The Determinants of Air Pollution Prevention; A Systematic Review

Mofareh Said A Alshehri[1], Idris Adewale Ahmed[2]

[1] Faculty Name, Lincoln University College, Petaling Jaya, Malaysia;

*Corresponding Author: rsnfm10@gmail.com

Abstract

Air pollution remains a critical global environmental and public health challenge, contributing to respiratory, cardiovascular, and developmental diseases while imposing substantial social and economic costs. Although numerous studies have examined air pollution impacts and mitigation strategies, prevention efforts remain fragmented, and a comprehensive understanding of the determinants that enable effective air pollution prevention is still lacking. This systematic review aims to identify, classify, and synthesize the key determinants of air pollution prevention, with a focus on behavioral, organizational, policy, technological, and contextual factors influencing preventive actions and outcomes. A systematic review was conducted in accordance with PRISMA 2020 guidelines. Peer-reviewed studies addressing air pollution prevention or control determinants were identified through structured database searches. Eligible studies were screened and assessed for relevance, and the findings were synthesized using a narrative approach. Determinants were categorized into thematic domains to examine their prevalence, interrelationships, and influence on prevention outcomes. The findings indicate that air pollution prevention is shaped by multiple interconnected determinants operating across individual, organizational, and contextual levels. Behavioral factors such as knowledge, awareness, attitudes, and risk perception influence individual preventive actions. Organizational determinants, including governance structures, internal monitoring mechanisms, and sustainability-oriented cultures, affect the implementation of prevention strategies. Contextual determinants, such as regulatory quality, institutional effectiveness, urbanization patterns, and infrastructure development, create enabling or constraining environments for prevention. Health concerns consistently emerge as a central driver linking individual behavior with organizational and policy responses. Air pollution prevention is a multi-dimensional process that requires alignment between behavioral engagement, organizational capability, and supportive governance contexts. Integrated prevention frameworks that address determinants across individual, institutional, and systemic levels are essential for achieving sustained improvements in air quality and long-term public health outcomes.

Keywords: Air pollution prevention; Environmental determinants; Behavioral factors; Environmental governance; Public health

1. Introduction

Air pollution remains one of the most pervasive environmental threats to human health and sustainable development worldwide. Exposure to ambient and household air pollutants has been consistently linked to adverse respiratory, cardiovascular, and developmental outcomes, contributing

substantially to global morbidity and premature mortality. Evidence indicates that air pollution not only exacerbates existing health conditions but also acts as an early-life determinant of chronic diseases, underscoring the importance of prevention-oriented approaches rather than reliance on downstream mitigation alone. For instance, early exposure to polluted air has been identified as a critical factor in the developmental origins of chronic respiratory diseases, highlighting the long-term consequences of inadequate pollution prevention strategies (Lu et al., 2022). Similarly, systematic evidence demonstrates that exposure to particulate matter during prenatal and postnatal periods significantly increases the risk of growth impairment and other adverse health outcomes, reinforcing the public health imperative for preventive action (Pun et al., 2021).

Beyond direct health impacts, air pollution is deeply embedded within complex social, economic, behavioral, and institutional systems. Urbanization, industrialization, transportation expansion, and energy consumption patterns continue to drive emissions in many regions, particularly in low- and middle-income countries experiencing rapid economic growth (Maji et al., 2023). At the same time, public awareness, risk perception, and individual behavioral responses play a crucial role in shaping pollution prevention outcomes. Empirical studies have shown that knowledge, attitudes, and perceived risks significantly influence individuals' willingness to adopt protective and preventive measures against air pollution (Huang et al., 2024). Psychological factors, including affective responses and satisfaction with governmental air quality control, further mediate the relationship between objective pollution levels and pro-environmental behavior (Yang et al., 2025).

At the organizational and institutional levels, governance quality, regulatory enforcement, and internal management mechanisms have been identified as decisive determinants of pollution prevention performance. Strong institutional quality, effective regulation, and transparent governance structures are associated with lower pollution levels and improved environmental outcomes across countries (Chen et al., 2022). Within firms, internal monitoring, corporate environmental responsibility, and sustainable investment decisions have been shown to significantly enhance pollution prevention efforts, particularly when aligned with supportive governmental involvement (Khan et al., 2024). Conversely, weak enforcement and misalignment between environmental priorities and regulatory actions can undermine the effectiveness of pollution control policies, even in high-income contexts (Ewing et al., 2024).

