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AN ANALYSIS OF THE ECONOMIC IMPACTS OF AIR POLLUTION IN THE URBAN AREAS: BIBLIOGRAPHIC REVIEW

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Abstract

Air pollution is a severe problem affecting cities worldwide, with significant environmental and public health implications. Air quality has become challenging as cities grow rapidly with far-reaching socioeconomic consequences. This paper aims to provide a bibliographic review of existing literature on the economic impacts of air pollution in urban areas. The review includes studies that measure health costs, labour productivity impacts, household consumption, stock market performance, and tourism. The findings show that air pollution results in significant economic burdens, such as increased healthcare costs due to pollution-related illnesses and productivity losses. Additionally, it negatively affects household consumption, stock market valuation, and tourism revenue.

1. Introduction

Urbanisation has emerged as one of the most prominent characteristics of contemporary times, with more than half of the global population now living in urban areas. While urban areas provide numerous economic opportunities, diverse cultures, and social amenities, they also present significant environmental challenges, with air pollution being a primary concern. One of the leading causes of air quality issues is the rapid growth of urban populations, often accompanied by land use changes resulting from the expansion of urban areas [63] [12]. Moreover, it is widely recognised that the prevalence of convenient disposable plastic has led to a worldwide problem of plastic pollution, with significant environmental and health effects [2] [18]. Moreover, industrial activities [11] [16] vehicular emissions [92][39] [75] [91] residential energy consumption [92] and forest fire [21] are the primary sources of urban air pollution, which has become a critical global issue with far-reaching economic implications. For example, in 2001, the economic impact of healthcare damage caused by particulate air pollution in Shanghai, China, was nearly 625.40 million US dollars, contributing to 1.03 per cent of the city's GDP [41]. Furthermore, in Singapore, the total economic cost due to air pollution was US$3662 million in 1999, approximately 4.32 per cent of GDP [72]. In 2011, the health effects of air pollution were a yearly economic expenditure of around €253 million or 3.2 per cent of the GDP in Macedonia [64]. According to a report by the World Bank, exposure to polluted air cost the world $8.1 trillion in health damages in 2019, representing 6.1% of the global gross product [78].

Urban air pollution has significant economic impacts beyond environmental degradation. These impacts include direct and indirect costs that can strain public finances, hinder high-quality economic development [31], and harm populations' mental health and well-being [69]. Therefore, understanding the complex link between air pollution and economics is essential to creating effective policy interventions and sustainable strategies for urban planning.

This review aims to summarise recent academic literature on the economic impacts of air pollution in urban areas, highlighting how pollution affects economic outcomes. The study examines the

economic effects of air pollution, including healthcare costs, labour productivity, household consumption expenditures, the stock market, and tourism business attractions.

2. Literature review

2.1 Impact of Air pollution

Air pollution negatively impacts human health and ecosystems [62] and seriously threatens the well-being of living beings and the planet. Air pollution has health effects that can be classified as either long-term or short-term. Brief exposure can lead to respiratory illness and death from lung cancer [114], asthma attacks [30] [29], heart attacks [43] and even death [25]. Long-term exposure can lead to 6-9 % increased odds of rhinitis and 7-8% asthma [60], chronic obstructive pulmonary disease and lung cancer [19] cardiovascular disease [5] and so on. From an ecosystem perspective, urban air pollution negatively affects crops, reducing yield and nutritional quality while increasing pest infestation levels, especially for crops grown to feed the urban poor [10].

Lu [54] conducted a study on the effect of air pollution on human psychology, economy, and society. The research reveals that air pollution has several adverse psychological effects, including reduced emotional well-being and life satisfaction, increased anxiety, distress, mental illnesses, self-harming tendencies, and suicide rates. From a social perspective, it intensifies criminal activity and deteriorates the public's opinion of the government. Furthermore, air pollution also has economic implications, negatively affecting work productivity and stock markets. The study addresses the economic impact of air pollution.

