

DOI: 10.5281/zenodo.124261058

FROM POLLUTION TO POLICY: MAPPING THE AIR QUALITY - HEALTH AND WELL-BEING NEXUS IN THE CONTEXT OF SDG - 3

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ABSTRACT

In present times where health consciousness has reached its all-time height and global well-being challenges have intensified, the alignment of health with Sustainable Development Goals (SDGs) has become a key focus for researchers and policymakers. The present study maps research trends related to the association between air pollution and health and well-being aligned with Sustainable Development Goal-3 (SDG-3). Bibliometric mapping of 192 Scopus-indexed publications was conducted using VOSviewer and Biblioshiny. Four thematic clusters emerged including climate and environmental health integration, particulate matter and atmospheric pollution, epidemiological health risks, and regional socioeconomic health disparities. The findings offer important implications for policymakers, researchers and practitioners aiming to ensure healthy lives and promote well-being for all ages in line with sustainable development.

KEYWORDS: Sustainable Development Goal-3 (SDG-3), air quality, health, well-being, bibliometric analysis.

1. INTRODUCTION

Sustainable Development Goals (SDG), also referred as Global Goals, were developed in 2015. It comprises 17 interconnected goals to balance economic growth, social inclusion and environmental sustainability. It calls for urgent attention and action by all countries to ensure that development pathways are sustainable and equitable. These goals acknowledge interdependence of human wellbeing and planetary health. Although the goals are ambitious, achieving them by 2030 remains significantly challenging (Alcamo et al. 2020). Scholars have pin pointed the complications in terms of too many and non-hierarchical goals, trade-off among the goals, target measurement and emphasizing more on economic growth and less importance to environmental protection (Van Norren, 2020).

Even, recent past COVID-19 situation has intensified these challenges. Pandemic, which affected not only health and well-being but mental health, peace, psychological state, social equality, supply chain and even limit the countrywide efforts for climate change, global warming.

Health is not only a fundamental right of every individual but also a prerequisite for achieving inclusive sustainable development. The Pan American Health Organization (PAHO/WHO) described health as a key input for Sustainable Development Goal-3 (SDG-3). Rather than making it confined to disease treatment only, SDG-3 broadened its focus towards preventive healthcare, protection from environmental health risks and equity on social health determinants. However, despite significant investments in healthcare access and medical advancements, certain environmental risk factors including high air quality index (AQI), contaminated air, mortality from non-communicable diseases, pollution related diseases and death continue to pose considerable barrier to the attainment of SDG-3.

Climate change, global warming and air quality are interlinked and significantly influence human health and wellbeing. Air pollution has emerged as the most critical trans-border issue demanding integrated policy responses aligned with the United Nation's vision for sustainable development. Atmospheric pollutants such as particulate matter (PM_{2.5}, PM₁₀), sulfur dioxide (SO₂), ozone (O₃), nitrogen dioxide (NO₂), and carbon monoxide (CO) degrades air

quality and poses severe health risks (Brook et al., 2004, De Sario et al., 2013). Fine particulate matter (PM_{2.5}) and coarse particulate matter (PM₁₀) are the most widely investigated pollutants and asthma, COPD and cardiovascular are the most commonly investigated health outcomes (Dominski et al. 2021). Through the comprehensive examination of the scholarly publications related to the impact of air quality on human health and well-being, the study uncovers the intellectual landscape by analyzing the SCOPUS indexed publications between 2020-2025. In this context, the present work is guided by central question of identifying dominant and emerging topics and following subsequent research objectives provides analytical framework of the study.

RQ.1 To map and analyze the dominant and emerging research topics highlighting the impact of air quality on health and wellbeing in the context of SDG-3.

RQ.2 To identify the most influential sources, authors, countries, and research themes, and examine their interrelationships through keyword co-occurrence network visualization.

