



How can UK cities clean up the air we breathe?

Lessons from cities taking action to reduce roadside emissions

January 2018

With the continued rise of emissions and illegal levels of pollution in many places, air quality is increasingly recognised as a serious public health issue. Cities are primarily affected and policy makers have come under increasing pressure from voters, campaigners and health professionals to find solutions to reduce emissions. In response to the issue, the Government published a plan in July 2017 to tackle roadside nitrogen dioxide emissions which gives responsibility to local authorities to clean up their air.¹

Around the world and in the UK, London and other cities are already showing leadership by undertaking measures to tackle air pollution. This briefing presents the geography of air quality in the UK and introduces examples of cities' good practice to help UK cities better understand what they can do to improve air quality locally.

Air pollution has long-term consequences on public health and the economies of UK cities

Air pollution worsens people's quality of life and contributes to many health problems, thus reducing life expectancy. It increases the risk of respiratory and cardiovascular disease, stroke² and dementia. The Royal College of Physicians (RCP) and the Royal College of Paediatrics and Child Health (RCPCH) estimate that 40,000 premature deaths per year are attributable to poor air quality.³ And from an economic perspective, the World Bank estimated that premature deaths in the UK represented a monetary cost of up to £57 million in 2013.⁴ Poor air quality is also responsible for lost working days - the RCP and RCPCH report estimated it caused over 6 million sick days and a total social cost of £22.6 billion a year.

1 Department for Environment, Food and Rural Affairs (DEFRA) and Department for Transport (DfT), UK plan for tackling roadside nitrogen dioxide concentrations (2017), London: The Stationery Office

2 Andersen ZJ et al. (2012), Stroke and Long-Term Exposure to Outdoor Air Pollution from Nitrogen Dioxide: a cohort study

3 Royal College of Physicians/Royal College of Paediatrics and Child Health (2016), Every breath we take: the lifelong impact of air pollution

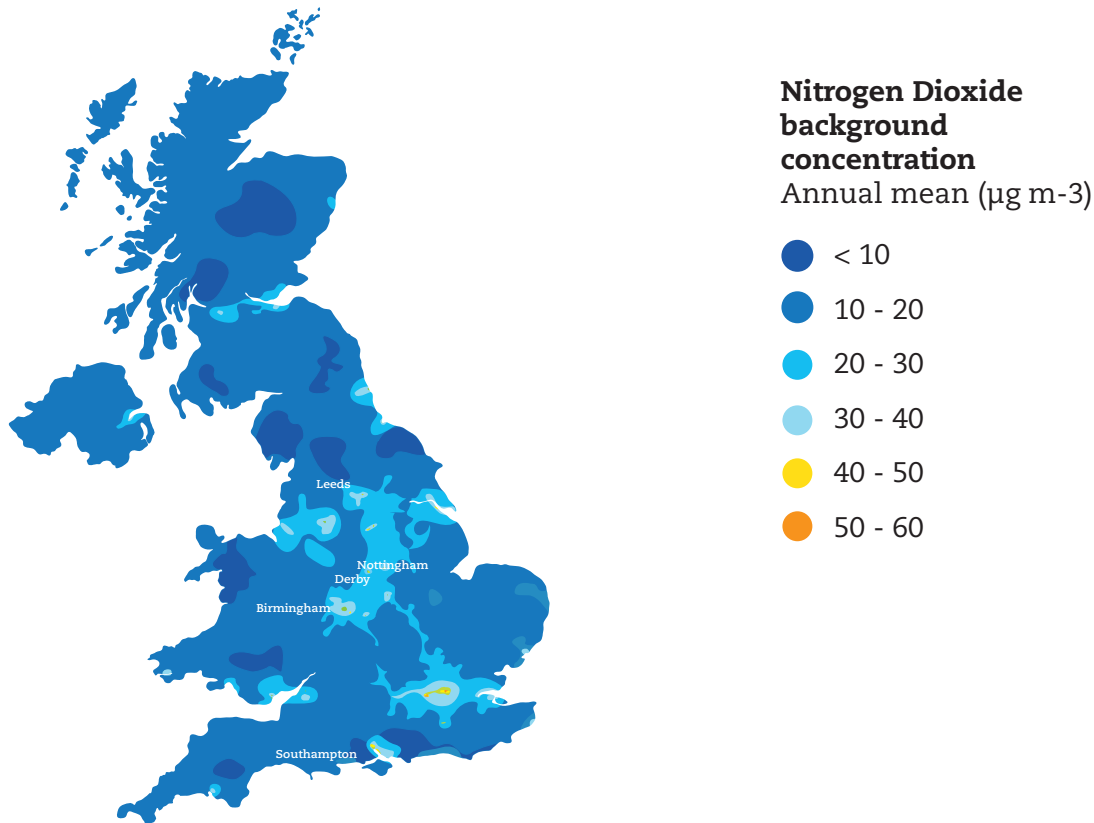
4 This approach takes into account individual's willingness to pay to avoid premature deaths as well as the financial cost of premature mortality: the present value of lifetime earnings. World Bank (2016), The cost of Air Pollution: Strengthening the economic case for action