2.2 Economic impact of Air pollution

The economic impact of air pollution can have negative, significant, and far-reaching effects on various sectors and aspects of the economy. Chowdhury [17] analysed the impact of air pollution on economic implications in Dehli and compared it to other urban areas. Researchers examined air pollution's economic impacts in cities through the cost estimation of disease approach, productivity decline assessment, and contingent valuation (CV) exercise. They utilised the cost of illness approach to estimate the direct medical costs incurred in Delhi and Haryana due to air pollution-related diseases. They concluded that the average health expenditures are higher in Delhi than in Narnaul. The productivity loss approach estimates the economic losses caused by reduced productivity and missed workdays due to air pollution-related illnesses. The study finds that Delhi has higher productivity losses than Narnaul. Additionally, the article conducts a contingent valuation survey to estimate the value of statistical life years lost due to air pollution. It is used to calculate the welfare loss from premature mortality. Total economic expenses due to air pollution, including health expenditures and productivity losses, are estimated to be ₹4.08 billion for Delhi and ₹31.28 billion for Haryana [17]. According to Gautam and Bolia [32], air pollution has socioeconomic impacts on various aspects of human life. Air pollution can negatively affect social and academic outcomes. It can reduce school attendance, lower academic performance, and decrease overall well-being. Additionally, air pollution can cause poor visibility, impacting travel and the living environment. Air pollution may influence fundamental economic measures, including housing prices. Moreover, air pollution leads to lost job productivity [65], harms stock markets [47], and may decrease household consumption by increasing negative emotions, reducing outdoor activities, and depressing future expectations [49], and can negatively and significantly impact tourism by reducing the number of foreign visitors [105].

3. Methodology

To achieve its purpose, the paper conducted a bibliographic literature review. The review consists of two parts: data collection and result analysis. The data was collected using the Google Scholar database. The search results on Google Scholar are arranged in a list, with the records with the greatest

relevance scores appearing at the top. This list includes all the scholarly information relevant to the search [85]. The study develops five objectives based on the literature review results, and different separate search keywords are used for each objective to find data. In addition to keywords, "urban areas or cities" is also used. The articles were randomly selected from 2018 to 2024, and each target covers two articles per year, for ten articles. (Table 1).

Table 1. Yearly distribution of papers

Keywords	2018	2019	2020	2021	2022	2023	2024	Total
"Air pollution and healthcare costs"	2	2	2	2	2	2	2	14
"Air pollution and labour productivity"	2	2	2	2	2	2	2	14
"Air pollution and household consumption expenditure"	2	2	2	2	2	2	2	14
"Air pollution and stock market performance"	2	2	2	2	2	2	2	14
"Air pollution and tourism business attraction"	2	2	2	2	2	2	2	14
Total articles	10	10	10	10	10	10	10	70

Using the Publish or Perish software, we selected relevant years and retrieved a maximum of 200 articles based on specific keywords from 1990 to 2024, which were then saved to an Excel file. Upon analysing the data, we observed that the number of articles remained relatively low and stable from 1990 to 2017, with only minor fluctuations. However, starting in 2018, there was a noticeable increase in published articles, with a significant rise observed in subsequent years, peaking in 2022 (Figure 1). This trend suggests a growing academic interest in the topic over recent years.