2. MATERIAL AND METHODOLOGY

2.1 About Bibliometric Analysis

Today, research in every field is increasing at unprecedented rate. Stay updated with the latest research developments, a researcher must be abreast with own field of research. Bibliometric analysis emerged as that robust approach which helps researcher systematically evaluating the thematic evolution, research structure, and intellectual landscape of a research domain. Bibliometric approach not only enables researchers in identifying emerging research trends, leading journals, influential authors, most cited publications, country collaborations within specific field (Groos & Pritchard, 1969), but also helps to develop evidence based support and theory development. Application of bibliometric analysis in research is not a fad but rather a reflection of its utility for managing large volumes of scientific data, and producing high research impact (Donthu et al., 2021). Furthermore, tools such as VOSviewer and Biblioshiny enhances the application bibliometric methods (Aria & Cuccurullo, 2017).

Table 1: Main information about database extracted from Scopus

Description	Results
Search Field	Article Title, Abstract, Keywords
Keywords	"air pollution" OR "environmental contamination" OR "particulate matter" OR "PM2.5" OR "PM10" AND "health wellbeing" OR "public health" OR "human health" OR "population health" OR "health outcomes" OR morbidity OR mortality OR "quality of life" OR "mental health"

AND "SDG 3" OR "Sustainable Development Goal 3" OR "good health and well-being" OR "sustainable development goals"	
Total no. of articles (without applying any filters)	409 (As on January 15, 2026)
Filtration applied	
Timespan	2020:2025
Document type	Articles, Review, Conference Papers
Sources (Journals, Books, etc)	125
Language	English
Source Type	Journal, Conference Proceedings
Open Access	All Open Access
Documents	192
Annual Growth Rate %	16.72
Average citations per doc	79.23
Document Contents	
Keywords Plus (ID)	1881
Author's Keywords (DE)	642
Authors	1574
Document Types	
Articles	146
Conference papers	9
Review	37

Source: Authors' own elaboration

2.2 Data analysis

Table 1. Illustrates the details about dataset used for the study. To map the air quality - health and well-being nexus in the context of SDG-3, VOSviewer software version 1.6.20 was utilized. The software is useful for many reasons including knowledge map

creation, data visualization of co-occurrence of keywords, co-citation of references, country collaborations for similar research areas, identification of most influential journals, authors, papers and themes. (Van Eck & Waltan, 2014; Niknejad, 2023).

3. RESULTS AND DISCUSSION

3.1 Descriptive Analysis

Figure 1: Annual Scientific Publications

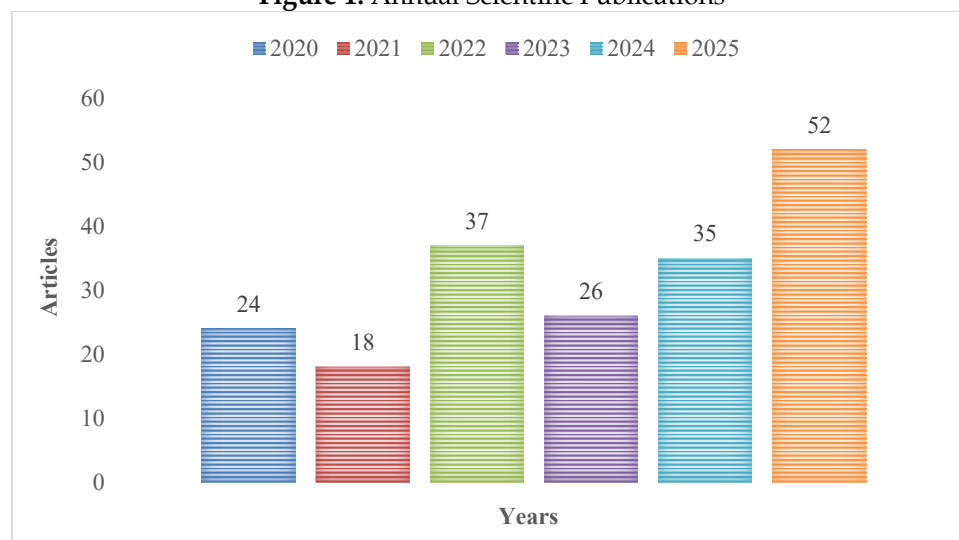


Figure 1 illustrates the annual scientific growth in terms of research publications during the last quinquennium (2020-2025). Though the journey shows noticeable fluctuations, this duration records considerable volume of publications overall.