Reducing roadside NO_x emissions in cities is a priority in the UK⁵

The most immediate action required on poor air quality is tackling NO₂ concentrations around roads, as it is the only statutory limit that the UK currently fails to meet.⁶ Unsurprisingly, the main cause of this is vehicles, with road transport responsible for 80 per cent of NO₂ roadside concentrations and diesel vehicles being the worst offenders, contributing 35 per cent of NO₂ roadside concentrations.⁷

This problem is particularly prevalent in UK cities, as shown in Figure 1. Urban areas are home to 88 per cent of roads which are predicted to have concentrations of NO₂ above legal limits.

Figure 1: UK Ambient Air Quality Interactive Map, NO₂ annual mean concentration



Source: Department for Environment, Food and Rural Affairs

Box 1: The geography of air pollution

Much focus of environmental policy in recent years has been on reducing carbon dioxide emissions. Because carbon emissions contribute to the heating of the globe as a whole, the policy response has mainly been at the national and international levels.

Nitrogen oxide emissions are local – their impacts are felt where the emissions occur. This means that a local policy response is more appropriate in tackling this pollutant.

5 When addressing NO₂ concentrations caused by transport, it is essential to consider emissions of oxides of nitrogen (NO_x). NO_x comprises of primary NO₂ and Nitric Oxide (NO), which is harmless but easily converts to NO₂ in the air.

6 National air quality objectives and European Directive limits for nitrogen dioxide came into force on 1st January 2010

7 DEFRA and DfT, UK plan for tackling roadside nitrogen dioxide concentrations (2017), London: The Stationery Office

The Government's plan to tackle roadside NO₂ emissions mandates local authorities to take action

The UK's first policy intervention on air quality was the introduction of the first Clean Air Act in 1956 in response to the 'Great Smog' that engulfed London in 1952. But it wasn't until the 1990s that local authorities were given responsibility for managing air quality in their areas.

This responsibility was set out in the National Air Quality Strategy (which itself was required as a result of the 1995 Environment Act), published in March 1997. Part IV of the plan requires local authorities to review air quality in their area and designate air quality management areas (AQMAs) where improvements are necessary. An air quality action plan describing the pollution reduction measures must then be put in place.

More recently the Government has mandated a number of areas to improve their air quality. In total, 28 local authorities as well as the Greater London Authority (shown in Figure 3) exceed legal limits of NO₂ (as defined in Box 2). They are required to develop local plans and assessments, and to consider the best options to achieve statutory NO₂ limit values within the shortest possible time. Initial immediate actions plans are expected within eight months and final plans by the end of 2018.

Box 2: NO₂ legal limit values

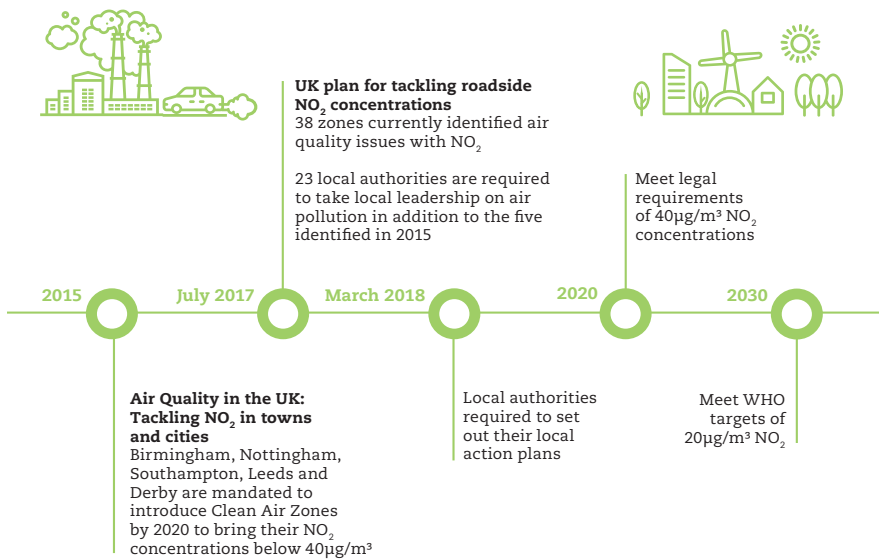
40µg/m³ annual mean concentration

200µg/m³ hourly mean concentration not to be exceeded more than 18 times a year

To help fund delivery of the plans that local authorities produce, the Government made two pots of money available. Last July, it announced £225 million in funding as part of its Clean Air Strategy, and launched an additional £220 million Clean Air Fund at the Autumn Budget, which places can bid for to support improvements in their areas.