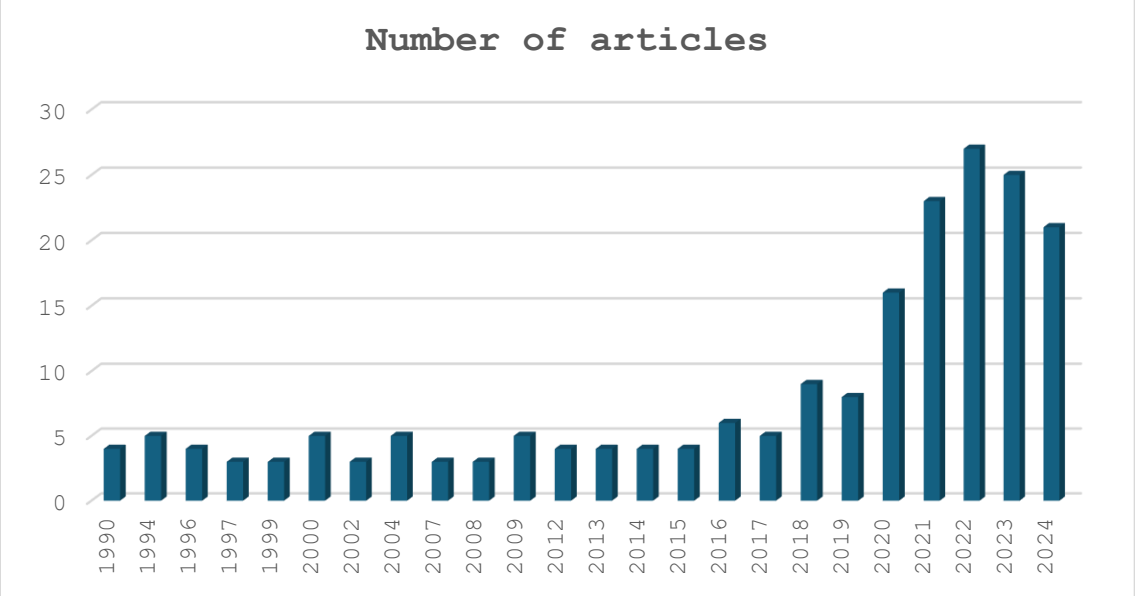

Figure 1. Number of articles published in years

After 70 papers had been collected, basically Q1 and Q2 SJR ranking journals (table 2), they were entered into an Excel file to analyse results, which included countries, years, major emission sources, and main findings. Moreover, the authors, titles, abstracts, and keywords are entered into the Excel file to analyse keywords in the VOSviewer software. VOSviewer is a tool for visualising and analysing bibliometric data, including co-authorship networks, citation networks, and keyword co-occurrence networks. This free software application can create and display bibliometric correlations between different variables [45]. Furthermore, the results comprise two main components: bibliometric analysis and elucidation of the main objective, which is the economic impact of air pollution.

4. Results and Discussion

4.1. Bibliometric Analysis

This section presents a bibliometric examination of the literature on the correlation between air pollution and economic factors. It includes the main countries mentioned in the articles, keyword analysis of the reviewed articles and key publishers of the reviewed articles.

4.1.1. Countries mentioned in the articles

The analysis of 70 articles shows that most of the research was conducted in Chinese cities, with 47 studies indicating a significant representation of China in the dataset. There are several compelling reasons why much environmental research is conducted in China. First, the rapid industrialisation and urbanisation of the country have resulted in significant environmental challenges, causing severe damage to natural resources [4]. Addressing these challenges requires thorough research to comprehend them and minimise their impact. Moreover, the government has strongly emphasised environmental governance, making significant investments in pollution control, consequently driving further research in this area [56]. Additionally, the dataset includes a small number of studies from other Asian countries, specifically three from South Korea, and two from India. The remaining articles consist of one article each, covering different geographical regions and groups (see Figure 2). Furthermore, here are the 'General' categories, which do not list specific countries or cities.

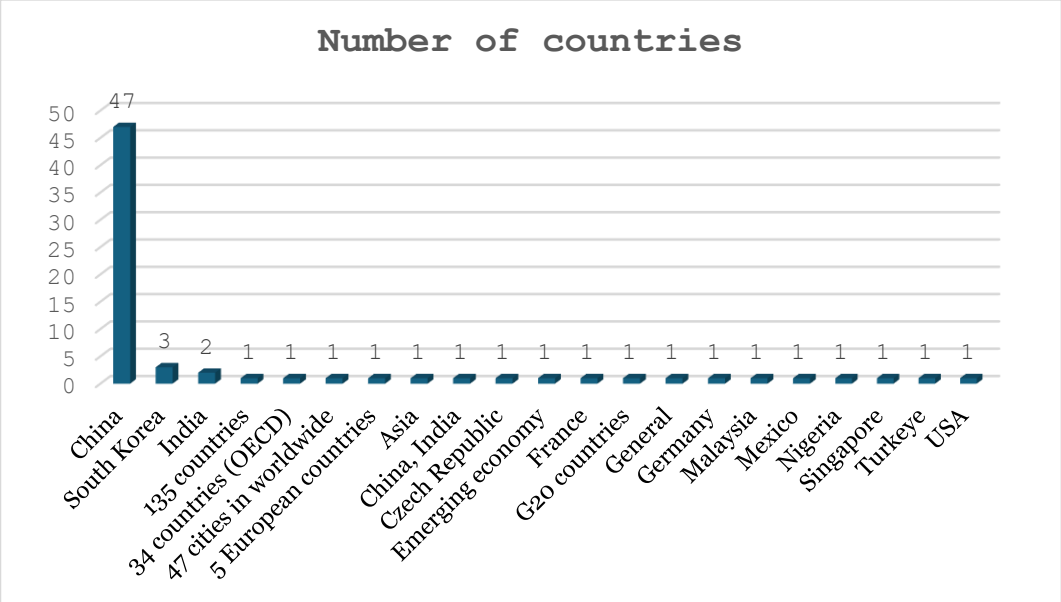

Figure 2: Countries mentioned in the articles

4.1.2. Key journals of the reviewed articles

The economic impacts of air pollution have become a topic of great interest among researchers. Several journals have published numerous articles on this topic. By identifying influential publishers, we can gain important insights into the potential contributions of future researchers to this expanding field of research. Out of the 70 articles reviewed, they were published in 47 journals. Among these, 16% were published in Environmental Science and Pollution Research, 6% in the Journal of Cleaner Production, and 6% in Sustainability. Moreover, 81 % of articles were published in Q1 journals (ranking in the top 25% of journals by impact factor), and 19% were printed in Q2 journals (i.e., the top 25-50%) (Table 2). This indicates that most of the research was published in high-ranking, prestigious journals (Q1), with a smaller portion in moderately ranked journals (Q2).