Technological innovation and clean technology adoption also constitute central pillars of air pollution prevention. Firm-level and cross-national evidence indicates that innovation reduces pollutant emissions by improving energy efficiency, optimizing resource allocation, and facilitating transitions toward cleaner production processes (Chen et al., 2022). At the macro level, the adoption of clean fuels, renewable energy, and low-emission technologies has demonstrated substantial potential to reduce carbon emissions and co-benefit local air quality, supporting integrated pollution prevention and climate strategies (Tangato, 2025). Urban planning and transportation infrastructure further shape exposure patterns and emission dynamics, with spatial spillover effects revealing the interconnected nature of air pollution across regions and jurisdictions (Guo et al., 2022).

Despite the growing body of literature addressing individual drivers of air pollution prevention, existing research remains fragmented across disciplines, scales, and contexts. Prior reviews have often focused narrowly on health risks, mitigation technologies, or specific policy instruments, without systematically integrating behavioral, organizational, socioeconomic, and contextual determinants within a unified analytical framework. Recent scoping and narrative reviews highlight the diversity of strategies employed across regions but also reveal significant gaps in understanding how different determinants interact to influence prevention outcomes (Okello et al., 2023). Moreover, limited attention has been given to early preventive actions embedded within urbanization processes

and governance systems that could avert pollution escalation before severe degradation occurs (Zhang X. et al., 2022).

In response to these gaps, this systematic review aims to comprehensively identify, categorize, and synthesize the determinants of air pollution prevention reported in the empirical literature. By integrating evidence across health, behavioral, policy, technological, socioeconomic, and urban planning domains, this review seeks to provide a structured understanding of the factors that enable or constrain effective air pollution prevention. In doing so, the study contributes to advancing prevention-focused environmental governance and offers evidence-informed insights for policymakers, organizations, and researchers seeking to design sustainable strategies for improving air quality.

2. Methodology

This study employed a systematic review design to comprehensively identify and synthesize empirical evidence on the determinants of air pollution prevention. The review was conducted in accordance with the PRISMA 2020 reporting guidelines to ensure methodological transparency, rigor, and reproducibility across all stages of the review process. A predefined and structured approach guided study identification, screening, eligibility assessment, and inclusion, thereby minimizing selection bias and enhancing consistency in evidence synthesis.

A comprehensive literature search was undertaken across major academic databases to retrieve peer-reviewed studies addressing air pollution prevention and its underlying determinants. The search strategy was designed to capture the multidimensional nature of air pollution prevention by incorporating health-related, behavioral, organizational, policy, technological, socioeconomic, and urban planning perspectives. Keywords and Boolean operators related to air pollution prevention, mitigation strategies, governance mechanisms, behavioral responses, and contextual drivers were systematically combined and refined iteratively to ensure both sensitivity and relevance. This approach is consistent with established practices in systematic reviews addressing complex environmental and public health phenomena (Pun et al., 2021).

Studies were selected based on clearly defined inclusion and exclusion criteria. Eligible studies explicitly examined air pollution prevention, control, or reduction strategies and analyzed one or more determinants influencing prevention outcomes, including health impacts, behavioral factors, policy and regulatory mechanisms, institutional or governance structures, technological innovation, or socioeconomic conditions. Quantitative, qualitative, and mixed-methods studies published in peer-reviewed journals in English were considered eligible. Studies focusing solely on pollutant measurement or exposure assessment without addressing prevention-related determinants were excluded, as were studies lacking sufficient methodological clarity. This eligibility framework aligns with prior reviews emphasizing the importance of contextual and determinant-based analyses in air quality management research (Okello et al., 2023).

All retrieved records were imported into a reference management system, and duplicate entries were removed prior to screening. Titles and abstracts were screened to assess relevance in relation to the review objectives, followed by full-text assessment to confirm eligibility. The study selection process followed a sequential and transparent approach, with reasons for exclusion documented at each stage.

The overall identification, screening, eligibility, and inclusion process is illustrated in Figure 1, which presents the PRISMA 2020 flow diagram summarizing the progression of records through the review.

Data extraction was conducted using a standardized extraction framework to ensure consistency and accuracy. Key information extracted from each included study comprised author(s), year of publication, study context, methodological design, and explicitly reported determinants of air pollution prevention. Determinants were coded according to predefined categories reflected in Table 1, including health impacts, early-life determinants, behavioral determinants, knowledge and awareness, attitudes and perceptions, protective or preventive actions, policy and regulatory factors, and socioeconomic factors. Only determinants explicitly mentioned in the original studies were recorded, ensuring objective evidence mapping.