Additionally, during the last year, the number of articles received (i.e. 52) is highest. This climb suggests a growing interest of researchers' especially in the area of impact of air quality on human health and wellbeing as a well-grounded trend.

Table 2: Average Citations Per Year

Year	Mean TC per Article	N	Mean TC Per Year	Citable Years
2020	423.54	24	60.51	7
2021	120.78	18	20.13	6
2022	28.73	37	5.75	5
2023	45.96	26	11.49	4
2024	13.69	35	4.56	3
2025	2.62	52	1.31	2

The yearly average citations of last quinquennium (from 2020-2025) has been described in Table 2. Highest mean total citations per article is reflected in the year 2020 which reflects longer citable window and larger scholarly influence of 24 articles. In

contrast although year 2025 has produced highest number of articles (N = 52), it could only avail 2.62 mean total citations per article suggesting that the citation impact of recent studies is yet to fully materialized.

Table 3: Country's Scientific Productions

Country	Frequency
USA	376
Iran	373
India	284
China	191
Australia	184
UK	182
Ethiopia	143
Brazil	89
Pakistan	78
Nigeria	70

Country Scientific Production

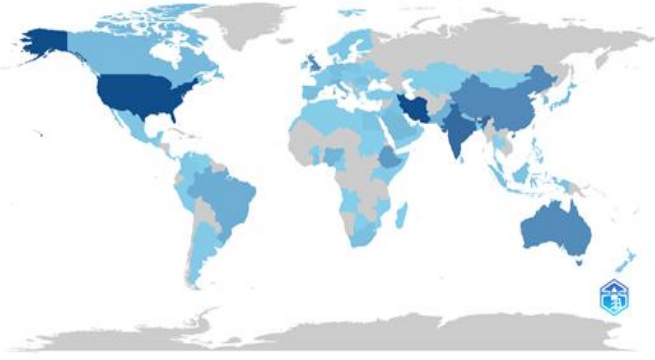


Table 3 reflects country wise scientific productions revealing USA as the most influential country with the highest number of productions (N=376). This number is closely followed by Iran (N=373) and India (N=284) indicating significant contribution in this

domain. China, Australia and UK forms second tier of contributors contributing comparatively moderate publications. Inclusively, this research contribution proposes substantial contributions from both developed and developing economies too.

Figure 2: Most Cited Countries

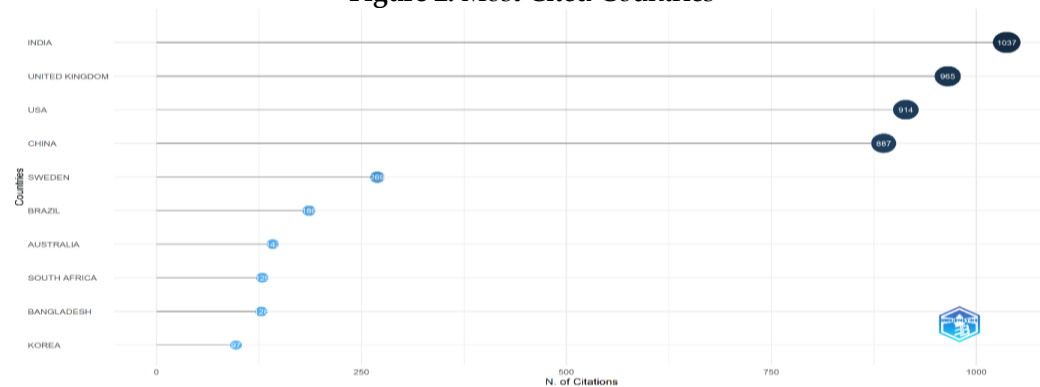


Figure 2 reflects that the USA leads in terms of contributing highest number of publications in this domain, India ranks highest in terms of citation impact across the analyzed dataset (N=1037). Countries like

Sweden, Brazil, Australia South Africa, Bangladesh and Korea have been cited very few times comparatively. Overall, citations are highly concentrated among few leading countries only.

