



# A breath of fresh air

Poor quality air is not always visible to the human eye, but it's reassuring to know that plenty is being done to clean up the air we breathe

Just inside the M25, the orbital motorway that encircles London, is another boundary: the city's Low Emission Zone (LEZ). The LEZ has been in operation since early 2008, 24 hours a day, seven days a week. Norwich has one, too, and other cities in the UK, such as Oxford, will soon follow suit.

The aim is to improve the air quality of the capital's residents by discouraging visits by high-polluting vehicles. Lorries and trucks are not banned per se. But by imposing a £200-a-day charge on vehicles not listed as exempt, Transport for London is aiming to get cleaner vehicles into the fleet faster. This month was supposed to see the LEZ apply to vans and minibuses, too, but this plan has now been suspended while a public consultation takes place.

Transport is the biggest source of pollution in our cities. The effect it has on human health is well understood and there is a clear link to both respiratory and cardiovascular illness. However, it is by no means the only source of air pollution to affect the UK.

Power plants and industry here and abroad also make a significant contribution (pollutants are able to travel from our shores to other countries and vice versa). Some substances in the atmosphere, such as sulphur dioxide, come mainly from natural sources. Others, like ozone, are the result of sunlight reacting with nitrogen oxides and volatile organic compounds (VOCs) from vehicles. Even the countryside is not immune - ozone can impact on rural areas far from any busy streets.

Understanding where different sources of air pollution come from, and how and why they build up in certain areas

at certain times, is a complicated process. Factor in variables such as different weather conditions, and a highly complex picture emerges. It's up to researchers and policy-makers to decipher why concentrations are as they are.

The UK has been collecting air quality data in a systematic way since the early 1960s. Today, there are hundreds of monitoring sites up and down the country. But making sense of this data is no easy task as David Carslaw, a research fellow at the University of Leeds, explains: "It's very difficult to analyse air quality data. There are many components to it and different sources, so you need quite sophisticated tools to develop any insight into why it is like it is. But," he adds, "better information leads to better decisions about managing and controlling it."

Making sure we manage and control air pollution effectively is the responsibility of Defra, working with the Departments for Transport, Health, Business, and Energy and Climate Change. Defra is also charged with keeping the UK within air quality targets, which are mostly set by Brussels.

"The bulk of the pressure comes from Europe," says Martin Williams, Head of Defra's air quality division, "although the UK has been quite influential in steering the debate. We were ahead of the game with the Environment Act of 1995, which led to the current Air Quality Strategy."

The latest news from Defra shows that the UK is meeting six of the eight policy targets set out in the strategy. However, the remaining two involve the pollutants nitrogen dioxide and particulate matter - the latter can be made up of a mix

of many different pollutants with serious effects on human health. This means that better research into air pollution remains vital. For this reason, Defra has invested in an innovative joint project with the Natural Environment Research Council and David Carslaw's team at the University of Leeds.

The Open Air Project is an attempt to overcome some of the barriers that prevent the more intelligent analysis of air pollution data. "The project is developing PC-based tools that can do clever analysis of the data quickly," explains Martin. "That analysis used to take weeks or months by hand."

While much of the science behind such tools is familiar, what is innovative about the Open Air Project is that it makes these tools accessible. "There are tools around but they tend to be locked up in quite proprietary software," says David. "What we've done is to choose a format that allows wide participation in the project, that is fully transparent, and which enables anyone in the air quality community to access the tools."

What this means in practice is that the tools are being created using "open source" software. This is software that has been developed in a public, collaborative manner. "All the software code and methods we're using are fully open," explains David. "This means that people can scrutinise what we do and the results that we or others get." This, he believes, is fundamental to building trust in environmental analysis.

The tools are already available for use by the research community in the UK - Defra scientists, local authorities and regulatory agencies like the Environment Agency - and will continue to be enhanced in the near future.

"Air quality is a very scientifically driven area of policy," says Martin, "and we've got some of the best air pollution and health effect scientists in the world here in the UK. The Open Air Project should ultimately lead to better policies because it will lead to faster and more comprehensive analysis of data." ●



For more information on the Open Air Project, or to access the tools, visit [www.openair-project.org](http://www.openair-project.org)

## POLLUTANTS: THE WORST OFFENDERS

### Particulate matter (PM)

Made up of extremely small particles of dust or soot from combustion sources, such as transport, or formed by chemical reactions in the air. PM is associated with respiratory and cardiovascular illness and increased risk of mortality.

### Oxides of nitrogen (NO<sub>x</sub>)

The main source is road transport. High levels of NO<sub>x</sub> can affect lung function in humans and reduce growth in vegetation.

### Ozone (O<sub>3</sub>)

This forms from chemical reactions between NO<sub>x</sub> and VOCs in strong sunlight. At high levels, it irritates the eyes and nose and reduces lung function.

### Sulphur dioxide (SO<sub>2</sub>)

Arises from the burning of fuels that contain sulphur, such as coal and oil. It can constrict the airways, and make soil and water more acidic.

### Polycyclic aromatic hydrocarbons (PAHs)

The most hazardous come from domestic coal- or wood-burning stoves or fires, accidental fires and bonfires, and industrial coke production. Some are human carcinogens, and exposure can lead to an increased incidence of tumours.

### Benzene

The main source is traffic exhaust fumes and petrol vapour from cars. Benzene is a recognised human carcinogen.

### 1,3-butadiene

Formed mainly from petrol combustion and the production of synthetic rubber. This substance is carcinogenic and can lead to lymphoma and leukaemia.