Table 2. Key journals of the reviewed articles

No	Name of Journals	Overall	H-index
1	Environmental Science and Pollution Research	11	179(Q1)
2	Journal of Cleaner Production	4	309(Q1)
3	Sustainability	4	169(Q2)
4	American Economic Journal: Applied Economics	2	109(Q1)
5	Current Issues in Tourism	2	108(Q1)
6	Energy Economics	2	210(Q1)
7	International Journal of Environmental Research and Public Health	2	198(Q2)
8	Journal of Environmental Management	2	243(Q1)
9	Pacific-Basin Finance Journal	2	75(Q2)
10	Risk Management and Healthcare Policy	2	45(Q2)
11	BMC Public Health	1	197(Q1)
12	Annals of Tourism Research	1	216(Q1)
13	Applied Economics	1	113(Q2)
14	China Economic Quarterly International	1	7(Q1)
15	China Economic Review	1	101(Q1)
16	Climate Change Economics	1	34(Q2)
17	Energy Reports	1	88(Q2)
18	Cogent Social Sciences	1	27(Q2)
19	Ecological Economics	1	248(Q1)
20	Economic Analysis and Policy	1	59(Q1)
21	Energy Policy	1	272(Q1)
22	Environmental Resource Economics	1	112(Q1)
23	Environment, Development and Sustainability	1	82(Q2)
24	Environmental Pollution	1	301(Q1)
25	Environmental Research Letters	1	183(Q1)
26	Frontiers Environmental Science and Engineering	1	61(Q1)
27	Frontiers in Public Health	1	101(Q1)
28	International Journal of Environmental Science and Technology	1	101(Q2)
29	International Review of Economics & Finance	1	78(Q1)
30	International Review of Financial Analysis	1	91(Q1)
31	Journal of Behavioral and Experimental Finance	1	39(Q1)

32	Asia Pacific Journal of Tourism Research	1	62(Q1)
33	Journal of Travel Research	1	172(Q1)
34	Nature Communications	1	522(Q1)
35	Nature Energy	1	229(Q1)
36	Plos ONE	1	435(Q1)
37	Nature Sustainability	1	115(Q1)
38	Review of Behavioral Finance	1	23(Q2)
39	Scandinavian Journal of Economics	1	74 (Q1)
40	Science Bulletin	1	148(Q1)
41	Science of the Total Environment	1	353(Q1)
42	Scientific reports	1	315(Q1)
43	Environmental Economics	1	7(Q2)
44	Annals of Regional Science	1	77(Q1)
45	Review of Economics and Statistics	1	200(Q1)
46	Journal of the Knowledge Economy	1	45(Q2)
47	Tourism Management	1	255(Q1)

4.1.3. Keyword analysis for reviewed articles

The keyword network analysis revealed six interconnected clusters, each comprising multiple nodes. At the centre of this network is the keyword "pollution," which connects to various other nodes, including "labour productivity," "inequality," "mortality," "household," "healthcare expenditure," and "stock market." This central positioning of "pollution" indicates its wide-ranging impact across multiple areas, underscoring the pervasive effects of air pollution on diverse aspects of society and the economy.

