

# Editorial for special issue Introduction to special issue ICAQ'AFRICA2022 Conference: Trends and perspectives in air quality research in Africa

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<https://doi.org/10.17159/caj/2023/33/2.17373>



## INTERNATIONAL CONFERENCE ON AIR QUALITY IN AFRICA (ICAQ' Africa 2022)

11-14 October, 2022 (VIRTUAL EVENT)



Air pollution is an emerging concern in many African countries transcending geographical boundaries and affecting the well-being of its communities due to the increase in population and industrial activities that control different pollution sources as well as the impact of climate change on various landscapes affecting traffic, residential combustion, and power generation emissions (Mead et al, 2023). African cities are growing at a fast pace (around 5% per annum urbanization rate in many places) and this growth is like those seen in emerging regions like South America and Southeast Asia. Africa now hosts megacities such as Kinshasa in the Democratic Republic of Congo, Lagos in Nigeria, and Cairo in Egypt. However, this development is followed by several challenges in water and electricity supply, municipal waste management, a growing need for infrastructure (hospitals, schools, etc.), and deteriorating air quality with adverse consequences on health.

In this light, the African Society for Air Quality (ASAQ) organized its first International Conference on Air Quality in Africa (ICAQ'22) to serve as a catalyst for collaborative research and knowledge exchange and called for papers that could highlight the state-of-the-art in the different specific research areas within the continent (Tchanche et al., 2022). The event convened researchers from various parts of the world delivering around 70 talks covering several topics including atmospheric pollutant monitoring and forecasting models, microplastics, the impact of atmospheric pollution on climate and economy, remote sensing, air pollution and health effects, urban heat island, and mitigation strategies.

The collective knowledge shared at the conference contributes to a deeper understanding of air quality challenges in Africa

and fosters collaborative efforts toward sustainable solutions. The articles presented in this Special Issue delve into the intricate dynamics that shape the air quality landscape across the continent and shed light on some emission problems, key management challenges, and potential solutions that could empower both the private and public sectors in developing air pollution mitigation strategies.

Nana et al. (2023) examine the carbon dioxide emission factors stemming from power generation focusing on the year 2018, which is used as an example to evaluate the contribution of renewable energy sources in mitigating CO<sub>2</sub> emissions. The findings emphasize the need for a nuanced understanding of emission factors and highlight the role of renewable energy in fostering sustainable power generation practices.

Faboya et al. (2023) use Lagos as an example of a specific urban area, where anthropogenic activities strongly contribute to the exceedance of PM<sub>2.5</sub> levels, and further quantify specific chemical components in these particles, especially, aliphatic hydrocarbons, evaluating source diagnostic indices, offering crucial insights into the local air pollution challenges. The conclusions drawn pave the way for targeted management strategies tailored to address the specific dynamics of air quality in Lagos.

Finally, a holistic approach is provided by Borge et al. (2023), on how air quality issues in five major African cities are managed. Through an exploration of urban air quality, monitoring capabilities, emission inventories, and governance structures, the study emphasizes the urgent need for comprehensive air quality management strategies. It further highlights the

intertwined nature of poverty, social equity, and environmental health, calling for collaborative, multi-level interventions in addressing air quality issues.

While these articles contribute significantly to the dialogue on air quality in Africa, it is imperative to highlight certain overarching themes emerging from ongoing research in the field of atmospheric science on the continent involving:

**Source apportionment and chemical composition:** Many studies have presented particulate matter concentrations, revealing widespread pollution across African cities. However, few studies have provided the sources and their chemical composition. Future research could delve more into source apportionment and the chemical composition of collected samples, and those of gases.

**Data availability challenges:** Ongoing atmospheric science studies in Africa consistently indicate poor air quality in major cities, however, data from many locations are still unpublished. The high upfront cost of air quality monitoring, coupled with low awareness among decision-makers and the public, and a shortage of well-trained personnel, pose significant obstacles to the availability of air quality data.

**Role of low-cost sensors:** A notable number of studies revolve around low-cost sensors as a potential solution to overcome the lack of air quality data in Africa. These sensors offer a promising avenue for cost-effective monitoring, potentially increasing data availability across the continent.

**Integrating remote sensing data:** Although air quality data retrievals via remote sensing using satellites are available, very few works have been published on this topic. Future research can encourage their application especially due to their ability to provide valuable insights into air quality data and dynamics currently limited.

**Health implications:** Atmospheric pollutants are significant contributors to several diseases, including asthma, cancer, stroke, and dementia, leading to morbidity and premature mortality. Despite progress, more research in this direction will benefit public awareness of curbing air pollution.

**Policy and legislation:** While legislation related to air pollution exists in many African countries, enforcement remains a challenge. The need for more countries to adopt and rigorously enforce air quality policies is important to enhance the collective effort in combating this challenge.

**Urban heat islands:** Heat islands negatively affect productivity and the economy in most African cities, particularly those located in tropical areas. There is a need for researchers to study the effects of heat islands in African cities and explore strategies, such as cool roofs, to mitigate these impacts.

**Collaboration and capacity:** Most African researchers are isolated and work with limited access to funds. South-South collaboration and more training in the field of air quality are highly recommended for capacity building. Nevertheless, the interest is growing in air quality research in Africa. The number of research groups as well as the number of published papers is increasing rapidly. More and more scientific events are being organized on the topic in various parts of Africa. After the ICAQ'Africa 2022, more than ten events were organized on the continent focusing on different aspects of air quality.

Collectively, the interdisciplinary nature of the ongoing research underscores the pressing need for policymakers, researchers, and stakeholders to collaborate in devising sustainable strategies for addressing air quality challenges in Africa. The complexity of the issue also necessitates international cooperation to build a healthier and sustainable future for the continent. It is anticipated that air quality research in Africa will continue to grow and improve in the upcoming years.

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