Policy options available include Clean Air Zones. A Clean Air Zone defines an area where targeted action is taken to improve air quality and resources are prioritised and coordinated to deliver improved health benefits and support economic growth. Under the 2017 plan, Clean Air Zones were identified as the most effective way of reducing air pollution from roads.

Figure 2: Bringing down emissions - the Government's plan for Clean Air



Source: Defra, Air Quality Plan for NO₂ in the UK

Figure 3: Cities required to take action by the July 2017 plan



Source: Centre for Cities

How can cities respond and solve their local air quality issues?

Ultimately, local policies have to change the behaviour of local firms and residents. There are a variety of approaches and mechanisms cities can use to deliver air quality improvement. These include reducing emissions by promoting public transport, cycling and walking, as well as accelerating the take up of cleaner vehicles.

Box 3: What are UK cities doing?

Cambridge is considering a potential 'Peak time congestion trial'

Consultation on increasing the cost of using city centre car parks during peak hours. Drivers will instead be encouraged to use park-and-ride sites, which will be free to use during these hours.

Leeds is seeking views on emission charge

Consultation on charging HGV and buses (pre-Euro 6 diesel) £100 per day, taxis and private hire vehicles £12.5 per day within the Outer Ring Road, to be introduced by October 2018.

Sheffield has launched its Clean Air Strategy

Main policies include a bus replacement scheme and anti-idling zones in front of schools. The council will consider charging some larger vehicles including buses, coaches and HGVs for operating in any potential clean air zones.

Oxford is consulting on a Zero Emission Zone

Oxford will roll out a ban on petrol and diesel vehicles across different parts of the city centre. But 45 per cent of the consultation responses have called for the zero emission zone to cover a wider area than just the city centre.

Southampton has set up a scheme to offer cashbacks to taxi owners

Southampton offers cashback for taxi owners to help them replace older, more polluting vehicles, funded by Defra's Air Quality Grant.

Case studies

What are other cities doing around the world?

Paris: Restricting vehicle access into the city centre

Paris uses a sticker system assigned to vehicles to restrict vehicle access into the city centre and therefore reduce emissions.

Crit'Air is a six category sticker system that applies to all motor vehicles in the most polluted areas in France to identify what emissions they produce.⁸ The six categories have different colours that denote how heavily polluting the vehicle is according to its Euro emissions standards, ranging from the most polluting vehicles to the least. Paris is operating a permanent scheme which has already excluded vehicles of category 5 from daily traffic. This means that during the working week, only vehicles of categories 1 to 4 can enter central zones of the city. In response to high levels of pollution on a given day, vehicles can be refused entrance to an area based on their Crit'Air sticker. During these periods, the city makes public transport free to encourage people to leave their vehicles at home.

Airparif, the observatory in charge of monitoring air quality estimated that the scheme would result in a 16 per cent reduction of NOx emissions.⁹

New York City: Reducing idling

To reduce unnecessary emissions from idling vehicles parking or stopping, New-York City introduced an anti-idling law in 2009.

Inside areas where the law operates, no one should allow the engine of their motor vehicle to idle for longer than three minutes while parking, waiting or stopping. This is even stricter around schools, where the time allowed is just one minute. The anti-idling fines range from \$100 to \$2000. Anyone can report an idling vehicle other than an authorized emergency vehicle.

Freiburg: Encouraging the use of public transport by restricting car ownership

Freiburg's long term strategy has tackled emissions by reducing car ownership in certain parts of the city.

The city has discouraged car ownership through a range of policies such as forcing cars to be parked in the outskirts, improving public transport and introducing a convenient car sharing system. For example, for large parts of the residential area, the development plan for the suburb of Vauban prohibits the building of parking space on private property. Instead, private cars are parked in a community car park located at the periphery of the residential area, where parking spaces are worth €18,000. In return, the city offers cheaper housing, a reduced price for a public transport monthly ticket and bicycle spaces.

⁸ Introduced by the Minister for the Environment Ségolène Royal in 2015

⁹ Airparif (2016), Etude prospective dans le cadre de la création d'une zone à circulation restreinte à Paris

Over the last three decades, the number of bicycle trips has tripled, public transport ridership doubled and the share of trips by automobile declined from 38 per cent to 32 per cent.¹⁰

In 2002, 39 per cent of Vauban households were registered with a car sharing organisation.¹¹ Over the years, Freiburg has therefore managed to make it more expensive to drive and more convenient and cheaper to take public transport.