Given the heterogeneity of study designs, contexts, and outcome measures, a narrative synthesis approach was adopted. Rather than aggregating effect sizes, the synthesis focused on identifying the prevalence and patterns of determinants reported across studies and examining their distribution across behavioral, organizational, and contextual levels. This approach is consistent with previous reviews addressing air pollution drivers and prevention strategies, where methodological diversity limits the feasibility of meta-analysis (Maji et al., 2023). The synthesized findings provided a structured foundation for subsequent analysis of determinant interplay and implications for policy, practice, and research.

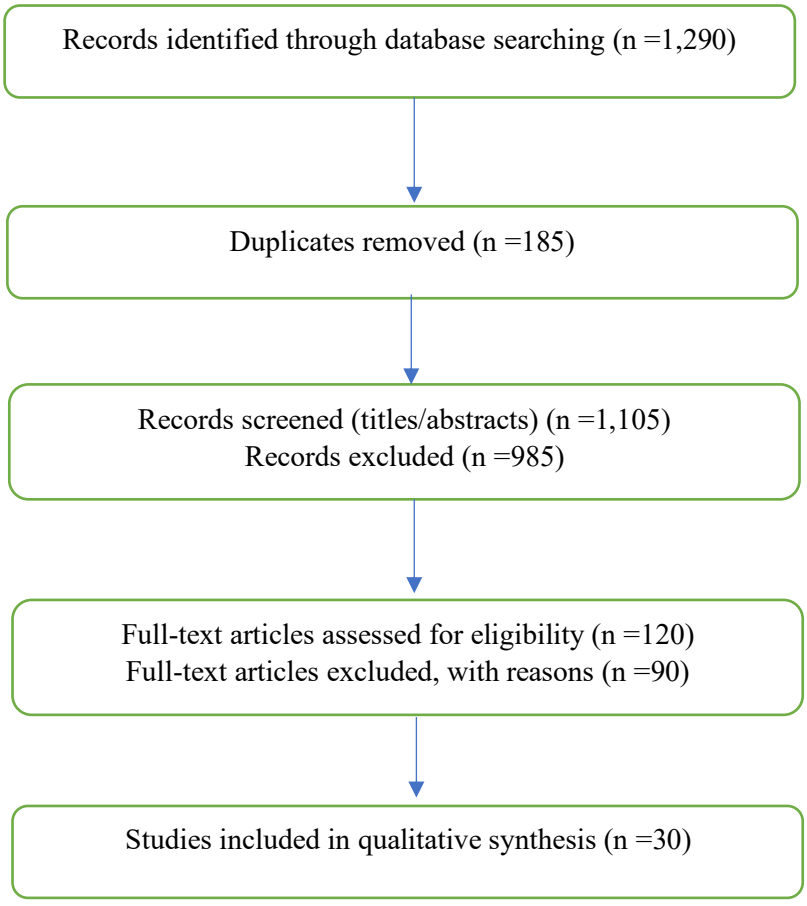

Figure 1: The Systematic Review Process

3. Results

3.1. Study Selection and Characteristics

The systematic search and screening process resulted in the inclusion of 30 peer-reviewed studies that met the predefined eligibility criteria. The identification, screening, eligibility assessment, and final inclusion of studies followed the PRISMA 2020 framework, as illustrated in Figure 1. Following duplicate removal and title and abstract screening, full-text articles were assessed to ensure that each study explicitly addressed air pollution prevention or control and examined at least one determinant relevant to prevention outcomes. The included studies represent a wide range of geographical contexts, including Asia, Africa, Europe, North America, and global multi-country analyses, reflecting the global relevance of air pollution prevention. Methodologically, the evidence base comprises systematic reviews, scoping reviews, quantitative observational studies, econometric analyses, structural equation modeling studies, and policy analyses. This diversity highlights the multidisciplinary nature of air pollution prevention research and the need for integrative synthesis across health, behavioral, policy, technological, and socioeconomic domains.

As summarized in Table 1 (Literature Review Matrix), health-related impacts were the most frequently examined dimension, with multiple studies explicitly linking air pollution exposure to adverse respiratory, cardiovascular, and developmental outcomes. Early-life determinants were also prominently reported, particularly in studies emphasizing prenatal and childhood exposure to air pollutants and their long-term health consequences, underscoring the preventive importance of early interventions (Lu et al., 2022). Systematic evidence further demonstrates consistent associations between air pollution exposure and growth impairment and chronic disease risk, reinforcing the role of prevention as a public health priority (Pun et al., 2021). Behavioral determinants emerged as a major thematic category across the included literature. Several studies explicitly examined how individual behaviors, risk perceptions, and psychological factors influence engagement in pollution prevention and protective actions. Knowledge, awareness, and attitudes toward air pollution were frequently identified as critical precursors to preventive behavior, particularly in studies applying behavioral theories and psychosocial models (Huang et al., 2024). Emotional responses, perceived air quality, and satisfaction with governmental air quality control were also shown to shape pro-environmental behavior, indicating the importance of subjective perceptions alongside objective pollution measures (Yang et al., 2025).

