17176424>
- Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE Publications.
- Douglas, M., & Wildavsky, A. (1982). *Risk and culture: An essay on the selection of technological and environmental dangers*. University of California Press.
- GBD 2021 Risk Factors Collaborators. (2024). Global burden and strength of evidence for 88 risk factors in 204 countries and 811 subnational locations, 1990–2021: A systematic analysis for the Global Burden of Disease Study 2021. *The Lancet*, 403(10440), 2162–2203. [https://doi.org/10.1016/S0140-6736\(24\)00933-4](https://doi.org/10.1016/S0140-6736(24)00933-4)
- Huang, Y.-J., Lee, P.-H., Hsieh, S.-H., Chiu, Y.-C., & Chan, T.-C. (2024). Understanding factors influencing adoption of air pollution protective measures using the knowledge-attitude-behavior model. *Scientific Reports*, 14, Article 28414. <https://doi.org/10.1038/s41598-024-79905-y>
- IQAir. (2025). *2024 world air quality report: Region and city PM2.5 ranking*. IQAir. <https://www.iqair.com/world-air-quality-report>
- Organisation for Economic Co-operation and Development. (2024). *Environmental justice: Context, challenges and national approaches*. OECD Publishing. <https://doi.org/10.1787/57616eb4-en>
- Pallant, J. (2020). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS* (7th ed.). Routledge. <https://doi.org/10.4324/9781003117452>
- Peng, M., Cai, Z., Chen, K., Yin, C., Ao, C., & Ren, H. (2025). How risk perception of air pollution influences consumers' pro-environmental behaviors: An empirical study based on the extended theory of planned behavior. *Sustainability*, 17(6), Article 2414. <https://doi.org/10.3390/su17062414>

- Pinakidou, S. (2025). People's perceptions of air pollution and their awareness of official indexes at the start of the twenty-first century: A review. *Discover Environment*, 3, Article 57. <https://doi.org/10.1007/s44274-025-00213-x>
- SEED Programme, & Peshawar Clean Air Alliance. (2022). *Study report: Status of air pollution in Peshawar*. SEED Programme. <https://seed-pk.com/status-of-air-pollution-in-peshawar/>
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach* (7th ed.). Wiley.
- Slovic, P. (1987). Perception of risk. *Science*, 236(4799), 280–285. <https://doi.org/10.1126/science.3563507>
- Slovic, P. (1995). The construction of preference. *American Psychologist*, 50(5), 364–371. <https://doi.org/10.1037/0003-066X.50.5.364>
- Sustainable Development Policy Institute. (2024, December 26). *Poor AQI posing public health risks in Peshawar, Islamabad*. The News International. <https://www.thenews.com.pk/print/1265439-poor-aqi-posing-public-health-risks-in-peshawar-islamabad>
- Tavares, M. S., Rodrigues, C. T., de Menezes, S. L. S., & Moreno, A. M. (2025). Health at risk: Air pollution and urban vulnerability—Perspectives in light of the 2030 Agenda. *Green Health*, 1(3), Article 21. <https://doi.org/10.3390/greenhealth1030021>
- Woo, S.-K., Pai, C.-J., Chiang, Y.-T., & Fang, W.-T. (2023). Predicting the protective behavioural intentions for parents with young children living in Taipei City and New Taipei City using the theory of planned behaviour for air polluted with PM2.5. *International Journal of Environmental Research and Public Health*, 20(3), Article 2518. <https://doi.org/10.3390/ijerph20032518>
- World Health Organization. (2021). *WHO global air quality guidelines: Particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide*. World Health Organization. <https://www.who.int/publications/i/item/9789240034228>
- World Health Organization. (2024, October 24). *Ambient outdoor air pollution*. World Health Organization. [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)



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