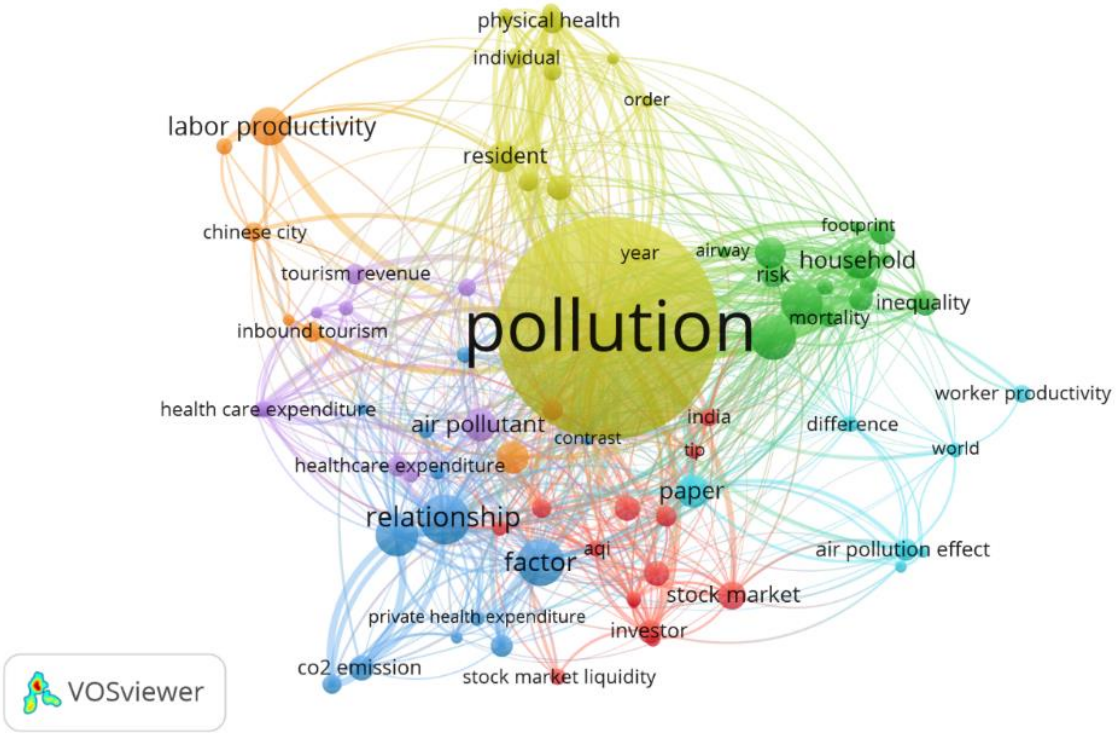

Figure 3. Keyword analysis for reviewed articles

4.2 Key findings: economic impact of air pollution

4.2.1 Air pollution and healthcare costs

Multiple studies have definitively linked air pollution to a range of health issues, including respiratory and cardiovascular disorders, reduced lung function, and higher mortality rates. These health impacts lead to higher usage of healthcare services and greater spending. Individuals exposed to elevated levels of air pollution are more prone to seeking medical assistance for respiratory symptoms such as coughing, wheezing, and shortness of breath. This ultimately results in higher healthcare expenses for diagnosis, treatment, and medication. As shown in Table 3, many studies showed that higher air pollution increases healthcare expenditure.

The study by Jaafar [40] indicated that air pollution leads to substantial economic losses due to increased healthcare costs and reduced productivity from work absenteeism in Asian countries. [50] examined the impact of air pollution on healthcare costs related to respiratory diseases in Beijing, China, from 2013 to 2015. Their study demonstrates that air pollution significantly increases healthcare costs. Higher levels of PM2.5 pollution generally lead to a more significant disease burden and higher costs, although the impacts vary depending on pollution severity. This highlights the financial burden of poor air quality on public health systems and individual expenses. Moreover, Xia [98] examined the effect of air pollution on medical costs in Beijing (China) over a short period. The findings indicated that higher levels of PM2.5 and more extended periods of pollution significantly increase healthcare visits and costs. Furthermore, estimating linear regression effects revealed that a 10 μg/m3 increase in PM2.5 concentrations is linked to a 0.376% increase in three-day medical expenses per beneficiary.

Table 3. Healthcare costs effect of air pollution

Location	**Years**	**Results (General)**	**Authors**
Asia	2007-2017	Increased healthcare expenses and reduced productivity	Zaafar et al. 2018
China (7)	1998-2015, 2013-2015, 2016-2018, 2017, 1991-2021, 2016-2017	Increase health expenditure	[33] [50] [52] [98] [103] [100] [8]
Emerging economy	1994-2017	Increase government health expenditures	[84]
G7 countries	2000-2018	Increased healthcare expenditures	[24]
Nigeria	1980-2017	Increased government health expenditure	[83]
South Korea (2)	2010-2017	Increased healthcare expenditure	[7] [46]
Turkeye	1975-2019	Increased health expenditure	[22]

These results are also confirmed by Raeissi [73]. The findings indicated that air pollution significantly positively impacted health expenditures in both the long and short runs. Specifically, a 1% increase in carbon dioxide emissions resulted in a 3.3 per cent and 1.16 per cent rise in public and private health costs. Across the duration, air pollution also significantly impacted health costs in the long run. Predominately, air pollution has a greater impact on younger individuals and females than other groups [52]. Additionally, the research by Belis [9] showed that the costs of air pollution in the Western Balkan region are higher relative to GDP than in EU countries. At the same time, PM2.5 pollution was identified as the most significant contributor to costs and mortality. Air pollution also increases medical care costs, hospitalisation spending and self-payment costs [52] [100]. A 10 μg/m3 increase in PM2.5 would increase the total monthly expenses for lower respiratory infections, coronary heart disease, and stroke by 0.226%, 0.237%, and 0.374%, respectively [99].