Figure 3: Most Relevant Sources

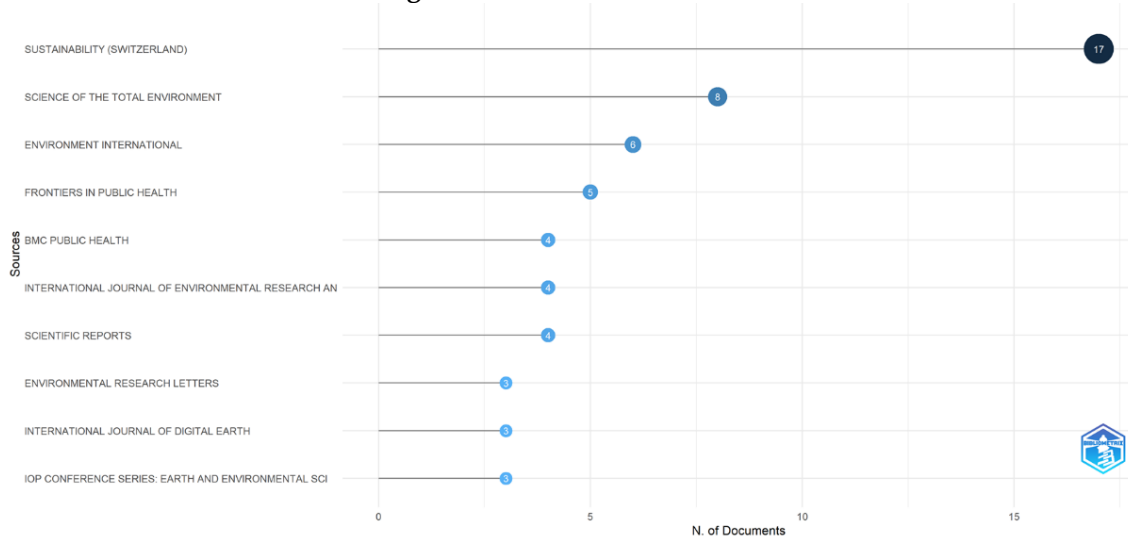
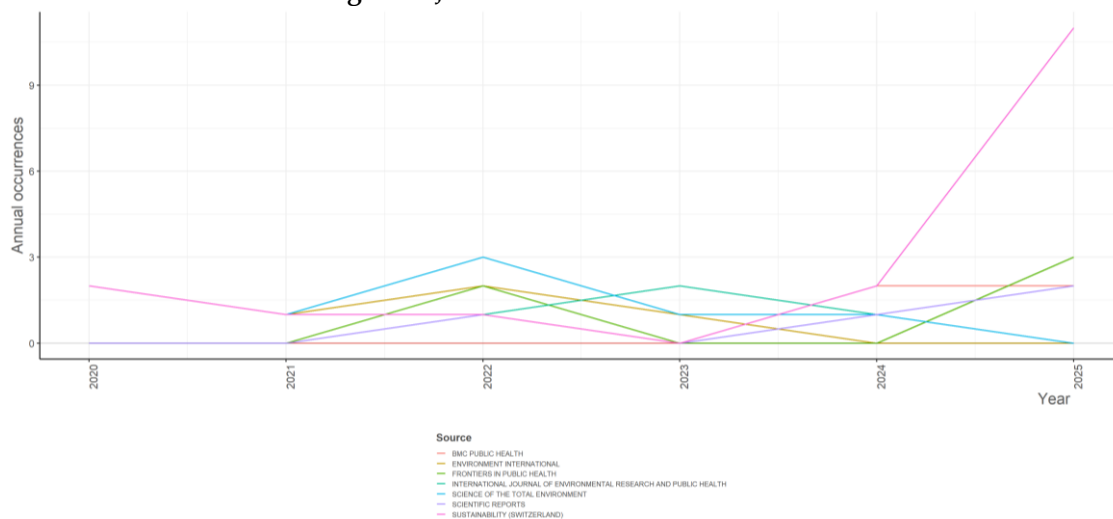


Figure 3 illustrates most relevant journal having noticeable number of article publications in the dataset. It indicates leading journals without showing yearly publication trend. With 17 publications, Sustainability (Switzerland) journal published by Multidisciplinary Digital Publishing Institute (MDPI) dominates indicating its significant contribution in the field of air

quality and SDG-3. Science of The Total Environment has contributed 8 articles, followed by Environment International has published 6 articles. Additionally, journals including Frontiers in Public Health, BMC Public Health and Scientific Reports highlights their interdisciplinary nature spanning from environmental science to public health.

