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Air quality

Air pollution remains the single biggest environmental threat to health in the UK, shortening tens of thousands of lives each year [1]. Historically, problems with poor urban air quality were from emissions by road transport and large industry. However, this is often no longer the case because factors including better regulation have led to significant reductions in these emissions [2].

Urban air pollution is a consequence of a complex combination of sources, both those located in urban areas and as well as further afield, including agriculture. Individuals' behaviour can strongly influence local air quality, for example limiting domestic fuel burning [3] and taking low pollution transport options.

The most effective way to improve urban air quality is almost always to reduce emissions at source [4], either by avoiding certain activities or using alternative technologies. There are many ways that urban design can achieve this, during both the construction and operation phases of developments [5]. Localised issues might also be reduced by increasing the distance between pollution sources and sensitive users. This can often be achieved with careful use of features such as green infrastructure, either to shape where people will spend time, or to provide a barrier to the flow of air [6]. Green infrastructure, as well as some commercially available products, can also sometimes remove pollutants from air, but these are unlikely to achieve significant reductions on their own, and might cause emissions of other air pollutants [7, 8]. Careful selection of different plant species is also a primary consideration if performance techniques are to be used to improve urban air quality.

Small changes to urban environments can result in large changes to pollutant concentrations. There is increasing evidence that reducing space for motor vehicles also reduces overall vehicle traffic, often described as ‘traffic evaporation’ [9]. Even if traffic does not reduce, moving roads away from buildings by reducing their size increases source-receptor distance, reducing the concentration of all traffic related pollutants for occupants, particularly NO_2 [Figure 1].

Road space can be replaced with active travel infrastructure to enable a modal shift and greenery or amenities for the community. In the scenario illustrated below, increasing the distance from traffic by approximately 2 metres and assuming road emissions remain the same is estimated to drop the concentration of NO_2 at the building facades from 39.4 to 34.6μg/m^3, a reduction of nearly 14% [10].

The processes which drive poor outdoor air quality are often different from those which control indoor air quality. Given the amount of time that people spend indoors, urban combined with building design considerations can reduce people’s exposure to poor air by including appropriate ventilation, and by minimising indoor emission sources and the ingress of outdoor pollutants [11].

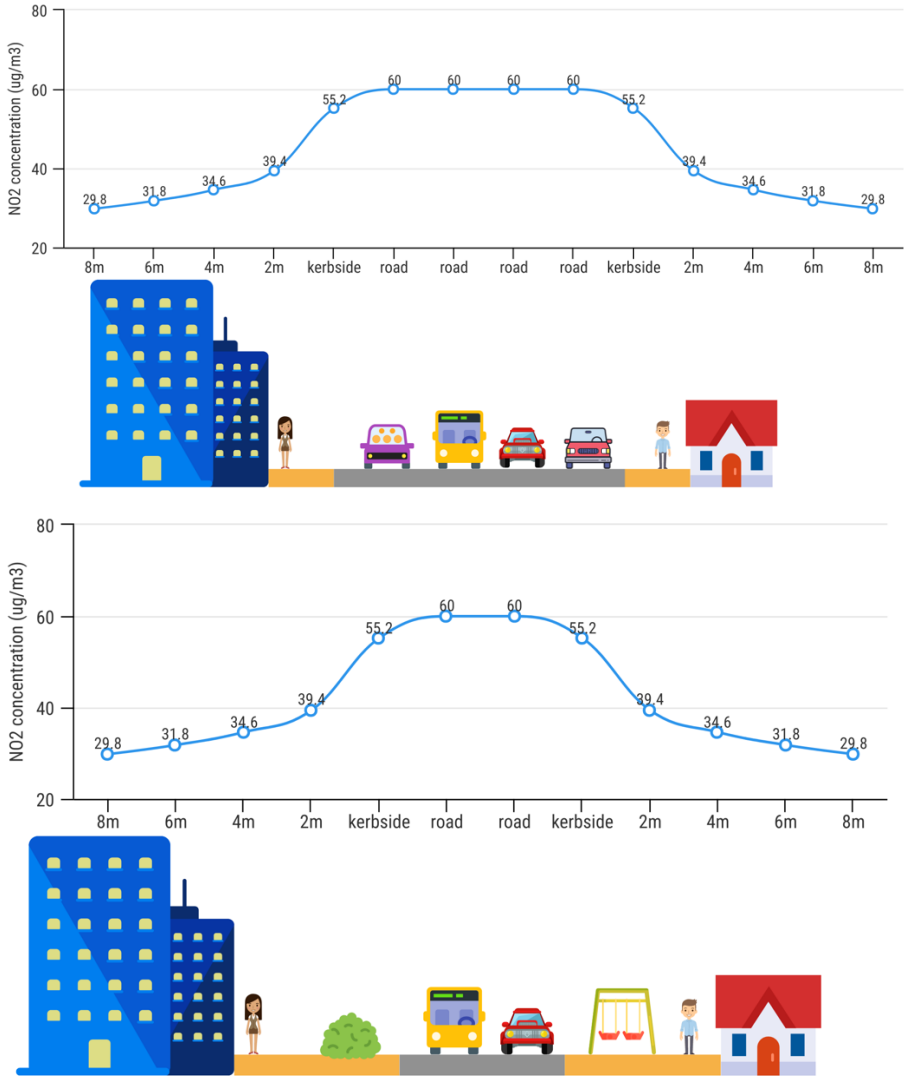

Figure 1: NO_2 concentration at buildings as a function of distance only

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