4.2.2 Air pollution and labour productivity

Air pollution can reduce productivity through various channels: lower labour supply [27], increased absenteeism and presenteeism [58], lower accumulation of innovative human capital [88] and lower consumer demand [3]. Employee absences can impose a dual strain on the organisation, both in terms of decreased productivity and the additional workload placed on those responsible for the neglected tasks of the sick employee. On the other hand, when unwell individuals continue to work within the firm, they expose other employees to the danger of being ill, and being ill can lead to a decrease in productivity and work quality [38]. Moreover, air pollution negatively impacts the net inflow of labour mobility. Typically, every one-unit rise in the health shocks of air pollution causes a decrease of between 24.9% and 44.7% in the net inflow of labour mobility. The primary cause of this impact is the health shocks caused by air pollution [109].

Table 4. Air pollution and labour productivity

Location	Years	Results	Authors
China (11)	2002-2013	The low level of pollution increases the urban labour supply	[110]
	2010-2012; 1998-2016; 2006-2014; 2004-2015; 2005-2018; 2010-2014; 2013-2018 and 1990-2015	Decrease Labor productivity	[13] [35] [105] [87] [15] [76] [27] [53] [86]
	2000-2019	Negatively impacts the labour supply	[95]
China & India	2013-2018	Decrease skilled professionals	[88]
India	1995-2011	Decrease Labor productivity	[61]
Mexico	2015-2017	Decrease judicial workers' productivity	[79]

The findings indicated the negative impact of air pollution on labour supply and productivity across different countries and periods (Table 4). According to Wu et al. [95], air pollution negatively affects the labour supply, particularly when levels exceed 30 μg/m3, due to pollution-induced health issues. However, according to a study by [110], low air pollution levels in China have increased the urban labour supply despite the overall environmental degradation. Moreover, many studies have indicated that air pollution can decrease labour productivity. For example, air pollution in China and India is causing a brain drain as high-skilled workers leave polluted areas. A 1% rise in PM2.5 in Chinese cities decreases technologically innovative professionals (TIP) by 146, while a 1% rise in PM10 in Indian states reduces TIP by 0.127% [88]. Furthermore, [15] investigated the causal link between pollution and labour productivity. Results showed that a ten-unit rise in air pollution resulted in a 4 per cent reduction in labour productivity.

Pollution can hurt worker productivity in several ways. Firstly, it can directly affect worker output by causing respiratory problems, fatigue, and other health issues that prevent workers from performing tasks efficiently. Secondly, pollution exposure can impair cognitive function, memory, and decision-making skills, making it harder for workers to concentrate and make accurate judgments. Moreover, it can also impact the labour supply in case of bad air quality, as workers may be more likely to miss work due to health issues or concerns about their well-being. This absence of workers leads to a loss in production and can hurt the overall economy [66]. Environmentally conscious individuals are

more aware of the impact of PM2.5 on health. This awareness leads to efforts to reduce pollution and its effects on health and employment [27].

4.2.3 Air pollution and household consumption and expenditure

Various factors, including environmental conditions such as air pollution, can influence household consumption. Household electricity consumption can significantly increase due to air pollution, as households may use more electricity to adapt to poor air quality [26]. The findings indicated the significant impact of air pollution on household consumption and expenditure across different countries and periods (Table 5). Wang [90] analysed the relationship between household air pollution and residential energy consumption using 135 countries' data. The findings suggested that transitioning to cleaner residential energy sources led to a noticeable reduction in household air pollution. Furthermore, nearly all research has demonstrated that air pollution in China leads to an increase in both household health expenses and consumption. The study by Zhou [117] reveals that increased air pollution correlates with higher household healthcare costs across various demographics, notably affecting urban women with higher education and income the most. Numerous scholarly works corroborate our research conclusions. For example, Zeeshan [107] examined the relationship between CO2 emissions, environmental degradation, and household health costs in China. The research findings indicate that increased CO2 emissions and pollution lead to a rise in household health expenditures and air pollution, significantly impacting household spending, particularly on energy. Due to air pollution, households are altering their behaviour to avoid exposure to polluted air, so they prefer to stay home more often. This avoidance behaviour, such as staying indoors more often, can indirectly lead to increased energy consumption. For instance, individuals may spend more time indoors, increasing energy usage for activities like housework [94].

