frontiers | Frontiers in Earth Science

TYPE Editorial
PUBLISHED 13 March 2024
DOI 10.3389/feart.2024.1293817

OPEN ACCESS

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RECEIVED 13 September 2023
ACCEPTED 06 March 2024
PUBLISHED 13 March 2024

CITATION
Rupakheti D, Mahapatra PS and Jalaludin J (2024), Editorial: Characterization, effects, perception, and mitigation of air pollution in Asia for better air quality management. *Front. Earth Sci.* 12:1293817. doi: 10.3389/feart.2024.1293817

Editorial: Characterization, effects, perception, and mitigation of air pollution in Asia for better air quality management

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KEYWORDS

air quality, air quality management, air pollution, air pollution characteristics, Asia

Editorial on the Research Topic
Characterization, effects, perception, and mitigation of air pollution in Asia for better air quality management

Air pollution affects billions of people globally and is a critical developmental challenge. Its presence is conspicuous and has a profound effect on people's lives and livelihoods in Asia (Maharjan et al., 2022), a major hotspot for air pollution. This has a large implications for both the continent and the global burden of diseases. Understanding the origins, causes, and ramifications of air pollution in this region is crucial for the present generation and the sustainable development of future generations. It is essential to recognize that majority of air pollution in Asia can be attributed to anthropogenic activities such as industrial emissions, domestic practices, construction and infrastructure development, transportation and others.

It is vital to address these anthropogenic factors to achieve on-ground air quality improvements across the continent. A comprehensive strategy incorporating scientific knowledge, thoughtful policymaking, readiness, and individual dimensions is required to mitigate the issue effectively. However, sometimes, policies alone cannot bring about the desired change without a basis of public awareness and individual responsibility. Therefore, to spread knowledge, increase awareness, and provide citizens the ability to make environmentally friendly decisions, governments, non-governmental organizations, and community leaders must work together. An excellent illustration of this is the introduction of "Mission LiFE" in India. Another crucial element in the fight against air pollution is preparedness. In addition to supporting long-term planning, creating resilient infrastructure, creating early warning systems, and putting emergency response plans into place help reduce the short-term effects of sudden spikes in air pollution levels. India implementing its Graded Response Action Plan (GRAP), Pakistan implementing its policy

to use only improved brick kilns to reduce pollution in winter, and Beijing issuing "red alert" closing schools, factories and construction sites and ordering half of all private cars off the road are some examples amongst many. Effective air quality management in Asia is contingent upon strategic planning and coordination at all levels—local, national, and international—due to the diversity of air pollution sources, sizable developing economies, the geography and landuse, population, and growth velocity, among other factors. Overcoming boundaries and ideologies is necessary for the joint effort to combat air pollution. One such initiative includes comprehending the complex air pollution problem in Pakistani and Indian Punjab (Shrestha et al., 2022). Implementing focused reduction methods and having a sophisticated grasp of risk assessment are necessary for mitigating the effects of air pollution.

Therefore, we endeavored to compile scientific data on several subjects pertaining to air quality in Asia for this Research Topic. This information would serve as the cornerstone for constructing reliable policy and future research and collaborations. A quick summary of articles published under this Research Topic is summarized here.

