

# How cities draw the heat

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Credit: PlanetEarth Online

It is 15 years since the UK sweltered in the record-breaking 2003 summer heatwave. While the sunshine was welcome to many, it also brought deadly consequences, with more than 2,000 people across England and Wales dying in the stifling heat. Some 800 of those deaths were due to air pollution.

The death toll spurred the government to improve a nationwide heatwave warning system using scientific research from NERC. The new system

provided more accurate predictions of growing smog as temperatures soared.

## **Toxic ozone**

As the mercury rises, so too do levels of toxic ground-level ozone. The ozone layer high up in the atmosphere shields people from the sun's harmful ultraviolet rays and the threat of skin cancer. Whereas ground-level ozone is the main component of smog, which triggers conditions like asthma and bronchitis.

Professor Alastair Lewis did pioneering work funded by NERC to predict peaks in smog during heatwaves. He found that trees in the UK also cause natural [pollution](#) by emitting a chemical called isoprene that reacts with manmade pollutants to increase smog further. As a result, natural emissions were included in future air quality forecasts, making them more accurate. These air quality forecasts are part of a heatwave warning system that the Met Office has estimated saves 24 lives for every ten days of heatwave alerts.

## **Home fires worse than idling lorries**

But air pollution comes in many forms caused by multiple sources. There is growing concern now in winter about a key source far closer to home for many people who could make their own lifesaving decisions to reduce pollution.

Alastair, now Deputy Director of NERC's National Centre for Atmospheric Science (NCAS), said, "Between 10,000 and 40,000 people die in the UK each year because of air pollution, so even a modest reduction in emissions can make a substantial difference."

Our air quality is very much better than it was 30 years ago, when the focus was on major industrial sources like power stations. There are still big improvements we can make to reduce the number of deaths and the costs to people's lives and the environment. Lots of that now lies with what individuals choose to do. The next challenge for the UK will be particulate matter, or PM, a serious pollutant from a huge number of sources. I think people would be surprised by the contribution of things like coal fires and woodstoves in their homes to urban PM.

The government currently estimates that a modern wood-burning stove can emit more PM than an idling diesel lorry. Ministers have warned that these popular stoves and other domestic heating appliances were the single largest contributors of PM in the UK in 2015, producing around 40% of total PM emissions. Ministers are urging people to switch to cleaner fuels and more efficient appliances. They also recently (end of January 2018) appealed to people to submit their views on how to reduce soot and smoke from their homes ahead of a new clean air strategy consultation, expected later this year.

## **Ahead of schedule on traffic fumes**

NERC-funded research is also playing a key role in addressing traffic fumes, to ensure efforts to cut pollution are based on the best understanding of the causes—giving politicians the greatest chance of success. Last year ministers announced a ban on all new conventional petrol and diesel cars by 2040 as part of a £3.5 billion plan to tackle nitrogen dioxide emissions from traffic.

The aim is to help the UK meet key national and European limits on [air pollution](#) from roadside traffic fumes. Many UK cities frequently breach these limits, producing illegal levels of pollution linked to serious health problems for thousands of people nationwide. Young children often get the worst of the fumes because they are closer to exhausts.

However, a recent study by NCAS and the University of York, which Alastair co-authored, revealed that the UK is likely to meet its targets several years sooner than the government's current forecast. The reason for that, perhaps surprisingly, is the finding that as diesel cars age, they emit less nitrogen dioxide pollution.

They made the unexpected discovery through a detailed analysis of vast amounts of existing data collected by the UK as part of Europe-wide information records held by the European Environment Agency. The government's own predictions were based on emissions forecasts instead of the actual figures recording the surprise reduction.

Alastair said, "Sometimes environmental scientists appear to be here just to deliver bad news, but we also have positive stories to tell. This is crucial evidence which can help the government develop plans for meeting targets to reduce roadside pollution."

Alastair and his team will now look at the same official data in a bid to find out more about PM pollution.

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