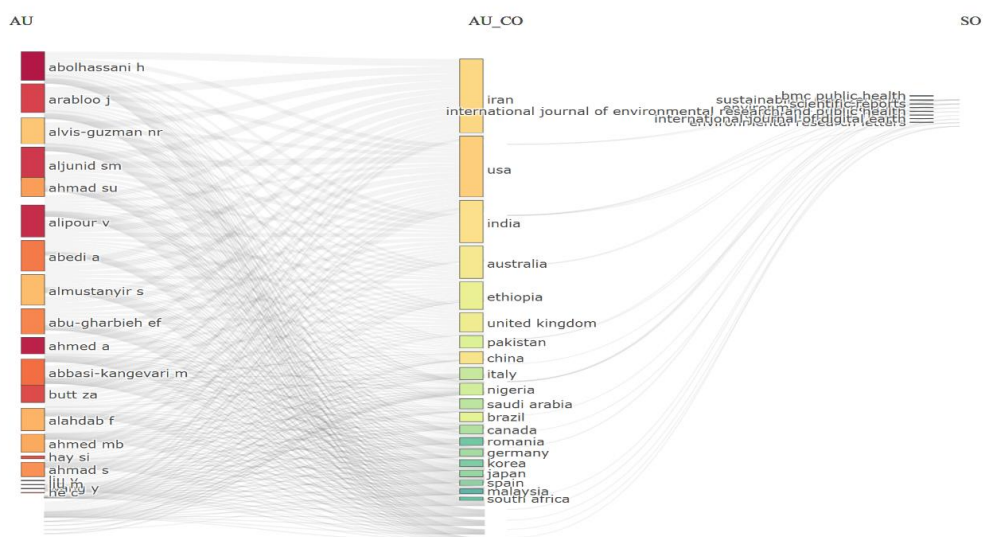
Figure 4: Journal's Production Over Time



Source's production over time indicates year-wise publications of the journals to track journal's growth trend over a period. Variety of journals publications from 2020-2025 has been shown in the Figure 4. A sharp rise in the production of Sustainability

(Switzerland) indicates its growing dominance in the domain of air quality and human health and well-being. Rest other journals have also exhibited consistent contributions as few key sources of research publications.

Figure 5: Three Field Plots



Three-Field Plot, also known as Sankey diagram shows the relationship between Authors (AU), Author’s Country (AU-CO) and Sources (SO). Figure 5 visualizes the respective countries from where leading authors belongs to and the journals in which their research has been published. Dominant authors

from Iran, USA and India have contributed to Int. J. of Environmental Research and Public Health, Sustainability and BMC Health. The figure overall, specifies geographic distribution of authors, countries and their preferred sources of publications.

Figure 6: Tree Map



Tree Map shown in the Figure 6 signifies influential author keywords in the dataset. The size of the box represents keyword’s frequency and percentage share. The words such as air pollution, sustainable development goals, sustainability, sustainable development, climate change, public health are

prominent in this dataset. It shows the link between air quality, health outcomes and sustainable development. Whereas, the keywords such as environmental health, plenary health, mortality, air quality, PM2.5 reflect health-impact assessment. The smaller blocks such as deep learning, machine

on cardiovascular and respiratory system (Pope & Dockery, 2006; Brook et al., 2010).

The cluster represents methodological and analytical foundation of air pollution research suggesting evidence for the studies emphasizing on its health impact and need for policy formulation to support in the fulfilment of SDG-3.