Policy and regulatory factors were another dominant determinant category, with a substantial proportion of studies emphasizing the role of environmental regulations, governance quality, and enforcement mechanisms in reducing air pollution. Cross-national and regional analyses revealed that stronger institutional quality, effective regulatory frameworks, and coordinated policy instruments are associated with lower emission levels and improved prevention outcomes (Chen et al., 2022). Evidence from policy-focused studies further demonstrates that environmental regulations, corporate disclosure requirements, and enforcement strategies significantly influence organizational behavior and pollution prevention performance (Wang et al., 2021). Technological and organizational determinants were also well represented. Firm-level and macro-level studies consistently reported that technological innovation, clean technology adoption, and energy efficiency improvements contribute to pollution reduction and prevention (Chen et al., 2022). Organizational culture, internal monitoring mechanisms, and corporate environmental responsibility were identified as enabling factors that strengthen pollution prevention efforts, particularly when supported by coherent policy environments (Khan et al., 2024). These findings indicate that prevention outcomes are shaped not only by external regulations but also by internal organizational dynamics.

Socioeconomic and contextual determinants were less frequently examined but remained analytically significant. Several studies explicitly linked socioeconomic status, urbanization patterns, and infrastructure development to air pollution exposure and prevention capacity. Urban planning and transportation infrastructure were shown to influence spatial pollution patterns and exposure risks, highlighting the importance of integrated, place-based prevention strategies (Guo et al., 2022). Reviews focusing on urbanization further emphasized the need for proactive pollution control measures embedded within development processes to prevent long-term air quality deterioration (Zhang X. et al., 2022). Table 1 demonstrates that air pollution prevention is influenced by a complex and interrelated set of determinants spanning health, behavioral, policy, technological, organizational, and socioeconomic domains. The heterogeneity of determinants across studies supports the need for an integrated analytical framework, which is further explored in the subsequent synthesis of determinant prevalence and outcomes.

Table 1. Literature Review Matrix

No.	Author(s) & Year	Health Impacts	Early-Life Determinants	Behavioral Determinants	Knowledge / Awareness	Attitudes / Perceptions	Protective / Preventive Actions	Policy / Regulatory Factors	Socioeconomic Factors
1	Lu et al. (2022)	✓	✓						
2	Maji et al. (2023)	✓						✓	
3	Pun et al. (2021)	✓	✓						
4	Huang et al. (2024)			✓	✓	✓	✓		
5	Zarate-Gonzalez et al. (2025)	✓		✓	✓	✓	✓	✓	✓
6	Awewomom et al. (2024)	✓	✓	✓	✓	✓			
7	Liu et al. (2022)			✓			✓		
8	Wang et al. (2021)			✓	✓		✓		
9	Ndou & Aigbavboa (2023)			✓	✓			✓	
10	Ewing et al. (2024)			✓	✓				
11	Khan et al. (2024)	✓	✓		✓	✓			
12	Chen et al. (2022)	✓		✓	✓				
13	Fok et al. (2022)						✓		
14	Wang et al. (2021)	✓			✓	✓			
15	Bouza et al. (2022)	✓			✓			✓	
16	Cheng et al. (2022)	✓	✓			✓	✓		
17	Thompson et al. (2024)	✓	✓	✓	✓	✓	✓		
18	Yang et al. (2025)	✓	✓				✓	✓	
19	Zhang et al. (2021)				✓		✓		
20	Farinetti et al. (2025)								✓
21	Du et al. (2021)	✓	✓			✓			
22	Chen et al. (2022)			✓					
23	Tangato (2025)				✓				
24	Mukwevho et al. (2022)	✓				✓	✓		
25	Jun et al. (2021)			✓		✓		✓	
26	Lin et al. (2024)	✓	✓	✓	✓				✓
27	Guo et al. (2022)		✓					✓	

No.	Author(s) & Year	Health Impacts	Early-Life Determinants	Behavioral Determinants	Knowledge / Awareness	Attitudes / Perceptions	Protective / Preventive Actions	Policy / Regulatory Factors	Socioeconomic Factors
28	Okello et al. (2023)			✓	✓	✓			
29	Zhang Q. Y. et al. (2022)				✓		✓		
30	Zhang X. et al. (2022)			✓		✓			

