

A Systems Approach to Air Pollution (ASAP) East Africa



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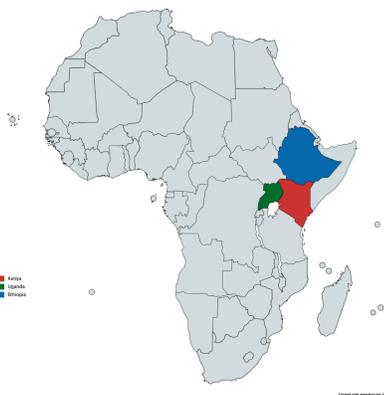
1. Introduction

Air pollution is the leading environmental risk factor globally. It causes approximately 7 million premature deaths per year globally, which is more than AIDs, war and murder combined. It affects both physical and mental health. Through inhibiting the ability to work and study, it places a brake on economic development.

The ASAP programme brings together UK and East African researchers in air pollution, engineering, urban planning, economic geography, public health, social sciences and development studies to provide a framework for improved air quality management in East African cities.

The target cities are Addis Ababa (Ethiopia) Kampala (Uganda) and Nairobi (Kenya). All three cities are rapidly developing with increasing populations, economies and hence sources of air pollution (Rajé et al. 2018).

The work is funded by the UK's Department for International Development (DFID). This poster gives a snapshot of some of the activities undertaken in ASAP.



2. ASAP Objectives:

- Study urbanisation trends and their impact on air quality
- Develop robust and cost appropriate approaches to monitoring air pollution
- Generate a holistic evidence base on the causes, consequences and levels of air pollution
- Identify and engage with locations and communities which are most vulnerable
- Identify social, environmental, policy and management measures to tackle air pollution
- Understand the dynamic political economies of focus cities and how these influence urban governance and air quality management
- Raise awareness of air pollution problems and impact policy uptake

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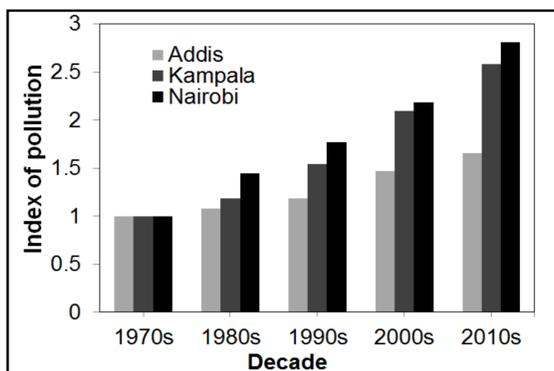
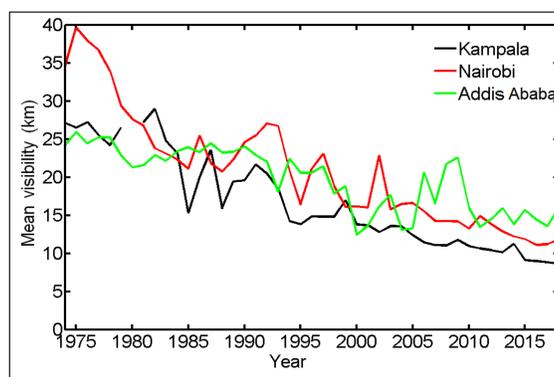
Department for International Development

3. Measuring current and historic air quality

A lack of air quality monitoring in East Africa makes it difficult to understand the causes and effects of air pollution in the region.

To construct the historic air quality, visibility was used as a proxy of air quality (Singh et al. 2020), see Figures below. Visibility is inversely proportional to the amount of particulate matter air pollution, which has the greatest health effect of all air pollutants.

Large decreases in air quality are seen in all three study cities.



Top Figure: Historical trend of annual visibility at three East African study sites derived from 45 years of hourly data (1974-2018).

Bottom Figure: Decadal index of PM pollution for all three study sites, calculated from historical visibility data, referenced to the 1970s.

4. Air Pollution Vulnerability

The ASAP project views vulnerability to air pollution as a function of:

- Air pollution exposure, which is a function of pollutant concentration and inhalation rate.
- Susceptibility to air pollution. The young and old, and those with pre-existing medical conditions such as asthma are particularly susceptible to air pollution.
- Adaptive capacity. This is the ability of to remove yourself from air pollution for example through use of air conditioning.

Hence, air pollution is a function of where you live, work, socialize, and how your travel between these activities.

The ASAP project has undertaken vulnerability scoping studies in schools, waste dumps, public transport, and other locations, taking into account the three dimensions of vulnerability.

5. Creating awareness

One of the problems of air pollution is its invisibility and its ubiquity. The invisibility makes it easy to ignore, and the ubiquity easy to feel helpless against it. To promote discussion about air pollution, we have collaborated with artists to generate places and spaces of discussion.

Audio-visual artist Dr Robin Price created light paintings of air pollution using low cost sensors that were calibrated and used to measure air pollution in the study cities (Pope et al. 2018; Crilley et al. 2020). These images created widespread interest with widespread media interest and art gallery shows, e.g.

<https://www.theguardian.com/cities/gallery/2019/apr/09/written-in-the-wind-visualising-air-pollution-levels-in-pictures>



Top Figure: Air pollution light painting at the University of Nairobi air quality supersite.

Bottom Figure: Postcard generated from Robin Price image of indoor air pollution, with simple messaging.

Conclusion

The ASAP project has generated a multidisciplinary and cross-disciplinary understanding of the causes and effects of air pollution in East African cities. This information is being used to generate a road map for better air quality for all. As the populations and economies of East African cities continue to increase, air quality needs to become a key consideration for urban planning.

References

- Singh et al. (2020) 'Visibility as a proxy for air quality in East Africa' Environmental Research Letters <https://doi.org/10.1088/1748-9326/ab8b12>
- Pope et al. (2018) 'Airborne particulate matter monitoring in Kenya using calibrated low-cost sensors' Atmospheric Chemistry and Physics <https://doi.org/10.5194/acp-18-15403-2018>
- Crilley et al. (2019) 'Effect of aerosol composition on the performance of low-cost optical particle counter correction factors' Atmospheric Measurement Techniques <https://doi.org/10.5194/amt-2019-370>
- Rajé et al. (2018) 'Traffic pollution: A search for solutions for a city like Nairobi' Cities <https://doi.org/10.1016/j.cities.2018.05.008>