Table 5. Air pollution and household consumption and expenditure

Location	**Years**	**Results**	**Authors**
135 countries	1990-2015	Influenced the type of residential energy consumption.	[90]
China (9)	1980-2016; 2012; 1990-2019; 2014-2016; 1998-2016;	Increased household health expenditures	[111] [107] [113] [115]
	2014-2016; 2015	Increase household consumption expenditure	[94] [14] [89]
	2011-2017	Decrease in household consumption.	[49]
Czech Republic	2010	Increase with household expenditures	[58]
India	2011-2012	Increased household health expenditures	[74]
Singapore	2012-2016	Increase household consumption	[2]
South Korea	2017-2018	Increase household consumption expenditure	[26]

However, Li & Sun [49] found that air pollution significantly impacts household consumption. A one-standard-deviation increase in PM2.5 levels leads to an 8.7% reduction in household consumption, and this effect persists in the short term. Air pollution also affects consumption patterns, particularly among low-income and rural households. It influences consumption by increasing negative emotions, reducing outdoor activities, and lowering future expectations.

4.2.4 Air pollution and stock market performance

Air pollution hurts the environment and human health, negatively impacting economic performance. Findings have shown that higher air pollution negatively affects stock return and turnover, increases volatility and illiquidity and amplifies stock market anomalies and mispricing. Moreover, air pollution negatively affects investor mood, thus causing risk-averse trading behaviour (Table 6). According to He & Liu [36], although air pollution's direct impact on stock prices is minimal, it significantly influences market volatility and liquidity after major environmental events. These effects are driven by changes in investor behaviour and increased public environmental awareness. Furthermore, He [37] analysed the influence of air pollution on the financial performance of Chinese enterprises in the stock market. The study suggests that air pollution negatively impacts the stock market by depressing investor sentiment. That led to a decrease in stock market liquidity [91]. On average, a 10 μg/m³ increase in PM2.5 concentration decreases daily returns by 1.2%. This effect is more pronounced in areas with lower average PM2.5 concentrations, higher mean returns, and lower local stock market capitalisation. In addition, a 10 μg/m³ increase in PM2.5 exposure increases stock market volatility by 0.2% [44].

Table 6. Air pollution and stock market performance

Location	Years	Results	Authors
47 cities in worldwide	2007-2019	Higher PM2.5 lowers daily returns and boosts market volatility	[44]
China (10)	2008-2013; 2005-2017; 2013-2018; 2005-2018; 2014-2017; 2014-2021; 2013-2019; 2014-2018;	Higher air pollution leads to lower stock returns and turnover, increases volatility and illiquidity, and negatively affects investor mood, causing risk-averse trading behaviour. Air quality leads to a positive average stock return	[97] [36][81] [82] [96] [101] [104][37] [91] [51]
Germany	2013-2017	Negatively impacts high-polluting industries by increasing their risk and reducing stock performance.	[70]
India	2015-2023	Negatively impacts stock prices, especially for companies with lower ESG scores.	[80]
USA	1980-2016	Severe air pollution amplifies stock market anomalies and mispricing.	[67]

Moreover, air pollution can indirectly impact stock performance by affecting investor psychology and decision-making, with varying consequences across different market sectors and conditions. Air pollution negatively affects stock returns and tends to decrease in finance, property, construction, healthcare, technology, energy, utilities, and consumer sectors [47]. It also negatively impacts stock prices, particularly for companies with lower ESG scores [80].

4.2.5 Air pollution and tourism business attraction

The global tourism business is adversely impacted by extreme weather conditions and air pollution resulting from human activities, such as smog. Furthermore, air pollution negatively impacts tourism in several ways. First, it reduces the number of tourists who visit a place. Second, it shortens the length of stay of tourists who visit, decreasing the money they spend there. This ultimately results in a decrease in tourism revenue (Table 7). Furthermore, studies have demonstrated that the impact of air pollution on tourism revenue, visitor flow, tourist expenditure per capita, and length of stay does not follow a straight line [71].