3.2. Prevalence and Determinants of Air Pollution Prevention

The synthesis of evidence presented in Table 1 reveals that air pollution prevention is shaped by a diverse set of determinants operating across health, behavioral, policy, technological, organizational, and socioeconomic domains. Among these, health-related determinants were the most prevalent, with a substantial number of studies explicitly framing air pollution prevention as a public health imperative. Several studies emphasized the role of air pollution as a contributor to chronic respiratory and cardiovascular conditions, reinforcing prevention as a necessary strategy to reduce long-term disease burden (Lu et al., 2022). Evidence also demonstrated that air pollution exposure during critical developmental periods constitutes an early-life determinant of adverse health outcomes, further strengthening the case for preventive interventions that target exposure reduction before disease onset (Pun et al., 2021).

Behavioral determinants were prominently represented across the reviewed literature, highlighting the importance of individual and collective actions in pollution prevention. Studies applying behavioral and psychosocial frameworks consistently identified knowledge, awareness, and attitudes toward air pollution as key drivers of preventive behavior. Individuals with higher levels of environmental knowledge and risk awareness were more likely to engage in protective and preventive actions, such as adopting pollution-reducing practices and supporting mitigation measures (Huang et al., 2024). Psychological processes, including affective responses to pollution and perceived proximity to environmental risks, were shown to influence behavioral intentions and willingness to support preventive actions, underscoring the role of subjective perception in shaping pollution prevention outcomes (Yang et al., 2025).

Policy and regulatory determinants emerged as another highly prevalent category influencing air pollution prevention. Multiple studies demonstrated that effective environmental regulations, policy enforcement, and institutional quality play a decisive role in reducing pollutant emissions and promoting preventive practices. Strong governance structures, regulatory effectiveness, and corruption control were consistently associated with improved air quality outcomes, indicating that prevention efforts are strongly conditioned by institutional capacity (Chen et al., 2022). In addition, empirical evidence showed that environmental regulations and disclosure requirements can incentivize firms to adopt pollution prevention strategies and strengthen corporate environmental responsibility (Wang et al., 2021).

Technological and organizational determinants were also frequently identified as critical enablers of air pollution prevention. Innovation-driven improvements in production processes, energy efficiency, and resource allocation were found to significantly reduce emissions at the firm level, contributing to broader prevention outcomes (Chen et al., 2022). Studies further highlighted the importance of clean

technology adoption, renewable energy use, and access to cleaner fuels as effective pathways for reducing emissions and supporting long-term environmental sustainability (Tangato, 2025). Within organizations, internal monitoring mechanisms and governance structures were shown to enhance commitment to pollution prevention, particularly when aligned with supportive policy environments and governmental engagement (Khan et al., 2024).

Socioeconomic and contextual determinants, although less frequently examined, were nonetheless integral to understanding variation in pollution prevention effectiveness. Socioeconomic status, urbanization patterns, and infrastructure development were explicitly linked to differential exposure levels and prevention capacity across populations. Urban growth and transportation infrastructure were shown to generate spatial spillover effects that influence pollution distribution beyond administrative boundaries, highlighting the need for coordinated and regionally integrated prevention strategies (Guo et al., 2022). Reviews focusing on urbanization processes further emphasized the importance of embedding preventive measures within development planning to avoid pollution escalation during periods of rapid economic and demographic change (Zhang X. et al., 2022).

3.3. Outcomes Associated with Air Pollution Prevention

The reviewed literature demonstrates that effective air pollution prevention is associated with a wide range of positive outcomes spanning health, behavioral, environmental, organizational, and policy domains. Health-related outcomes were the most consistently reported, with multiple studies linking preventive reductions in air pollution exposure to improvements in respiratory and cardiovascular health. Evidence indicates that minimizing exposure to ambient and household air pollutants can reduce the risk of chronic respiratory conditions and mitigate long-term disease progression, particularly when preventive measures are implemented early in the life course (Lu et al., 2022). Preventive actions targeting air quality have also been shown to lower the incidence of growth impairment and developmental risks associated with particulate matter exposure, reinforcing the role of prevention in protecting vulnerable populations (Pun et al., 2021).