While COVID-19 did show the world what it needs to do for blue skies, several researches thereafter have consolidated these findings and supported mitigations efforts. In one of the research, Liu et al. investigated the impact of the COVID-19 lockdown on air quality in Lanzhou, a city in northwest China, using the time series decomposition method. The lockdown provided an opportunity to understand the changes in air pollution levels and to test the effectiveness of previous environmental protection measures. This study showed that temporary social closure measures (such as lockdown during COVID) have a limited effect on improving air quality in Lanzhou. In another study, Jethva et al. assessed the predictability of post-monsoon crop residue fires in Northwestern India which can support mitigation efforts in the South-Asian region. This study demonstrated a robust relationship between satellite measurements of vegetation index (a proxy for crop amounts, and post-harvest fires—a precursor of air pollution events), for predicting seasonal agricultural burning. Based on the spatial autocorrelation and geographically and temporally weighted regression model (GTWR), She et al. explored spatial-temporal characteristics and driving factors of PM2.5 through 252 prefecture-level cities in China. Results demonstrated that $PM_{2.5}$ concentrations showed a significant downward trend in North and Central China, and the reason might be the transition from a high environmental pollution-based industrial economy to a resource-clean high-tech economy since the implementation of the Air Pollution Prevention and Control Action Plan in 2013. Singh et al. investigated the seasonal concentrations of particulate and gaseous Polycyclic Hydrocarbons Carbon (PAHs) along with carcinogenic health risk assessment in the urban atmosphere of Delhi. The principal component and correlation were used to identify the sources of particulate and gaseous PAHs during different seasons. These studies could be used to focus mitigation efforts as laid under the National Clean Air Programme of India. Guo et al. measured the carbon emission efficiency of pig farming in 30 provinces of China by using the non-expected output SBM model and analyzed the spatial and temporal characteristics and the influencing factors by using the limited dependent variable model. Yuan et al. investigated the ambient air pollution and associated health risks and premature mortality in four functional (urban, suburban, industrial and rural) areas of Jining, China. The four functional areas exhibited the same seasonal variations and diurnal patterns in air pollutants, with the highest exposure excess risks (ERs) from ozone. Highest health-based air quality index (HAQI) in industrial area influences the HAQI in urban and suburban area through transport mechanism. Thus puts forward the requirements of mitigation efforts to be concentrated for different pollutants on a seasonal basis. Feng et al. explained the mechanism of national development zone policy affecting carbon emissions in China using the panel data of 285 cities in China from 2003 to 2020, and adopting the DID model to analyze its impact on carbon emissions through tests such as placebo test, dynamic test, endogeneity test, and parallel trend test. The findings show that the development zone policy indeed significantly reduces carbon emissions. From a large birth cohort (572,106 mother-infant pairs) in Chongqing, China, Zhou et al. explored the relationship between exposure to ambient air pollutants during pregnancy and the risk of very low birth weight (VLBW). The Generalized Additive Model were applied to estimate exposures for each participant during each trimester and the entire pregnancy period. Findings showed that the maternal exposure to high levels of PM2.5, PM10, NO2, and O3 might increase the risk of very low birth weight, especially for exposure on the first and second trimester. You et al. conducted this time series study to explore the association between ambient PM2.5 exposure and daily hospital admissions for circulatory system diseases (CSD) from 2016 to 2020 based on 201,799 hospitalized cases in Ganzhou, China by using generalized additive models (GAMs). Based on the panel data of 75 cities in the Yellow River Basin, China, Lu et al. constructed an evaluation index system and measured the environmental regulation efficiency using a super-EBM hybrid distance model. Regional differences and dynamic evolution characteristics of environmental regulation efficiency with the help of Dagum's Gini coefficient decomposition and kernel density estimation methods was also analyzed. These studies indicate the effects of air pollutants on health through different routes.

In conclusion, the issues of air quality stand out as a unique opportunity to put these concepts into practice, especially as integration and interdisciplinary studies are still popular subjects in many conversations. The complexity of air pollution in Asia, from its definition and impact to the way it is perceived and tackled, highlights the urgent need for a comprehensive and collaborative approach. The region can pave a path towards better air quality management by combining scientific knowledge, technical breakthroughs, sustainable urban design and infrastructres, policy frameworks, public awareness, behavioural change and preparedness measures. Through the adoption of well-designed and implementable solutions to combat air pollution, we can concurrently address broader global challenges. By working together, we can only hope to lessen the negative impacts of air pollution and ensure a healthier tomorrow, and a more sustainable future for the millions of people residing in Asia.

Author contributions

DR: Writing–original draft. PM: Writing–review and editing. JJ: Writing–review and editing.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. DR was supported by the Startup Foundation for Introducing Talent of NUIST (2022r024) and the Jiangsu Province "Double Innovation Doctor" Program (JSSCBS20220552).

Acknowledgments

This Research Topic has been realized in collaboration with Dr. Pratima Singh, Research Scientist at the Centre for Study of Science, Technology and Policy (CSTEP), Bangalore, India. We wholeheartedly thank all the authors and reviewers who have participated in this Research Topic. The views and interpretations in this publication are those of the authors and are not necessarily attributable to their organisations.

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The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Publisher's note

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