Table 7. Air pollution and tourism development

Location	Years	Results	Authors
Cyprus and Great Britain	2008-2015	Poor air quality decreases tourism demand.	[77]
Austria and Italy		Air quality has a weaker impact on tourism.	
Switzerland		No significant link between air quality and tourism.	
China (11)	2016	Smog negative effect destination image, travel dissatisfaction, and avoidance tendency	[68]
	2009-2012; 2013-2019; 1999-2017	Air pollution negatively impacts inbound tourism demand	[112] [105] [56]
	2004-2013	Air pollution reduces domestic tourism.	[23]
	2013-2017; 2017-2019; 2010-2017; 2005-2017	Air pollution negatively affects tourism and decreases the number of tourists and tourism revenue.	[108] [34] [116] [71]
	2008-2018	In areas with low tourism, air pollution initially increases tourism, but as development progresses, the impact becomes negative.	[99]
G20 countries	1995-2014	Air pollution adversely affects international tourist arrivals, and this effect is stronger in developing countries.	[20]

Robaina [77] investigated the link between air quality and tourism demand across five European countries. Findings indicated that air quality significantly reduces tourism demand in Austria and Italy. Conversely, poor air quality in Cyprus and Great Britain reduces tourism demand. Additionally, the study found no significant between air quality and tourism demand in Switzerland, suggesting that air pollution may not have a noticeable impact on tourism in this country. Moreover, Fan [28] measured the impact of air pollution on the likelihood of foreign tourists revisiting China by analysing many TripAdvisor reviews. The study estimated the possibility of revisiting for each traveller and found that those who experienced air pollution during their trips were 92.857 per cent less inclined to revisit a particular city and 93.421 per cent less inclined to revisit China. Xu and Dong [102] examined how air pollution affects China's inbound tourism. They utilised a gravity model framework to analyse tourist arrival data at the province level from 13 countries from 2010 to 2016. The study revealed that air pollution in tourist destinations and their corresponding origin regions significantly negatively impacted China's inbound tourism. On average, a one μg/m3 increase in the concentration of PM2.5 in China and foreign countries led to a decline of approximately 1.7% and 3.8% in the number of inbound tourist arrivals. Also, for every one μg/m³ increase in the concentration of PM2.5, the number of inbound tourists decreases by about 80,000 [57]. According to Hao [34], haze pollution hurts tourism revenue in 14 key tourist cities in China, highlighting seasonal and regional variations. For example, haze is more severe during autumn and winter in Nothern China, thus leading to higher economic expenditure than in summer.

Conclusion

In conclusion, the analysis of economic impacts reveals that air pollution has severe consequences in urban areas. First, it is a significant problem with various negative economic impacts.

These economic costs occur from different aspects, such as augmented healthcare expenditures, declined work effectiveness, and lower agricultural output [42]. For example, it increases healthcare costs because people get sick more often due to pollution. Studies have shown that higher levels of air pollutants, such as PM2.5, are linked to higher medical expenses and more healthcare usage. Air pollution also reduces labour productivity because it can cause health problems that make workers less efficient, resulting in more absenteeism and presenteeism. Moreover, air pollution can negatively influence the stock market by impairing the cognitive abilities of investors and affecting their decision-making. Pollution also affects household consumption patterns. It can increase energy usage as households try to avoid poor air quality, and it can indirectly impact the consumption of other goods because pollution affects household finances and emotions. Finally, the tourism industry experiences losses due to air pollution's negative impact on the number of tourists visiting places with high pollution levels. It also shortens visitors' length of stay.

As urbanisation continues to increase worldwide, air pollution poses a significant economic challenge. According to various studies, the associated costs, such as healthcare spending, productivity losses, impacts on business sectors, and reduced living standards, amount to billions annually. Governments and policymakers must comprehensively curb emissions and minimise this economic burden through effective emission control policies and sustainable development practices. Moreover, the analysis highlights the need to address air pollution to safeguard human well-being and promote sustainable economic growth. Countries can avoid the projected adverse effects of climate change, biodiversity loss, water scarcity, and health issues by implementing more ambitious policies to reduce air pollution by 2050 [1]. The study also emphasises the requirement for further research to understand the intricate correlation between air pollution and health. Additionally, the study suggests that living close to industrial activities can negatively affect respiratory health and heart disease [1]. In conclusion, the analysis of the economic effects of air pollution in urban areas underlines that it is a significant issue with far-reaching consequences.

The included studies may vary in quality and rigour, which could affect the reliability and validity of the findings. Therefore, due to the similarity of the results, the researcher recommends that future studies conduct a meta-analysis.

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