Behavioral and psychosocial outcomes were also prominently associated with air pollution prevention efforts. Several studies reported that increased knowledge, awareness, and risk perception contribute to greater adoption of protective and preventive behaviors, including support for pollution control measures and individual-level actions to reduce exposure. Preventive initiatives that enhance public understanding of air pollution risks were found to strengthen pro-environmental behavior and willingness to engage in pollution-reducing practices (Huang et al., 2024). Psychological responses, such as reduced negative affect and increased satisfaction with local air quality governance, were further associated with higher levels of preventive engagement and sustained behavioral change (Yang et al., 2025). At the environmental and technological levels, air pollution prevention outcomes were reflected in measurable reductions in pollutant emissions and improvements in energy efficiency. Empirical evidence showed that technological innovation and cleaner production processes lead to significant decreases in firm-level emissions, thereby contributing to broader environmental quality improvements (Chen et al., 2022). The adoption of clean technologies and renewable energy sources was similarly associated with lower carbon emissions and co-benefits for local air quality, supporting the effectiveness of prevention-oriented technological transitions (Tangato, 2025).

Organizational and institutional outcomes were evident in studies examining governance mechanisms and corporate behavior. Firms operating under strong regulatory frameworks and effective internal monitoring systems demonstrated greater commitment to pollution prevention and increased

investment in sustainable practices (Khan et al., 2024). Preventive regulatory approaches, including environmental disclosure requirements and balanced enforcement strategies, were shown to incentivize corporate environmental responsibility and reduce pollution levels when appropriately designed and implemented (Wang et al., 2021). Conversely, weak enforcement and misalignment between environmental priorities and regulatory actions were associated with limited prevention effectiveness, highlighting the importance of institutional coherence (Ewing et al., 2024). At the policy and urban systems level, air pollution prevention outcomes extended beyond emission reduction to include improved coordination across jurisdictions and sectors. Studies focusing on regional and urban contexts reported that integrated planning and coordinated policy instruments can mitigate spatial spillover effects and enhance prevention effectiveness across administrative boundaries (Guo et al., 2022). Preventive strategies embedded within urbanization and development processes were further associated with more sustainable air quality trajectories, emphasizing the long-term benefits of proactive planning and early intervention (Zhang X. et al., 2022).

4. Discussion

4.1. Interplay of Behavioral, Organizational, and Contextual Determinants

The findings of this systematic review indicate that air pollution prevention is driven by a dynamic and interdependent interplay between behavioral, organizational, and contextual determinants rather than by isolated factors. Behavioral determinants, including knowledge, awareness, attitudes, and psychological responses to air pollution, frequently emerge as immediate drivers of preventive actions. However, the effectiveness and sustainability of these behaviors are strongly conditioned by organizational structures and broader contextual environments. Evidence suggests that individuals are more likely to engage in pollution prevention when they perceive air pollution as a direct health threat and believe that their actions can contribute meaningfully to mitigation outcomes (Huang et al., 2024). These behavioral responses are further shaped by affective reactions and satisfaction with local air quality governance, which can either reinforce or suppress pro-environmental behavior (Yang et al., 2025).

Organizational determinants play a mediating role between individual behavior and systemic pollution prevention outcomes. Internal governance mechanisms, such as monitoring structures, leadership composition, and corporate commitment to sustainability, translate regulatory expectations and societal pressure into concrete preventive actions. Firms with robust internal monitoring and governance systems demonstrate higher levels of investment in pollution prevention and cleaner production practices, particularly when such efforts align with regulatory incentives and public accountability mechanisms (Khan et al., 2024). Organizational culture and quality improvement practices further influence how environmental priorities are internalized, shaping whether prevention is treated as a compliance obligation or as a strategic objective linked to long-term performance and legitimacy (Fok et al., 2022).

Contextual determinants, including policy frameworks, institutional quality, socioeconomic conditions, and urban development patterns, provide the structural conditions within which behavioral and organizational responses unfold. Strong institutional quality and effective regulatory environments create enabling conditions that amplify the impact of both individual and organizational preventive actions. Cross-country evidence demonstrates that higher regulatory quality, rule of law, and government effectiveness are associated with lower pollution levels, suggesting that contextual governance capacity is a prerequisite for successful prevention (Chen et al., 2022). Conversely, weak enforcement and misalignment between policy goals and implementation can undermine behavioral

motivation and organizational compliance, limiting prevention effectiveness even where awareness and technological capacity exist (Ewing et al., 2024).

