Commentary

A Critical Reflection on Air Quality Monitoring in Ethiopia: Challenges, Progress, and the Way Forward

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Introduction

The strategic measures that improve environmental air quality contribute to better public health. The role of air pollution in environmental effects continues to be a major factor affecting health among populations living within urban settings. This is because air pollution has been identified as one of the highest contributors to health problems in cities worldwide (Oleszkiewicz et al., 2023).

Rapid economic growth in Ethiopia has resulted in the many technological, industrial and agricultural improvements. However, such rapid economic and population growth with expanding technology has also resulted in increased emissions of various air pollutants. The general climatic condition is seasonal, with rainfall levels varying in relation to topography. During the rainy season (from June to September), there is high precipitation, while during the semi-rainy season (from February to May) the amount of rain is moderate, and during the dry season (from October to January) it is generally dry. Therefore, these seasonal variations might be influencing the measured ambient air pollution level and air quality index.

The most serious threat to human health comes from urban air pollution. People residing in urban areas are highly threatened, and exposure to pollution can thus prevail over their health status. The poor and children are among the most disproportionately affected segments as to environmental, economic, and health challenges (WHO, 2021). Simultaneously, exposure to polluted air can cause of various diseases. For example, in Addis Ababa, cases of Chronic Obstructive Pulmonary Disease (COPD) annually increased by 53.44% from eight cases in 2013 to 1,871 cases in 2017, while pneumonia cases increase from 575 to 29,844 within the same period of time (Tarekegn and Gulilat, 2018). Respiratory and cardiovascular diseases, such as acute upper respiratory infections, bronchitis, asthma, COPD, and pneumonia, are likely to increase in Addis Ababa due to long-term exposure to air pollution.

Besides these developing problems, air quality monitoring (AQM) and evaluation still remain one of the major challenges in air quality management in Ethiopia. Such a challenge might be important to be addressed, with rapid urbanization and economic growth that increase air pollution. It might be because of the lack of AQM devices, shortage of qualified experts, inadequate knowledge regarding how to maintain the existing monitoring systems, and the absence of a revised national level air quality guideline (NAQG) and unavailability of national air quality index (NAQI). While air pollution is still deteriorating, the prevalence of respiratory cases has become one of the leading health burdens of many people (US EPA, 2021a). Although there is some improvement, AQM in the country remains underdeveloped. These inhibit the potential of Ethiopia to address health risks, environmental degradation, and economic impacts effectively. Hence, it is vital to point to challenges, opportunities, and possible means of enhancement in order to underline an integrated, robust approach toward AQM.

Challenges and current gaps

The current infrastructure setup of Ethiopia's AQM has some drawbacks, which ultimately lead to many issues with data availability, public access, and policy implementation efficiency. Major issues regarding this question are linked to the fact that most of Ethiopia's monitoring stations are located within only urban city centers like Addis Ababa. Moreover, this only provides limited coverage and fails to capture a comprehensive picture of air quality, especially over rural areas affected by agricultural and biomass burning emissions that often involve the burning of wood, agricultural residues, and other organic material for cooking and heating. Besides, existing devices are outdated and lack consistent maintenance, affecting data accuracy and continuity. The current form of the AQM device, for example, includes the Ethiopian Meteorology Institute (EMI) have federal equivalent method AQM device, NASA MAIA PurpleAir device, Ethiopian Environmental Protection Authority and , Athletic Federation have Kunak cloud device, and GeoHealth and UNDP have BAM device. These all suffer from huge challenges due to power disruptions, malfunctioning sensors, and a lack of qualified personnel for regular equipment maintenance. As a result, real time data is barely available to the public, which makes it difficult to create awareness and thereby involve citizens in the reduction of pollution. Transparency of data shall facilitate the dissemination of information and support proactive actions at the level of public health.

Regulatory and policy gaps

Even though there have been some recent air quality plan updates In Ethiopia (US EPA, 2021b); nevertheless, the air quality management system of Ethiopia is rudimentary at present, with some serious gaps regarding enforcement and the development of new standards and an air quality index. While there are, in fact, laws to protect air

quality, these regulations typically do not have explicit, enforceable provisions, so implementation and monitoring across the country are not consistently carried out. Operating laws are either so old or so vague that regulatory bodies find it tough to bring polluters to justice. Such ambiguity and laxity in the laws have kept efforts at bay in an attempt to rid the skies of pollution, as industries and other sources can be seen with minimal accountability. Lacking an integrated central data repository that would bring together and oversee multiple sources of data for management, effective policy operations and mechanisms for response by sectors remain unreachable. Consequently, health risks from deteriorated air quality continue to increase. For this reason, the fight against air pollution requires an update of air quality standards, a development of better mechanisms for enforcement, and consistent use of regulations throughout the nation.

Strengths and opportunities

The partnerships developed with entities like the United Nation Environmental Programme (UNEP) and the World Bank provides immense technical as well as financial support. These partnerships are helpful in capacity building as well as knowledge and infrastructural development agreements. Also, the Ethiopian governmental and public awareness of the health implications of air pollution is growing, as evidenced through advocacy, public health workshops on pollution-related diseases, and urban air quality studies; thus, this sets a good prospect to start community-led and government-supported initiatives.

Recommendations

Adequate AQM and control needs accurate and complete data to underpin its evidence based policies and actions. The gaps in the AQM system and management in Ethiopia require expanding coverage, reliability, and accessibility of data. This would also involve increasing the number of monitoring stations both in urban and rural areas, with sophisticated monitoring technologies, quality assurance on regular calibration, and a centralized repository for efficient sharing and analysis. These would potentially facilitate improved decision-making, enhancing public health outcomes and enforcement of sustainable environment-based practices. Of more importance, investments should be done on advanced air quality monitors with rigorous maintenance protocols. This would involve budgeting for technical training and the adoption of real-time data integration technologies. Publishing air quality data through accessible platforms would increase the awareness of the public about air quality issues and aid community action against pollution. A centralized data platform would facilitate effective policy development and compliance monitoring and offer timely responses to air quality challenges. Additionally, public awareness through campaigns about the health consequences of air pollution may be launched in order to gain community support for the measures on air quality improvement and result in behavioral changes.

Conclusion

The Ethiopian effort towards the achievement of air quality monitoring and management for sustainability reflects both significant strides and substantial challenges. Strengthening the air quality monitoring system can help protect public health and contribute to the broader sustainability goals of Ethiopia. These will ensure more infrastructure expansion, regulations, and public engagement in ways that will significantly set one on the path toward cleaner, safer air for all.

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Conflict of interest

The author declares no competing interests.

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