Copenhagen: Investing in infrastructure to make cycling easier, faster and safer

The city has set the explicit aim of becoming the world's best cycling city and measures to make cycling easier, faster and safer feature heavily in the local policy agenda.

In Copenhagen, urban planning policies have been designed to reduce the need for private car usage and to promote cycling in the long term. For example, commercial buildings are required to have 0.5 bicycle spaces per employee, and residential developments should have 2.5 bike parking spaces per 100 square metres. The city is also currently building cycling superhighways to reach the suburbs. There are over 469 kilometres of cycle paths and a large part of the city centre is closed to motor vehicles. To support investment in cycling infrastructure, Copenhagen also discourages private car use through a tax increase of up to 150 per cent on new car sales. The tax is discounted for low consumption vehicles to encourage for the purchase of smaller and more efficient cars.

As a result, cycling is the preferred mode of transport in Copenhagen where 41 per cent of all trips by workers and students to and from Copenhagen are made by bike, and 62 per cent of all Copenhageners commute to work and study by bike.¹²

Los Angeles: Reducing congestion by introducing a demand-based parking system

Los Angeles is tackling the problem of cars driving around looking for somewhere to park, therefore producing unnecessary congestion and pollution, by introducing a demand-based parking system that adjusts prices based on real time occupancy data.

The L.A. Express Park system was launched in 2012 and uses sensors to monitor where spaces are full or empty. Drivers can access the data easily on their phone in real time to see which spots are free. The city introduced a dynamic pricing system that raises parking fees in spots where demand is high and cuts them where demand is lower. The smart system came into force with a rise in the number of parking meters from 5,000 to 8,000.

Since the implementation of the Express Park, the average occupancy of parking spaces has increased by more than 15 per cent. After the introduction of the scheme, studies found that city traffic from drivers looking for parking space has fell by as much as 30 per cent¹³.

10 Buehler R and Pucher J (2011), Sustainable Transport in Freiburg: Lessons from Germany's Environmental Capital, International Journal of Sustainable Transportation

11 Foletta N and Field S (2011), Europe's Vibrant New Low Car(bon) Communities, Hamburg: Institute for Transportation and Development Policy Europe

12 Copenhagen City of Cyclists Report (2017), Copenhagen: Cycling Embassy of Denmark

13 Source: LA Express Park, <http://www.laexpresspark.org/>

Milan: Introducing a congestion charge to restrict access to the city centre

Milan is one of five cities around the world to have introduced a congestion charge in its central 'Area C'. This was introduced in January 2012, initially as a pilot programme with objectives to tackle congestion, reduce pollutant emissions and encourage alternative methods of transport.

The €5 charge was implemented in March 2013 from 7.30am to 7.30pm. From 16 October 2017, vehicles entering this area must satisfy a minimum emissions standard, and diesel vehicles must have a particulate filter. Electric vehicles get free access to the zone, and hybrid electric vehicles are exempt from charge until October 2019. The charge offers a significant additional source of income for the city and all net earnings are invested in policies to promote sustainable mobility and to reduce air pollution.

The introduction of a congestion charge in Milan has coincided with falling traffic congestion in the city. In the first six months of 2015, the average number of cars entering the restricted area was 28.6 per cent lower than in the same period in 2011. Most drivers entering the area only entered few times a year. A study estimated that the air pollution reductions resulting from the introduction of Area C translated into an overall net benefit equivalent to \$3 billion.¹⁴

Barcelona: Changing the flow of traffic

Barcelona is aiming to reduce emissions by changing the flow of traffic to allow more cycling and promote pedestrian friendly neighbourhoods.

Barcelona's urban mobility plan explores solutions to solve the issues of air pollution and congestion in the city. The strategy focuses on the idea of 'superblocks', a small neighbourhood created on a local grid around which traffic will flow. In the strategy, higher speed traffic and public transport are confined to the outer roads around the 'block', so that the streets inside the block are dedicated to pedestrian and cycling public space. By removing space for vehicles inside the blocks and increasing space for alternatives, the city hopes to create incentives for people to switch from using cars to walking and cycling in their neighbourhoods.

Barcelona estimates that its urban mobility plan will reduce traffic by 21 per cent in the next two years¹⁵.

¹⁴ Gibson M and Carnovale M (2015), The effects of road pricing on driver behaviour and air pollution, *Journal of Urban Economics*

¹⁵ Source: BCN Ecologia: Agencia d'Ecologia Urbana de Barcelona, <http://www.bcnecologia.net/en/conceptual-model/superblocks>

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