The interaction between these determinants becomes particularly evident in urban and regional contexts, where behavioral choices, organizational practices, and infrastructural systems intersect. Urbanization and transportation development shape exposure patterns and influence both individual behavior and institutional responses. Spatial spillover effects linked to transportation infrastructure illustrate how pollution generated in one jurisdiction can affect neighboring areas, necessitating coordinated governance and collective behavioral engagement across administrative boundaries (Guo et al., 2022). Preventive outcomes in such contexts depend not only on individual willingness to adopt pollution-reducing behaviors but also on organizational compliance and regionally integrated policy instruments.

Health considerations serve as a unifying mechanism linking behavioral, organizational, and contextual determinants. The recognition of air pollution as a contributor to chronic respiratory and cardiovascular diseases strengthens individual motivation for preventive behavior while simultaneously justifying organizational investment and regulatory intervention. Evidence highlighting early-life exposure and long-term health consequences underscores the urgency of preventive action embedded within institutional and urban planning frameworks (Lu et al., 2022). This health-centered framing enhances public acceptance of regulatory measures and encourages organizational actors to align pollution prevention with corporate social responsibility and long-term risk management (Wang et al., 2021).

4.2. Policy, Practical, and Theoretical Implications

The findings of this systematic review carry important policy implications for governments and regulatory bodies seeking to strengthen air pollution prevention. The evidence indicates that effective prevention is closely linked to the quality of governance, regulatory coherence, and enforcement capacity. Policymakers should prioritize the design and implementation of robust environmental regulations that are supported by strong institutional quality, transparency, and accountability mechanisms. Studies demonstrate that regulatory effectiveness, rule of law, and government performance are consistently associated with lower pollution levels, suggesting that prevention-oriented policies must be embedded within broader institutional reform agendas rather than treated as isolated environmental initiatives (Chen et al., 2022). In addition, regulatory instruments that incentivize corporate environmental responsibility and disclosure can motivate firms to adopt pollution prevention strategies, provided that regulatory intensity is balanced to avoid counterproductive effects (Wang et al., 2021).

From a practical perspective, the review highlights the need for integrated, multi-level interventions that align behavioral engagement with organizational capability and contextual infrastructure. Public awareness and education campaigns remain essential for fostering preventive behavior, but their effectiveness depends on trust in governance systems and the availability of feasible preventive options. Evidence shows that increased knowledge, positive attitudes, and risk awareness enhance individuals' willingness to engage in pollution prevention and support mitigation measures (Huang et al., 2024). However, these behavioral gains must be supported by practical enablers, such as access to clean technologies, improved urban design, and reliable public transportation systems. Urban planning strategies that incorporate pollution prevention into transportation and land-use decisions can significantly reduce exposure and emissions, reinforcing the practical value of prevention-oriented development (Lin et al., 2024). At the organizational level, the findings underscore the

importance of internal governance mechanisms and strategic leadership in translating policy objectives into operational outcomes. Firms with effective internal monitoring systems, strong governance structures, and a sustainability-oriented culture are better positioned to invest in pollution prevention and cleaner production practices. Empirical evidence suggests that organizational commitment to sustainable investment is strengthened when internal governance aligns with external regulatory expectations and governmental support (Khan et al., 2024). Practitioners and managers should therefore view pollution prevention not merely as a compliance requirement but as a strategic investment that enhances long-term resilience, legitimacy, and performance.

Theoretical implications emerge from the need to move beyond single-factor explanations of air pollution prevention. The reviewed evidence supports a multi-level and systems-based perspective in which behavioral, organizational, and contextual determinants interact to shape prevention outcomes. Behavioral theories that emphasize knowledge, attitudes, and affective responses provide valuable insights into individual-level engagement but are insufficient on their own to explain sustained prevention without accounting for institutional and structural constraints. The observed influence of perceived air quality, emotional responses, and satisfaction with governance suggests that psychological and perceptual constructs should be more explicitly integrated into environmental governance and policy theories (Yang et al., 2025). Furthermore, the findings contribute to advancing prevention-oriented frameworks within environmental and public health theory by emphasizing early intervention and cumulative exposure reduction. Evidence linking air pollution exposure to long-term respiratory and cardiovascular outcomes reinforces the importance of embedding prevention within life-course and urban development perspectives (Lu et al., 2022). Theoretical models of air quality management should therefore incorporate early-life vulnerability, socioeconomic context, and spatial dynamics to better capture the complexity of prevention processes. By integrating health, behavioral science, organizational theory, and institutional governance, future theoretical development can provide more comprehensive explanations of how and why air pollution prevention succeeds or fails across different settings.

