



TACKLING URBAN AIR POLLUTION

Air pollution contributes to seven million premature deaths annually. The leading environmental risk factor for many areas of the world, its effects are felt from birth until old age, including low birth weight, perinatal mortality, stroke and cancer.

Key advances in sensor technology and data analysis have evolved our understanding of air pollution and provided a stark warning about the prevalence of poor air quality. For cities and population-dense urban areas around the globe, the concern about unsafe levels of particulates is growing.

Francis Pope, Professor of Atmospheric Science and Fellow at the Institute for Global Innovation (IGI), University of Birmingham, explains that it is a common impact of burgeoning populations.

'Perversely, in many ways bad air quality can be seen as a measure of your success as a region. In the simplest terms, if your economy is booming and people are headed to the cities for work, you will have the related air quality problems. For us, it is about finding ways to continue that economic development but not doing so at the expense of the environment.'

Getting to grips with that significant global challenge was the focal point for two IGI-funded projects in Kenya and India, supported by the Global Challenges Research Fund.

EAST AFRICA AND RAPID URBANISATION

Nairobi, The Kenyan capital, is projected to see its population nearly double to seven million by 2030. It is a similar story across East Africa in Kampala, Uganda, and Addis Ababa, Ethiopia. Ever-more cars fill rapidly expanding road infrastructure, services are put under increasing pressure, and air quality is deteriorating rapidly.

'In cities we see multiple major sources of pollution,' says Professor Pope. *'You need to think about air pollution as a product of the city and ask yourself 'What is the city doing?' There is a system of connecting systems at work. There are the more obvious contributors such as vehicles emissions, but indoor pollution from cooking and heating is a particular threat in low and middle income settings. The solution is not as simple as introducing low-emission cars, for example.'* By pooling expertise from diverse backgrounds the team were able to make inroads into mapping the complex problem faced by booming East African cities. Leading UK and East African researchers in air pollution, engineering, urban planning, economic geography, public health, social sciences and development studies came together

at an IGI-supported workshop to develop a framework for improved air quality management.

That said, without adequate information to support policy recommendations, air pollution is often neglected by governments facing competing development challenges. Through the Department for International Development (DfID) funded research project 'A Systems Approach to Air Pollution (ASAP) – East Africa', Professor Pope has employed low-cost sensors and advanced modelling techniques to build the evidence base to push for policy change.

'There is a real appetite in East Africa to stem the threat of air pollution as they continue to develop economically. Poor air quality is responsible for more premature deaths than unclean water, bad sanitation and childhood malnutrition. But generating research that relates to, and can inform, domestic policy decisions is crucial. We need to have great advocacy skills, supported by credible data, if air pollution issues are to gain traction in development circles in Kenya,' he says.

With such readily available natural resources for power it is conceivable that Africa could sidestep some of the fossil-fuel dependence that Western countries and some of the Asian countries have gone through. However, whereas East African cities aspire to keep air pollution under control as they develop, the air quality in Delhi could not get much worse.



SUPPORTING CHANGE IN DELHI

Delhi and the surrounding region is home to about 46 million people. They are impacted by particulate matter levels up to 15 times above World Health Organization guidelines.

Key contributors to air pollution in Delhi include vehicles, construction, road dust, burning of solid waste, crop burning in Northern Indian states and, during Diwali, fireworks. Delegates at a two-day IGI supported workshop convened by Dr William Avis, Professor Pope and Professor Mukesh Khare from the India Institute of Technology called for insight that could inform a new approach to resolving health, social and economic problems associated with air pollution in Delhi and similarly polluted regions.

By bringing together such a broad coalition of experts the participants were able to identify issues that are often overlooked. The street dweller community was cited as a key example. Thousands of men, women and children who are at risk of serious illness and death because of their constant exposure to dangerous levels of air pollution.

'You have this marginalised, vulnerable community who have the dual problem of constant exposure to particulate matter both at work and home, right by the side of the road, and often they lack the capacity to reduce that exposure,' says Professor Pope. *'Air quality presents a very real and dangerous risk to public health.'*

This insight served as an example of how the impacts of air pollution infiltrate all areas of urban life.

Representatives of local and national branches of the Indian government, academia, civil society and the international development community were in agreement on a series of key recommendations that can drive significant change in how poor air quality is combatted in urban areas.

Attendees called for:

- Air quality metrics to be incorporated into several of the 17 UN Sustainable Development Goals, most notably SDG3 – Good Health and Well-being

- Air pollution to be treated as a disaster, in the same way as natural events such as earthquakes and forest fires
- Access to clean air to be considered as a basic human right

Professor Pope said, 'Air pollution kills millions and costs the world economy billions. Tackling the problem is not just a technological issue, but a social-economic and social-political challenge that requires a new approach.'

Though the delegates acknowledged that a new SDG was not possible, they emphasised how air pollution aligns with a number of the existing SDGs through its harmful impact on public and environmental health, implications for climate change targets and, if tackled correctly, its role in reducing inequality. The experts believed that acknowledging it through the SDGs and reassessing it as a disaster would give air pollution proper recognition and assist policy makers in implementing meaningful changes.

ON THE HORIZON

The progress made by experts from a diverse array of countries including representatives from Africa, Asia, Europe and North America speaks to the growing interest in the work being done by the IGI Resilient Cities team and their ability to engage a broad international stakeholder network.

'Typically, air pollution is invisible,' explains Professor Pope. *'Of course, in some places like Delhi you can see it, but for most people poor air quality is something almost intangible. Therefore, you have to find ways of 'sensitising' the population.'* The prevalence of air pollution was illuminated by Robin Price, an artist who attended the meeting in Delhi. His long-exposure photographs show particulate matter in a new light.

'Partnerships are at the core of our efforts to understand the causes and consequences of air pollution. Examples such as the collaboration with the Population Council on the street dweller study in Delhi exemplify the benefits of working together. With their knowledge of working with hard-to-reach groups and our expertise in air quality monitoring were able to shine a light on the extreme levels of air pollution this particularly vulnerable group are exposed to.'

– Dr William Avis

'What's next?' continues Professor Pope, *'We want to continue establishing the relationships we have grown and work towards implementing our recommendations. There is an appetite to build our network and bring together more and more experts with a view towards making meaningful changes that can improve air quality for all.'*

