London's atmosphere may still have its mysteries, but compared to many places it's an open book.

Taking UK atmospheric science global

Around the world, many big cities have enormous air-pollution problems and virtually no good information on what specifically is causing them. This means governments are in the dark about what they should do to protect their citizens. Right now, air pollution claims an estimated 3.5m lives a year globally. UK atmospheric scientists are working with local academics and policymakers to help change this.

For instance, Professor Roy Harrison of the University of Birmingham – an expert on pollution and its health effects – is now leading a big project aimed at applying similar techniques to the air of Beijing. This will measure emissions of pollutants including particles, NOx and volatile organic compounds (VOCs) in real time from a tower in central Beijing, in both winter and summer.

China's air-quality problems are far worse than the UK's, and the authorities there have much less good information on them. Air pollution there contributes to the deaths of an estimated 1.3m people a year, and some half-billion Chinese city-dwellers are thought to be at risk of ill-effects from breathing the pervasive grey haze. The economic cost is vast too – estimated at nearly a trillion pounds a year in China alone.

'If you look at PM2.5 particle pollution (tiny particles that can penetrate deep into people's lungs, causing serious harm), in the UK it's estimated to cause about 29,000 premature deaths a year,' says Harrison. 'London accounts for something like 5,000 of those. In Beijing, concentrations are typically ten times higher and the city itself has a much bigger population (nearly 22.7 million people this year according to official figures, compared to a little over 8.5 million in London), so the overall impact on health is far more severe.'

He explains that the Chinese public is becoming much more aware of these problems, so there's growing pressure on authorities to clean up the air. The researchers will analyse the chemical composition of Beijing's pollution, assigning it to different parts of the city and different types of activity and thus helping local policymakers and academics create more accurate emissions inventories.

'We want to help the local authorities understand where that pollution is coming from, and what they could do about it,' Harrison explains. 'For example, is it being produced locally, or is it blowing into the city from upwind? This kind of information is vital if they are going to manage air quality more effectively – mitigation depends on having good knowledge of where pollution is being generated.' This information will lead to better air-quality models that will let the authorities predict the effect of different possible interventions – from issuing pollution improvement plans to problem factories to changing traffic regulations to discourage driving at particular times.

Both Lee and Hewitt will be involved in Beijing, looking after the NOx and VOC tower measurements respectively. They are also planning a variety of other exciting research trips – the China work will be followed up by a similar collaborative project between Indian and UK researchers, and Lee plans to visit Delhi to make pollution flux measurements in 2018 with Hewitt and others. In the meantime he's heading to Togo as part of an EU-funded project that will fly over West African cities and measure fluxes of pollutants including NOx, ozone, soot particles, carbon monoxide and greenhouse gases.

West African governments often have little or no information on atmospheric conditions – a NERC-funded flight around Lagos nearly a decade ago collected the first ever airborne measurements of aerial pollution in the region, and there's been very little since. Until they know how bad each kind of pollution is, and where it's coming from, it's near-impossible for them to target the limited resources available for cleaning up the air effectively.

To find out more about the Atmospheric Pollution & Human Health in a Developing Megacity programme, visit www.nerc.ac.uk/research/funded/programmes/atmospollution.