4.3. Comparison with Existing Reviews, Limitations, and Future Research

When compared with existing reviews on air pollution and air quality management, the present systematic review extends the literature by offering a more integrative and determinant-focused synthesis. Earlier reviews have predominantly concentrated on the health risks associated with air pollution or on specific mitigation strategies, such as technological solutions or emission control instruments. For example, prior syntheses have provided detailed accounts of the health consequences of major air pollutants and their mitigation pathways, but have tended to treat prevention as a secondary outcome rather than a central analytical focus (Maji et al., 2023). Similarly, reviews examining air pollution from a public health perspective have emphasized disease prevention and exposure reduction without systematically integrating behavioral, organizational, and governance-related determinants within a unified framework (Bouza et al., 2022).

More recent scoping and narrative reviews have begun to acknowledge the importance of policy, technological, and contextual factors in shaping air quality outcomes, particularly in low- and middle-income regions. Reviews focusing on African contexts have highlighted the diversity of air quality management strategies and the challenges posed by socioeconomic constraints and competing development priorities (Okello et al., 2023). However, these reviews often prioritize cataloguing strategies over analyzing how different determinant categories interact to enable or constrain prevention. In contrast, the present review advances the literature by systematically mapping the

prevalence of health, behavioral, policy, technological, organizational, and socioeconomic determinants and examining their combined influence on air pollution prevention.

Despite its contributions, this review is subject to several limitations that should be acknowledged. First, the evidence base exhibits substantial heterogeneity in study design, analytical methods, and outcome measures, which constrained the use of quantitative synthesis techniques such as meta-analysis. As a result, the findings rely on narrative synthesis to identify determinant patterns and prevalence. Second, the review is limited to peer-reviewed studies published in English, which may have excluded relevant evidence from non-English sources and grey literature, particularly policy reports and local evaluations in underrepresented regions. Third, while the review captures a wide range of determinants, the relative strength and causal pathways of these determinants could not be consistently assessed due to differences in methodological rigor and data availability across studies.

The reviewed literature also reveals important gaps that provide direction for future research. First, there is a need for more longitudinal and quasi-experimental studies that can clarify causal relationships between prevention-oriented policies, behavioral interventions, and long-term air quality outcomes. While cross-sectional and econometric analyses offer valuable insights, they are limited in their ability to capture dynamic changes over time. Second, future research should place greater emphasis on the interaction between early-life exposure, socioeconomic vulnerability, and preventive policy design, building on evidence that highlights the long-term health consequences of early exposure to air pollution (Lu et al., 2022). Third, more empirical work is needed to examine how psychological and perceptual factors, such as perceived air quality and affective responses, interact with institutional trust and governance quality to shape sustained preventive behavior (Yang et al., 2025).

Further research is also warranted to explore prevention within rapidly urbanizing contexts, where infrastructure development, transportation systems, and spatial spillover effects complicate pollution control efforts. Studies employing spatial and systems-based approaches could enhance understanding of how regional coordination and integrated urban planning influence prevention effectiveness (Guo et al., 2022). In addition, future reviews and empirical studies should seek to incorporate multidisciplinary theoretical perspectives that bridge public health, behavioral science, organizational theory, and environmental governance. Such integration would support the development of comprehensive prevention frameworks capable of addressing the complex and interdependent determinants of air pollution prevention identified in this review.

5. Conclusion

This systematic review set out to identify, categorize, and synthesize the determinants of air pollution prevention across diverse disciplinary and contextual settings. The findings demonstrate that air pollution prevention is shaped by a complex constellation of interrelated determinants spanning health considerations, behavioral engagement, organizational capacity, policy and regulatory frameworks, technological innovation, and socioeconomic context. Rather than operating in isolation, these determinants interact across individual, institutional, and systemic levels to influence the effectiveness and sustainability of preventive efforts. The evidence highlights health protection as a primary driver of prevention, with concerns about respiratory, cardiovascular, and developmental outcomes motivating both individual behavior and policy intervention.

Behavioral determinants, including knowledge, awareness, attitudes, and psychological responses to air pollution, play a critical role in translating risk recognition into preventive action. However, the review shows that behavioral change alone is insufficient without supportive organizational practices and enabling governance structures. Organizational commitment, internal monitoring mechanisms, and sustainability-oriented cultures are essential for operationalizing prevention within firms and institutions. At the contextual level, policy coherence, regulatory quality, and institutional effectiveness emerge as foundational conditions for successful air pollution prevention. Preventive outcomes are strongest where regulations are well designed, consistently enforced, and aligned with technological and economic incentives. Urbanization patterns, infrastructure development, and spatial interdependencies further shape exposure and prevention capacity, underscoring the need for coordinated, place-based, and regionally integrated approaches.

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