Green Cluster: Emerging global health risk: Role of epidemiology, infant mortality and chronic disease

The green cluster reflects research domain centered on health outcomes. Highlighted keywords are epidemiology, mortality, infant and child health, chronic diseases, and global health. It reveals the world wide hazardous impact of air pollution, related risk factor and epidemiology that leads to increased mortality, infant and child mortality risks, mental disorders and non-communicable diseases including cardiovascular and respiratory disorders (Brook et al., 2010; Chong-Neto & Filho, 2025; Kelishadi & Poursafa, 2010). The presence of infant mortality and chronic disease indicates growing concern of populated areas and long term health consequences.

The core focus of this cluster is on risk factors of air pollution on health and wellbeing in context of morbidity, mortality, and health inequities.

Yellow Cluster: Regional and socioeconomic dimensions of air pollution health risk

The cluster highlights distributive dimensions of air pollution linking with socioeconomics, regional and health disparities indoor air pollution, awareness and sanitation in developing regions like India and Asia. Evidence indicates that low and middle income countries disproportionately bear the burden of air pollution and related health diseases due to rapid industrialization, limited regulatory policies and socioeconomic vulnerability (Landrigan et al., 2018; Health Effects Institute, 2026). Higher impact can be noticed among low and middle-income regions of developing areas and especially in socioeconomically deprived communities.

The cluster underlines air pollution as an urgent need of environmental justice and equity focused interventions, reinforcing the need for region-specific interventions rather than one-size-fits-all policy solutions.

4. LIMITATIONS AND FUTURE SCOPE

Unlike every research, this study also has certain limitations. First, the analysis is confined to Scopus database published literature only, while future research could integrate multiple databases for

broader coverage. Second, filter applied for publication period (2020-2025), document type, source type, language and open access availability may exclude few potential literatures published in this domain. Expanding these criteria in future research could offer more inclusive and well-grounded perspective in this field. Third, the keyword co-occurrence may not reflect the true and full picture of author collaborations as some authors may have contributed in research without appearing as key author. Finally, the interpretations of thematic clusters developed through VOSviewer and Biblioshiny involves author's subjective judgement. Application of other platforms such as Pajek, SciMAT, Gephi, ScientoPy may yield varied results. Future study may apply longitudinal bibliometric techniques to validate and refine thematic interpretations.

5. CONCLUSION

The present study provides a comprehensive mapping of evolving research landscape by examining the air quality - health and well-being nexus in the context of SDG-3. Related literature pertaining to last quinquennium published in Scopus database reveals sustained growth in scholarly output reflecting global concern towards this urgent need fulfilment and thereby achieving overall sustainability. Descriptive analysis using VOSviewer presents USA emerged as the highest contributor for this research domain whereas India dominates in terms of most cited countries. Sustainability (Switzerland) journal published by Multidisciplinary Digital Publishing Institute (MDPI) leads by contributing highest number of literature in the field of air quality and SDG-3. Overall, country wide productivity, source dynamics and citation impact highlights uneven geographic contributions by few countries such as Iran, USA, India and Australia.

Network visualization through co-word analysis indicates particulate matters namely PM2.5 and PM10, carbon emission, as significant contributor to air pollution having strong interconnections with climate change, environmental degradation, several health risks including hyper tension, child mortality, non-communicable diseases such as cardiovascular risk and respiratory disorders. Health risk related to epidemiology, health inequalities, socioeconomic disparity, health policies poses another level challenges in attainment of SDG.

Subsequently, findings indicate that strengthening healthcare system alone is not sufficient, it requires integrated environmental governance, pollution control policies and government interventions for the

accomplishment of SDG-3. Further, a need for equity-focused strategy development is an urgent need for low and middle income regions which are disproportionately burdened by air pollution related health risks.

By systematically mapping dominant and emerging research themes, this study contributes to a clearer understanding of knowledge structures and research priorities in the air quality–health and well-being nexus in the context of SDG-3. The findings of the study help policymakers, governments and environmental agencies to align the results with global sustainable development goals.

ACKNOWLEDGEMENTS

Authors acknowledge the support provided by institutes to conduct this work.

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CONFLICT OF INTEREST STATEMENT

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ETHICS STATEMENT

This manuscript presents a scoping review of previously published literature and does not involve the collection of primary data from human or animal participants. As such, ethical approval from an institutional review board was not required.

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